8-1-1998

Teacher Perception of the Impact of Technology Assistance Teams on Technology Staff Development in the Papillion-La Vista School District

Julie Rae Duerfeldt
University of Nebraska at Omaha

TEACHER PERCEPTIONS OF THE IMPACT OF TECHNOLOGY ASSISTANCE TEAMS ON TECHNOLOGY STAFF DEVELOPMENT IN THE PAPILLION-LA VISTA SCHOOL DISTRICT

A Thesis

Presented to the

Department of Teacher Education

and the

Faculty of the Graduate College

University of Nebraska

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

University of Nebraska at Omaha

by

Julie Rae Duerfeldt

August 1998

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

THESIS ACCEPTANCE

Acceptance for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the degree Master of Arts, University of Nebraska at Omaha.

Committee

Chairperson Raymond A. Gilbert

Date 7-9-98

TEACHER PERCEPTIONS OF THE IMPACT OF TECHNOLOGY ASSISTANCE TEAMS ON TECHNOLOGY STAFF DEVELOPMENT IN THE PAPILLION-LA VISTA SCHOOL DISTRICT

Julie Rae Duerfeldt

University of Nebraska, 1998

Advisor: Dr. Raymond Ziebarth

Technology and staff development in education are important issues in today's educational systems. To help staff be better prepared for the technological age, the Papillion-La Vista School District has integrated Technology Assistance Teams (TAT teams) to help provide technology support for teachers within their buildings. These teams are comprised of 8-12 members depending on building size.

This study was conducted to evaluate if TAT teams are beneficial to the staff at their individual schools in the area of computer-related technology. The research hypothesis for the study states: According to teacher perceptions, Technology Assistance Teams help facilitate technology staff development in the Papillion-La Vista School District. The research hypothesis was further broken down into five research questions.

A one page, 40 item questionnaire was created and distributed to all certified teachers in the district during regularly scheduled staff meetings. The questionnaire was completed on a voluntary, anonymous basis.

Items on the questionnaire were clustered around the five research questions, each of which examined a specific aspect of teacher technology use and TAT activities. Responses were examined from a district-wide perspective, an elementary non-TAT member perspective, and a secondary non-TAT member perspective. In general, the results showed little difference between these three perspectives.

The study revealed that Papillion-La Vista teachers have experience using computers, feel comfortable using computers, and want to increase their computer knowledge. They are also comfortable approaching TAT members, are willing to utilize their services, and perceive TAT teams to be beneficial to their buildings. Areas where TAT teams could improve involve providing more handouts and individual training, making additional efforts to help teachers learn new technological skills, and in assisting teachers to become more proficient and literate in technology.

The overall results of the study suggest that Papillion-La Vista teachers are strong users of technology and TAT members are effective in their efforts to facilitate staff development in the area of technology.

ACKNOWLEDGEMENTS

A special thanks goes to all the teachers in the Papillion-La Vista School District who helped me in completing the questionnaire and providing valuable data for this study and for the district.

Dr. Raymond Ziebarth, the chair of my extraordinary committee, has been the backbone throughout the entire process. He has my sincere appreciation for sharing his wealth of knowledge, demonstrating his commitment to excellence, providing unconditional support, and spending an exceptional amount of time contributing to this study. I could not have done it without him.

Many thanks go to my incredible committee for providing assistance and guidance to help me throughout the thesis process. Dr. Jim Akers, Dr. Verne Haselwood, and Pam Krambeck have been excellent sources of information and provided a plethora of knowledge in which I learned from. A special thanks to Pam for helping me throughout the entire CADRE experience. Your support and guidance was above and beyond the call of duty.

Finally, to my mom and dad who have always been there for me. Thanks for the encouragement, motivational pep talks, love, guidance, and never ending support. I love you both and hope you realize what an important part of my life you are.

TABLE OF CONTENTS

CHARTS

TABLES

Table Page

CHAPTER 1

Introduction

Preface

Computers and technology have created a huge impact on today's society. Over sixteen years ago, in 1982, TIME magazine named the computer its "Man of the Year." In the next decade and a half the computer has become an even greater asset to society. Technology can be found in almost all businesses, universities, hospitals, school systems, and many homes. One computer expert illustrates the trend by estimating that if the automobile business had developed like the computer business, a Rolls-Royce would now cost $2.75 and run three million miles on a gallon of gas (Friedrich, 1983). What if all computers were removed from businesses tomorrow? Most businesses would find it nearly impossible to continue (Peck & Dorricott, 1994).

Not only have computers greatly impacted society, but the educational systems as well. Administrators, teachers and students now have extended access to limitless sources and information through the Internet. Not only does the Internet provide an abundance of information, but it has increased communication, strengthened one's ability as an individual, and enabled students to experience opportunities they would not have had over ten to twenty years ago.

With technology having a great impact on education there is a need for students to acquire technological literacy. Technological tools can foster students' abilities, revolutionize the way they work and think, and give them new access to the world (Peck & Dorricott, 1994). Educational systems in turn, must educate their faculty and staff to provide students with the skills and abilities needed to adapt to a technologically advanced society.

Although computers can be found in almost every public school in the United States, the integration of computer-assisted instruction has been minimal (Waxman & Huang, 1993). Individual school districts need to address this concern and develop a strategy to increase computer-related instruction and assistance. Many factors contribute to the challenge educational systems face to keep pace with rapidly increasing technological

advances including time, commitment, knowledge and the willingness of individuals to change.

Like many school districts across the country, the Papillion-La Vista School District has taken on the challenge of developing a strategy for increasing computer instruction and assistance. The Papillion-La Vista School District is located in an suburban community that includes the cities of Papillion and La Vista; suburbs of Omaha, Nebraska. There are approximately 15,000 people within the city limits of Papillion and 12,000 within the city limits of La Vista. This creates a population of 27,000 for which the Papillion-La Vista School District provides services.

Within the school district there are fourteen schools: ten elementary schools, two junior high schools, one high school, and the Ideal High School for at risk students. These schools provide services to approximately 7,500 students, jobs for 456 certified staff, and employs a total of 802 staff members. Because Papillion is continually growing and the numbers of staff and students is constantly increasing, a plan for professional development for staff members is an important component of the district activities.

The mission statement of the Papillion-La Vista School District states that its role "...is to prepare all students to be productive responsible citizens in a changing society through superior educational programs in a safe and supportive environment." This changing society includes computer-related technology skills; thus, Papillion-La Vista Public Schools must ensure that their teachers are knowledgeable in the area of technology.

The Papillion-La Vista School District has developed Technology Assistance Teams in each of its schools to help bring awareness and peer support to this area. These teams of educators were formed in each of the district's buildings to assist Papillion-La Vista Public Schools in achieving District Wide Target Area Goal #7: The Papillion-La Vista Public Schools will enable students and staff to be more proficient in technology. Technology Assistance Teams are trained to instruct and assist the staff within their respective buildings to become more computer literate. "Developing technology literacy for faculty, staff, and students is critical to a successful technology program" (Hurst, 1994). Technology Assistance Teams (TAT teams) in the Papillion-La Vista School District provide teachers

easy access to support and guidance at the building level when assistance is needed. Having made this commitment, the district needed to assess its effectiveness. As a part of this assessment, this study was designed to determine if TAT teams were succeeding in accomplishing their goals.

Statement of the Problem

According to teacher perceptions, do Technology Assistance Teams in Papillion-La Vista Public Schools help facilitate technology staff development in the Papillion-La Vista School District?

This study is designed to evaluate the TAT teams' proficiency in informing other teachers about computer-related technology in the Papillion-La Vista School District, and assisting them in integrating this technology into the curriculum programs and instructional practices.

Definition of Terms

Certified Teachers

All teachers in the Papillion-La Vista School District in grades kindergarten through twelfth grade who hold a valid Nebraska Teaching Certificate. It excludes administrators, nurses, counselors, speech pathologists and psychiatrists. It also excludes: paraprofessionals, teaching aides, secretaries, cooks, custodians, student teachers, and substitute teachers.

Teacher Perceptions

Attitudes and impressions certified teachers have toward TAT teams, as determined by responses to a researcher designed questionnaire.

Research Hypothesis

"According to teacher perceptions, Technology Assistance Teams help facilitate technology staff development in the Papillion-La Vista School District." It is hypothesized that the overall district perceptions are positive and TAT teams have helped facilitate the understanding of technology by the staff members at their respective buildings. It is also presumed that, with the help of TAT members in their building, teachers feel they are more proficient in using computer-related technologies. This hypothesis can be further

delineated into the following research questions:

1. What is the comfort level and extent of using computers by teachers in Papillion-La Vista School District?
2. Have Technology Assistance Team members' knowledge of computer-related technologies been utilized in Papillion-La Vista Public Schools?
3. Have Technology Assistance Team members facilitated computer-related technology training within their buildings?
4. Do teachers perceive themselves as more proficient and computer literate due to the efforts of the Technology Assistance Teams?
5. Do teachers perceive Technology Assistance Team members' computer-related knowledge as beneficial to their buildings.

Background and Significance of the Problem

Technology training in the education system has been a constant challenge due to many factors including: scarcity of technology knowledgeable individuals, lack of time for proper training, insufficient funds to keep up with changing technological advances, and individual apprehension towards change.

The only way change can be brought about in schools is by investing in teachers: we need to invest time, money, and support in involving them in change (Zeitz, 1995). By reaching teachers with technology knowledge and integration skills, schools can disseminate the information to students as well. Traditionally, schools have attempted to train teachers in computer related areas through inservices, workshops, or training seminars. Yet, as Hurst notes, this is not always during the time frame teachers need it most or times when teachers can retain the information best. "Technology inservices are often held at the beginning of the year, or during times of the year when other items are on teachers' minds. Technology inservices will be far more effective when teachers have access to them as needed" (Hurst, 1994).

On April 1, 1996, Papillion-La Vista School District received an Excellence in Education grant through the Education Innovation Fund. The grant was available through

the efforts of the Nebraska State Lottery Commission which established the Education Innovation Fund. Papillion-La Vista School District submitted their proposal in November, 1995. The grant was approved in January, 1996 and the grant cycle began in April, 1996. This grant helped fund the creation of TAT teams for thirteen of the fourteen schools in the Papillion-La Vista School District. The ideal high school was excluded from this study because it did not exist when grant funding was obtained. In 1997-98, TAT teams were in their second year at Papillion-La Vista School District. Grant funding included training sessions for members of the district's TAT teams that involved 36 hours of training in 1996 and 8 hours of training in 1997.

Administrators were responsible for selecting team members for their schools. Commitment to the TAT team was a two-year commitment. The number of members on the TAT team at each school depended upon the grade level of the school. Each of the ten elementary schools have five-member teams, consisting of the media specialist, one primary instructor, one intermediate instructor, and two additional at-large members who represent a cross-section of staff and have access to input from a wide variety of areas and people with diverse computer abilities. Teams were encouraged to include a novice user to avoid overlooking items which beginning users may find challenging.

The three secondary school TAT teams have 8-10 members. Secondary teams consist of one administrator, the media specialist, and teachers from different subject areas and varying computer abilities. Again, the goal was to obtain a cross section of teachers from all grade levels, subject areas, and computer abilities.

TAT members determine what technology activities or inservice topics are needed in their buildings and offer staff development presentations on the topics selected. They also share the responsibility of facilitating and presenting roles on a voluntary basis, and are available to help with any individual computer-related questions that teachers may encounter.

Purpose of the Study

This study will help the Papillion-La Vista School District to evaluate whether or not Technology Assistance Teams are benefiting the staff at their individual schools in the

area of computer-related technology.

Because TAT teams are relatively new to the Papillion-La Vista School District, it is important to evaluate teachers' perceptions of TAT performance. Information and opinions gathered will provide the district with a solid benchmark of perceptions of current performance and a baseline for continuing research on TAT teams.

Assumptions and Limitations

Assumptions

When completing the questionnaires the respondents answered the items honestly.

Limitations

This study is limited to questionnaire responses of teachers concerning their perceptions of Technology Assistance Teams in the Papillion-La Vista School District. Because the data was collected from voluntary respondents, the study is also limited to the number of respondents who completed the questionnaire. No attempt was made to obtain independent empirical evidence about actual teacher usage of technology in their instructional activities. It should also be noted that the researcher is teaching in the Papillion-La Vista School District.

CHAPTER 2

Literature Review

History of Computers

The information revolution that futurists have long predicted has arrived, bringing with it the promise of dramatic changes in the way people live and work, perhaps even in the way they think; America will never be the same (Friedrich, 1983). This was Friedrich's assumption over 15 years ago, and so far his prediction has been accurate. Technology has come a long way, and is continuing to develop at amazing speeds. Dramatic changes have occurred which allow members of society to do almost anything from the comfort of their own home. With the help of technology, individuals can now sit at their computer and shop, bank, work, visit museums and libraries, read magazines, listen to music, and even pay bills directly from home. Obviously technology has had a tremendous effect in society and will continue to do so as advancements are made.

History Time Line

Where did all of this technology come from? Actually computers have been around for over 50 years, only not in the same fashion that is known today. The following is a condensed time line of important events relating to technology and education over the past 50 years. This is only a selection of a few taken from an extended version of the history of computers time line (Timeline: 50 years.., 1997):

1946 First large-scale general purpose electronic digital computer, the ENIAC, is created at the University of Pennsylvania

1964 The first mouse input device is developed

1967 Texas Instruments invents the electronic hand-held calculator

1968 First demonstration of the keyboard, keypad, and mouse

1970 Intel releases its first microprocessor, the 4004

1971 Email Program to send messages across a distributed network invented

IBM introduces the "memory disk," an 8-inch floppy plastic disk

1973 Ethernet connectivity system invented

Minnesota founds MECC (Minnesota Education Computing Corporation) to provide mainframe computer time-sharing service to education

1975 Microsoft Corporation founded, the company releases a Basic interpreter for MITS' Altair, the first language program for the first personal computer

1976 Apple Computer Company founded

1977 Apple Computer unveils the Apple II, which comes with 4K of standard memory, a keyboard and game paddles, but lacks a monitor

1979 Apple Education Foundation is founded, granting Apple systems to schools for classroom and curriculum integration

1981 Microsoft releases MS-DOS operating system for the IBM PC

1982 Columbia Data Products release the MPC, the first IBM PC clone

1983 TIME Magazine selects the personal computer as "Machine of the Year."

Sony introduces the 3.5-inch floppy disk. Double-sided, double-density, it holds up to 875K unformatted

1986 Apple announces it will build a network of specialty dealers to service the education market. U.S. schools are given the opportunity to trade in old Apple, IBM, Tandy and Commodore PCs for credits toward the purchase of new Apple machines

1989 Compaq introduces the Systempro, its first server PC

1991 The HP Scanjet IIc scanner allows computers to input photographs and other visual images in color

1992 Sprint becomes the first national long distance carrier to provide data transmission based on TCP/IP

1994 Netscape Communications releases Navigator 1.0, which quickly becomes the most popular graphical browser for the World Wide Web

Gateway 2000 sells its first PC powered by Intel's 75MHz Pentium processor

Iomega introduces its Zip drive and Zip disks

1995 Microsoft releases Windows 95. One million copies of the OS are sold through retail channels with in the first four days

Where will technology go from here? The imagination and ideas forming in the minds of the computer experts will pave the way of future technology.

Business and Education Paths to Technology

As the history of computers has shown, computers are continuing to become more powerful and are having an increasing impact on society. These influences and impacts will continue to increase as technology becomes more prevalent, faster, cheaper, and easier to use. As school districts prepare students for life in this environment, it is imperative that

students are given the tools and training for these surroundings.

In an increasingly technological society, computers are an essential tool and exposure to computers in school may help young people gain the computer literacy they will need to function effectively in society (U.S. Department of Commerce, 1995). Broadly speaking, the two major functions of education are to transmit the culture, values and lessons of the past to the current generation, and to prepare our children for the world in which they will live (Molnar, 1997). This world is becoming saturated with technology and this needs to be addressed by schools.

Technology in Businesses and Schools

Businesses have been building electronic highways while education has been creating an electronic dirt road (Peck and Dorricott, 1994). This seems to be the trend that concerns many officials. Technology in the work place is expanding far above and beyond what is offered in our school systems. Budget cuts, lack of training, and not having a solid plan for future integration of technology seem to be key factors that are hindering school systems. Larry Irving, Assistant Secretary of Commerce, has suggested that 60 percent of the jobs available at the turn of the century will require skills currently held by 20 percent of today's work force (Thornburg, 1997). Thornburg also states that this same work force will have to fill technical jobs that have not yet been invented.

Peck and Dorricott identified the top ten reasons for using technology in the educational system which, in turn, will help improve graduates destined for the work force:

1. Students learn and develop at different rates and technology can individualize instruction. Students can move at an appropriate pace in a non threatening environment.
2. Graduates must be proficient at accessing, evaluating, and communicating information. Educational technologies can provoke students to raise searching questions, enter debates, formulate opinion, engage in problem solving and critical thinking, and test their views of reality.
3. Technology can foster an increase in the quantity and quality of students' thinking and writing.

4. Graduates must solve complex problems. Higher-level process skills cannot be "taught" in the traditional sense.
5. Technology can nurture artistic expression.
6. Graduates must be globally aware and able to use resources that exist outside the school.
7. Technology creates opportunities for students to do meaningful work. It can provide a widespread audience for students' work.
8. All students need access to high-level and high-interest courses.
9. Students must feel comfortable with the tools of the Information Age. Computers and other technologies are an increasingly important part of the world in which students live.
10. Schools must increase their productivity and efficiency.

These same assertions have also been mentioned indirectly in many other journals and articles; however, not all literature is quite as positive as Peck and Dorricott. The push to connect schools to the information highway is taking precedence over the issue of content; most of civilization's most important ideas are not on the Internet yet, but they are available in free public libraries (Kay, 1997). Kay brings up the issue that schools are primarily concerned with obtaining technology; specifically focusing on the Internet, with little consideration given to how technology is going to be integrated and used in the educational setting. Kay does not comment negatively about technology, but he does state that more research and planning needs to be completed before technology is distributed into the classrooms. Kay's view stressed that quality and efficiency in using technology is more important than being the first to have technology or have large amounts of it. Not having a specific methodology to integrate technology into the curriculum is causing additional challenges that could be avoided.

Others agree with Kay. Designing for technology begins with a master plan that defines the district's mission and vision and identifies its main objectives.... It should lay the groundwork for future advances and allow for ongoing growth, change, and obsolescence (Cincoski, 1997). Cincoski also supports technology, but strongly believes

in having a concrete plan in effect first.

Technology in Education

Preparing students for the work force is an objective of all educational systems, yet are schools fulfilling their duties? President Clinton has called for a massive federal effort to make computers "as much a part of the classroom as blackboards," and America's teachers seem to support him (Oppenheimer, 1997). Clinton has recognized the need for technology in education, yet an efficient and effective way of training teachers and students has not been provided.

Increased Computer Usage

The percentage of students in grades 1-12 using a computer at school more than doubled between 1984 and 1993, increasing from 31 to 66 percent (U.S. Department of Commerce, 1995). This is a positive figure in the number of computers available to students and teachers in schools. In a recent poll, teachers ranked computer skills as more important than European history, biology, chemistry, and physics (Oppenheimer, 1997). This perception of teachers of the importance of computer skills strongly supports the need for integrating and providing these skills to students. As numbers of computers have increased, the need to train teachers has also increased.

With the number of jobs requiring technological skills increasing, educators now must develop and share these skills with students. Many programs, training sessions, and workshops have been conducted in recent years to determine how to best train teachers and students to benefit from technology.

Electronic Portfolio Assessment

Portfolio assessment is increasing in popularity as a way to assess students. A portfolio, or collection of samples of student work that demonstrates student progress, is often used in K-12 classes. Electronic versions of portfolios can also be used in the classroom. Computer technology can assist educators in the management, storage, and retrieval of data and artifacts using a portfolio system, thereby eliminating excessive paper, cumbersome video, and audiotapes, and allowing students to keep original copies of their work (Hunter, Bagley, & Bagley, 1993). This is yet another useful and productive way to

integrate technology in the classroom.

Virtual High School

In Massachusetts, public schools are taking technology one step further. With the assistance of a five-year U.S. Department of Education Technology Innovation Challenge Grant, the Hudson Public Schools, the Concord Consortium Educational Technology Lab, and 30 collaborating high schools across the nation have begun a bold and far-reaching experiment to realize this potential through the development of a virtual high school over the Internet (Berman & Tinker, 1997). Not only are they taking advantage of the technology at their individual schools, but they are taking advantage of the technology of schools all over the district to enhance the offerings of courses for high school classes. In September, 1997 Virtual High School teachers began offering 29 courses to more than 550 students from 27 high schools (Berman & Tinker, 1997). Berman and Tinker identified four ways by which this program benefits all who participated: 1) expansion of course offerings, 2) provisions for technology-rich instruction, 3) brings unprecedented resources to schools, and 4) enhancement of teacher skills in technology that can extend to their regular classroom instruction.

Effects on Student Achievement

One pilot program in Australia, The Laptop Program, showed increased student achievement and motivation when all students were provided with personal laptops (Gottfried & Gilliland-McFeely, 1997-8). Many other studies have produced results indicating that technology can increase student achievement and effort.

Some professionals agree technology may increase student achievement, but not necessarily because of increased motivation, higher level processing skills, and proficiency in accessing information. An expert in developmental education, performed a meta-analysis of 500 individual studies examining the effects of computer-aided or computer based instruction. He concluded that students usually learn more in classes in which they receive computer-based instruction and often learn their lessons in less time with computer-based instruction (Skinner, 1997). When reviewing this study, Skinner noted that this research was completed in the 1980's. During that time period, computer abilities were far

more limited than they are today and emphasized the use of basic drill and practice programs that promoted "rote" learning. In other words, anything that is repeated over and over again is retained because of habit, not necessarily indicating that students understand the information. There are two sides to this study, and both have merit.

Most people agree that technology is good for education; however, some also believe that education systems are late in their technology efforts. In March of 1996, an IBM executive smugly told Education Week that "education is the only industry still debating whether technology is a good idea;" the implication was obvious: schools are behind the times (Skinner, 1997).

Most experts are positive about the effects technology can have on education, but are concerned about the approach education is taking toward technology. In particular, they question whether educators are able to prepare students adequately for the work force. This, in turn, leads to the issues of teacher training.

Training and Development

Training and development is an important factor not only in education, but in the business and industrial world as well. Ironically, business and industry seem to recognize the potential and value of human development more than public education. One indication of this is the budget available for training--about 5 percent or more of annual expenditure in some companies, on the other hand, public education seldom allocates more than 1-2 percent of its total expenditure to training and development (Killion & Lanzerotte, 1992).

Business and education also differ in the amount of on-the-job training available to, and expected of employees (Killion & Lanzerotte, 1992). Creating a model of continuous learning is beneficial for educators as well as for students who will, in turn, be better able to adapt to their future.

It takes an untrained practitioner, user, or developer three to six times as long to accomplish the amount of work done by the trained worker... That means that 12 hours of formal training can equate to as much as 72 hours of self-training (Ryan, 1995). This statistic begins to demonstrate the importance of training. In the long run, more can be accomplished if time is taken for proper training.

Training Staff

Businesses have varying philosophies on the most efficient way to train employees. According to Ellen Hersch, senior analyst in information technology training and education services research at International Data Corporation, "When business require complex training, some companies adopt a mentoring program; while it's not exactly a new concept, companies are using mentors to train a few key people who will then train other people in their organization" (Ryan, 1995). This is similar to the trainer of trainers model that many school systems are implementing. This model has proven to be economical; however, limited by the amount of time it takes to train all those who need or would like the training.

Many schools are discovering that traditional models of staff development--particularly one-time inservice training for the entire faculty--are ineffective for teaching computer use and for helping teachers develop methods to use computers as instructional tools (Benson, 1997). Technology takes time and patience to learn and understand. Inservices often are voluntary and are limited in the length of time available for teacher to experiment and ask questions.

When to Implement Training

Teacher training today occurs after hours, on weekends, or in the summer. It is inconsistent that the very organization that values learning for its clients does not hold the same values of learning for its employees as a strategy to achieve success (Killion & Lanzerotte, 1992). Businesses view training as a natural part of the work day and provide the time and resources to make it available to employees. If businesses do that, should not educational systems also provide time and resources for training to teachers? Teachers have reported that their inservice training in technology has been positive, but too short and infrequent (Hurst, 1994). Teachers have repeatedly indicated that inservice training is not meeting their needs.

Other Factors

A study of Industrial Technology projects has found that success depends more on people-related components, such as training, than on the technology itself (Kolbasuk-McGee, 1997). Although technology is wonderful, it does not mean just because a

company or school has the biggest, fastest, and most expensive equipment that the organization will produce the best outcome. What educators know and can pass on to students is more important than the physical equipment.

Reduction in funding for public education has even eliminated staff development in some school districts; evidence from Illinois, Colorado, and New York among other states confirms this recent trend (Killion & Lanzerotte, 1992). When budgets are reduced, it is necessary to cut back in many areas. Distributing the effects of budget cuts can be more beneficial than completely cutting staff development. If training is too late, users often have already [psychologically] rejected the technology (Kolbasuk-McGee, 1997). It is important to recognize this need and assure administrators and teachers that a complete understanding will be provided before any outcomes are expected.

Training managers and consultants agree that a close relationship with top management can only help efforts to keep training aligned with corporate objectives and secure funding (Barron, 1996). This is a similar philosophy that most trainers in education have in relation to principals and administration. The most successful programs reported were those that involved both teachers and principals in the planning (Hurst, 1994). When teachers and administration work together the outcome is greater. Both parties have the opportunity to express needs and recognize what is best for the district, faculty, and students.

Another factor that must be considered is the amount of time dedicated in planning for training and technology integration. In the long run, for technology to succeed, as much time and money must be invested in teachers as is invested in the actual hardware and software (Investing in teachers..., 1998). Computers often do not live up to expectations because no one shows teachers how to integrate their new technology into their instruction or, into their students' learning process (Caverly, Mandeville, & Peterson, 1997). Computers are a key to accessing resources, information, people, places, and opportunities. This key can collect dust on the teacher's desk, or it can open the door and provide resources for the entire class.

As American education begins to move toward a new model of school, the

education of teachers must undergo a fundamental shift toward a model that treats the lifelong education of teachers with the same importance as the education of students (Investing in teachers..., 1998). This parallels the same concern of recognizing today's changing society. If education is expected to meet the needs of society, schools must first meet the needs of teachers.

Technology Staff Development

The mission of professional development is to prepare and support educators to help all students achieve high standards of learning and development (Building bridges.., 1996). Staff development is a key component to maintaining a productive, effective, and resourceful educational system in the U.S. Although many elements are included in quality education, staff development is the current focus.

Key Elements

There are hundreds, probably thousands of articles that specify what is needed to create a staff development program which best benefits all those involved. School administrators can create an environment in which new and experienced teachers receive the support they need by providing the following: 1) administrative support, 2) staff development, 3) availability of technology, 4) technology use plan, 5) technology coordinator, 6) facilities and maintenance, 7) assessment, and 8) broad participation (Hoffman, 1997).

Children are accessing computers starting at the ages of two or three. Some teachers, who are responsible for educating these students, lack even primary computer knowledge. The gap between what many students know and what teachers know technologically, is widening, and not in favor of the teacher. Many current educators completed their professional training before the technological age in education, and are now expected to use technology they find intimidating and with which they may be unfamiliar (Armstrong, Davis, & Young, 1996). Teachers need to be provided with technology training and to gain expertise sharing their knowledge with students, instead of relying on their students for this computer knowledge.

Inservice Programs

A quality technology inservice program must be maintained through constant evaluation. This can range from a suggestion box to a formal survey measuring teachers' responses to inservice activities (Hurst, 1994). Staff development processes were typically on-going and open for suggestions, comments, and questions. Informal surveys and evaluation forms questioning how teachers felt training was progressing, what should be changed, and what topics need to be covered were typical questions.

Collaboration

Research about technology staff development refers to the positive effect of a partnership with higher education organizations such as a university or community college. University inservice teacher training provides teachers with greater comfort in using computers, an increase in the desire to use computers and an understanding of how to integrate software into the classroom curriculum (Report on the effectiveness of technology..., 1998). Within these collaborative efforts, colleges and universities offered technology classes to teachers and in turn, had faculty and students majoring in education work with and observe classes. This is a win-win situation which creates a community of learners.

Only 13 percent of public schools mandate technology-related training for teachers (Salpeter, 1998). Educational technologies are not self-implementing, and they do not replace the teacher.... Investments in technology cannot be fully effective unless teachers receive training and support (Chin & Hortin, 1993-4). Professional growth is limited by the fact that training is either minimal or null. Numerous studies have shown that the more frequently teachers use technology, the more they feel confident and comfortable in using technology for teaching and classroom management, and the more likely they are to actively engage themselves in all kinds of educational projects.

According to a national survey conducted by Electronic Learning Magazine, despite the lip service about the importance of technology staff development, 28 percent of schools spend not one penny on it; on average, staff development makes up only 8 percent of technology budgets (Lee, 1996). This suggests that schools need to reevaluate the spending process and determine if training needs are being met in the schools. If not,

adjustments need to be made to further facilitate necessary training.

Professional Development Models

There are many options from which to choose when selecting a professional technology development model to integrate into a school system. All of the research points to continuous support from administration, positive attitudes toward technology, semi-flexible budgets, and set goals as key elements.

Trainers of Trainers

The trainer of trainers model has excellent potential to impact the greatest number of teachers at school sites, but this impact may be weakened without ongoing support and follow-up for the trainers (Lee, 1996). The trainer of trainers model is one in which a set of trainers learn the material, then train others in their building or district. Many trainer of trainers models collaborate with colleges or universities to obtain initial training. Others have experts come to the district or have experts within the district, supply training.

New Braunfels Independent School District of Texas represents one way of implementing the trainer of trainers model. In this particular model, teachers learn technology from an instructionally strong first generation of teachers, practice what they have learned, and pass on their expertise to a second generation of teachers, who pass it on to a third (Caverly, Mandeville, & Peterson, 1997). In collaboration with Southwest Texas State University's education department, principal-selected, instructionally strong teachers attended a three-week technology institute. One day a month teachers were released from their classroom duties to create and integrate technology into interdisciplinary units and to visit teachers to answer questions and help them extend their knowledge (Caverly, Mandeville, & Peterson, 1997). There were also bimonthly meetings related to technology in the school. After the first year, each first-generation teacher mentored two second-generation teachers to pass on what they knew and have learned. Positive results occurred. Teachers began to take responsibility for their professional development, and, most importantly, teachers' notions of teaching, learning, and technology changed (Caverly, Mandeville, & Peterson, 1997).

Collaboration with higher educational systems was used in Westfield Washington

Schools, Westfield, Indiana. The initial step was to create enthusiasm for technology throughout the district. A pilot program was developed and 18 staff members received five days of training at Ball State University in an area of technology that would be available in Westfield after equipment was installed (Cooley, 1997). When the 18 staff members returned, they demonstrated to other staff how technology can energize teaching. Education Technology Teams (ET teams) were formed that consisted of teachers, parents, students, the media specialist, the building principal, the director of technology, and other staff. Team selection is critical because faculty and staff must have credibility with their peers, possess good communication skills, and volunteer the extra time needed for ET team activities (Cooley, 1997).

The California Technology Project (1991) suggests that staff development must be a continuous process and be available to educators at the local site.... Teacher leaders at each local site were provided with in-depth training in integrating technology with specific content areas (Wiburg, 1994). These teachers then taught other teachers about the hardware, software, and strategies that had been shared.

The Fort Worth Independent School District came up with a professional development model titled The Four T's. In this initiative to improve technology knowledge, the four T's refer to in Time, Training, Technology and Teacher-type Tasks (Shelton & Jones, 1996). In this model initially trained teachers received 65 hours of staff development and agreed to provide 36 hours of training to other teachers in the school district during the next school year.

Computer Assisted Teacher Talk (CATT) began in Valley Integrated School, Grand Falls, Windsor, Canada during the 1993-94 school year. CATT is the district's technology plan to integrate technology into the classroom, by introducing or reintroducing technology to the teachers. Technology training in the past was an isolated event and without ongoing support; the results were minimal. Teachers applied to be a member of CATT. Interviews were conducted to select two teacher from each of the eleven schools in the district. These teachers attended a one-week summer institute. Once the school year began, participants and facilitators met Tuesday evenings every week. Training was so successful that one of

the district's schools financed a mini-CATT at the school level. In this instance the two participants from a previous year facilited weekly sessions with the entire staff (Armstrong, Davis, & Young, 1996). This model is similar to others in that a select few from each building were trained. However, the emphasis to share the information learned with others in the building was not emphasized in this approach.

Greenwood School District 50 in Greenwood, South Carolina, provides yet another model of training trainers, entitled peer coaching. This model involves training teachers who really enjoy applying the technology in appropriate ways, and sharing the products of their efforts with other teachers (West, 1994). Teachers strong in technology provide the coaching for those with less technology skills.

The mentoring model is another variation of the trainer of trainers model. The Computer Mentor Program is a collaborative effort between a university and school district. It was developed and evaluated as a model for staff development in the effective use of computers and is based on successful mentoring model for beginning teachers (MacArthur, 1995). The project included 59 mentors and 154 protegees in 24 different schools. The overall structure of the program included a course for mentors and a workshop for their proteges (MacArthur, 1995). Mentors and protegees worked together for support and encouragement. The protegees always had someone to turn to with problems, questions, and ideas.

<u>One Person Empowerment</u>

Pearson gives a strong supporting argument for enabling one person at each building to help with all questions and concerns immediately. The essential link for empowering teachers with the ability to make effective use of technology is someone in every school dedicated full time to technology (Pearson, 1994). Being constantly available to troubleshoot, handhold and advise as the needs arise, an atmosphere is created where technology support is rock solid and always available (Pearson, 1994).

Providing teachers with education, encouragement, incentives, curriculum materials, and on-the-job support will not make it happen for a teacher who is trying to carry on the daily load of a full classroom teaching schedule--there just is not enough time

(Pearson, 1994).

Training on Demand

Training on demand is very similar to the one person empowerment model but has a different title. The training-on-demand model has worked well for Ralls, Texas, which has just concluded its second year of implementation. First, a curriculum director who had a strong foundation in instructional technology and curricular reform was hired. The staff development model is based on a three-component approach that includes: 1) whole group instruction, 2) written procedures, 3) one-on-one or small-group sessions. All staff members are provided with the first two training components (Boyd, 1997). Ralls Independent School District had several recommendations for those interested in replicating this model. Training-On-Demand trainers should be scholarly, life-long learners, not have other teaching duties, and have a set of clearly defined technology goals for the district (Boyd, 1997).

Inservices

Most districts provide inservices for distribution of educational information. In the version of this model used at Noblesville Schools, in Noblesville, Indiana, technology committees created goals and provided inservice for staff to learn the technology information. Once district standards were created, building and district technology committees were relied upon to relay the goals and the expectations to the rest of the faculty (Costello, 1997).

The technology inservice program for McNairy Central High School in Selmer, Tennessee uses a similar model. Teachers trained one another in short sessions throughout the year using modules they had developed (Hurst, 1994).

A combination of one person empowerment, peer support, and inservices was the model used by the Totino-Grace High School, Fridley, Minnesota. Seven computer illiterate faculty members were invited to create a technology project with their classes. This sparked interest with other faculty and a consortium sponsored by Apple Computer started between Apple, the University of Minnesota, and Totino-Grace High School. Teachers became excited and were invited to attend after-school inservice opportunities.

Inservices are offered on a regular basis and peer support was a key ingredient. One teacher was given a half-time position as a lab coordinator (Paul, 1994).

Workshop Series

The Malcolm Price Laboratory School in Cedar Falls, Iowa, examined the staff development process and decided to provide a semester-long, weekly series of technology workshops. A questionnaire was completed by faculty and staff to determine what topics should be included in the workshop series. Through this means a list of 13 topics was created. These voluntary workshops were presented by a variety of presenters during morning and after school hours. Overall, an excellent response was received.

Conclusion

There is a wide variety of information about technology in education, training, staff development, and models of technology professional development which schools continue to utilize. While some descriptions were positive, others raised questions that need to be answered within individual school systems. Teacher training in the use of technology has been limited in many school districts and there are many issues to consider for staff development. Teachers want to know more about technology, but the lack of time, support, and proper training methods are all major limitations to their professional growth in this area. There are many models of staff development that schools can evaluate. While trainer of trainers model is the most common, all models have had positive results in their individual districts. One thing is obvious, there is much to consider when looking at how to effectively integrate technology into a school system.

CHAPTER 3

Study Procedures

Research Design

This study was a cross sectional survey of all certified teachers employed in the Papillion-La Vista School District during the 1997-98 school year. It was designed to gather quantitative input from these teachers concerning their perceptions of the Technology Assistance Teams effort to facilitate technology staff development within the schools. A researcher-designed questionnaire was used to obtain the data for the study.

Instrumentation

The instrument used in this research project consisted of one questionnaire which was distributed to all certified teachers to evaluate their perceptions of TAT teams. (Appendix A) It was created by the researcher with input from many experts in the area of technology and questionnaire design.

Preliminary discussions with experts in the field of questionnaire development during the fall of 1997 led to the creation of a one page, 40-item questionnaire. Existing questionnaires, related texts, and articles also served as sources for a foundation of understanding of the questionnaire development. Throughout the process of creating the questionnaire, the district computer coordinator added suggestions and ideas which would assist the district in effectively evaluating the Technology Assistance Teams in areas that were beyond the scope of this study.

In February, 1998, a draft of the questionnaire was distributed at a meeting of Omaha-area technology specialists. Their suggestions were incorporated into the questionnaire where appropriate.

The questionnaire was also reviewed by the assistant superintendent, three principals, two assistant principals, a high school English teacher, and the TAT team leader at a junior high; all employees of Papillion-La Vista School District.

Finally, in March, 1998, eight certified teachers served as a sample group. They completed the questionnaire and supplied the researcher with comments and suggestions for improving the questionnaire. All of this input was synthesized into the final instrument

that was used to gather data.

The questionnaire was designed to determine perceptions of the Technology Assistance Teams' effort in facilitating technology staff development within Papillion-La Vista schools. It consisted of statements about teacher use of technology, the interaction with TAT teams, and opinions about TAT team effectiveness. Almost all items asked teachers to choose from among several possible responses. The responses ranged from factual information to how strongly they agreed or disagreed with statements concerning the TAT teams.

The questionnaire was printed on the front and back of a single sheet of paper. These pages also included "bubbles" which teachers filled in to indicate their desired answer. Directions were printed on the top of the front page, with twenty questions on one side and twenty more questions on the second side. It required the respondents approximately seven to ten minutes to complete the questionnaire.

Each question on the questionnaire was directed toward one of the five Research Questions that guided the study.

1) Personal ability with computers, time spent using computers, and comfort level with computers
2) Utilizing Technology Assistance Team members' knowledge and comfort utilizing their knowledge
3) Technology Assistance Team facilitating training in their perspective buildings
4) Staff within their perspective building becoming more proficient and computer literate due to the help of Technology Assistance Teams
5) Overall perception of Technology Assistance Teams as being beneficial

These five research questions and the related questionnaire items are shown in Table 3.1.

Setting and Subjects

Questionnaires were administered to the entire certified teaching population in the Papillion-La Vista School District. All certified teachers, grades K-12, in thirteen of the fourteen school buildings that comprise the Papillion-La Vista School District served as

Table 3.1

Five Research Questions Grouped with Related Questionnaire Items

5 Research Questions	Questionnaire Items
1) Respondent's perceptions about personal ability with computers, time spent using computers, and comfort level with computers	7, 8, 9, 12 24, 25, 38
2) Respondent's perceptions about utilizing Technology Assistance Team members' knowledge and comfort utilizing their knowledge	17/18, 19, 26, 36
3) Respondent's perceptions about Technology Assistance Team facilitating training in their perspective buildings	20, 27, 28, 30
4) Respondent's perceptions about staff within their perspective building becoming more proficient and computer literate due to the help of Technology Assistance Teams	29, 31, 32 34, 37
5) Respondent's perceptions about overall perception of Technology Assistance Teams as being beneficial.	33, 35, 40

Note. The following questionnaire items pertain to demographics of those who responded to the questionnaire, but are not relative to the five research questions: 1, 2, 3, 4, 5, 6

potential subjects for the study. A total of 470 certified staff members were asked to voluntarily complete the questionnaire. A total of 406 questionnaires were completed and returned for a district wide completion percentage of 86.38 percent. Table 3.2 provides a listing of the thirteen schools in the district that were involved in the study, the

Table 3.2

Percentage Rate of Completed Questionnaires

	Number of Teachers	Number of Questionnaires Completed	Percent Returned
Papillion-La Vista High School	81	74	91.36
La Vista Junior High School	49	44	89.80
Papillion Junior High School	56	49	87.50
Anderson Grove Elementary School	19	16	84.21
Carriage Hill Elementary School	27	22	81.48
G. Stanley Hall Elementary School	31	27	87.10
Golden Hills Elementary School	27	22	81.48
Hickory Hills Elementary School	33	24	72.73
La Vista West Elementary School	27	22	81.48
Parkview Heights Elementary School	29	26	89.66
Rumsey Station Elementary School	35	26	74.29
Tara Heights Elementary School	29	29	100.00
Trumble Park Elementary School	27	25	92.59

number of certified teachers at each building, the number of questionnaires completed at each building, and the percentage of questionnaires completed at each building.

When all thirteen schools' percent returned is averaged, it equals 85.68 percent. When compared to the average percent returned rate figured by total of certified staff members and the number of staff members who completed the questionnaire from above, there is a difference of 0.70 percent. The difference is due to the fact that seventeen teachers were counted more than once in the total number of teachers in each building. These teachers travel between two different schools and could have been counted twice in the number of teachers column.

Methodology

The questionnaires were administered at all thirteen of the schools between March

19 and May 7, 1998. Each building administrator was contacted to discuss the research project, the questionnaire, and to schedule a set time to visit the building during an all staff meeting to explain and distribute the instrument.

During these staff meetings, either the researcher; Pam Krambeck, Papillion-La Vista's Computer Curriculum Coordinator; or the building principal administered the questionnaire and was present to answer any questions that teachers had. A cover letter (Appendix B) explaining the questionnaire was also distributed when administrators administered the questionnaire.

To ensure that each certified teacher had the opportunity to complete a questionnaire the following steps were taken. A complete list of the current year's certified staff at each building was obtained. While at the building, the researcher marked off those who were present when the questionnaire was distributed. Additional questionnaires were left with the principal and were delivered to the mailboxes of those who did not attend the staff meeting. Those not present were asked to complete the questionnaire and return it to the researcher with their school name in the designated area. Individual names were not requested.

Directions were given verbally to the entire group in addition to the printed instructions on the cover letter. At the conclusion of the staff meeting, the questionnaire was collected anonymously and returned to the researcher for data tabulation. The name of the school was written on the questionnaire, but no individual names were included.

Data Collection

Questionnaires were picked up immediately after staff members completed the questionnaire. Once the questionnaires were collected, data was compiled, analyzed, and interpreted.

Completed response forms were computer scanned by the Computing and Data Communications Center at the University of Nebraska-Omaha. This produced a text file of the data that was then imported into a FileMaker Pro Database. This database, in turn, was used to analyze and summarize the data. The results of this summarization and analysis are described in Chapter 4.

CHAPTER 4

Data Analysis

Introduction

With 406 questionnaires returned there was a plethora of data to be analyzed. In analyzing the data, responses to individual questions were examined and responses to combinations of questions were compared to help answer the five research questions. The five research questions, in turn, are the primary basis for determining if the research hypothesis -- According to teacher perceptions, do Technology Assistance Teams in Papillion-La Vista Public Schools help facilitate technology staff development in the Papillion-La Vista School District -- should be accepted. The responses from the questionnaire will be viewed from three perspectives.

The first perspective is of all 406 teachers in the district who responded by completing the questionnaire. This includes both TAT members and non-TAT members in Kindergarten through twelfth grade and from all thirteen schools that participated in the study.

The second perspective is of all 186 elementary teachers who are not TAT members, and teach Kindergarten through sixth grade in the ten elementary schools in the district.

The final perspective is of all 143 secondary teachers who are not TAT members, and teach seventh through twelfth grade at both junior high schools and at the senior high school.

When viewing the results of the questionnaire analysis, several points should be kept in mind:

1) The last two perspectives are from elementary and secondary teachers who are not TAT members. This was done to eliminate the impact of a possible bias of TAT team members.

2) Eighteen of the items on the questionnaire asked respondents to select from the following five responses: strongly agree, agree, undecided, disagree, and strongly disagree. Throughout this chapter, those responses have been grouped into three

categories: a) agree/strongly agree, b) undecided, and c) disagree/strongly disagree. The charts that display the data relating to these eighteen items reflect this categorization.

3) Results in the text are stated in percentages. These values represent the percent of those who responded to the question. Since not every teacher who completed a questionnaire responded to each item on the instrument, the actual "N" for each item may differ slightly from the district-wide, elementary, and secondary totals of 406, 186, and 143 respectively as given earlier. In every case the chart shows the actual number who responded to that item.

4) Percentages in the text and in the charts may not total exactly 100 percent due to rounding.

5) Finally, a level of 80 percent or greater in agree/strongly agree category was used as the successful target percent to evaluate each of the individual questionnaire items, which in turn, answer the five research questions.

Research Question One: Ability and Comfort Level of Teachers

The first research question asks: What is the comfort level and personal ability of using computers of certified teachers in Papillion-La Vista School District? Although this question is not directly related to the effects TAT teams have on technology staff development, it does set a foundation about how staff members feel toward using technology. This research question can be analyzed by evaluating responses to seven items on the questionnaire.

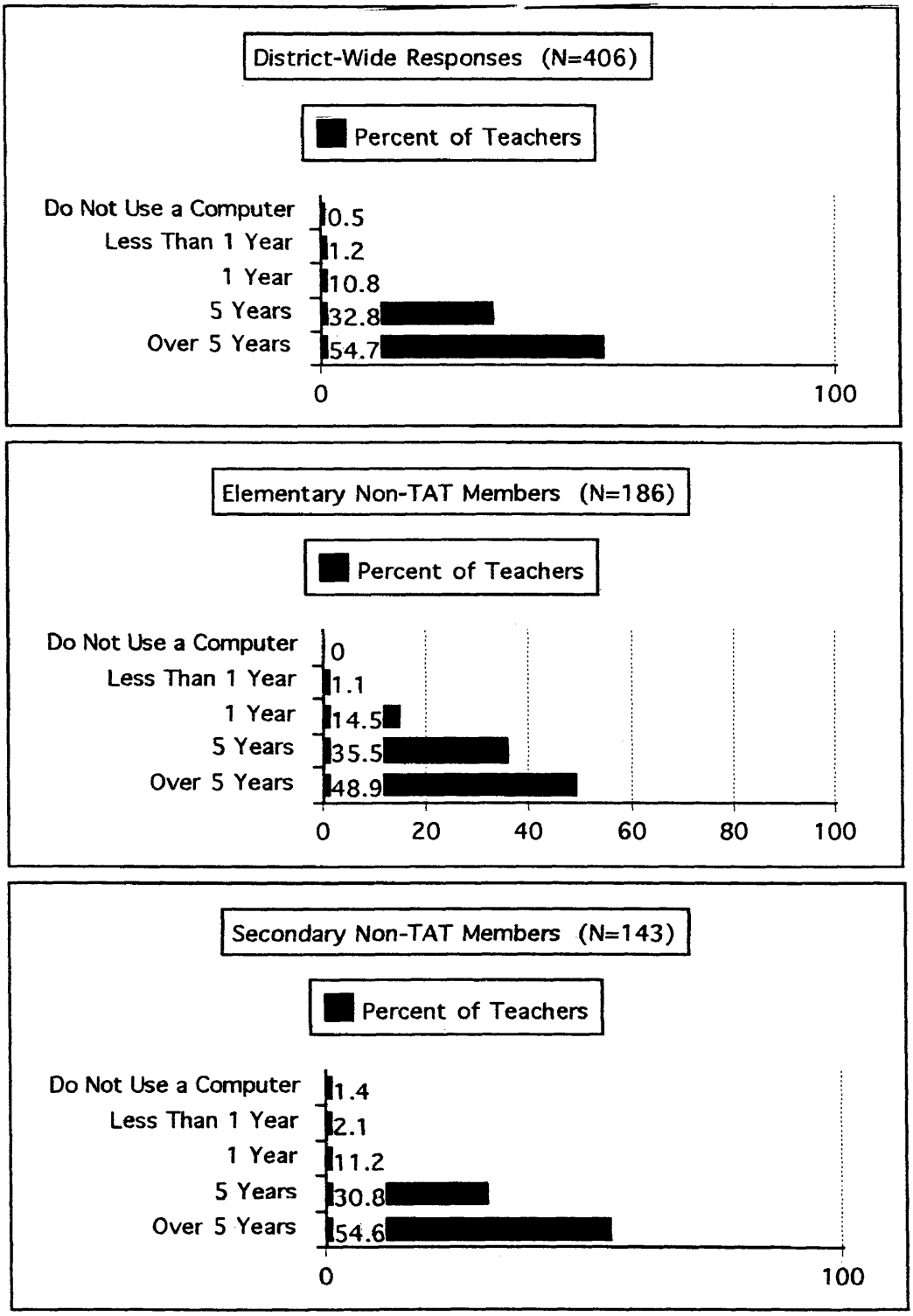
Computer Use (Item 7)

The first questionnaire item analyzed is item seven which asks: How many years have you been using a computer? The number of years teachers have been using computers can have an impact on how comfortable they are with using a computer. Chart 4.1 shows the responses for the entire staff, elementary non-TAT members, and secondary non-TAT members.

District-wide results indicate that 54.7 percent of teachers have used a computer for over five years, while another 32.8 percent have used a computer five years. In addition, 10.8 percent of the teachers have used a computer for one year, 1.2 percent for less than

Chart 4.1

Computer Use (Item 7)



one year, and 0.5 percent do not use a computer.

Responses show that 48.9 percent of elementary teachers have used a computer for over five years, 35.5 percent have used a computer five years, also, 14.5 percent for one year, and 1.1 percent for less than one year.

Results for the secondary teachers are very similar. Over 54 percent (54.6) of teachers have used a computer for over five years, while another 30.8 percent had used a computer five years. In addition, 11.2 percent of the teachers have used a computer for one year, 2.1 percent for less than one year, and 1.4 percent do not use a computer.

Overall the data indicates that over 87 percent of teachers within the district have been using a computer for five or more years. When the data was analyzed by level and the TAT members were excluded, elementary and secondary results were 84.4 percent and 85.3 percent, respectively. These percents are very high, and show an impressive number of years in which teachers have used computers. In conclusion, it is encouraging that over 80 percent of teachers have had five or more years of experience with computers. The next item analyzed focused on how teachers perceive their ability using a computer.

Computer Ability (Item 8)

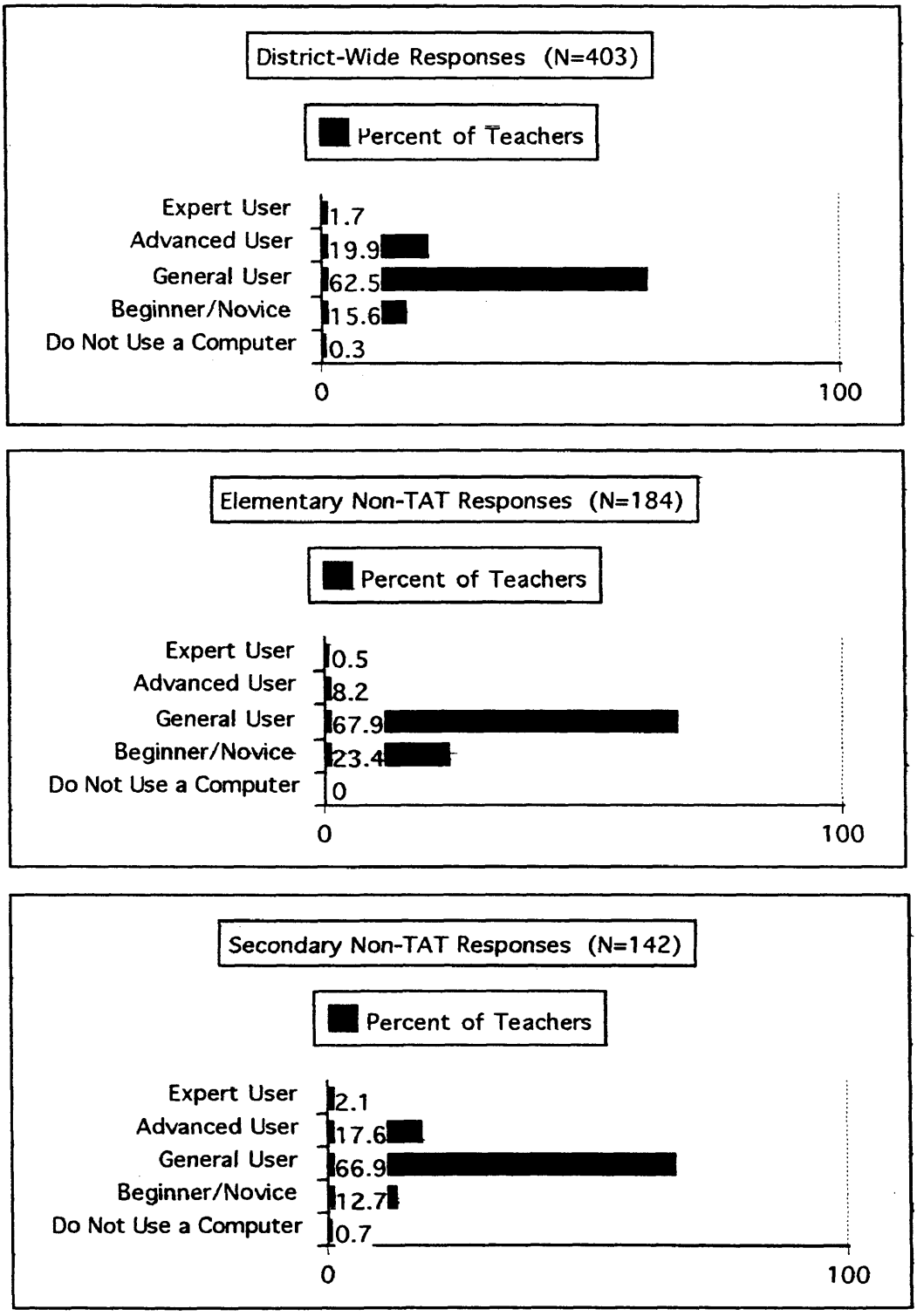
Questionnaire item number eight asks: What level would you rate yourself as a computer user? Respondents could select one of the following responses: expert user, advanced, general, beginner/novice, and do not use a computer. Responses to this question provide an understanding of how each individual feels about his or her personal computer ability. Chart 4.2 shows the responses for the entire staff, elementary non-TAT members, and secondary non-TAT members.

According to the data shown in these three charts, the majority of the district's teachers (62.5 percent) rate themselves as a general user. District-wide 1.7 percent of teachers who rate themselves as an expert user, 19.9 percent rate themselves as an advanced user, 15.6 percent rate themselves as beginner/novice, and a mere 0.2 percent do not use a computer.

Similar findings occur when the results are separated by elementary and secondary levels. The majority of elementary teachers, 67.9 percent, rated themselves as a general

Chart 4.2

Computer Ability (Item 8)



user, 8.2 percent rate themselves as an advanced user, 0.5 percent rate themselves as an expert user, 23.3 percent rated themselves as beginner/novice, and 0.0 percent do not use a computer.

The majority of secondary teachers rated themselves as a general user at 66.9 percent. Over 17 percent (17.6) percent rate themselves as an advanced user, 2.11 percent rate themselves as an expert user, 12.7 percent rate themselves as beginner/novice, and 0.7 percent do not use a computer.

The numbers varied slightly, with all three categories having the vast majority of teachers rate themselves as a general user, then advanced or expert user in that order. Elementary teachers had the highest percent of beginner/novice user at 23.3 percent; however, they also had the highest percent in the general user rating at 67.9. Overall, the district's teachers have a high perception of their personal computer ability.

Computer Use at School (Item 9)

Questionnaire item nine was analyzed to determine how often teachers use the computer at school. It asks: How often do you use a computer at school?

As seen in chart 4.3, overall district results show an overwhelming 95.3 percent of teachers in the district use a computer every day at school. Another 3.5 percent of teachers us a computer once a week, 0.3 percent of teachers use a computer once a month, 0.5 percent once a semester, and 0.5 percent never use a computer.

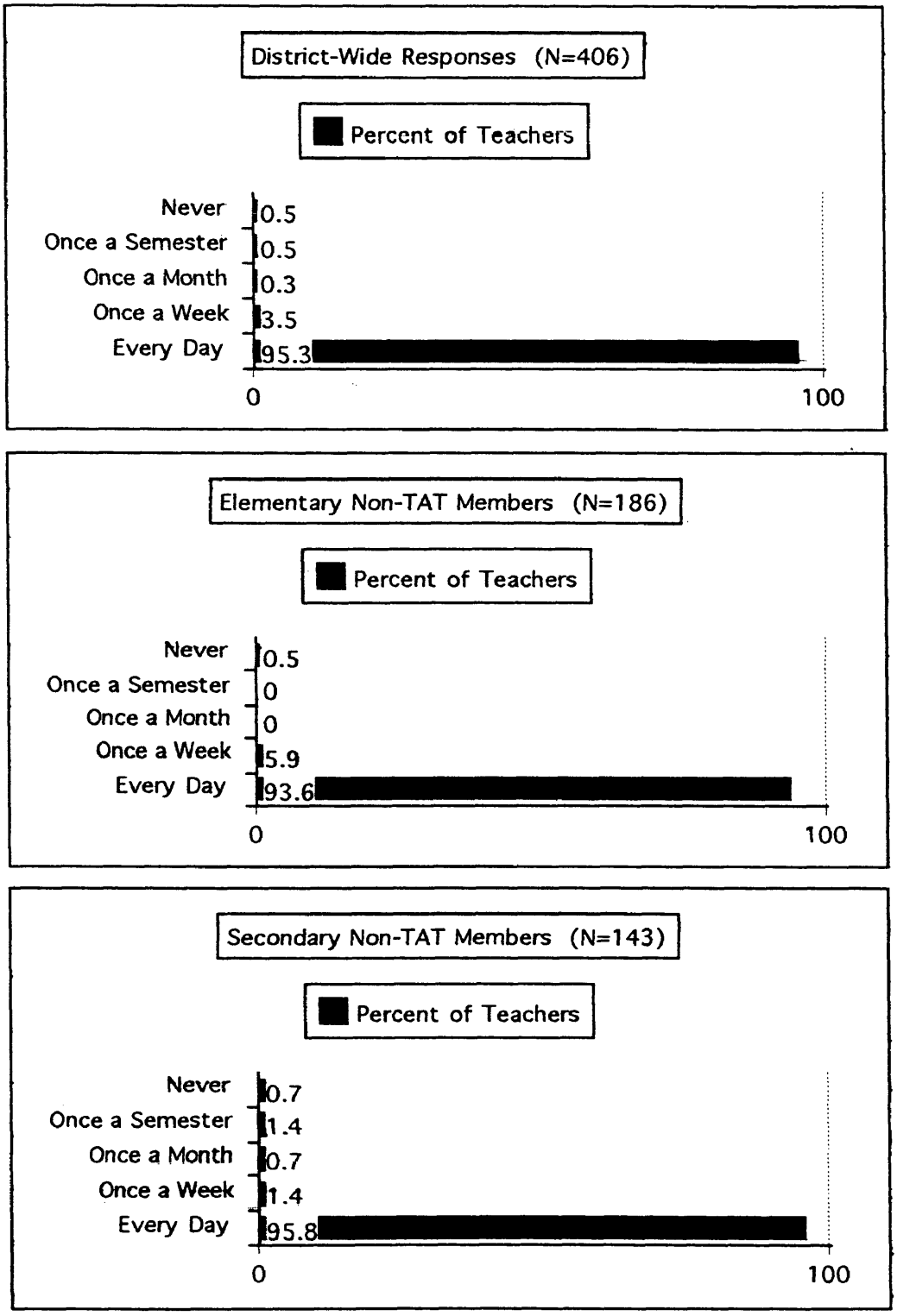
Elementary teacher results were equally impressive. Over 93 percent (93.6) use a computer daily while 5.9 percent use a computer once a week, 0.0 percent once a month, 0.0 percent once a semester, and 0.5 percent never use a computer.

The secondary teacher responses were similar. Almost 96 percent (95.8) of the teachers use a computer daily. An additional 1.4 percent use a computer once a week, 0.7 percent once a month, 1.4 percent once a semester, and 0.7 percent never use a computer.

The district-wide results that indicate that more than 95 percent of teachers in the district reported that they use a computer on a daily basis strongly suggest that teachers have access to computers at school and are utilizing them. Elementary and secondary teachers provided similar responses with percentages at the two levels respectively at 93.6

Chart 4.3

Computer Use at School (Item 9)



percent and 95.8 percent using a computer every day.

Computer Use at Home (Item 12)

The results of questionnaire item twelve provide the opportunity to compare the amount of computer use at home to the amount of computer use at school. Item twelve asks: How often do you use a computer at home? Results, as shown on chart 4.4, show that teachers are more likely to use a computer at school than at home.

District-wide responses reveal that 31 percent of all teachers use a computer every day at home, 26.9 percent use a computer once a week, 9.9 percent use a computer once a month, 14.3 percent use a computer once a semester, and nearly one fifth never use a computer at home.

For the elementary teachers, 26.9 percent use a computer every day at home. 24.7 percent use a computer once a week, 14.5 percent use a computer once a month, 12.9 percent use a computer once a semester, and 21.0 percent never use a computer at home.

Secondary teacher responses indicate that 30.1 percent do use a computer every day at home. 22.4 percent use a computer once a week, 6.3 percent use a computer once a month, 21.7 percent use a computer once a semester, and 19.6 percent never use a computer at home

Several factors may explain why over 95 percent of teachers use a computer at school every day, but only 31 percent use a computer at home on a daily basis. These include the fact that teachers often prefer to complete their work at school and not have to take it home with them, and that teachers may not have a computer at home.

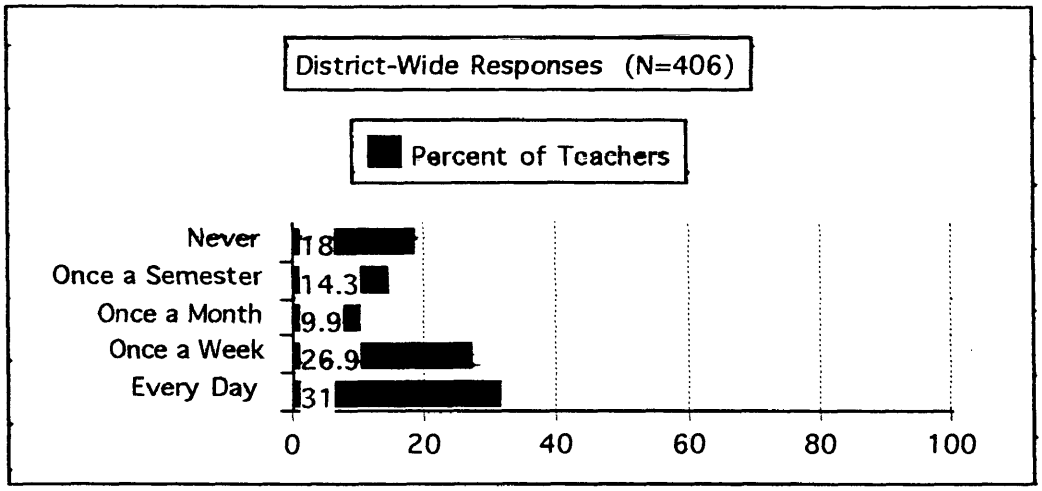
Desire to Improve Computer Skills (Item 24)

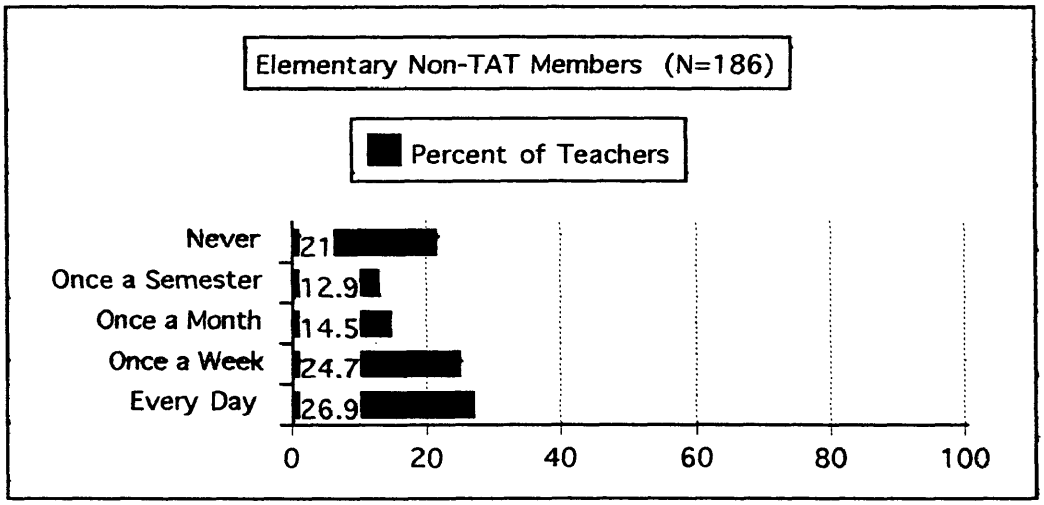
Questionnaire item 24 states: I would like to improve my skills in the use of computer-related technologies. The responses for this question were grouped into the three categories of 1) agree/strongly agree, 2) undecided, or 3) disagree/strongly disagree.

As seen on chart 4.5, overall district responses indicate that 97.3 percent fall in the agree/strongly agree category. Only a small percent, 2.2 percent are undecided, and an even smaller percent, 0.5 percent indicate they would not like to improve their computer-related technology skills.

Chart 4.4

Computer Use at Home (Item 12)





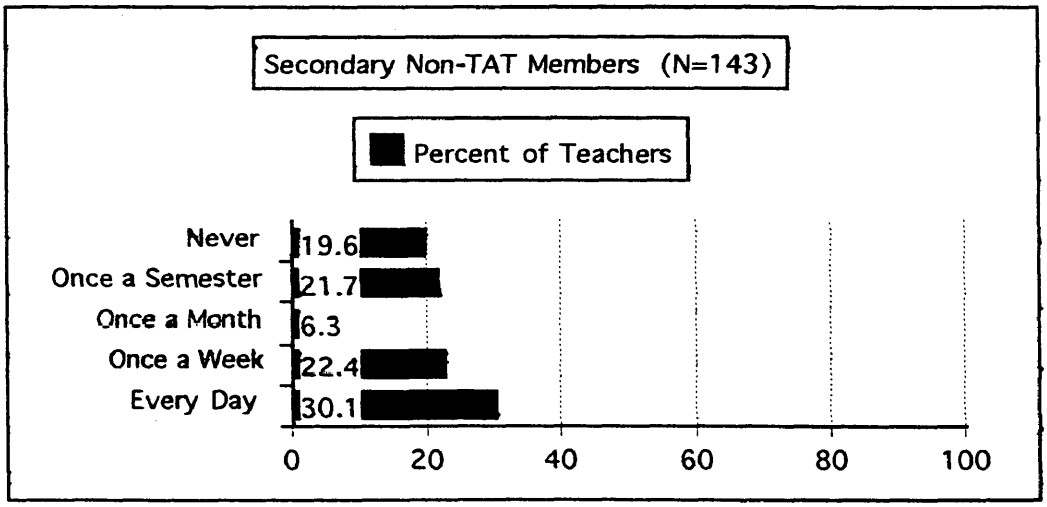
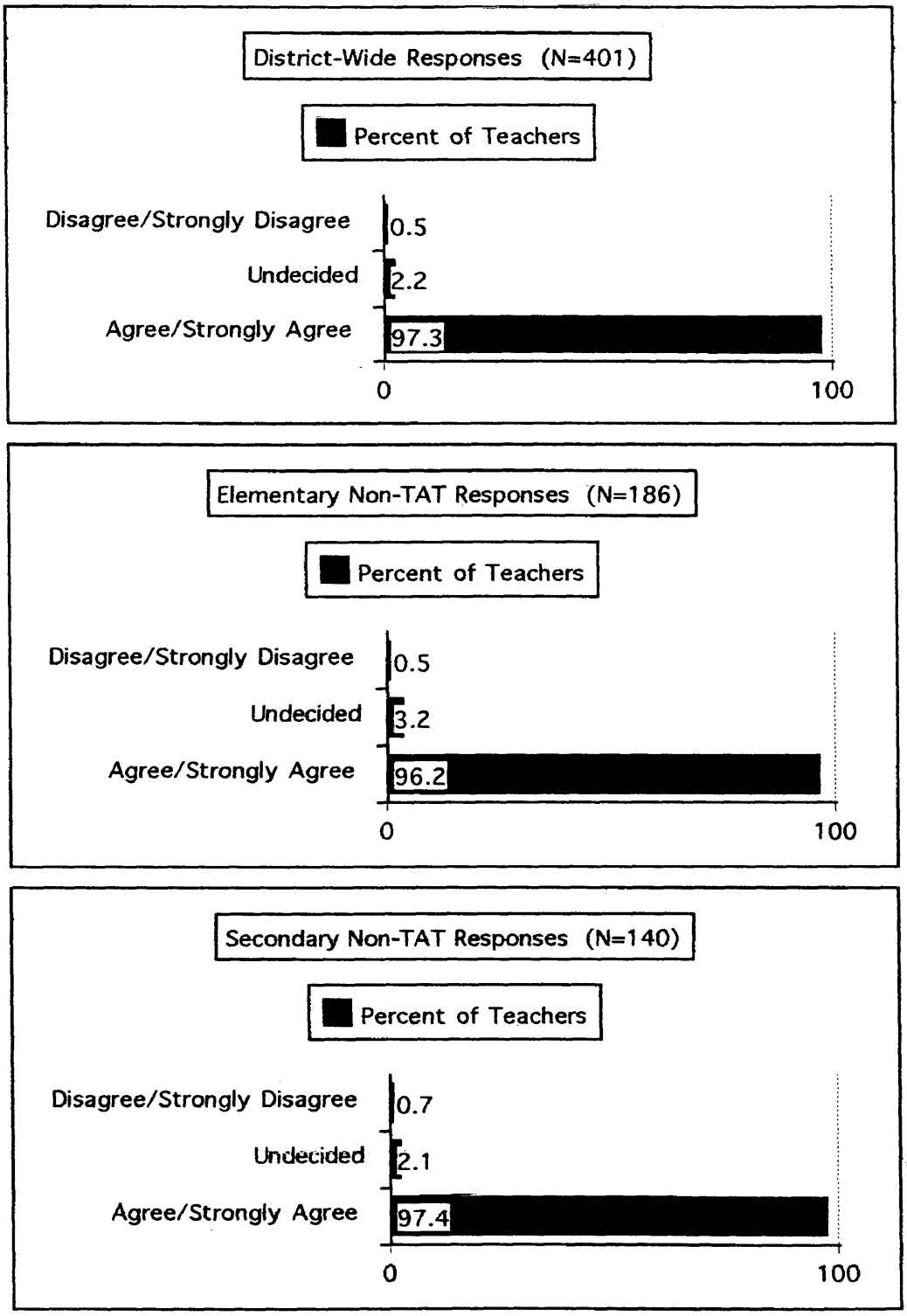


Table 4.5

Desire to Improve Computer Skills (Item 24)



A high percent of elementary teachers indicate they want to improve their technology skills. Impressively, 96.2 percent were in the agree/strongly agree category, 3.2 were undecided, and 0.5 percent selected disagree/strongly disagree.

Secondary teachers also had a large percent who want to improve their technology skills with over 97 percent (97.1) in the agree/strongly agree category while only 2.1 percent were undecided, and 0.7 percent were in the disagree/strongly disagree category.

These numbers show that teachers at all levels want to learn new technology skills. Such high percentages of teachers wanting this knowledge suggest that the district must respond to their needs.

Comfort With Computers (Item 25)

Questionnaire item 25 states: I feel uncomfortable working with computers. Although the vast majority of the district teachers use a computer every day, the question of their comfort level with doing so is of interest. Chart 4.6 displays the somewhat surprising results of the responses to this item.

The district-wide responses show that 37.8 percent of teachers in the district are uncomfortable using computers. Approximately 11 percent (11.3) are undecided, and nearly half (51 percent) are not uncomfortable using computers.

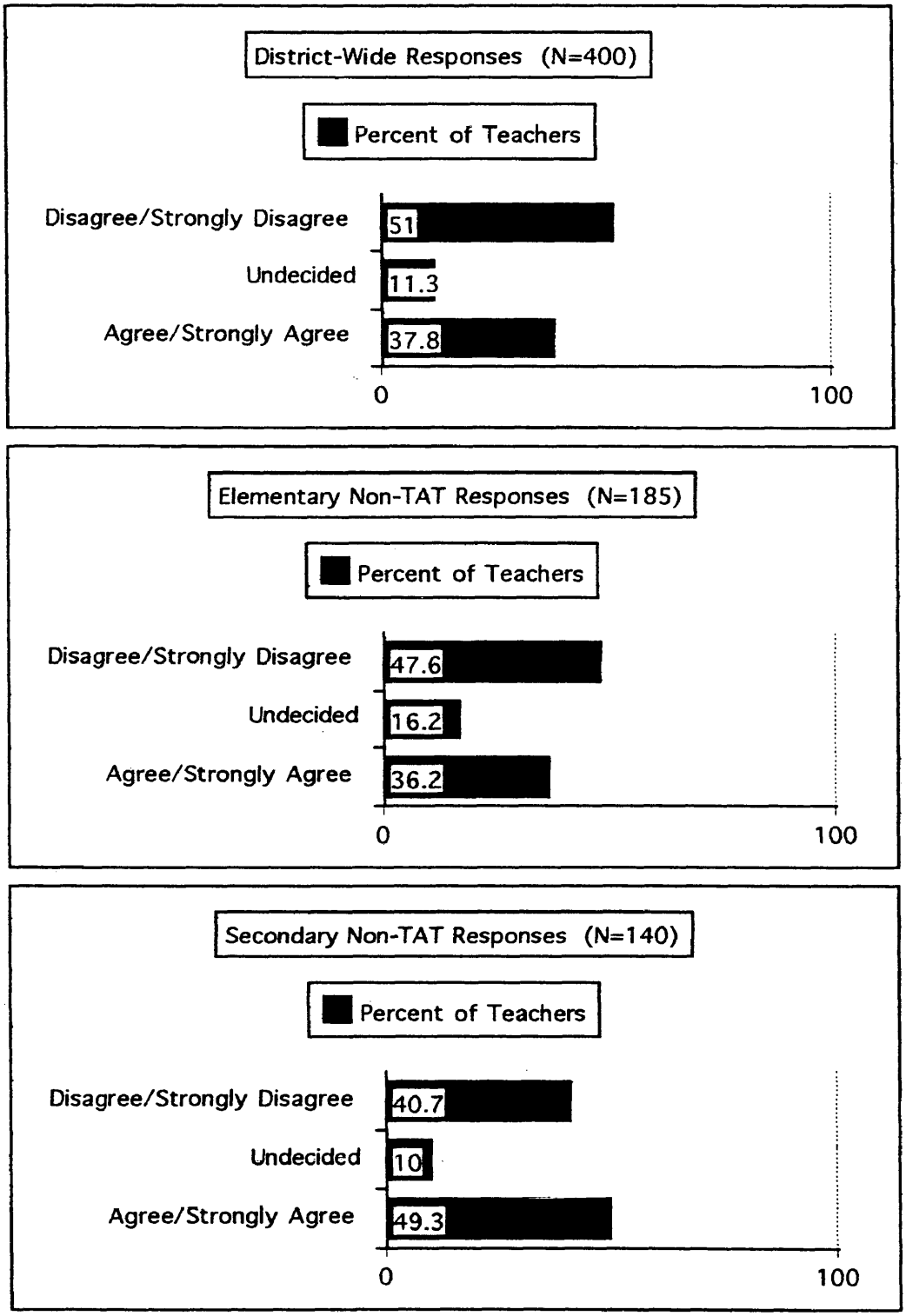
At the elementary level, 36.2 percent of teachers stated they were uncomfortable using computers, while 16.2 percent are undecided, and 47.6 percent are not uncomfortable using computers.

The secondary level responses indicate that 49.3 percent of teachers are uncomfortable using computers, 10.0 percent are undecided, and 40.7 percent are not uncomfortable using computers.

A comparison of the results for the two levels shows more teachers (over 13 percent) at the secondary level are uncomfortable using computers than at the elementary level. When comparing these results with the fact that 95 percent of teachers use a computer every day, and over 62 percent rate themselves as a general user or more advanced, this data seems a bit contradictory. One possible explanation is that the question states, "I am uncomfortable using computers" instead of stating "I am comfortable using

Chart 4.6

Comfort With Computer (Item 25)



computers." This may have caused some misunderstanding. Although the outcome of this question is a bit alarming, the results of other questions that dealt with similar topics were more positive. Questionnaire item 38 is an example.

Comfort Using Computer Technology for Personal Use (Item 38)

Instead of asking if the teacher is uncomfortable, item 38 asks if teachers are "comfortable using computer-related technologies for personal use." Response results are provided in chart 4.7.

District-wide responses reveal that 83.0 percent of teachers are comfortable using computer-related technologies for personal use, while 11.7 percent are undecided and only 5.2 percent are not comfortable. This shows a drastic difference in teacher comfort level when compared with the results to the previous item.

Analysis of the responses reveals that 75.8 percent of elementary teachers are comfortable using computer-related technologies for personal use, while 16.7 percent are undecided and 7.5 percent are not comfortable.

Secondary teacher responses show the highest comfort level at 86.4 percent, while 9.3 are undecided and 4.3 are not comfortable using computer-related technologies for personal use.

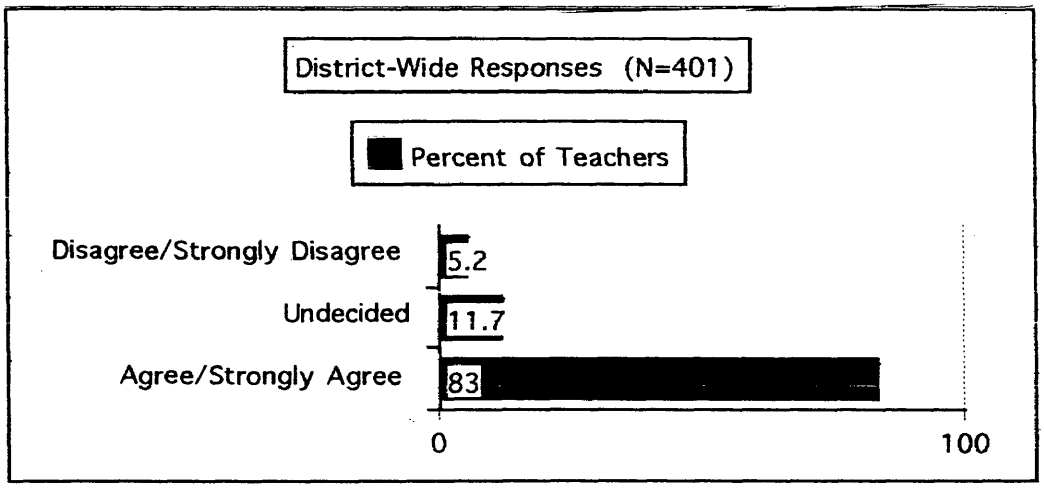
As discussed earlier, responses to item 25 suggests that secondary teachers are not as comfortable using computers as elementary teachers. The results for item 38 show just the opposite, with 75.8 percent of elementary teachers comfortable using computer-related technology for personal use compared to 86.4 percent of secondary teachers. One explanation for this difference is the possibility that respondents read the questionnaire quickly and misunderstood item 25 to say comfortable instead of uncomfortable. It is also possible that teachers were confused because item 25 did not specify the type of computer use.

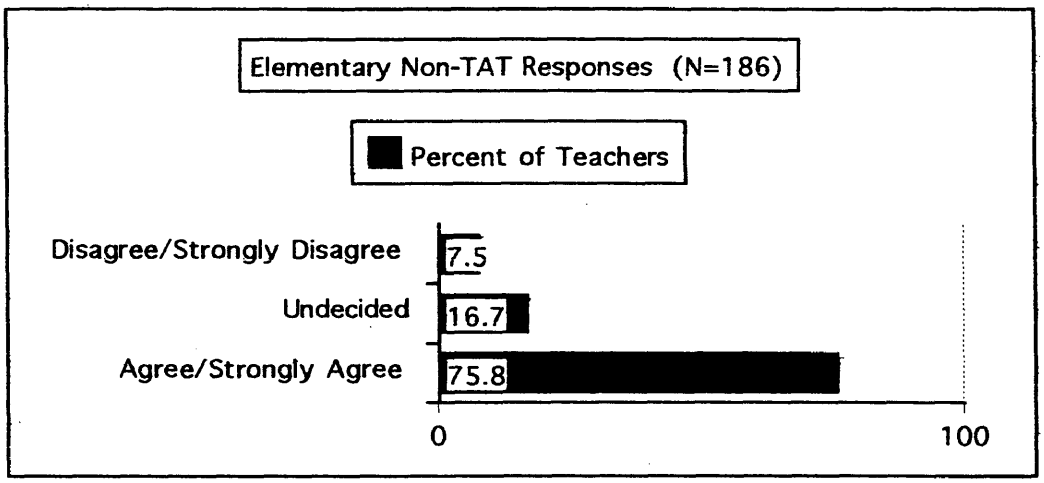
Conclusion

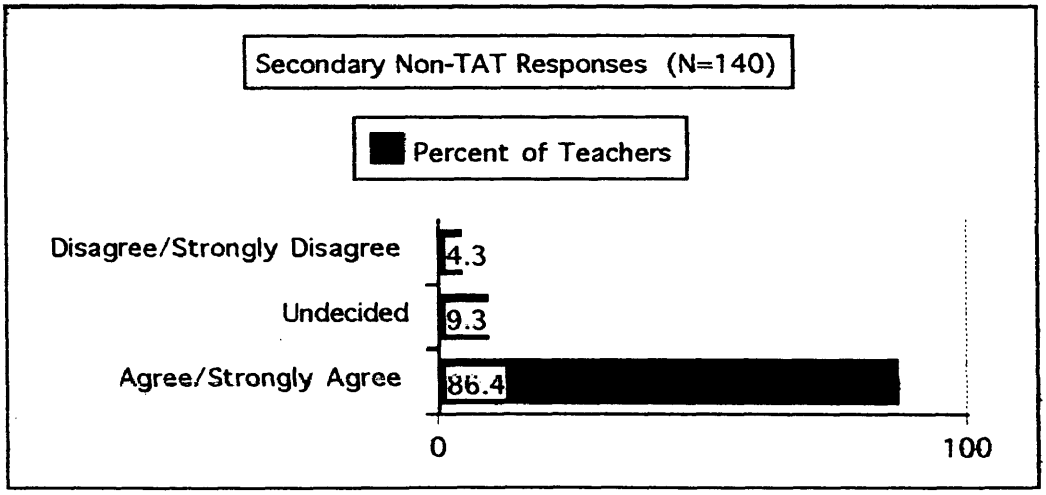
Research question one focused on determining the amount of computer usage by teachers an their comfort level with that usage. Of the seven questionnaire items analyzed, five had responses that reached the 80 percent level and that could be interpreted as being

Chart 4.7

Comfort Using Computer Technology for Personal Use (Item 38)







"positive." Only two items had responses that did not.

It was found that over 80 percent of teachers had five years or more of experience using computers, over 84 percent of teachers rate themselves as a general or more advanced user, over 95 percent use a computer daily at school, over 97 percent want to increase their technology skills, and 83 percent felt comfortable using computer technology for personal use.

The two areas in which teacher responses were not as positive, include a limited use of computers at home and the more general level of comfort working with computers. There were two questions that asked about the comfort level of using computers. One of the results were positive, while the other was not. The less positive responses may be due to the wording of the question. Overall, Papillion-La Vista teachers have positive perceptions toward their personal ability and comfort level using computers.

Research Question Two: Utilized Knowledge of TAT

The previous analysis was designed to determined the extent of computer usage by teachers, how comfortable they feel using computers, and to what extent they want to learn more about computer related technologies. The next research question attempts to ascertain if teachers are using the knowledge of the TAT teams. Specifically, research question two states: Do certified teachers perceive that Technology Assistance Team members' knowledge of computer-related technologies is utilized in Papillion-La Vista Public Schools?

Familiar With TAT Members (Item 26)

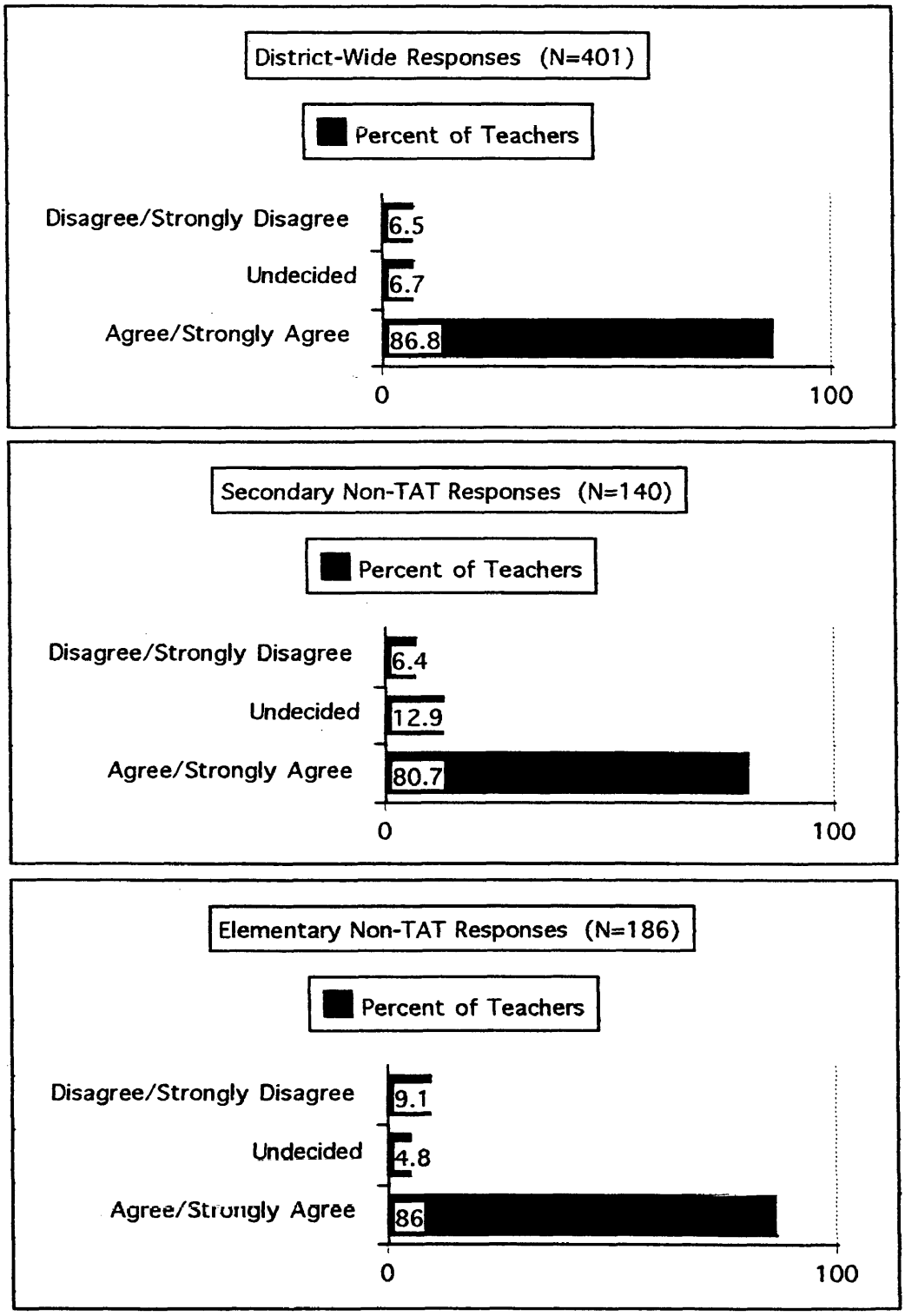
Knowing who the members of the TAT teams are is the first step in being able to turn to them for help with computer related technology. Questionnaire item 26 states: I know the members of the TAT team at my school. Chart 4.8 demonstrates the results.

The majority of the district teachers know the members or the TAT teams in their building. 86.8 percent of the teachers district-wide agree with this statement, 6.7 percent are uncertain, and 6.5 percent disagree with this statement. The elementary and secondary level outcomes are similar.

Of the elementary teachers, 86.0 percent know the members of the TAT teams, 4.8

Chart 4.8

Familiar With TAT Members (Item 26)



percent are uncertain, and 9.1 percent do not know the members of the TAT team at their building.

For secondary teachers, 80.7 percent know the TAT team members at their building, 12.9 percent that are uncertain, and 6.4 percent that do not know the TAT team members at their building. The lower number of secondary teachers who know the members of the TAT teams and higher percent of uncertainty may be due to larger staffs in these buildings.

For teachers to take advantage of having TAT members in their building it is important to know who these people are. At the district-wide and within the elementary and secondary levels, over 80 percent of teachers know the members of the TAT team at their respective buildings. Although this is a large percent, it could possibly be increased by publicizing, promoting, or simply supplying a list of members of the TAT team to their colleagues.

Comfort Approaching TAT Members (Item 36)

Knowing who the TAT members are is one thing, feeling comfortable approaching them is another. Questionnaire item 36 was designed to determine this and states: I am comfortable approaching the members of the TAT team with questions. Because technology can be frustrating, it is important that the members of the TAT team are willing to help and this demeanor is perceived by fellow teachers. Chart 4.9 shows the results.

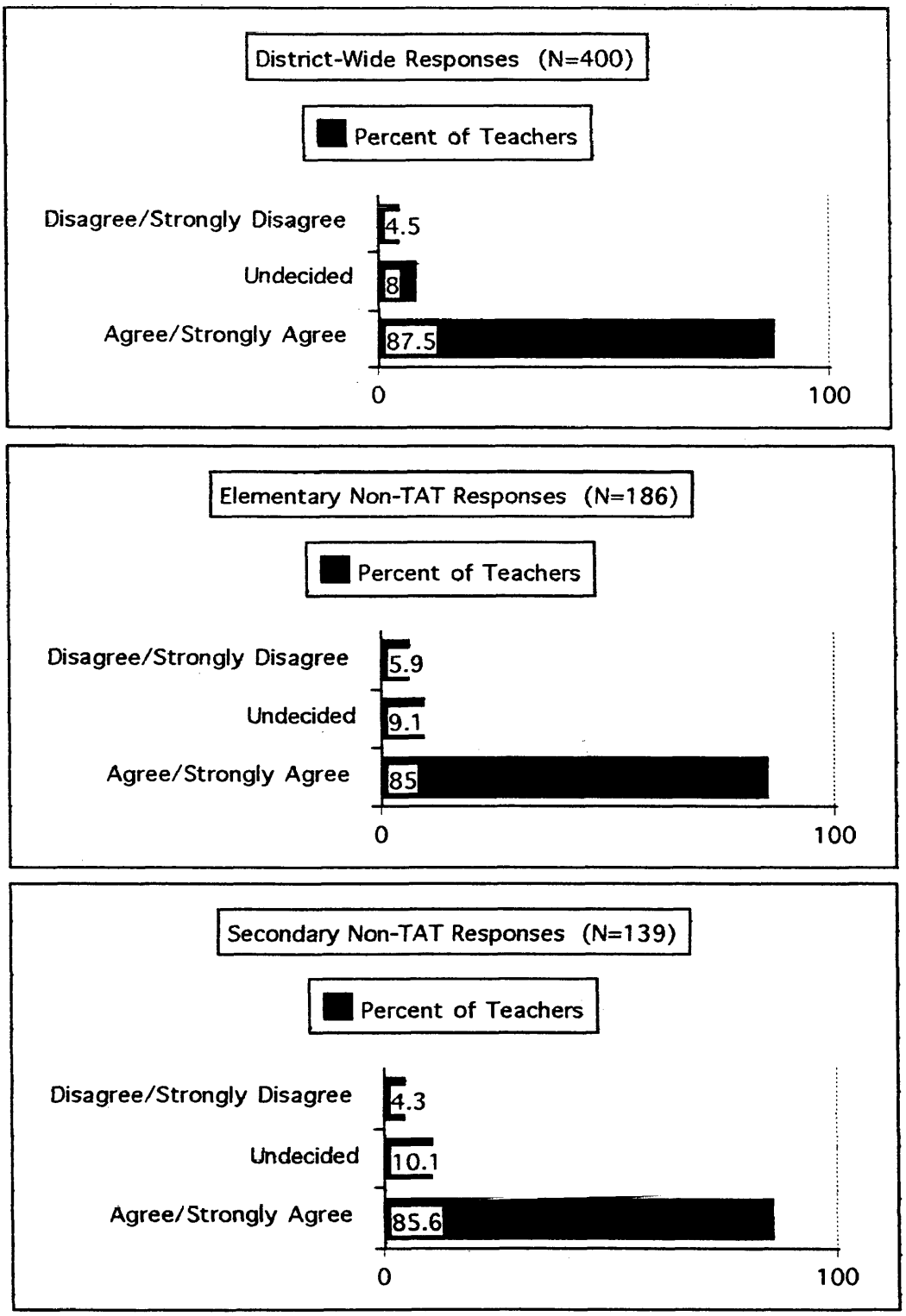
District-wide responses imply that 87.5 percent of teachers do feel comfortable approaching TAT members. Only 8.0 percent are undecided and 4.5 percent are not comfortable approaching TAT members with questions.

When separated into elementary and secondary level, the responses are almost the same. The elementary level had 85.0 percent who feel comfortable approaching TAT members, 9.1 who are undecided, and 5.9 who do not feel comfortable.

Over 85 percent (85.6) percent of secondary teachers feel comfortable approaching TAT members, 10.1 are undecided, and 4.3 are not comfortable approaching TAT members. The responses to this item do not make it possible to determine why teachers are not comfortable approaching TAT members. However, those who are uncomfortable may

Chart 4.9

Comfort Approaching TAT Members (Item 36)



also be those who do not know the members of the TAT team. Nevertheless, with over 87 percent of teachers feeling comfortable approaching TAT members, these team members appear to be doing well in this area.

Source of Information (Items 17/18)

Since most teachers know who TAT members are and are comfortable approaching these members, the expectation would be that teachers utilize TAT teams when they have questions about computer-related technology. The responses to combination questionnaire items 17/18 provide data about this expectation. It asks: If you had questions about using computer-related technology, who would you ask for assistance? Responses participants could choose from include: TAT member, another teacher, media center specialist, District Technology Coordinator, computer teacher, vendor support or representative, student, and other. It should be noted that the "N" for each category in chart 4.10 exceeds the normal 406, 186, and 143 for district-wide, elementary, and secondary perspectives respectively, due to teachers selecting more than one item for this question.

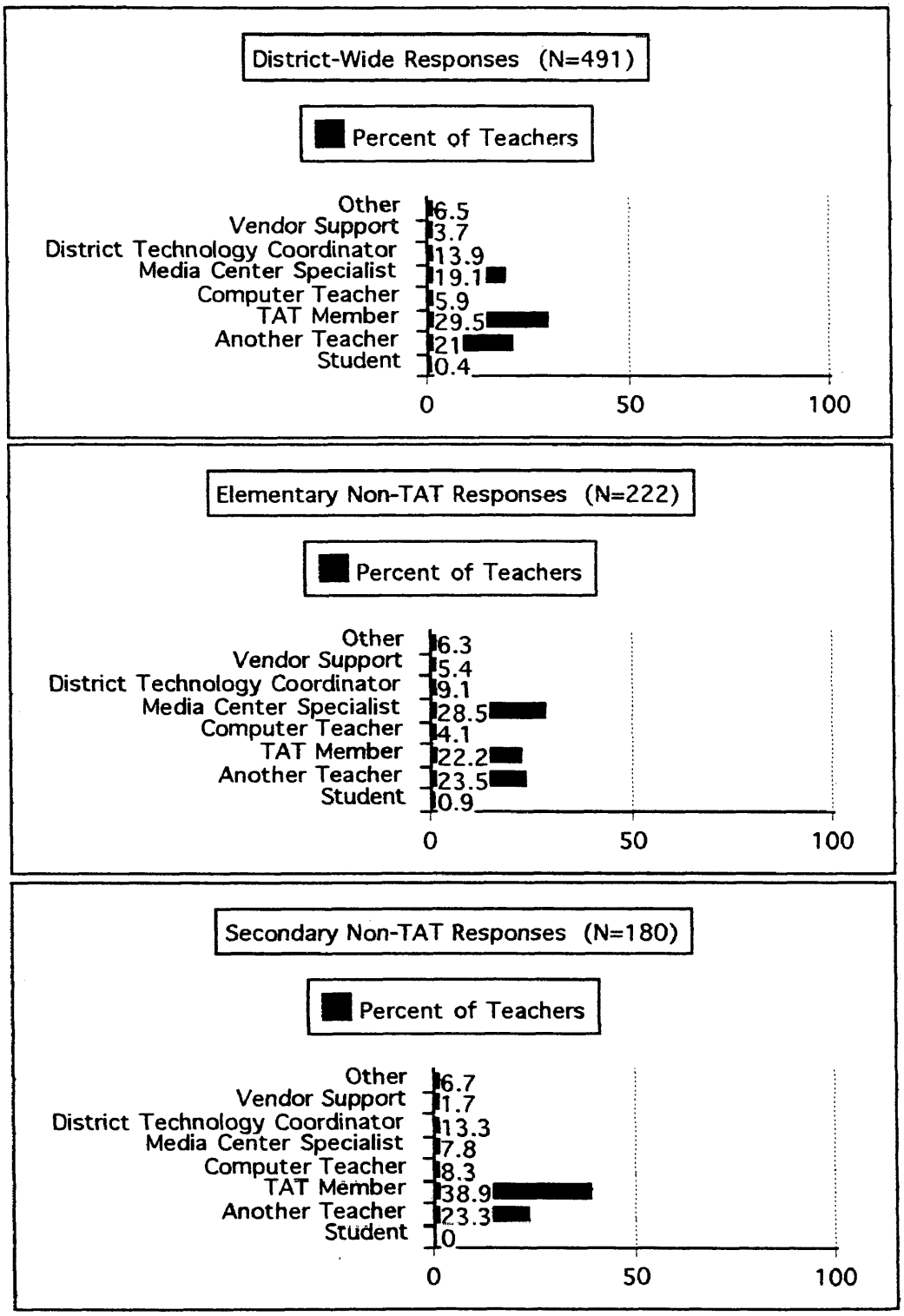
As chart 4.10 shows, district-wide responses suggest that 29.5 percent would turn to a TAT member, 21.0 would ask another teacher, 19.4 percent would turn to the media center specialist, 13.9 percent would turn to the District Technology Coordinator, 5.9 percent said the computer teacher, 3.7 percent said the vendor support or representative, 0.4 percent said a student and 6.5 percent said another source not listed.

Elementary level responses indicated 22.2 percent would turn to a TAT member, 23.5 would ask another teacher, 28.5 percent would turn to the media center specialist, 9.1 percent would turn to the District Technology Coordinator, 4.1 percent said the computer teacher, 5.4 percent said the vendor support or representative, 0.9 percent said a student and 6.3 percent said another source not listed.

Secondary level responses revealed that 38.9 percent would turn to a TAT member, 23.3 would ask another teacher, 7.8 percent would turn to the media center specialist, 13.3 percent would turn to the District Technology Coordinator, 8.3 percent selected the computer teacher, 1.7 percent selected the vendor support or representative, 0.0 percent selected a student and 6.7 percent indicated another source not listed.

Chart 4.10

Source of Support (Item 17/18)



Note. "N" exceeds 406, 186, and 143 due to teachers selecting more than one response.

This data reveals secondary teachers are more likely to go to TAT members with questions than elementary teachers. However, there is one thing to consider when interpreting this outcome. The media center specialist at every school is also a member of the TAT team. When combining responses for TAT member and media specialist at the district-wide level, the percentage who turn to TAT members rises almost 20 percent to 48.7 percent, almost half of the teachers. When the TAT member and media center specialist categories are combined at the elementary and secondary levels, rates rise to 50.7 percent and 46.7 percent respectively.

Still, with over 80 percent of the teachers knowing who TAT members are and feeling comfortable approaching them, it is some what surprising that only about one-half of the teachers would turn to a TAT member for help.

Assistance From TAT Member (Item 19)

Questionnaire item 19 states: I have received help from a TAT member in the last ... Respondents could choose one of the following responses: week, month, semester, year or never. This item was designed to determine if teachers are utilizing the TAT members within the buildings. Chart 4.11 shows the results.

District-wide responses indicate that 32.3 percent had received help from a TAT member in the last week, 37.0 percent had received help in the past month, 15.0 percent had received help within the past semester, 10.1 percent had received help in the past year, and 5.7 percent have never received help from TAT members.

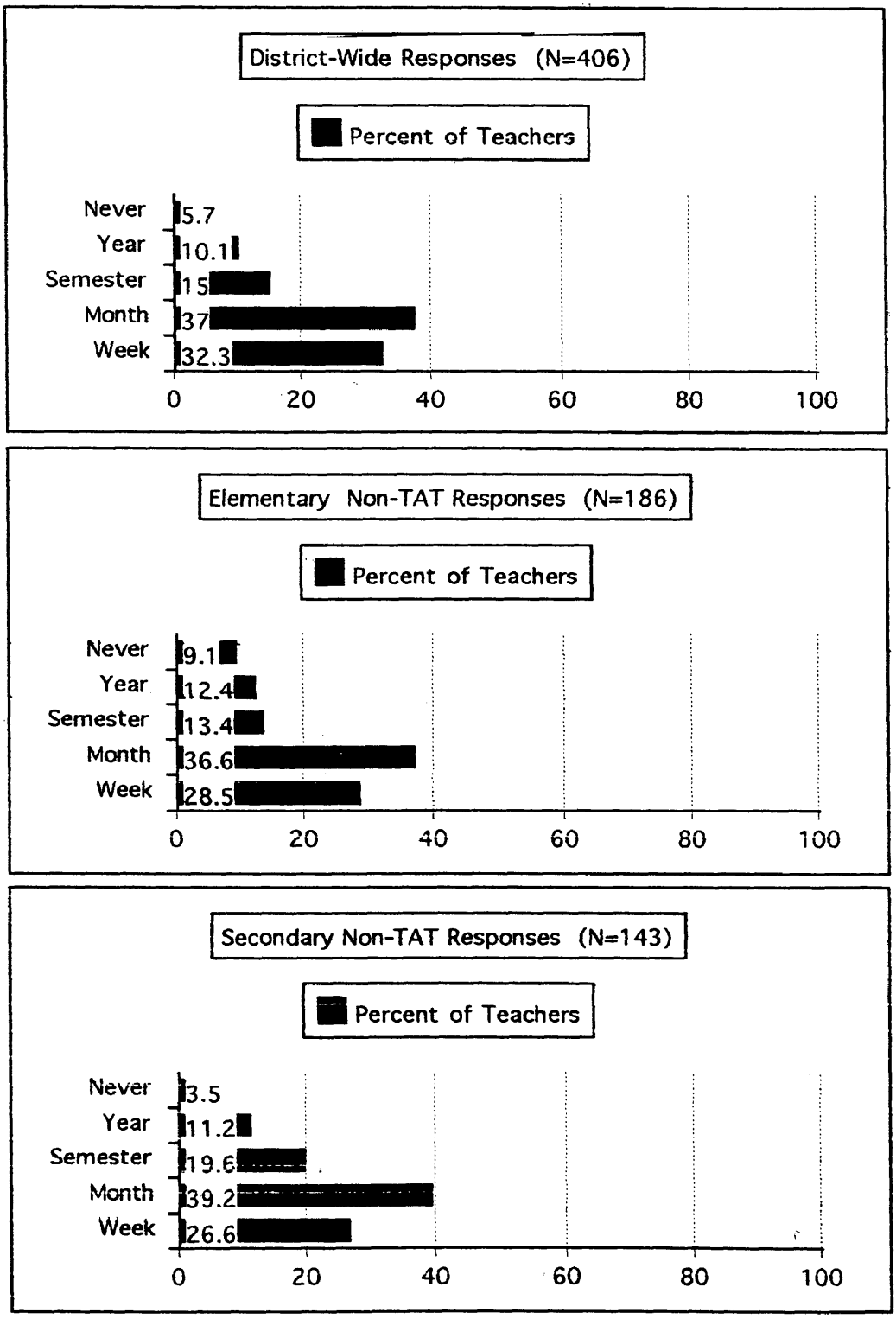
Elementary level responses indicate that 28.5 percent had received help from a TAT member in the last week, 36.6 percent had received help in the past month, 13.4 percent had received help within the past semester, 12.4 percent had received help in the past year, and 9.1 percent have never received help from TAT members.

Secondary level responses reveal that 26.6 percent had received help from a TAT member in the last week, 39.2 percent had received help in the past month, 19.6 percent had received help within the past semester, 11.2 percent had received help in the past year, and 3.5 percent have never received help from TAT members.

The results suggest that teachers in the district do utilize the knowledge of TAT

Chart 4.11

Assistance From TAT Member (Item 19)



members with over 65 percent for both elementary and secondary level teachers having utilized a TAT member within the past month, and over 94 percent within the past year.

Conclusion

Research question two focused on determining if teachers perceive TAT members knowledge as utilized in the district. Of the four questionnaire items analyzed, three resulted in 80 percent or more of teachers agreeing positively with the statements in the favor of utilizing TAT teams.

These three items included knowing who are the members of the TAT teams, feeling comfortable approaching them with questions or concerns, and receiving help from them in the past year.

The one area in which teacher responses were not over 80 percent was in the area of to whom they would turn for support if they have a problem. This result can be explained by a variety of reasons. Teachers do not know who TAT members are; they may never have computer problems; it is easier or more convenient to ask a teacher next door or a student in the class; or make a call to the District Technology Coordinator. Overall, Papillion-La Vista teachers appear to have positive perceptions toward the utilization of TAT teams knowledge.

Research Question Three: Training Provided by TAT

Research question three asks: Do certified teachers perceive that Technology Assistance Team members facilitate computer-related technology training within their buildings? The previous research question results revealed that teachers do want to learn more about computer related technologies, and over 69 percent have asked a TAT member for help. The items relevant to research question three seek to determine if TAT teams have provided training for teachers at their respective building.

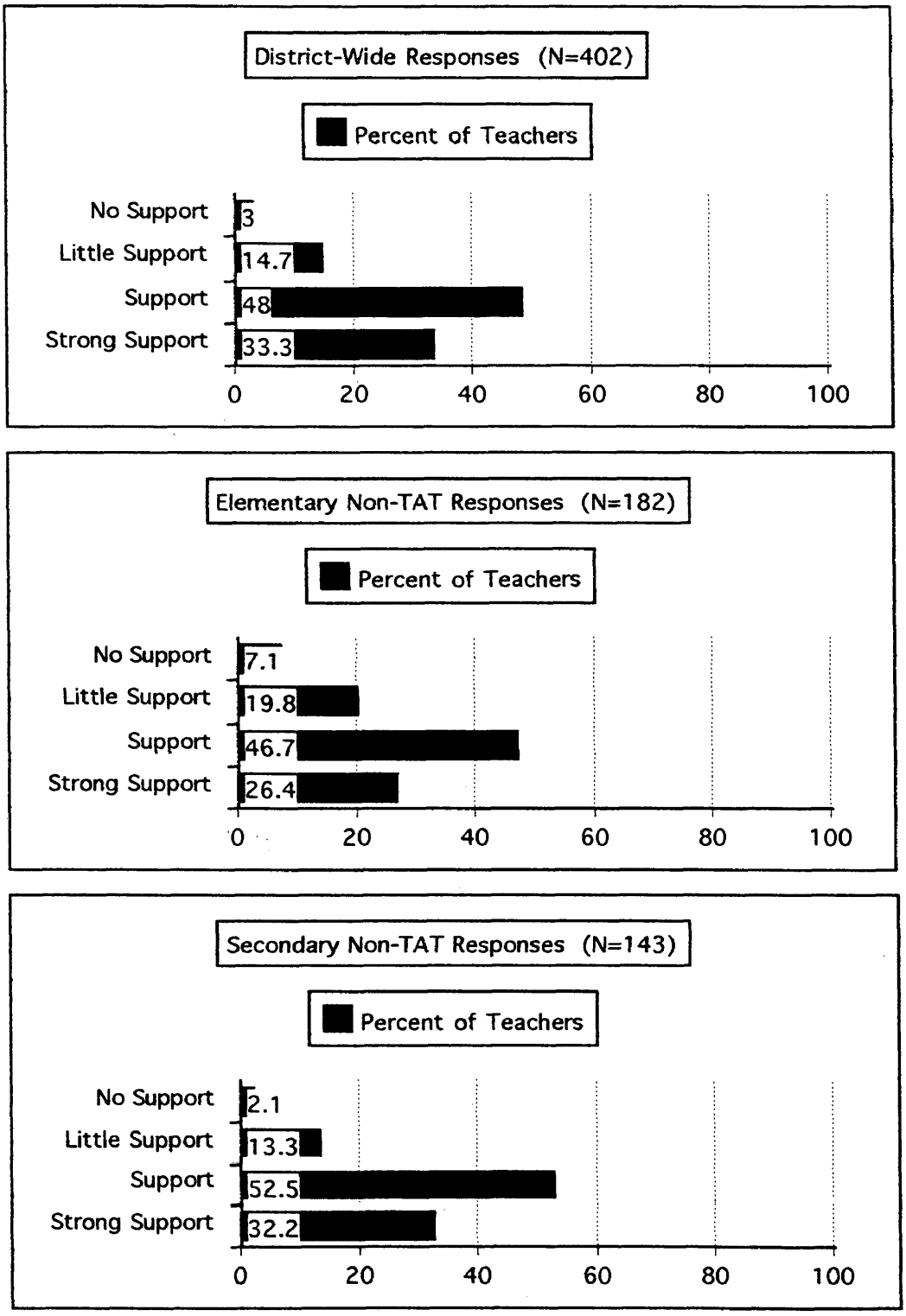
Technology Assistance (Item 20)

Questionnaire item 20 states: Please rate the computer-related technology assistance you have received from TAT members. The results to this item can help determine if TAT teams have provided the needed and necessary assistance to fellow teachers.

As chart 4.12 shows district-wide responses were positive with over 81 percent

Chart 4.12

Technology Assistance (Item 20)



receiving support or strong support from the TAT teams. A further break-down of these responses indicates 33.3 percent feel they received strong support, 48.0 percent feel they received support, 14.7 percent feel they received little support, and 4.0 percent feel they receive no support.

When separated by levels, the elementary teachers do not feel as strongly supported as the secondary teachers. Of the elementary teachers, 26.4 percent feel strong support, 46.7 percent feel support, 19.8 feel little support, and 7.1 percent feel no support. Yet, 73.1 percent still feel support or strong support.

Secondary teachers feel they have more support than the elementary teachers. Over 32 percent (32.2) feel strong support, 52.5 percent feel support, 13.3 percent feel little support, and 2.1 feel no support. Overall, secondary teachers feel they have had support or strong support from the TAT teams.

While the results for this item are very positive, further attention might need to be provided for the elementary level teachers.

Inservices Provided (Item 27)

Inservices have been a popular way to distribute information in educational systems. Questionnaire item 27 states: TAT members have provided inservices to help staff development. The data, shown in chart 4.13, reveals the extent to which teachers feel there have been instructional inservices provided by TAT members.

On a district-wide basis, 80.5 percent of teachers agree that TAT members provide inservices to help staff development. 11.0 percent are undecided and 8.5 percent feel inservices were not provided to help staff development.

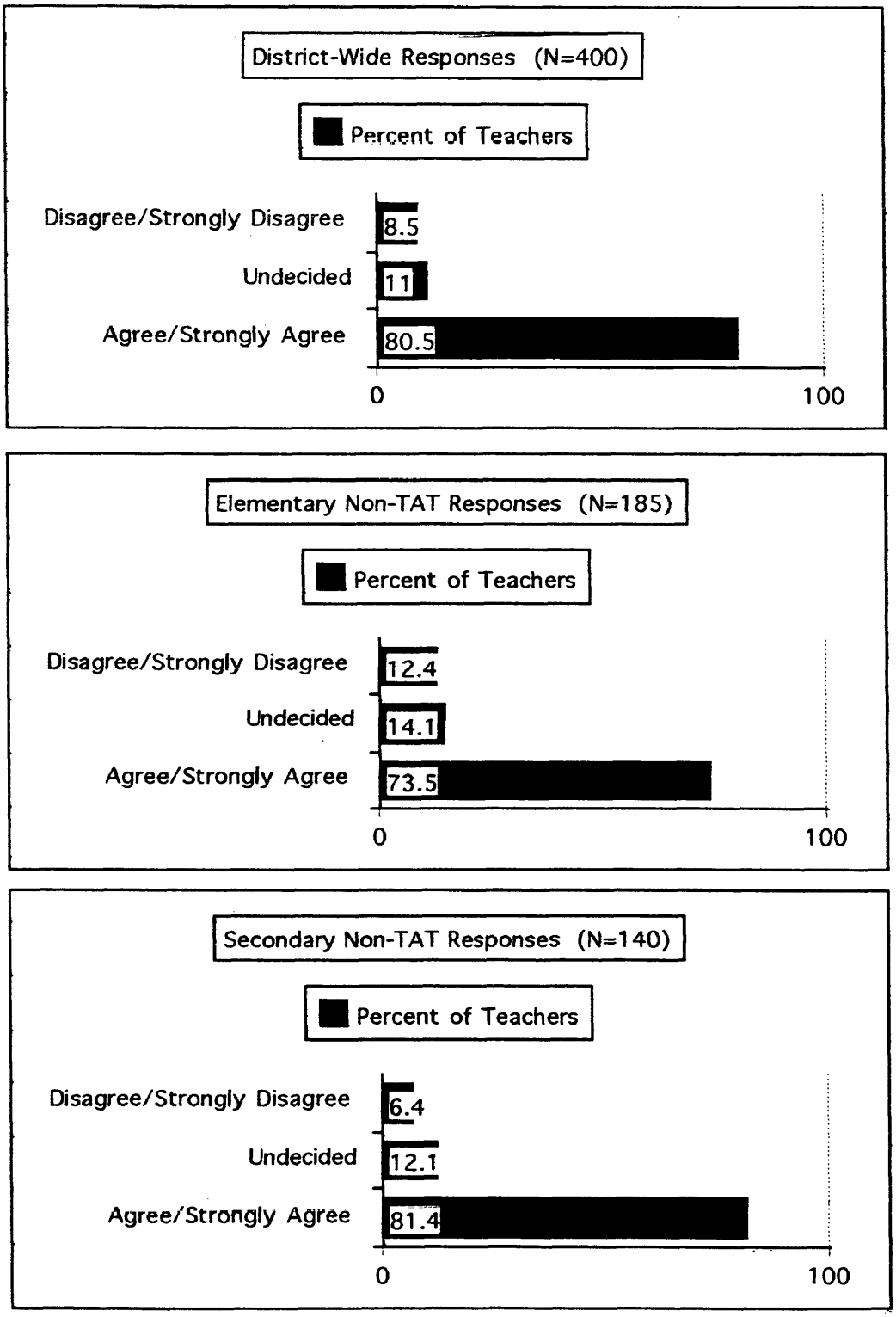
Elementary level responses showed that 73.5 percent of teachers felt TAT members have provided inservices to help staff development. 14.0 percent are undecided and 12.4 percent disagree.

Secondary responses indicate that 81.4 percent of teachers feel TAT members have provided inservices to help staff development. Another, 12.1 percent are undecided and 6.4 percent disagree.

While secondary teachers are somewhat more positive about TAT teams providing

Chart 4.13

Inservices Provided (Item 27)



inservices than are the elementary teachers; overall, the district teachers are positive toward the availability of inservices.

Handouts Provided (Item 28)

Inservices are one way to share information, handouts are another. Handouts may be distributed during an inservice or made available for those who indicate they would like a copy. Item 28 on the questionnaire states: I have received TAT handouts to assist my use of technology when requested. Chart 4.14 shows these results.

District-wide responses indicated that 75.4 percent agree they have received handouts, while 16.8 percent were undecided and 7.8 percent feel they did not receive handouts when requested.

Elementary level responses indicate 69.6 percent agree they did receive handouts when requested, 16.8 percent were undecided and 13.6 percent did not receive handouts when requested.

Secondary responses were slightly more positive than indicated by elementary teachers. Their responses indicate 72.1 percent agreed they did receive handouts, 23.6 percent were undecided and 4.3 percent did not receive handouts when requested.

These results may be influenced by the possibility that teachers never have requested a handout, or they may not remember if a handout was provided by a TAT members or if they have received any handouts.

Individual Training (Item 30)

Questionnaire item 30 states: TAT members in my building have provided individual technology training to staff members. This individual training is not necessarily a formal session, but a time when a TAT member has met with a colleague and explained a technology concept to them.

As chart 4.15 indicates, district-wide responses show 72.8 percent have been provided with individual training, 16.7 percent are undecided and 10.5 percent state they have not been provided with individual training.

Elementary responses reveal 67.2 percent of teachers have been provided with individual training, while 17.2 percent are undecided and 15.6 percent have not been

Chart 4.14

Handouts Provided (Item 28)

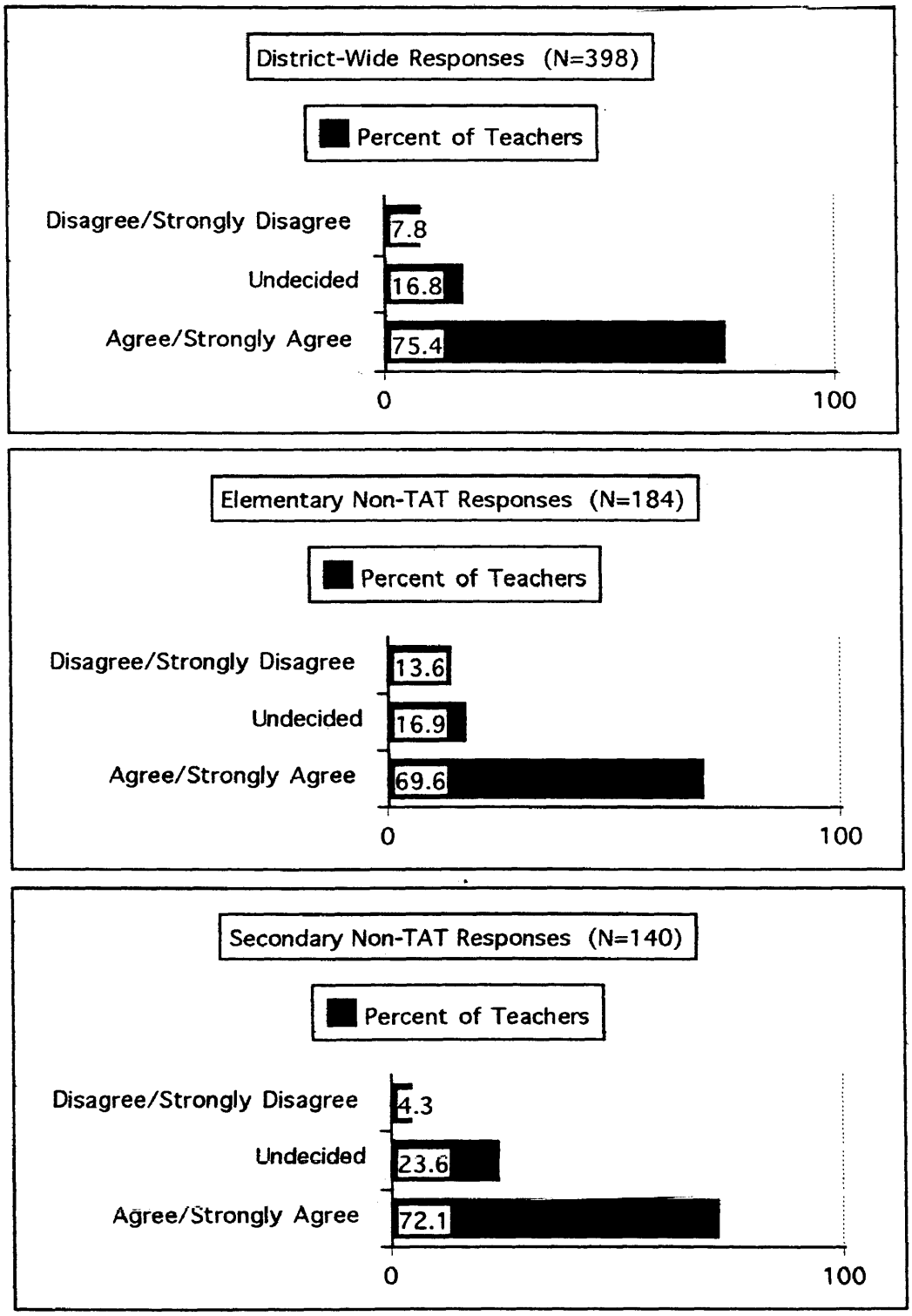
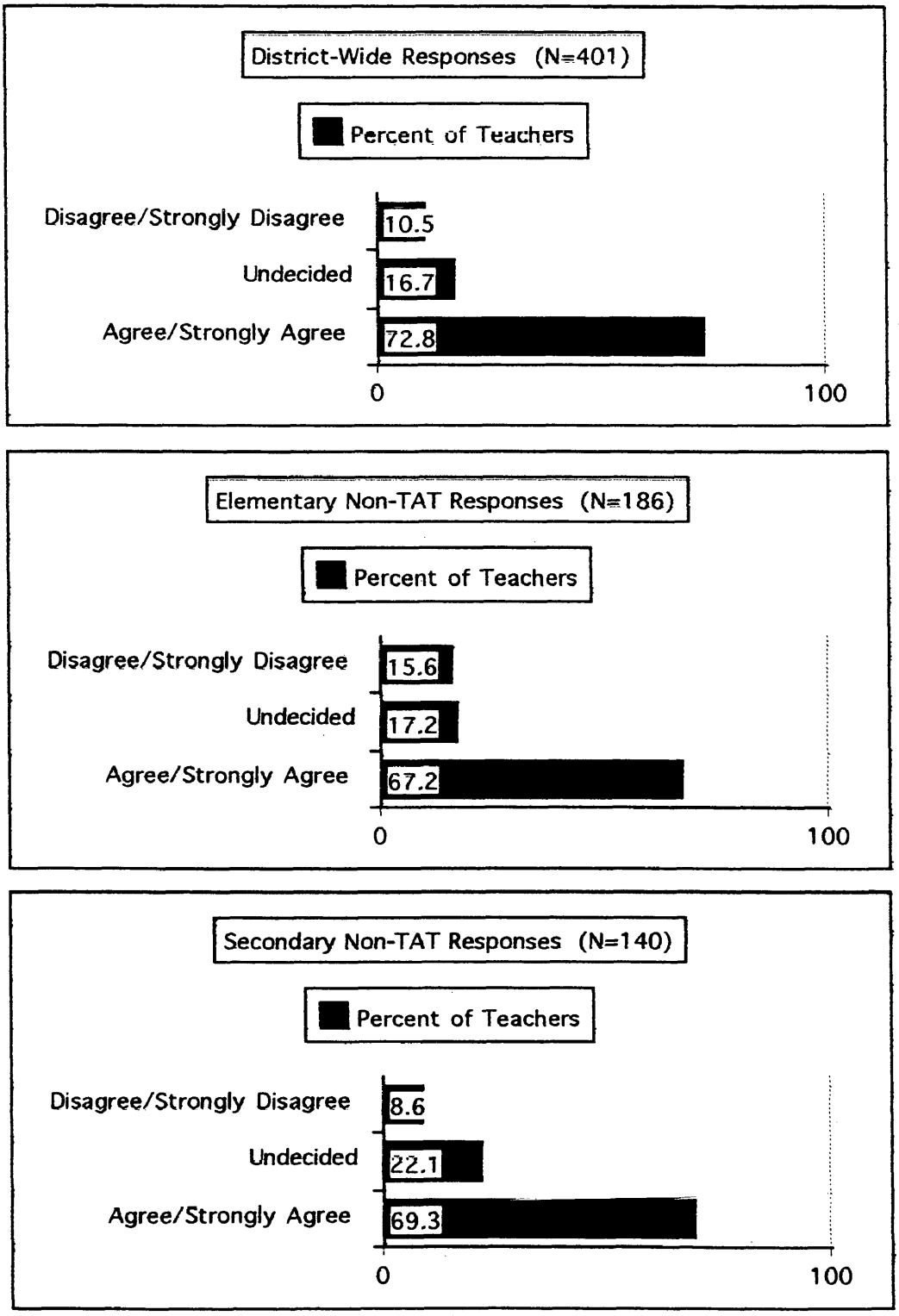


Chart 4.15

Individual Training (Item 30)



provided with individual training.

Secondary responses were a bit more favorable with 69.3 percent indicating they have been provided with individual training, while 22.1 percent are undecided and 8.6 percent have not been provided with individual training.

The percentages reflect that individual training is being conducted by many TAT members. With over 72 percent of staff being provided with this individual training technology knowledge is being spread among teachers in the district. While this is very positive, it is also an area on which TAT members could improve.

Conclusion

Research question three focuses on determining if teachers perceive TAT member facilitate training within their buildings. Of the four questionnaire items analyzed, two reached the 80 percent or more level, while two fell below that level.

Over 80 percent of teachers feel that they received technology assistance support from TAT members and that TAT teams have provided inservices to help staff development.

The two areas in which teacher responses were less positive include providing handouts and individual training. In both instances, a large percentage of the respondents were undecided. Overall, Papillion-La Vista teachers have mixed perceptions about the training provided by TAT members.

Research Question Four: Proficiency and Literacy Due to TAT

The next research question moves beyond that of providing training to that of the effectiveness of the training. Research question four asks: Do certified teachers perceive themselves as more proficient and computer literate due to the efforts of the Technology Assistance Teams?

Increased Use of Computers (Item 29)

One way to answer the question of whether TAT teams have helped colleagues to become more proficient is to determine if teachers feel TAT teams have helped to increased personal use of computers. Questionnaire item 29 states: My use of computers has increased due to the help of TAT members.

District-wide responses, as shown in chart 4.16, reveal that 61.0 percent believe TAT teams have helped increase the respondents personal use of computers, while 18.8 are undecided and 20.3 percent disagree.

Elementary level responses reveal that 55.4 percent believe TAT teams have helped increase the respondents personal use of computers. An additional 16.1 are undecided and 28.5 percent did not feel TAT teams have helped increase personal use of computers.

Secondary level responses show that 53.6 percent believe TAT teams have helped increase the respondents personal use of computers. 28.6 are undecided and 17.9 percent did not support this statement.

TAT teams are credited with helping increase the personal use of computers by over 60 percent of the teachers in the district. With a large undecided percent it is unclear if teachers are not sure if they have increased use of computers due to TAT or if they have increased use of computers in general at all. This large percent of undecided along with the 20.3 percent who disagree with increased computer use due to the efforts of the TAT team may cause apprehension for some; however, another factor to consider is these teachers may be currently using their computers at the highest extent they plan to.

New Computer Skills (Item 31)

Item 31 on the questionnaire states: I have gained a new computer-related technology skill in the past year due to the efforts of the TAT team. Once again, this was designed to determine if TAT members are helping teacher to become more computer literate.

As shown in chart 4.17, district responses toward this item indicated 63.5 percent have gained a new computer-related technology skill in the past year, 15.5 percent are undecided and 21.0 percent feel they have not gained a new technology skill.

Elementary responses included 58.4 percent who feel they have gained a new computer-related technology skill, 11.9 percent are undecided, and 29.7 percent do not feel they have gained a new technology skill due to the efforts of TAT teams.

Secondary responses had an unusually large percent in the undecided category, almost one-fourth of the teachers. Over 57 percent (57.1) do feel they have gained a new

Chart 4.16

Increased Use of Computers (Item 29)

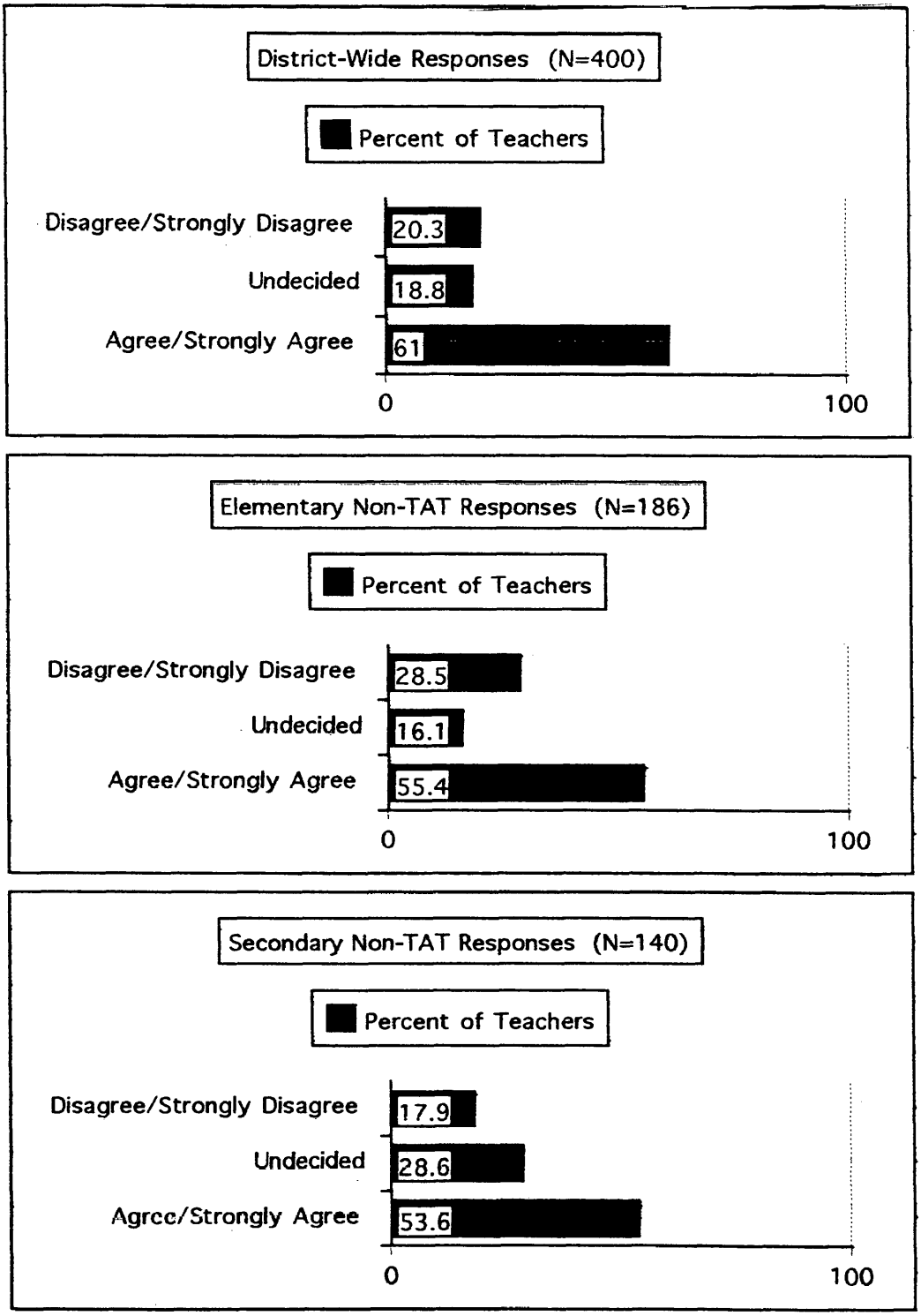
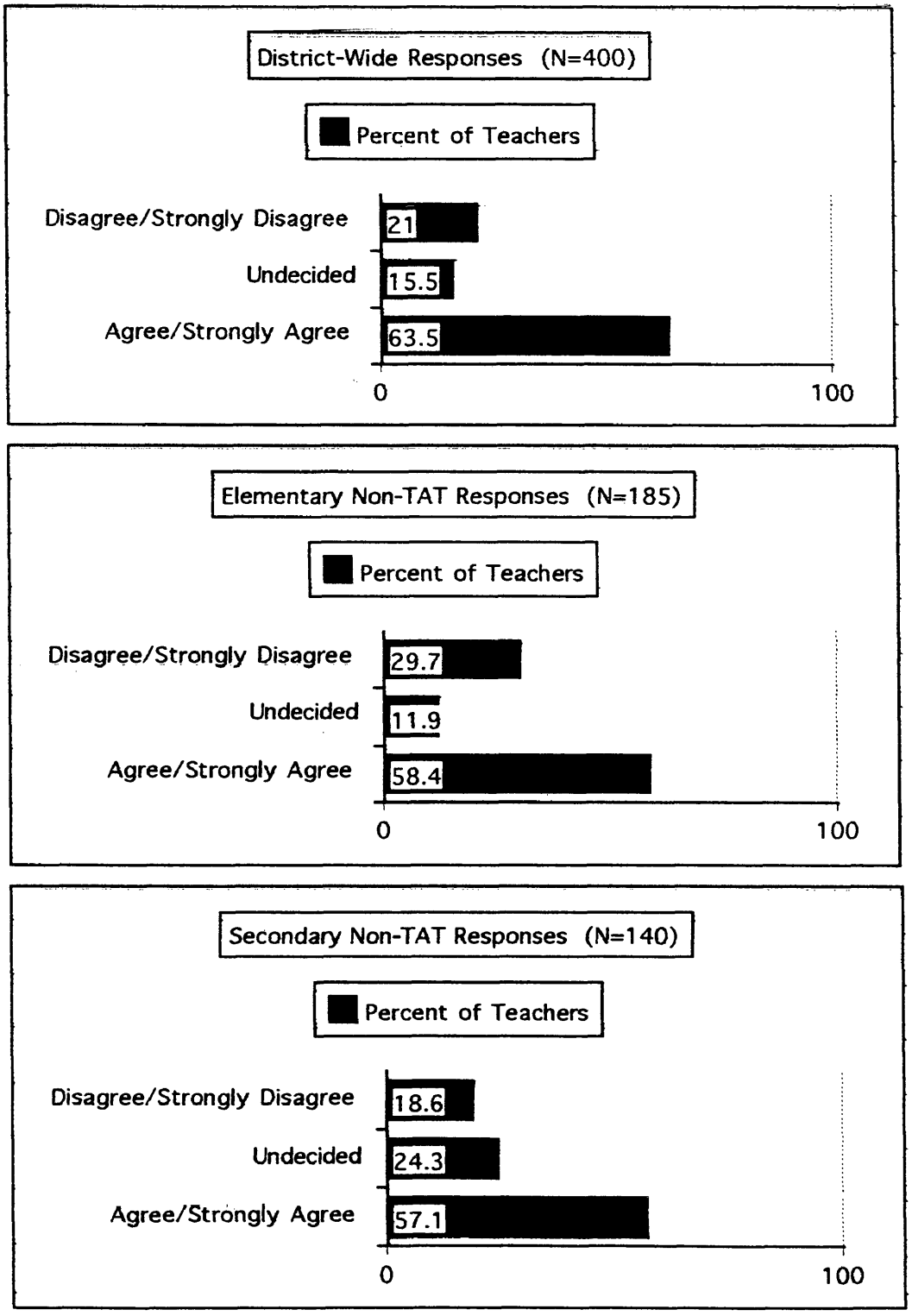


Chart 4.17

New Computer Skills (Item 31)



computer-related technology skill in the past year due to the efforts of TAT teams, 24.3 percent are undecided, and 18.6 percent disagree with the statement.

TAT teams have been beneficial for at least 63 percent of the district teachers in learning a new computer skills. Again, the large undecided percent makes it unclear if teachers are not sure if they were taught by TAT members, or if they are unsure if they have learned a new skill this year. This large percent of undecided along with the 21.0 percent who disagree that learning a new skill was due to the efforts of the TAT team suggests more effort could be made in this area. This should be seriously considered by TAT teams since almost all percent of the teachers said they would like to learn a new computer-related technology skill.

Improving the Knowledge About Computers (Item 32)

Being able to understand and know how to work computers is half the battle. Questionnaire item 32 states: TAT teams in the schools are helping improve the knowledge of computer-related technologies in our schools. This is an important factor in answering research question four. Chart 4.18 displays the respondent answers.

District-wide responses reflects that 75.2 percent do feel TAT teams are helping improve the knowledge of computer-related technologies in the schools. Exactly 16.0 percent are undecided, and 8.8 percent disagree.

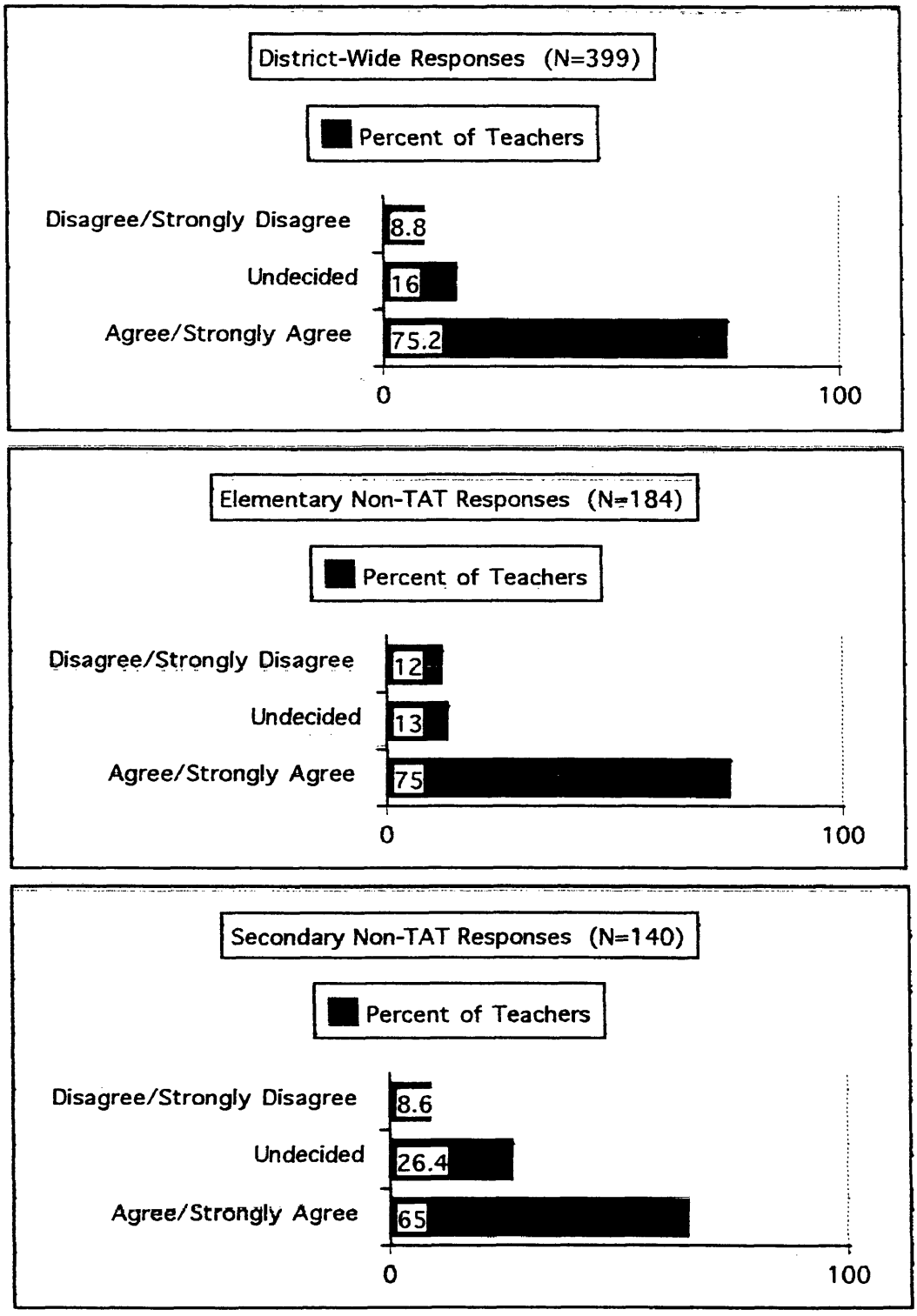
Elementary level responses indicate that 75.0 percent do feel TAT teams are helping improve the knowledge of computer-related technologies in the schools, while 13.0 percent are undecided, and 12.0 percent disagree.

Secondary level responses show that 65.0 percent do feel TAT teams are helping improve the knowledge of computer-related technologies in the schools. 26.4 percent are undecided, and 8.6 percent disagree.

The secondary results are similar to the district-wide and elementary level views although secondary teachers have 10 percent more in the undecided category and 10 percent less in the agree category. In general, the district has over 75 percent of teachers who do feel TAT teams are helping improve the knowledge of computer-related technology, and 8.8 percent who feel they have not.

Chart 4.18

Improving Knowledge About Computers (Item 32)



Teachers Becoming More Proficient in Technology (Item 34)

Item 34 is similar to item 32, but asks teachers if they feel they have become more proficient in technology as well. Item 34 states: TAT members have helped teachers to become more proficient in technology.

District-wide responses in chart 4.19 show that 75.8 percent of teachers feel TAT teams have helped the staff to become more proficient in technology, while 16.8 percent are undecided and 7.5 percent do not agree with the above statement.

Elementary level responses indicate similar responses as the district-wide: 75.1 percent feel TAT teams have helped the staff to become more proficient in technology, 13.5 percent are undecided and 11.4 percent do not feel TAT teams have helped teachers become more proficient.

Secondary responses vary slightly. The number of teachers who agree that TAT teams have helped teachers to become more proficient dropped to 66.4 percent, the undecided percent rose to 27.9 percent, and those who disagreed remained about the same at 5.7 percent.

These are similar with the exception of secondary teachers who have over 10 percent more in the undecided category than did the other two categories. Also, the secondary level agree percentage was much lower at 66 percent. In general, the district has over 75 percent of teachers who feel TAT members have helped them become more proficient in technology, and 7.5 percent who feel they have not. If one compares the results of this item and those of the previous item, the results are almost identical.

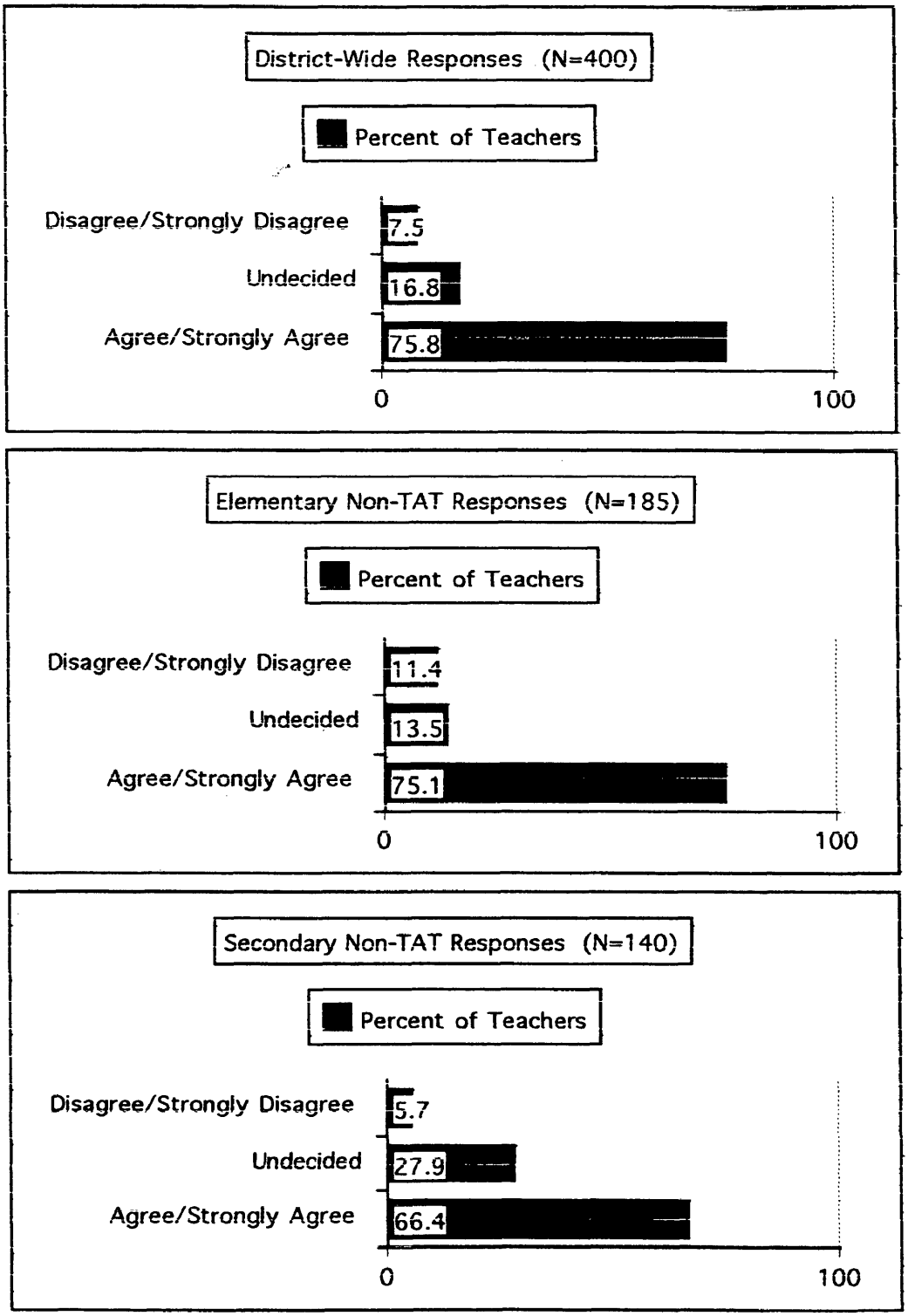
Conclusion

Research question four focuses on determining if teachers feel TAT members have helped them become more computer literate and proficient. None of the four questions had results that reached 80 percent or more of teachers agreeing with the statements relating to TAT teams helping teachers become more literate and proficient.

These areas include 1) their use of computers had increased due to the efforts of TAT teams, 2) they have learned a new skill due to the efforts of the TAT teams, 3) TAT teams helped improve their knowledge of computers, and 4) they are more proficient in

Chart 4.19

More Proficient in Technology (Item 34)



technology due to TAT teams. While the results show TAT teams are headed in the right direction, more can be done to help teachers become more computer literate and proficient. These four areas provide the TAT teams with a challenge for the next school year.

Research Question Five: How Beneficial are TAT Teams

Research question five states: Do certified teachers perceive Technology Assistance Team members' computer-related knowledge as beneficial to their buildings. This question was framed to elicit an overall understanding of teacher perceptions about TAT teams.

TAT Members Beneficial (Item 33)

Questionnaire item 33 states: TAT members are beneficial in my building. This item seeks to determine if teachers feel TAT teams have been beneficial, not only providing technological knowledge as dealt with in item 43, but if they feel they have been beneficial for the building as a community.

District-wide responses, as shown in chart 4.20, reveal that 81.3 percent do feel TAT members are beneficial in their building. While 12.5 percent are undecided and 6.2 percent disagree that TAT teams have been beneficial to their building.

Elementary level responses suggest 81.3 percent do feel TAT members are beneficial in their building. Almost 13 percent (12.9) are undecided, and 9.1 percent do not feel they have been beneficial.

Secondary level responses show that 77.9 percent agree TAT teams are beneficial, while 17.1 percent are undecided and 5.0 percent disagree.

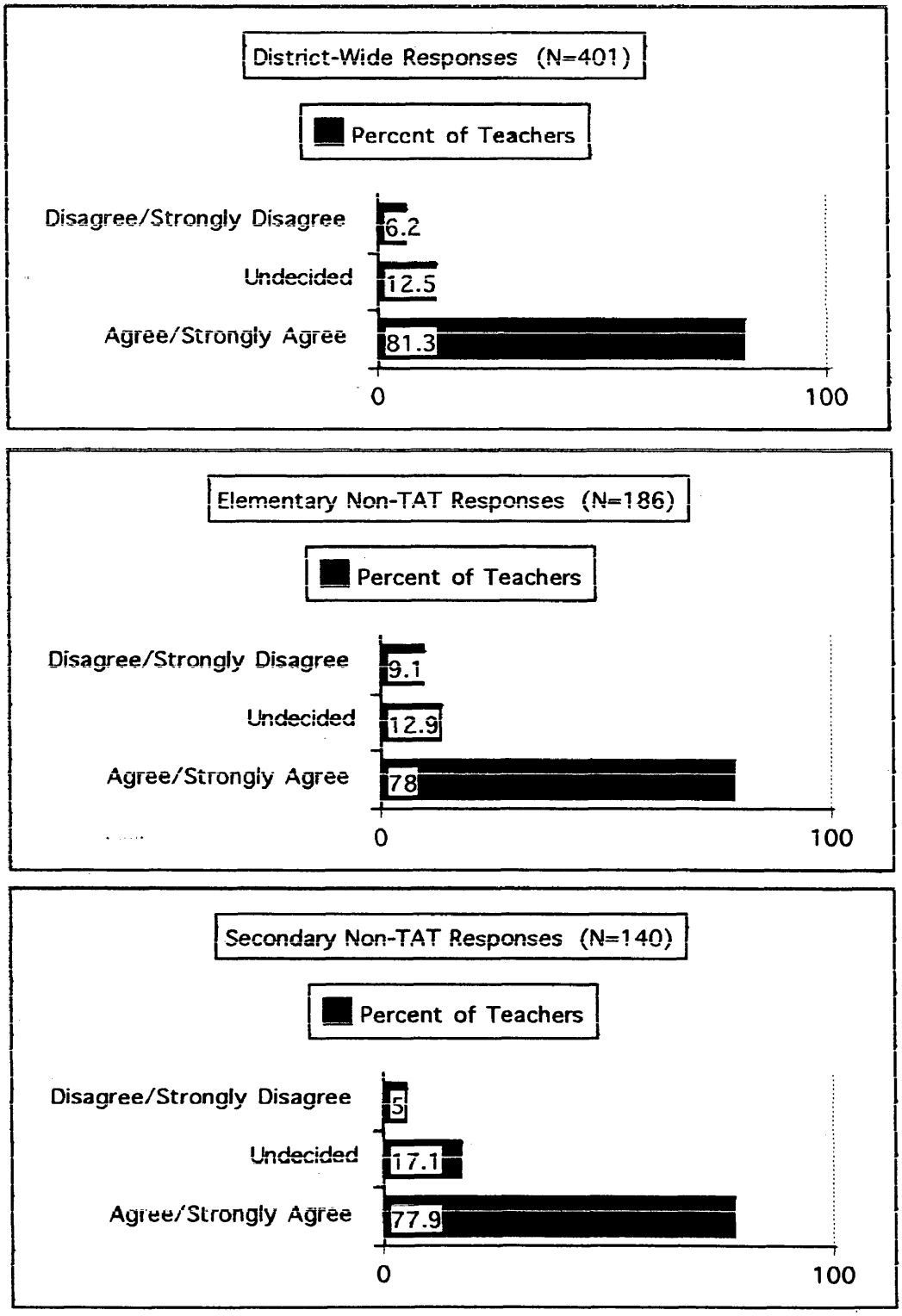
When comparing the three categories, they are relatively similar. It interesting to note that when TAT members are included, as they are in the district-wide results, over 81 percent felt that TAT members are beneficial at the building. However, when the TAT members are eliminated at the elementary and secondary level, neither of the agree percentages rose above 78 percent. TAT bias does show slightly in the overall district statistic.

Importance for Professional Growth (Item 35)

Professional growth is an ongoing process which all teachers are encouraged to experience. It is important for teachers to grow professionally and be able to recognize

Chart 4.20

TAT Members Beneficial (Item 33)



what has helped them to grow professionally. Item 35 helps to gather teacher perceptions about the extent they feel TAT teams are important in this area. It states: TAT teams are important for professional growth. Chart 4.21 shows these results.

District-wide responses reveal that 79.5 percent agree TAT teams are important for professional growth. Exactly 14.0 percent are undecided and only 6.5 percent feel they are not important for professional growth.

Elementary level responses show 76.2 percent feel TAT teams are important for professional growth, while 15.1 percent are undecided and 8.7 percent disagree with this statement.

Secondary responses indicate that 82.1 percent agree with this statement. Over 11 percent (11.4) are undecided, while 6.4 percent disagree TAT teams are important for professional growth.

It is interesting that elementary teachers did not feel quite as strongly toward TAT teams being important for professional growth when compared to district-wide responses, while secondary level responses were slightly more supportive than district-wide responses.

Overall Evaluation (Item 40)

Finally, questionnaire item 40 states: Please indicate your evaluation of the TAT teams in the Papillion-La Vista School District. This was the last question on the questionnaire and allowed teachers to give one final evaluation of their perception of TAT teams. There were five responses to choose from: outstanding, more than adequate, adequate, inadequate, and very inadequate. Results can be viewed in chart 4.22.

District-wide responses shows 18.2 percent feel TAT teams are outstanding, 38.4 percent feel TAT teams are more than adequate, 34.4 feel TAT teams are adequate, 7.7 percent feel TAT teams are inadequate, and 1.3 percent feel they are very inadequate.

Elementary level responses show 15.1 percent feel TAT teams are doing outstanding, 36.0 percent feel TAT teams are more than adequate, 37.1 percent feel TAT teams are adequate, 9.1 percent feel TAT teams are inadequate, and 2.7 percent feel they are very inadequate.

Chart 4.21

Importance For Professional Growth (Item 35)

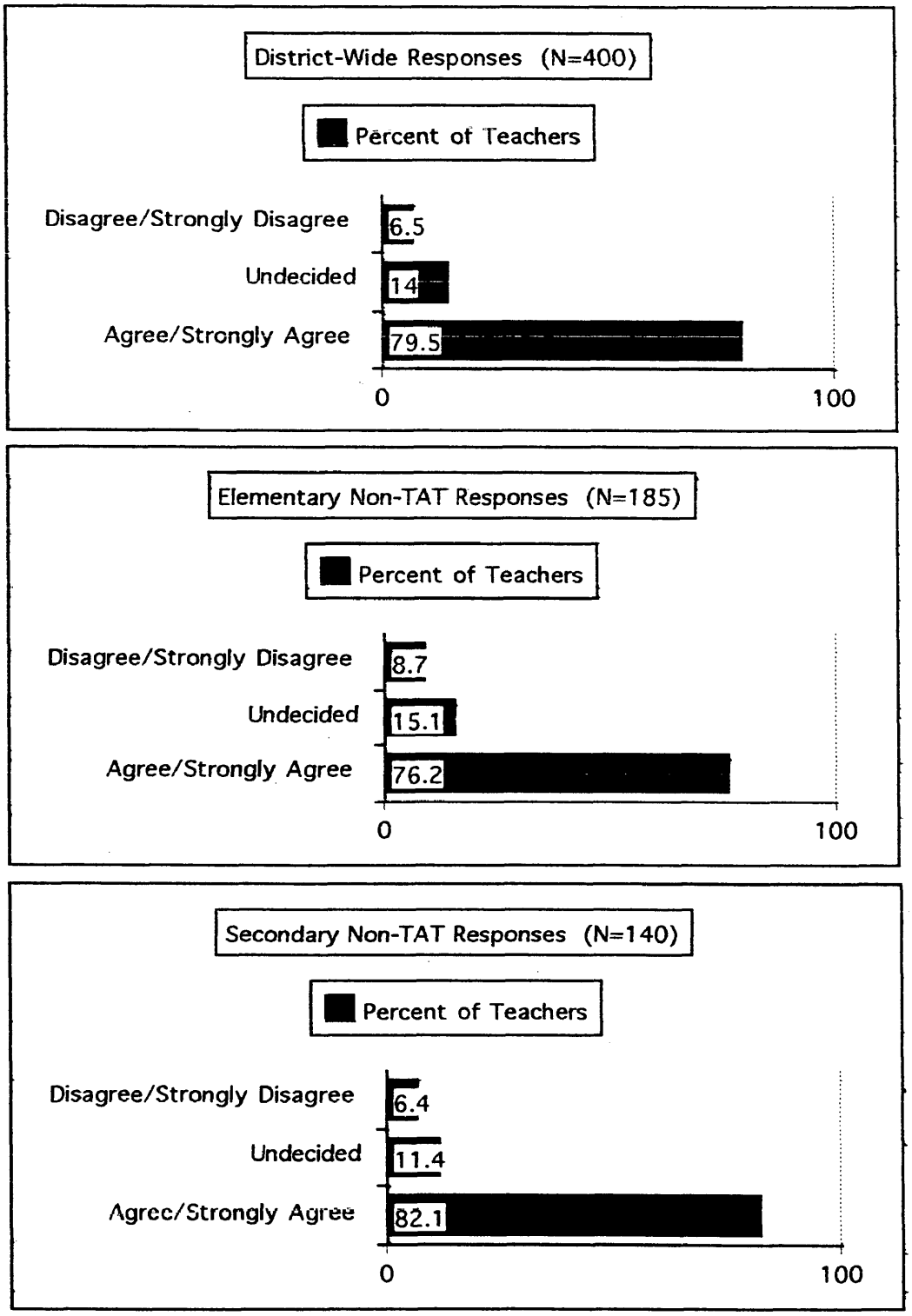
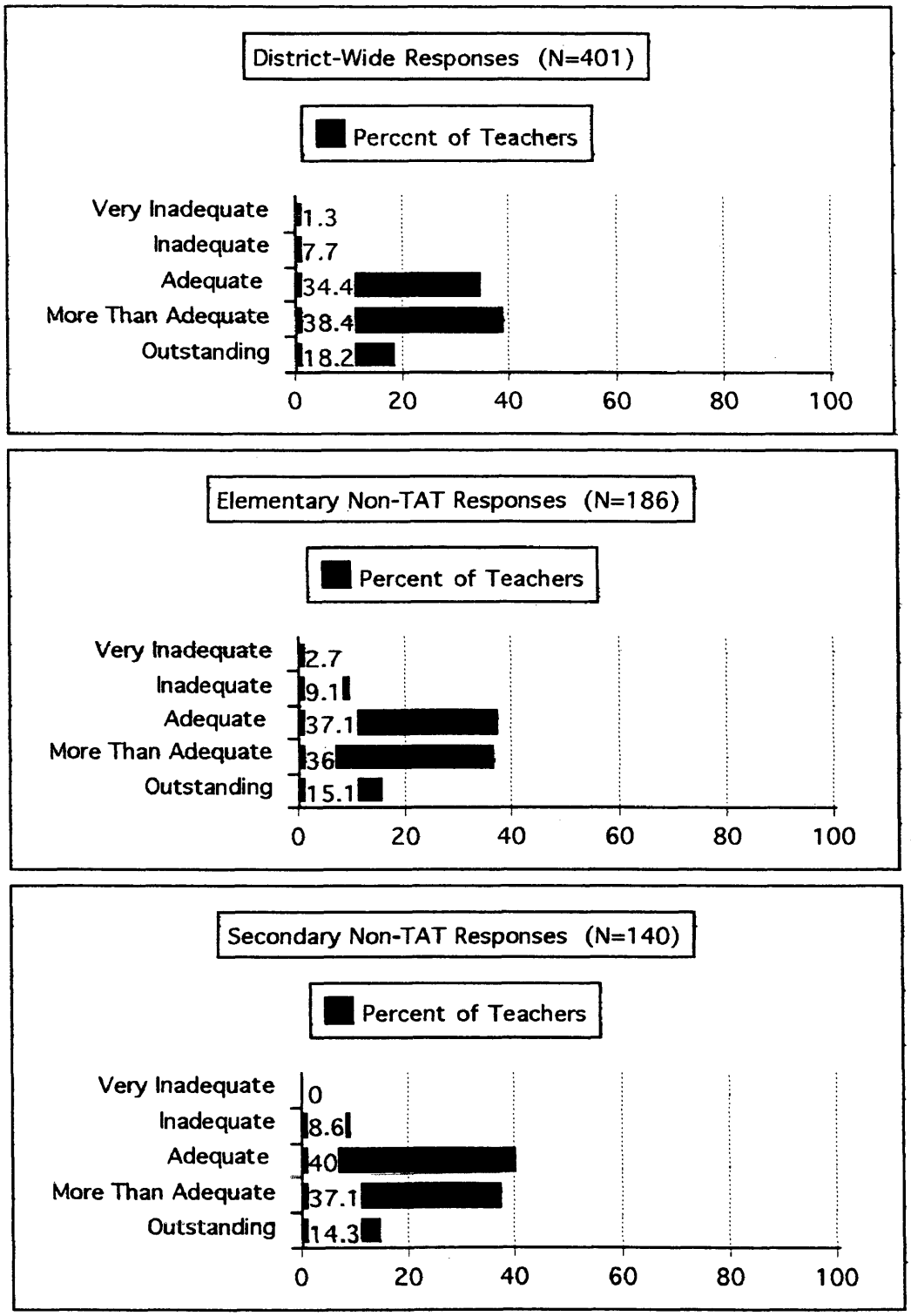


Chart 4.22

Overall Evaluation (Item 40)



Secondary responses indicate 14.3 percent feel TAT teams are doing outstanding, 37.1 percent feel TAT teams are more than adequate, 40.0 percent feel TAT teams are adequate, 8.6 percent feel TAT teams are inadequate, and 0.0 percent feel they are very inadequate.

The researcher grouped this final evaluation into two categories. Outstanding, more than adequate, and adequate were grouped into an "efficient" category, while inadequate and very inadequate were grouped into an "inefficient" category. Looking at the district's overall perception of TAT teams, and combining the groups, over 91 percent ranked TAT teams as efficient, while only 9 percent felt they were inefficient.

Conclusion

The fifth and final research question, sought to determine if teachers perceive TAT teams as beneficial to their building. Of the three questionnaire items analyzed, two had results that reached the 80 percent level of agreement and one that did not reach that level.

The two areas that reached the 80 percent level were that TAT members are beneficial to the building and were performing efficiently.

The one item that did not reach the 80 percent level dealt with professional growth. In summary, teachers are supportive or TAT teams and feel they have value in the buildings. These results suggest that research question number five could be answered affirmatively.

Summary

Many of the questionnaire items had results that reflected positively toward TAT teams, while a few identify areas for improvement. Examining these results in terms of the five original research questions suggests the following.

Research Question One -- what is the comfort level and personal ability of using computers of certified teachers in Papillion-La Vista School District -- can be answered affirmatively. Teachers use the computers a large amount of time and rate themselves as general or a more advanced user. Of the seven questionnaire items analyzed, five items had 80 percent or more of teachers agreeing positively with the statement in the favor of computer use and ability using the computer.

Research Question Two -- do certified teachers perceive that Technology Assistance Team members' knowledge of computer-related technologies is utilized in Papillion-La Vista Public Schools -- could also be answered affirmatively. Teachers do know the members of TAT teams, are comfortable approaching them, and have received assistance from them in the past year. Of the four questions examined, the results of three of them reached the 80 percent level of teachers agreeing positively with the statement in the favor of the utilization of TAT teams knowledge.

Research Question Three -- do certified teachers perceive that Technology Assistance Team members facilitate computer-related technology training within their buildings -- could not be answered affirmatively. Two of the questionnaire items' results reached the 80 percent level and two did not. TAT teams have provided technology assistance and inservices, but have not provided requested handouts or individual training.

Research Question Four -- do certified teachers perceive themselves as more proficient and computer literate due to the efforts of the Technology Assistance Teams -- is the only question that would be given a "no" response. None of the four questionnaire item results reached the 80 percent level. TAT teams did not help teachers increase their use of technology, learn new computer skills, improve their knowledge about computers, or help them to become more proficient in technology. This provides areas for district TAT members to work on.

Finally, Research Question Five -- do certified teachers perceive Technology Assistance Team members' computer-related knowledge as beneficial to their buildings -- could be answered affirmatively. Teachers do feel TAT members are beneficial and support TAT teams overall. Of the three questionnaire items considered, two reached the 80 percent level.

In retrospect, of the five research questions that directed this study, three received a "yes" answer, one a "no" answer, and one was neither "yes" nor "no". These results suggest that the research hypothesis for the study --According to teacher perceptions, Technology Assistance Teams help facilitate technology staff development in the Papillion-La Vista School District -- should be accepted.

CHAPTER 5

Conclusion

Summary

Like most school districts across the country, the Papillion-La Vista School District is faced with the task of preparing its students to function effectively in an information-driven society. One important ingredient in such an effort is having technologically literate teachers. In the spring of 1996, the Papillion-La Vista School District took a major step in that direction through the formation of Technology Assistance Teams (TAT) in each of the district's buildings. The purpose of these teams was to facilitate staff development in the area of technology understanding and utilization.

This research study was conducted to determine if certified teachers in the district perceived TAT teams to be beneficial in facilitating technology staff development in their respective buildings. The study's problem statement asks: According to teacher perceptions, do Technology Assistance Teams in Papillion-La Vista Public Schools help facilitate technology staff development in the Papillion-La Vista School District?

Five research questions were developed to determine the answer to that problem statement. These research questions include: 1) what is the comfort level and personal ability of using computers of certified teachers in Papillion-La Vista School District; 2) do certified teachers perceive that TAT team members' knowledge of computer-related technologies is utilized in Papillion-La Vista Public Schools; 3) do certified teachers perceive that TAT team members facilitate computer-related technology training within their buildings; 4) do certified teachers perceive themselves as more proficient and computer literate due to the efforts of the Technology Assistance Teams; 5) do certified teachers perceive TAT team members' computer-related knowledge as beneficial to their buildings. While research question one does not directly relate to the problem statement, it does provide an understanding of the current technology skill level of teachers in the district.

A 40 item, one page front and back, questionnaire was used to gather data from teachers in thirteen of the fourteen schools in the Papillion-La Vista School District. This questionnaire was created by the researcher with help from experts in the field, the district

technology coordinator, suggestions from teachers within the district, and a sample group of teachers who provided input to improve the questionnaire after completing it.

The questionnaire was completed on a voluntary and anonymous basis by certified teachers. Items on the questionnaire were grouped in accordance with their relevance toward each of the five research questions. Of the 470 certified teachers in the district, 406 completed the questionnaire for a return rate of 86.38 percent.

The questionnaire was administered during staff meetings at the various schools during March, April, and May of 1998. Teachers who were not at the staff meeting were asked to complete the questionnaire and return it to the researcher without their name. Directions were given verbally to each group at the time the questionnaire was completed. In addition to these verbal directions, a cover letter was provided.

Questionnaires were collected, and data was compiled at the Computing and Data Communications Center at the University of Nebraska-Omaha. The data was then converted to a FileMaker Pro document for analysis.

Data was examined in three categories. The first category included responses from all of the respondents regardless of their teaching level or whether or not they were a TAT member. The second category included elementary teachers who were not TAT members. The final category consisted of secondary level non-TAT members. This provided views from a district-wide perspective as well as from two instructional levels.

Although the questionnaire results were analyzed for each of these three categories, there was relatively little difference in responses between these categories. For that reason, the results are considered as a whole, rather than from each of the three. Finally, a level of 80 percent or greater was used as the successful target percent to evaluate each of the individual questionnaire items, which in turn, answer the five research questions.

Conclusions

This research provided valuable data for evaluation of the strengths and weaknesses of Technology Assistance Teams. Conclusions reached throughout this research identified many aspects of the TAT approach that teachers perceive to be extremely beneficial, as well as a few that are perceived to need more effort.

Research Question One asked: *What is the comfort level and personal ability of using computers by certified teachers in Papillion-La Vista School District?* The responses to the questionnaire items related to this question indicate that the vast majority of Papillion-La Vista School District teachers have five or more years of experience using computers, rate themselves as a general or more advanced user, use a computer daily at school, want to increase their computer knowledge, and feel comfortable using a computer. The analysis also revealed that teachers use computers at home less frequently than at school. These results suggest that the answer to Research Question One should reflect that Papillion-La Vista teachers are experienced computer users, use them frequently, and are comfortable doing so.

Research Question Two asks: *Do certified teachers perceive that Technology Assistance Team members' knowledge of computer-related technologies is utilized in Papillion-La Vista Public Schools?* A majority of teachers felt they know the members of TAT teams, are comfortable approaching TAT members, and have utilized members of the TAT teams in the past year. Also, over half of the responding teachers turn to a TAT member for support about technology questions. The responses to this last item did not reach the 80 percent standard used throughout this research. These results suggest that the answer to Research Question Two is "yes."

Research Question Three posed the question: *Do certified teachers perceive that TAT team members facilitate computer-related technology training within their buildings?* The analysis of the related questionnaire items show that teachers perceive that TAT members have provided technology support and inservices. Using the 80 percent level of response, teachers did not perceive that TAT members provided handouts when requested or individual technology training. A large percent of the respondents were undecided about the two items that related to handouts and individual training. Because of these mixed results, Research Question Three was neither supported or unsupported by the respondents.

The fourth research question asked: *Do certified teachers perceive themselves as more proficient and computer literate due to the efforts of the TAT teams?* This question

was one where the related questionnaire item responses did not reach the 80 percent level. The items asked teachers to indicate their feelings in the following areas: 1) if their computer use had increased due to TAT teams effort; 2) if they had learned a new skill due to TAT teams; 3) if TAT teams helped improve their knowledge of computers; and 4) if TAT teams had helped them become more proficient in technology. Although some response percentages were close to the 80 percent level, that standard was not met. As a result, Research Question Four is not supported by the respondents.

The fifth and final research question asked: *Do certified teachers perceive TAT team members' computer-related knowledge as beneficial to their buildings?* Using the 80 percent standard it was found that teachers felt TAT teams were beneficial to the building, and that overall, the efforts of TAT teams are viewed positively. On the other hand, teachers did not perceive that TAT teams were important to professional growth. These responses suggest that Research Question Five is supported by the respondents.

In summary, the analysis of the results of the five research questions shows that three are supported by respondents, one is not supported by respondents, and one is neither supported or unsupported. These results suggest the Research Hypothesis for the study is supported by Papillion-La Vista teachers.

Recommendations

The research results indicate that in general, TAT teams in the Papillion-La Vista School District are perceived in a positive light. They also suggest there are areas that need improvement and other research avenues to be explored. The following recommendations attempt to capture these next steps:

1) Evaluation of TAT teams should be conducted on a regular basis to determine if TAT teams continue to meet the needs of the district. The rapidly changing nature of technology and its applications call for ongoing staff development.

2) Those areas which fall below the 80 percent standard need further study. One such area includes professional development that enables teachers to gain new computer skills. Although 63 percent of teachers district-wide said they learned a new skill due to the efforts of TAT members, over 97 percent responded they wanted to learn a new skill. This

suggests that 34 percent of teachers would still like to learn a new skill, but it is not being provided by TAT members.

Providing handouts to teachers and conducting individual training sessions are two other areas that should be examined more closely. Similar consideration should be given to other questionnaire item topics that fell below the standard.

3) While the questionnaire results analysis made some comparisons between the elementary and secondary levels and found little differences, further comparisons between respondent categories should be made. For example, comparisons between different elementary level buildings or between secondary level subject areas might identify other aspects of TAT performance needing attention. The same is true of comparisons between gender, years of teaching experience, and level of education.

4) While the results of this study show a high level of computer usage by the Papillion-La Vista teaching staff, they do not indicate how these computers are being used. Using a computer as an electronic grade book is far different than using it as a classroom tool to promote higher order thinking skills. Additional research into how teachers are using technology is needed.

5) An investigation into the amount of time teachers are provided to learn technology along with the time allotted for TAT members to share their knowledge with teachers should be evaluated. This would provide the district with data to determine if teachers feel they have ample time to learn technology and if TAT members have ample time to provide services to their colleagues.

In conclusion, the study hypothesis has been supported by the teachers of the Papillion-La Vista School District. The findings should help the TAT teams become more effective and, in turn, help the district's teachers become more knowledgeable in the area of technology. This is just one step in creating an educational society that is prepared for the technological world which we are currently experiencing.

Appendix A

Questionnaire on Following Page

Y N

Please bubble in the answer you select for the following questions:

1. Are you a Technology Assistance Team (TAT) Member?
   A. Yes B. No
2. What is your gender?
   A. Male B. Female
3. What level do you teach?
   A. Elementary B. Middle School C. High School D. Travel between 2 or more levels
4. How many years have you been teaching? (Total years teaching, not only in PLS)
   A. 1-5 years B. 6-10 years C. 11-15 years D. 16-20 years
   E. 20 or more years
5. If you are a **secondary** level teacher, what subject area do you teach:
   A. English B. Social Studies C. Math D. Science
   E. Elective
6. Degree you currently hold:
   A. Bachelors B. Bachelors +hours C. Masters D. Masters +hours
   E. PhD
7. How many years have you been using a computer?
   A. I do not use a computer B. Less than a year C. One year
   D. 5 years E. Over 5 years
8. What level would you rate yourself as a computer user?
   A. I do not use a computer B. Beginner/novice C. General user
   D. Advanced user E. Expert user
9. How often do you use a computer at school?
   A. Every day B. Once a week C. Once a month
   D. Once a semest. E. Never
10/11. Select the application you most commonly use for personal use. (Quest. 10 & 11)
   10A. Word Processing 10B. Spreadsheet 10C. Database
   10D. Email or QuickMail 10E. Internet (WWW) 11A. Desktop Publishing
   11B. Curricular Software 11C. Grading Program 11D. Money Management
   11E. Other _____ (please specify type of program)
12. How often do you use a computer at home?
   A. Every day B. Once a week C. Once a month D. Never
   E. I do not have a computer at home
13/14. Select the application you most commonly use for student instruction. (Quest. 13 & 14)
   13A. Word Processing 13B. Spreadsheet 13C. Database
   13D. Email or QuickMail 13E. Internet (WWW)
   14A. Desktop Publishing 14B. Curricular Software
   14C. Grading Program 14D. Money Management Program
   14E. Other_____ (please specify type of program)
15. How often do students use the computer in your class for purposes that are class related?
   A. Every day B. Once a week C. Once a month
   D. Once a semes. E. Never
16. Do you teach at least one class a week in a computer lab?
   A. Yes B. No
17/18. If you had questions about using computer-related technology, who would you ask for assistance? (Quest. 17 & 18)
   17A. Student 17B. Another Teacher 17C. TAT Member
   17D. Computer Teacher 17E. Media Center Specialist
   18A. District Technology Coordinator 18B. Vendor Support or Representative
   18C. Other _____ (please specify)
19. I have received help from a TAT member in the last
   A. Week B. Month C. Semester D. Year E. Never
20. Please rate the computer-related technology assistance you receive from TAT members.
   A. Strong Support B. Support C. Little Support D. No Support

SURVEY MARKING INSTRUCTIONS
- Use a No. 2 Pencil
- Fill circles completely
- Erase cleanly

SURVEY NAME

SPECIAL CODES

A	B	C
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

SURVEY NUMBER

DO NOT PRINT IN THIS AREA

Y N

21. How would you rate access to technology/computers in the building?
A. Easy Access B. Some Access C. Little Access D. No Access

Using the following scale, select the bubble on the answer sheet that best indicates your answer to the following questions: A=Strongly Agree B=Agree C=Undecided D=Disagree E=Strongly Disagree

22. I would like to learn more about computer-related technologies to use in my teaching.

23. I have completed a computer-related technology project in my classroom in the past year.

24. I would like to improve my skills in the use of computer-related technologies.

25. I feel uncomfortable working with computers.

26. I know the members of the TAT team at my school.

27. TAT members have provided in-services to help staff development.

28. I have received TAT handouts to assist my use of technology when requested.

29. My use of computers has increased due to the help of TAT members.

30. TAT members in my building have provided individual technology training to staff members.

31. I have gained a new computer-related technology skill in the past year due to the efforts of the TAT team.

32. TAT teams in the schools are helping improve the knowledge of computer-related technologies in our schools.

33. TAT members are beneficial in my building.

34. TAT members have helped teachers to become more proficient in technology.

35. TAT teams are important for professional growth.

36. I am comfortable approaching the members of the TAT team with questions

37. I use the knowledge of TAT members to help use computer-related technology in my classroom.

38. I am comfortable using computer-related technologies for personal use.

39. I am comfortable using computer-related technologies with students in my class.

40. Using the following scale, please mark the bubble on the answer sheet that best indicates your evaluation of the TAT teams in the Papillion-LaVista School District.
A. Outstanding B. More than Adequate C. Adequate D. Inadequate E. Very Inadequate

Appendix B

TO: Certified Teachers in the Papillion-LaVista School District

FROM: Julie Duerfeldt, CADRE teacher, Papillion Junior High School

DATE: March 19, 1998

SUBJECT: Questionnaire

Technology is having an increasing impact on today's society. As an employee of the Papillion-LaVista School District you have the opportunity to participate in a research study analyzing the perceptions of Technology Assistance Teams and the impact of TAT teams on technology staff development in the Papillion-LaVista schools.

The attached questionnaire is to be completed on a voluntary basis. Your participation in the research study will take approximately five minutes and will be greatly appreciated. Be assured that your responses will be kept confidential; you are not being asked to provide your name or other personal identification on the questionnaire--responses are anonymous. An analysis of the data collected will be available upon completion of the research. If you have any questions about this research, please contact me at (402) 339-3262.

Your responses will help Technology Assistance Teams better accommodate technology staff development needs in the Papillion-LaVista School District. Thank you for taking the time to complete the questionnaire.

Sincerely,

Julie Duerfeldt
Papillion Junior High School

** This study is being completed in conjunction with a Masters Degree program at the University of Nebraska at Omaha. I am the principal investigator in the study and am working with Dr. Ray Ziebarth, Dr. Neal Grandgenett, and Pam Kramheck, Papillion-LaVista CADRE associate. This study has the approval of assistant superintendent, Dr. Leon Dappen.*

Bibliography

Armstrong, D., Davis, R., & Young, G. (1996, October) Technology integration at the middle and high school levels: a model for staff development. NASSP Bulletin, 80, 81-88.

Barron, T. (1996, January) A new wave in training funding. American Society for Training & Development, 50, 28-34.

Benson, D. (1997, January) Technology training: meeting teachers' changing needs. Principal, 76, 17-19.

Berman, S. & Tinker, R. (1997, November) The world's the limit in the virtual high school. Educational Leadership, 55, 52-54.

Boyd, E. G. (1997, August) Training-on-demand: a model for technology staff development. Educational Technology, 37, 46-49.

Building bridges: the mission & principles of professional development. (1996, June 21) [On-line] Available: http://www.ed.gov/G2K/bridge.html

Caverly, D. C., Peterson, C. L., & Mandeville, T. F. (1997, November) A generational model for professional development. Educational Leadership, 55, 56-59.

Chin, S. S. & Hortin, J. A. (1993-1994) Teachers' perceptions of instructional technology and staff development. Journal of Educational Technology Systems, 22, 83-98.

Cincoski, D. T. (1997, March) Designing for the future. Learning by Design, 21-25.

Cooley, V. E. (1997, Winter) Technology: building success through teacher empowerment. Educational Horizons, 75, 73-77.

Costello, R. W. (1997, November) The leadership role in making the technology connection. Technological Horizons in Education Journal, 24, 58-62.

Friedrich, O. (1983, January) Machine of the year: the computer moves in. TIME.

Gottfried, J. & Gilliland-McFeely, M. (December/January, 1997-98) Learning all over the place: integrating laptop computers into the classroom. Learning and Leading With Technology, 25, 6-12.

Hoffman, B. (1997, January) Integrating technology into schools. Education Digest, 62, 51-55.

Hunter, B., Bagley, C., & Bagley, R. (1993, Summer) Technology in the classroom. Schools in the Middle, 2, 3-6.

Hurst, D. S. (1994, April) Teaching technology to teachers. Educational Leadership, 51, 74-76.

Investing in teachers. (1998, April 28) [On-line] Available: http://www.nap.edu/readingroom/books/techgap/investing.html

Kay, A. (1997, July) Technology and powerful ideas. The American School Board Journal, 184, 16-19.

Killion, J. P. & Lanzerotte, J. K. (1992, Fall) Is the grass greener on the other side? Discoveries about training in business and industry. Journal of Staff Development, 13, 6-10.

Kolbasuk-McGee, M. (1997, February) Poor training can sink technology projects -- managers advised to plan carefully. Information Week, 89.

Lee, C. (1996, April) Teacher training for technology. Thrust for Educational Leadership, 25, 12-13.

MacArthur, C. A. (1995, Fall) mentoring: an approach to technology. Journal of Research on Computing in Education, 28, 46-62.

Molnar, A. R. (1997, June) Computers in education: a brief history. Technological Horizons in Education Journal, 24, 63-68.

Oppenheimer, T. (1997, September/October) Computers in the classroom. Policy Review, 85, 57-58.

Paul, D. (1994, April) An integration/inservice model that works. Technological Horizons in Education Journal, 21, 60-62.

Pearson, K. (1994, September) Empowering teachers for technology. The Computing Teacher, 80, 70-71.

Peck, K. L. & Dorricott, D. (1994, April) Why use technology? Educational Leadership, 51, 11-14.

Report on the effectiveness of technology in schools, 95-96: executive summary. (1998, April 29) [On-line] Available: http://www.spa.org/project/edu_pub/summary.htm

Ryan, A. J. (1995, January) Alternative growth. Computerworld, 29, 101-102.

Salpeter, J. (1998, February) News extra: three recent reports present a snapshot of educational technology today. Technology & Learning, 18, 68-69.

Shelton, M. & Jones, M. (1996, October) Staff development that works! A tale of four T's. NASSP Bulletin, 80, 99-105.

Skinner, D. (1997, Summer) Computers: good for education? The Public Interest, 128, 98-109.

Thornburg, D. D., Ph.D. (1997, April 15) 2020 visions for the future of education. [On-line] Available: http:www.tcpd.org/handouts/thornburg/2020visions.html

Timeline: 50 years of computing. (1997, June) Technological Horizons in Education Journal, 24, 32-34.

U.S. Department of Commerce, Bureau of the Census. (1995, January 30) Student use of computers. [On-line] Available: http://nces.ed.gov/pubsold/CoE95/05txt.html

Waxman, H. C. & Huang, S. L. (1993, March) Investing computer use in elementary and middle school inner-city classrooms. Paper presented at the annual meeting of the Society for Technology and Teacher Education, San Diego, CA.

West, G. (1994, April) Planning for tomorrow's technology. The School Administrator, 51, 26-32.

Wiburg, K. (1994, February) Integrating technologies into schools: why has it been so slow? The Computing Teacher, 21, 6-8.

Zietz, L. (1995, April) Developing a technology workshop series for your faculty and staff. The Computing Teacher, 22, 62-64.