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ABSTRACT
        This quantitative and qualitative study examined
self-reported perceptions of student teachers, inservice teachers, parents,
and community members regarding beginning and preservice teachers' levels of
technological competence, focusing on (1) how well beginning teachers were
able to apply these technology competencies; (2) where the gaps were between
the teacher education curriculum and beginning teacher technology competence;
and (3) what supports higher education faculty, P-12 administrators, and
policymakers need to provide to ensure that beginning teachers can apply
expected levels of technology competencies in teaching. Data from surveys and
focus groups with student teachers, inservice teachers, parents, and
community members indicated that while beginning and preservice teachers did
indeed use and infuse technology throughout the curriculum, all of these
skills were not acquired during their professional education. The only skills
they acquired during their academic training were basic technology skills
such as word processing and keyboarding. There was a definite gap in
introducing beginning and preservice teachers to emerging technologies.
Respondents indicated needs and/or concerns in the areas of: beginning
teacher preparation; addressing differing student needs; continuing education
for inservice teachers; modeling by faculty; and access to current
technology. The appendixes present the surveys, tables and graphs, and a
response summary. (SM)

Research
in
Teacher Education

Technology Competencies
in Teacher Education

Leroy Kemp, Editor

L. Kemp

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MINNESOTA STATE UNIVERSITY
MANKATO

COLLEGE OF EDUCATION

Minnesota State University, Mankato

College of Education

Technology Competencies in Teacher Education

An Evaluation to Guide Implementation
of
Beginning Teacher Technology Standards

Research in Teacher Education

Technology Competencies in Teacher Education

An Evaluation to Guide Implementation

of

Beginning Teacher Technology Competencies

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Preface

In 1998 the Minnesota State Legislature appropriated three million dollars—the teacher Education Technology Funds—for Minnesota State Colleges and Universities (MnSCU). Legislators dedicated this money to redesign teacher education programs with emphasis on infusing core technology competencies and Graduation Standards into curricula in MnSCU's teacher education programs. In collaboration with the Council on Professional Education (Bemidji State University/Metro Teacher Collaborative, Minnesota State University, Mankato, Minnesota State University, Moorhead, Southwest State University, St. Cloud State University, and Winona State University) MnSCU developed the *MnSCU Educational Technology Draft Standards for Effective Practice of Technology Competencies for Minnesota's Beginning Teachers.*

During the 1998-1999 academic year, the Council on Professional Education (COPE) implemented regional studies to assess the degree to which the beginning teacher technology competencies were actualized by graduates of MnSCU's COPE teacher education institutions. Additionally, these studies were to examine the following questions: (1) How well are beginning teachers able to apply these technology competencies as judged by students, parents, teachers, faculty, and administrators? (2) Where are the gaps and how do we fill them? and (3) What support do higher education faculty, P-12 administrators, and policy-makers need to provide to ensure that beginning teachers can apply expected levels of technology competencies in teaching? This summary report "Technology Competencies in Teacher Education: An Evaluation to Guide Implementation of Beginning Teacher Technology Standards" represents Minnesota State University, Mankato's (MSU,M) examination of these questions.

I thank the College of Education at Minnesota State University, Mankato research team for their efforts in conducting this study. Team members included: Dorothy Engan-Barker, Professor of Education, and Director, Center for School-University Partnerships, Don Descy, Professor of Library Media Education, Diane Coursol, Professor of Counseling and Student Personnel, Jacqueline Lewis, Professor of Counseling and Student Personnel, Alyssa Nelson, Graduate Student in Experiential Education, Sue Krohn, Mankato School District's Media & Technology Specialist, Susan Moore (Mankato School District, Clinical and Student Teaching Coordinator) and Leroy Kemp, Professor of Education and Dean, College of Education. Dorothy Engan-Barker served as the Project's Director.

Beginning January 1999, the research team began to assess the current level of competency among pre-service teachers and recent teacher education graduates and to identify program needs for meeting the new *MnSCU Educational Technology Standards for Effective Practice of Technology Competencies for Minnesota's Beginning Teachers.* The research team's research plan included: the research design, instrument development, data collection, data analysis and reporting of findings. From January to June 1999, research team members attended organizational meetings (including a two-day retreat in January 1999 with other MnSCU COPE's institutional representatives),

distributed surveys, and facilitated focus-groups in order to gather the extensive data required for this project.

Leroy Kemp, Dean
College of Education

Executive Summary

Background and Purpose of Study

In 1998 the Minnesota State Legislature appropriated three million dollars to establish the Teacher Education Technology Funds for Minnesota State Colleges and Universities (MnSCU). Legislators allocated this money for the infusion of core technology competencies and graduation standards into curricula in MnSCU teacher education programs. In October of that year, a MnSCU subcommittee developed the *MnSCU Educational Technology Draft Standards for Effective Practice in Educational Technology for Minnesota's Beginning Teachers* ("Draft Standards," 1998). According to the committee, these proposed Standards will ensure that new teachers graduating from Minnesota's state universities are prepared to use and apply technology in their classrooms.

With the ultimate goal of providing better education to students in Minnesota's primary and secondary schools, this study examined the self-reported perceptions of student teachers, in-service teachers, parents, and community members regarding beginning and pre-service teachers' levels of technological competence. Technological competencies include the *basic use* of computers and related technology such as the Internet, as well as the ability to *infuse* technology (e.g., key-boarding, web page design, and assistive technology) into the classroom to promote student learning. Thus, this study attempted to answer the following questions:

I. *What is the current level of technological competence among beginning and pre-service teachers?*

II. *What specific areas of technology competency need to be addressed in Colleges of Education to prepare effective teachers?*

III. *What steps are necessary to ensure the implementation of the MnSCU Educational Technology Standards?*

This report includes the findings of the research based on those three main questions and makes recommendations for:

- Minnesota State University, Mankato's College of Education

- Other colleges and universities in the MnSCU system

- Elementary and secondary schools at Minnesota State University, Mankato

- State of Minnesota policy-makers

Conclusion and Recommendations

The two data sets—quantitative and qualitative—combine to render an interesting picture for analysis. The results indicate that while many beginning and pre-service teachers report that they can use, design and develop instructional units for their subject areas, they were not trained to do so during their formal education. As more school districts require teachers to know how to use and to infuse technology into the school curriculum, it is imperative that colleges of education ensure that beginning and pre-service teachers develop the necessary technological skills required by the comprehensive MnSCU Technology Standards: *beyond basic word processing and key-boarding.* The data especially indicate a need for more training for beginning and pre-service teachers in the areas of *emerging multimedia technologies.*

In summary, the data consistently shows that:

- Nearly all respondents—shareholders and beginning/pre-service teachers alike—believe pre-service teachers must, before graduating from teacher education programs, demonstrate high levels of technological competence and that this must be demonstrated in their ability to *infuse* technology into their instructional practices;

- In order for pre-service teachers to demonstrate these competencies, teacher education faculty must, themselves. 1) model the use of technology in their own teaching, and 2) develop course syllabi that require students to demonstrate technology competencies; and

- Schools expect both new and veteran teachers to be technologically competent; colleges of education must facilitate communication, collaboration, and on-going instruction (e.g., in-services) among P-12 educators in the area of technology education.

The following recommendations stem from the previous three belief statements.

Necessary Steps to Ensure Implementation of Standards

Because respondents reported that they generally have not acquired their technology skills through formal education, colleges of education should put more emphasis on this important area of professional training. However, the following resources will be necessary for effective implementation of the Technology Standards:

- <u>Training</u> in emerging technologies for faculty in teacher education programs;

- <u>State-of-the-art technology labs</u> designed to support multimedia technologies for both students and teacher educators (at the college level as well as primary and secondary levels);

- <u>Hardware</u>: projection cameras, video-conferencing cameras, digital cameras, scanners, and distance learning equipment;

- <u>Software</u>: multimedia programs, video-conferencing software, distance learning software, web development software;

- <u>Resources for maintenance</u>: hardware, software and personnel support; and

- <u>Personnel resources</u>: Lab support personnel, director of Information Technology, and a help-line for students, faculty and community shareholders.

In conclusion, this inquiry suggests that the technology competencies will *not necessarily* ensure that every new teacher graduating from a Minnesota State University is prepared to use and apply technology in the classroom. In order to achieve this goal, MnSCU teacher preparation institutions must:

- Provide sufficient software and hardware so that student teachers have adequate access to technology;

- Allocate sufficient funding and resources to train the faculty who will be responsible for preparing the next generation of teachers; and

- Keep in mind that teaching and learning, not technologies, should drive educational programs.

Purpose

Having the ultimate goal of providing better education to students in Minnesota's primary and secondary schools, the research team presents data for the purposes of evaluation and improvement of teacher education programs. Teacher education programs in Minnesota focus on the beginning teacher's acquisition of teaching competencies in relationship to requirements of: the National Council for Accreditation of Teacher Education (NCATE), the Standards of Effective Practice for Teachers (SEPT), and the Graduation Rule Standards.

This study investigated the importance of the technology competencies within these various standards, namely the Draft Standards, which integrate the International Society for Technology in Education (ISTE) and National Council for Accreditation of Teacher Education (NCATE) technology standards.

How well are beginning teachers able to apply these technology competencies as judged by students, parents, teachers, faculty, and administrators?

Where are the gaps? How do we fill them?

What support do higher education faculty, P-12 administrators, and policy-makers need to provide to ensure that beginning teachers can apply expected levels of technology competencies in teaching?

To address these important questions, the research team set the goal of providing recommendations relative to: the requirements for teacher preparation in educational technology; the assessment of beginning and pre-service teachers' technology competencies; and resource needs for supporting improvement and assessment of the required competencies. These goals included two main objectives:

    1.1.   To engage P-12 educators, education faculty, students, and other shareholders in developing recommendations; and

1.2.   To develop recommendations for implementation of the Technology Standards in MnSCU Colleges of Teacher Education.

Therefore, this study examined the self-reported perceptions of student teachers, in-service teachers, parents, and community members regarding beginning and pre-service teachers' levels of technological competence.

Technological competencies include the *basic use* of computers and related technology such as the Internet, as well as the ability to *infuse* technology (e.g., key-boarding, web page design, and assistive technology) into the classroom to promote student learning. Thus, this study attempted to answer the following questions:

1.   *What is the current level of technological competence among beginning and pre-service teachers?*

2.   *What specific areas of technology competency need to be addressed in Colleges of Education to prepare effective teachers?*

3.   *What steps are necessary to ensure the implementation of the MnSCU Educational Technology Standards?*

This report includes the findings of the research based on those three main questions and makes recommendations for both local and global shareholders, including:

- Minnesota State University, Mankato's College of Education
- Other colleges and universities in the MnSCU system
- Elementary and secondary schools in Minnesota
- State of Minnesota policy-makers

The report first presents the research methods that guided the study, then the separate analyses of the quantitative and qualitative data gathered during the study. The conclusion synthesizes the data and provides recommendations.

RESEARCH METHODOLOGY

Design

Given the purpose of this study, the research team decided to utilize both quantitative and qualitative research methods. Additionally, the research objectives indicated the need for a *descriptive design* (Gall, Borg & Gall, 1996). In order to gather this *descriptive data*, the study incorporated both surveys and focus groups for investigation on the perceptions of beginning and pre-service teachers' technological competence of students, teachers, parents, and community members. Participants in the study included student teachers in the College of Education at Minnesota State University, Mankato; beginning teachers with three (3) or fewer years of experience; experienced teachers with 4 or more years of experience; parents; and other members of communities from 32 school districts across Minnesota. In this way, the quantitative design creates a description of the phenomena, as they exist, while the qualitative part provides a context for understanding the numerical survey data.

Coursol and Lewis managed the quantitative data analysis, while Engan-Barker and Descy, with the assistance of Alyssa Nelson, coordinated the qualitative research and data analysis. Sue Krohn and Sue Moore acted as liaisons with local schools for survey administration and also conducted focus-groups. Leroy Kemp edited and prepared the final report.

Instrumentation

Drs. Coursol and Lewis constructed two versions of the Education Technology Survey (ETS) for the purpose of this study, based upon the Draft Standards (1998). The research team disseminated two versions of the survey to two different sample groups:

- **ETS-T**—to beginning and pre-service teachers—for assessing the effectiveness of teacher education programs in preparing them for the technological requirements of their jobs. (Questions began, "My education has prepared me to...."); and

- **ETS-S**—to shareholders—for measuring the perceived levels of technological competence of beginning and pre-service teachers by more-experienced teachers, parents, and community members. (Questions began, "Beginning teachers can....")

[Because of the basic similarity between the two versions, this report refers to 'the survey' (singular) instead of 'surveys'.] The survey was a self-report, forced-choice instrument that required participants to rate each item on a Likert-type scale ranging from Strongly Agree (6) tc Strongly Disagree (1), or Don't Know (0). The survey also included three open-ended questions designed to elicit creative responses for the purpose of qualitative analysis. Additionally, researchers organized focus groups to discuss these issues more in-depth and compiled the notes taken during these group discussions with the rest of the qualitative data from the individual surveys.

Participants

Participants completing the survey totaled 134, including 60 beginning and pre-service teachers, and 74 shareholders. For the purpose of this study, the research team defined *beginning teachers* as individuals who had three (3) or fewer years of teaching experience, and *pre-service teachers* as student teachers in the College of Education at Minnesota State University, Mankato. The beginning/pre-service teacher group included 17 men and 43 women with a mean age of 27 years (SD 6.21). Some of the Minnesota school districts represented by this group included: Alden, Austin, Burnsville, Cannon Falls, Chaska, Cleveland, Eden Prairie, Fairmont, Jackson, Lake Crystal Wellcome Memorial, Maynard-Clara City-Raymond, Mankato, New Richland, Osseo-Maple, Prior Lakes-Savage, Robbinsdale, St. Paul, St. Peter, United South Central, West St. Paul, and Waterville-Elysian-Morristown.

The 74 *shareholders*, on the other hand, consisted of parents, community members, and experienced teachers (including student-teacher supervisors and cooperating teachers). Of the shareholders, 15 men and 50 women completed surveys; nine (9) individuals did not indicate their gender. Shareholders had an average age of 38.74 years (SD 10.35), and represented school districts such as: Armstrong-Ringsted, Bloomington, Faribault, Holy Redeemer, Mankato,

Minneapolis, North St. Paul, Rosemont-Apple Valley-Eagan, Robbinsdale, South St. Paul, and Sleepy Eye.

Focus groups included undergraduate and graduate students in Curriculum and Instruction, Library Media Education, and Educational Foundations classes, as well as student teacher supervisors and members of the Mankato District Media Advisory Board. Demographic data were not collected on the focus-group participants.

ANALYSIS OF FINDINGS A: QUANTITATIVE DATA

This section addresses the first two research questions from the perspective of the quantitative data:

- Current level of technological competence
- Needed areas of technological competence

The third main question (regarding the steps necessary for implementation) is addressed in the conclusion.

To identify the level of technological competence among beginning and pre-service teachers, the researchers analyzed the results in terms of means and standard deviations. In addition, this report presents the data in the form of response percentages in the following survey categories: Strongly Agree (6), Moderately/Slightly Agree (5, 4), Moderately/Slightly Disagree (3, 2), Strongly Disagree (1), and Don't Know (0).

Although the original survey listed seven response choices, for data analysis the researchers decided to combine the Moderately Agree and Slightly Agree categories, as well as the Moderately Disagree and Slightly Disagree categories, because their inclusive responses were consistently similar. However, the data are presented in the statistics, tables, and graphs on a scale of 0-6.

Current Level of Technological Competence

For a more meaningful interpretation of the data, this report presents the responses of beginning and pre-service teachers and shareholders in terms of how educational preparation has (or has not) provided teachers with the skills to *use* technology and to *infuse* technology into the school curriculum.

Use of Technology. The mean scores of beginning and pre-service teachers on items addressing educational preparation for use of technology ranged from a low of 1.66 (video-conferencing) to a high of 5.03 (word processing) on the 0-6 scale. Mean scores ranked at or below 3.00 (Moderately Disagree) for the following items:

> *video-conferencing (M=1.66, SD=1.09)*
>
> *assistive technology (1.83, 1.24)*
>
> *distance education (2.10, 1.45)*
>
> *instructional unit development (2.22, 1.50)*
>
> *LCD projection equipment (2.47, 1.59)*
>
> *video cameras (2.53, 1.70)*
>
> *digital cameras (2.61, 1.77)*
>
> *software installation (2.78, 1.69)*
>
> *scanners (2.78, 1.87)*
>
> *trouble-shooting techniques (2.83, 1.63)*
>
> *spreadsheet applications (3.00, 1.66)*

On the other hand, beginning and pre-service teachers indicated (with a rating above 3.00) that their education did prepare them adequately to:

> *use multimedia software (M=3.13, SD=1.87)*
>
> *evaluate and recommend educational software (3.30, 1.83)*
>
> *use software in their subject area (3.35, 1.55)*
>
> *understand computer use in business, industry, and society (4.70, 1.39)*
>
> *word processing (5.03, 1.44)*

Overall, beginning and pre-service teachers reported that education faculty should provide novice teachers with greater access to computers and related technology (3.48, 1.44).

Shareholders' perceptions of educational preparation correlated directly with those of beginning and pre-service teachers. Scores ranged from a mean low of 1.97 (video-conferencing) to a high of 5.51 (word processing). Again, respondents gave low scores to preparation for using emerging technologies:

video-conferencing (M=1.97,SD= 1.74)

distance education (2.07, 1.80)

assistive technology (2.27, 1.77)

digital cameras (2.32, 1.61)

scanners (2.39, 1.69)

video cameras (2.66, 1.86)

instructional unit development (2.76, 1.85)

LCD projection equipment (2.91, 1.71)

Shareholders expressed that beginning and pre-service teachers could effectively:

evaluate and recommend educational

software M=(3.19, SD=1.59)

use multimedia software (3.30, 1.74)

implement trouble-shooting techniques (3.54, 1.30)

install software in their subject area (3.82, 1.61)

use spreadsheets (3.91, 1.72)

understand computer use in business, industry

and society (4.26, 1.42)

use software in their subject area (4.28, 2.63)

word processing (5.51, 0.93)

Interestingly, only 38 (63.33%) beginning and pre-service teachers in this study reported having taken a media technology class during their teacher education program while 21 (35%) had not taken a media technology course [one (1.67%) participant did not respond].

Infusion into the curriculum. The mean scores of beginning and pre-service teachers on items concerning infusion of technology into curricula ranked surprisingly higher than items in the area of educational preparation. In fact, the mean ratings ranged from a low of 3.55 (ability to develop activities to teach the equitable and legal use of technology) to a high of 5.20 (ability to use the Internet in an informed manner in teaching).

Beginning and pre-service teachers reported that they could use technology to:

   assess learning (M-3.67, SD=1.6)
   address diverse learning needs (3.85, 1.55)
   promote critical thinking (4.28, 1.56)
   require cooperation and teamwork (4.43, 1.28)
   teach key-boarding skills (4.45, 1.42)
   teach word processing (4.82, 1.2)
   teach the use of the Internet (4.85, 1.06)

Overall, the majority of beginning and pre-service teachers felt strongly that they could infuse technology into the curriculum (5.43, 0.89). It is interesting that the majority of beginning and pre-service teachers contend that they are capable of infusing technology into the curriculum, despite results indicating that their formal education did not prepare them adequately for this challenge.

Shareholders consistently ranked beginning and pre-service teachers' ability to infuse technology into curricula higher than they ranked perceptions of educational preparation. Mean ratings ranged from 3.35 (ability to assess learning through technology) to 4.51 (use of the Internet in an informed manner in teaching). Shareholders reported that beginning and pre-service teachers could:

teach equitable and legal use of

technology (M=3.34, SD= 1.77)

assess learning through technology(3.35, 1.74)

use technology to promote critical thinking (3.45, 1.62)

require cooperation and teamwork (3.88, 1.55)

use computers to address diverse learning

needs (3.92, 1.61)

teach key-boarding skills (4.03, 1.62)

teach word processing (4.41, 1.38)

teach the use of the Internet (4.49, 1.21)

use the Internet in teaching (4.51, 1.21)

According to the responses, shareholders perceive that beginning and pre-service teachers can infuse technology well into the curriculum (5.27, 1.41). Shareholders may state that they believe beginning and pre-service teachers can infuse technology into the curriculum, yet they claim that the education programs did not adequately prepare teachers with all the required technological skills. Shareholders—like the beginning and pre-service teachers—reported that colleges of education should provide novice teachers with greater access to computers and related technology preparation (3.49, 1.47).

Needed Areas of Technology Competency

The results indicate that the majority of respondents perceived that beginning and pre-service teachers could effectively use *basic* computer and related technologies such as word processing, keyboarding and educational software. However, *emerging* technologies such as video-conferencing, scanners, digital cameras, and LCD projection equipment rated low. While respondents considered all the technologies delineated in the survey and Draft Standards important, the data suggest that special attention needs to be paid to these emerging technologies in order to keep up with technological evolution.

Considering the relatively low percentage (63.33%) of beginning and pre-service teachers who took media classes, technological competence may improve dramatically if more students are exposed to such classes. Colleges must place more emphasis on technology <u>in all classes</u> in the teacher education curriculum.

The following section, an analysis of the qualitative findings, reflects similar findings.

ANALYSIS OF FINDINGS B: QUALITATIVE DATA

In addition to the numbered-response questions, the surveys also included three open-ended questions. Facilitators used these same questions to guide focus-group discussions.

> *1) How can teacher education programs better prepare teachers to use technology?*

> *2) What kind of computer and related technologies should be included in teacher education programs?*

> *3) What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?*

A number of themes surfaced in the open-response section of the surveys and in the focus-group discussions. Participant responses indicated needs and/or concerns in the following six categories:

- Preparation of beginning teachers
- Addressing differing student needs
- Continuing education for in-service teachers
- Modeling by faculty
- Access to current technology

As does the Quantitative Analysis, this section also investigates the current level of technological competence and the needed areas of competencies. The sub-sections below summarize the sentiments in six categories and provide sample-comments (in italics) quoted from the surveys.

Preparation of Beginning Teachers

Most respondents agreed that technological competence should be required of teachers and that students in teacher education programs should be provided with instruction in this area. However, respondents disagreed about how this should be accomplished. A significant number of respondents suggested that separate, required courses focusing specifically on technology should be part of the teacher education curriculum.

Require worthwhile classes to be taken that teach technology skills and introduce software that is available.

Provide required courses in technology for all areas.

There should be more than one class. All the types of media were crammed into one class and [they] were very overwhelming.

However, far more respondents recommended that students would achieve higher levels of technology competency if the College of Education followed a deliberate plan of technology instruction across the curriculum.

Put technology in all methods classes.

Require its use in all phases of preparation, not just one or two classes.

Incorporate LME [Library Media Education] class into other Ed classes and make them part of class requirements.

Consistent use in classes—not just a one-shot deal.

Embedded into educational program without adding required courses—put into already existing classes or make optional.

Use of technology should be infused throughout the program—don't focus on a two-credit course.

Some respondents, however, expressed concern that the College of Education would be over-extending itself by trying to add technology competencies to an already-full curriculum. Some suggested that it should be the students' own responsibility to teach themselves the necessary technology, as is currently done by many in-service teachers.

I think only an introductory or survey class should be part of the university experience. Site-specific. . . training would be better done at the school.

I don't believe this should be a requirement for all. . . . Teachers learn most by doing as they develop specific curricula. Performance Assessments for College of Ed grads might be appropriate.

Your premise is that technology is somehow vital. The beginning teachers in my district—a large urban school system—struggle to deal with kids whose skills are well below grade level. . . . Technology may indeed be a useful tool, but its emphasis is overstated.

Of all competencies necessary for good and meaningful teaching, technology (the use thereof) would be low on my list. Dealing with students, working with parents, and learning to adapt to changing communities are far more important. While I am generally very satisfied with the program at Mankato, I think greater attention ought to be paid to these areas. Regrettably, many faculty are not strong in these areas. To think that undergraduates are prepared (ill prepared) in large measure with such disordered priorities is disturbing.

Addressing Different Student Needs

Some respondents pointed out the need for flexibility within the teacher education program based on students' experience levels. They showed concern that each student would be made to pay for credits in technology-specific classes even if she or he already had a high level of competency, thereby wasting time, energy, and money. Also, some noted the need to treat graduate and undergraduate students differently.

Courses should start with basic skills; don't make assumptions about what students know.

Recognize that students are at different computing/technological levels. Do not make tech class mandatory. Perhaps have short, 1-credit, optional, enrichment classes to choose from according to need. Give students a checklist of necessary technology requirements that they must demonstrate competency in before they can graduate.

Continuing Education for In-Service Teachers

Because technology evolves quickly, so must the abilities of teachers. Teachers recognize the need to be life-long learners; for this reason, a number of in-service teachers suggested that continuing training for in-service teachers should be a regular part of University offerings in technology.

Technology changes so much from year to year, we need to continually update our skills.

Provide workshop days for technology.

Teach . . .district personnel/colleagues how to do these things.

The College should offer Continuing Ed courses for in-service teachers.

Reinforce the idea that the student-teaching process is a shared educational experience: student teachers and cooperating teachers should be learning from each other!

Modeling by Faculty

Survey respondents and focus group participants clearly indicated that, if pre-service and beginning teachers are expected to infuse technology in their presentations and/or lessons, then faculty in colleges of education must not only have high levels of technological competence, themselves, but must use it regularly in their courses to model the importance of this to beginning teachers.

Make sure the professors know the software and can provide examples of using technology in the classroom.

Professors must realize the importance of having these skills.

. . .Have students prepare lessons that incorporate the use of technology within classroom lessons.

Teachers at all levels and in all subject areas must utilize technology to help deliver the curriculum.

Teach it, use it, and incorporate it into our teaching courses consistently.

. . Make sure that everybody knows what other instructors are doing so that many different skills are taught in context.

Faculty need to offer support: . . .require students to infuse their skills into lesson planning and curriculum development.

Faculty who teach regular courses must, themselves, be up-to-date.

Access to Current Technology

Survey responses highlighted the ability—or inability—of pre-service, beginning, and experienced teachers to access technology. If students are to be expected to use technology, they must have equipment to use! They also need to know how to find information on their own about technology and to become self-sufficient once they leave the education program.

Schools should keep up-to-date with the rest of the world.

This question assumes that universal technologies are employed in schools. In my school—and in all that I have worked in (suburban/urban)—new and old computers are the norm. Different software packages, different platforms, etc. make it very difficult. I've learned four different electronic grade books, three different email programs, and more.

Site specific (equipment specific) training would be better done at the school.

Require assignments that infuse technology—but then the ACC [Academic Computing Center] has to have it or a separate educators' tech lab.

All schools use a different kind of computer . . . .so I feel there needs to be a variety of hardware [on] which to prepare.

Students should be exposed to both Macs and PCs.

Different schools require different technology skills.

Needed Areas of Technology Competency

Because respondents indicated, with remarkable consistency, that *all* of the areas identified in the survey were important for achieving technology competence, no one skill stands above the rest nor does any particular skill seem less important. *PowerPoint* and *Hyper studio* were mentioned most often as effective classroom tools. In-service teachers more frequently listed the need to know how to use electronic grade books or specific curricular software packages.

> *All the different systems—PowerPoint, Microsoft, DOS. . . .Teach a variety of skills so teachers can be knowledgeable in different programs.*

> *Grade books, multimedia presentations, spreadsheets, word processing, art programs, email.*

> *Review software packages, use of video cameras, digital cameras, scanners, LCD projection equipment, Hyper studio.*

> *Research and communication productivity tools, web page creation.*

Trouble-shooting. One area not made prominent in the survey (though it was mentioned) seemed of particular importance to several respondents: the need for teachers to have *trouble-shooting skills*. Respondents described the need to be not only self-taught within their districts, but to know what to do when their equipment or programs failed to function. Most districts have a technical assistant, but often the busy schedules of these specialists preclude quick attention to problems. With minimal knowledge, many users are able to find and remedy the problem themselves.

> *[We need] more hands-on classes dealing with trouble-shooting.*

> *[Teach] basic trouble-shooting!*

Two more issues that neither the open-ended questions nor the focus groups specifically targeted (although they were mentioned in the survey), were raised often by respondents: *moral/ethical issues in technology*, and the use of *assistive technology* for special needs students.

Moral/Ethical Issues.   Students in a graduate course that included both experienced and beginning teachers discussed at some length the notion of *how* technology is infused. Several observed that teachers do not always use technology because it is important to the instruction, but because it adds "glitz". This group also agreed that all instruction in technology should include attention to ethical issues. Participants in a second focus group suggested that copyright issues should become part of instruction on Internet usage.

Assistive Technology.   Several respondents addressed the need for more software and more instruction in the area of assistive technology. These observations came from both Special Education teachers and mainstream classroom teachers. With increasing numbers of special-needs students being mainstreamed into regular education classrooms, teachers must find more effective ways to meet the individual needs of all students.

[Teacher education programs should teach] what programs in assistive technology are [available] and how to use them for special education.

I would like to have learned a little bit more on technologies for special needs students.

I work with MMMI [severely mentally disabled] students—my student teachers have not used computer skills with [these] students.

I work with children birth [sic] to age 6 with developmental delays . . . and I had no training in any of this, grad or undergrad, at MSU.

[We need] adaptive technology for special-needs students.

> *CIS [Computer and Information Science] offers a meaningful course in assistive*
> *technologies that Ed students should take.*

While these qualitative data do provide important information, they should also be viewed within the larger context of the rest of the study.

RECOMMENDATIONS

The two data sets, quantitative and qualitative, render an interesting picture for analysis. The results indicate that while many beginning and pre-service teachers report that they can use, design and develop technology supported instructional units for their subject areas; they were not trained to do so during their educational training. School districts require teachers to know how to use and to infuse technology into the school curriculum. Therefore, it is imperative that colleges of education ensure that beginning and pre-service teachers develop the necessary technological skills required by the comprehensive MnSCU Technological Standards, beyond basic word processing and key-boarding. The data especially indicate a need for more training for beginning and pre-service teachers in the areas of emerging multimedia technologies.

In summary, the data consistently show that:

Nearly all respondents-shareholders and beginning/pre-service teachers believe pre-service teachers must, before graduating from teacher education, demonstrate high levels of technological competence and that this must be demonstrated in their ability to infuse technology into their instructional practices.

In order for pre-service teachers to demonstrate these competencies, teacher education faculty must, themselves, 1) model the use of technology in their own teaching, and 2) develop course syllabi that require students to demonstrate technology competencies.

Schools expect both new and veteran teachers to be technologically competent; colleges of education must facilitate communication, collaboration, and on-going instruction among P-12 educators in the area of technology education.

The results indicate that both beginning and preservice teachers and shareholders perceive that beginning and preservice teachers can use basic computer and related technologies such as word processing, key boarding and software in their specific subject areas. However, relative to more contemporary and emerging technologies such as video conferencing, scanners, digital cameras and LCD projection equipment, both beginning and preservice teachers and shareholders report that beginning and preservice teachers are not prepared by their training programs to use these technologies.

The results indicate that while many beginning and preservice teachers report that they can use, design and develop instructional units for their subject areas, they were not trained to do so during their educational program.

Teachers are obviously required to know how to use and to infuse technology into the school curriculum. Therefore, it is imperative that the MnSCU's Colleges of Education ensure that beginning and preservice teachers develop the necessary technological skills as required by the comprehensive MnSCU, NCATE, and ISTE.

These standards require that beginning and preservice teachers acquire technological skills beyond basic word processing and key boarding. Thus, there is a definite need for more training for beginning and preservice teachers in the areas of emerging multimedia technologies. A knowledge of these emerging technologies is necessary to enable them to more effectively infuse technology into the school curriculum, now and into the new millennium in support of the educational achievement of all learners.

In order for preservice and beginning teachers to meet the MnSCU, NCATE, and ISTE technology standards, the following recommendations are provided.

Recommendations Related to Use:

- Increased experience in software installation
- Increased training in basic troubleshooting techniques
- Increased training in emerging technologies such as scanners, digital cameras, video cameras, LCD projection equipment, video conferencing
- Increased awareness and training in assistive technologies for students with special needs
- Increased awareness and training in distance education technologies
- Increased exposure and use of teacher application and educational software
- Increased training in order to develop instructional units that use educational software
- Increased training in the development of multimedia presentations
- Increased training in Web page development
- One media technology course is not sufficient. Require that all beginning and preservice teachers have a media course. This course should focus not just on basic technology competencies but also on emerging technologies.
- The training of technology competencies should be infused throughout the teacher education curriculum.
- All teacher education faculty should be aware of the MnSCU, NCATE, and ISTE technology standards
- All faculty in the Colleges of Education are proficient in the technological skills delineated in the MnSCU, NCATE, and ISTE technology standards
- Provide training in emerging technologies for all faculty in teacher education program

Recommendations Related to Infusion:

- More emphasis on technology in all classes in the teacher education curriculum
- Increase opportunities for beginning and preservice teachers to use technology to assess student learning (e.g., electronic portfolios)
- More training to use technology to develop educational units that promotes critical thinking

Recommendations Related to Resources:

- State of the art technology labs designed to support multimedia technologies for both students and teacher educators
- Training for Faculty in teacher education programs in emerging technologies
- Hardware: projection cameras, videoconferencing cameras, digital cameras, scanners, distance learning equipment
- Software: Multimedia programs, videoconferencing software, distance learning software, web development software
- Resources for maintenance: hardware, software and personnel support
- Personnel resources: Lab support personnel, Director of Information Technology, Help-line for students, faculty and community shareholders

CONCLUSIONS

While the data suggest that beginning and preservice teachers are perceived to use and infuse technology throughout the curriculum, apparently all of these skills are not acquired during their professional education. In fact, the only skills they appear to acquire during their academic training are basic technology skills such as word processing and keyboarding. While these skills are clearly essential to a strong foundation in technology implementation, there is a definite need to introduce beginning and preservice teachers to emerging technologies. Knowledge of these emerging technologies will ensure that beginning and preservice teacher graduates from the MnSCU Teacher Education Programs are prepared to meet the constantly changing nature of technology in a global society. Attention to these areas will ensure that MnSCU's teacher education graduates are prepared for the educational technology demands of the new millennium in support of the education of all learners.

REFERENCES

Coursol, D. & Lewis, J. (1999). *Education Technology Survey*. Minnesota State University, Mankato: Mankato, MN.

Gall, M. D., Borg, W. R. & Gall, J. P. (1996). *Educational Research*. Longman Publishers: NY.

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APPENDIX A

ETS-T: Beginning and Pre-Service Teacher Survey

Minnesota State University, Mankato
College of Education
Center for School-University Partnerships

Dear Participant:

Enclosed is a short questionnaire asking for your perceptions and opinions about technology and teacher preparation. The purpose of this questionnaire is to examine how prepared you believe beginning teachers are to infuse technology into the curriculum. The questionnaire should take approximately 15 minutes to complete.

The information from the questionnaire will be used to provide direction for the College of Education future technology directives and interventions. Based on your responses, recommendations to prepare teachers with the technological skills required for the new millennium will be developed. Directions can be found on the first page of the enclosed questionnaire. If you would like to receive a copy of the results please provide your name and address on the attached index card.

Thank you for you time in responding to this questionnaire.

Sincerely,

Leroy Kemp, Dean
College of Education

Directions to Survey Participants
(Beginning and Student Teachers)

This survey will examine how effectively your education has prepared you to infuse technology into the curriculum. Participation is voluntary. If you wish to participate, please complete and return the survey. No identifying information is requested so your responses are anonymous and confidential. You may choose to withdraw from the study by not returning the survey.

Please Return Surveys by April 15, 1999

Return Surveys to:
Dottie Engan-Barker
Director of Center for School-University Partnerships
Box 52
Minnesota State University, Mankato
Mankato, Minnesota 56002-8400

Technology in Teacher Education

This questionnaire contains statements about how effectively your education has prepared you to infuse technology into the curriculum. There are no right or wrong answers. Please indicate your answer by **circling** the appropriate response.

1. **My education has prepared me to install a variety of software packages on a computer to use in teaching in my subject area.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

2. **My education has prepared me to use a variety of software packages to teach in my subject area.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

3. **My education has prepared me to implement basic trouble-shooting techniques (e.g., resolve printing problems) on computers.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

4. **My education has prepared me to use a scanner with a computer to develop and deliver instructional units in my subject area.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

5. **My education has prepared me to use digital cameras with a computer to develop and deliver instructional units in my subject area.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

6. **My education has prepared me to use video cameras with a computer to develop and deliver instructional units in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

7. **My education has prepared me to use LCD projection cameras with a computer to develop and deliver instructional units in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

8. **I am aware of how computers and related technology are used in business, industry and society.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

9. **My education has prepared me to use word processing for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

10. **My education has prepared me to use spreadsheet applications for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

11. **My education has prepared me to use multimedia software (HyperStudio, HyperCard)for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

12. **My education has prepared me to use assistive technology (e.g., voice recognition software) to promote learning for students with special needs.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

13. **My education has prepared me to evaluate and recommend educational software to use for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

14. **My education has prepared me to use technology for distance education to teach in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

15. **My education has prepared me to use video conferencing to teach in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

16. **My education has prepared me to develop instructional units that require the use of educational software (e.g. Inspiration, Teacher Helper Plus) in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

17. **I can assess student learning through activities that integrate computers and related technology (e.g., electronic portfolios and electronic grade books).**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

18.   **I can develop activities that are designed to teach students about the equitable, ethical and legal use of computers and related technology in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

19.   **I can design instructional units in my subject area that uses computers to promote critical thinking, problem solving and decision making among students.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

20.   **I can design instructional units in my subject area that use computers to facilitate learning for students with diverse learning needs.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

21.   **My education has made me aware of the opportunities and professional organizations that promote continuing professional development in computers and related technology.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

22.   **I can develop learning opportunities in my subject area that integrate computers and related technology that require students to cooperate and work as a team.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

23.   **I can use the Internet in an informed manner and critically evaluate the information it provides for use in teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

24. **I can develop instructional units in my subject area that teach students computer-related skills such as keyboarding.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

25. **I can develop instructional units in my subject area that teach students computer-related skills such as word processing.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

26. **I can develop instructional units in my subject area that teach students computer-related skills such as use of the Internet.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

27. **I can use software, graphics and digital images to create a multimedia presentation for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

28. **I can use graphics and digital images to create a web page for teaching in my subject area.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

29. **The College of Education should provide beginning teachers with greater access to computers and related technology.**

6	5	4	3	2	1
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree

30. **My education has prepared me to infuse technology in the curriculum.**

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

31. The level of media technology at my school is highly sophisticated.

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

32. Appropriate media technlogy in my school is readily available for teachers when needed.

6	5	4	3	2	1
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Agree	Agree	Agree	Disagree	Disagree	Disagree

33. Have you taken a media technology course?   Yes____   No____

We would appreciate your responses to the following questions.

1. How can teacher education programs better prepare teachers to use technology?

2. What kind of computer and related technologies should be included in teacher education programs?

3. What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?

Demographic Information

Please **check or circle** the most appropriate response.

1.   **Gender:**   Female   Male

2.   **Age (specify):_____**

3.   **Race/Ethnicity:**

African American   Asian American   Bi-racial   Caucasian

Hispanic/Latino   International student   Native American

Other(specify)_____

4.   **Student Status:**   Full time   Part time

5.   **Year in program:**

First Year   Sophomore   Junior   Senior   Graduate ·

Other (specify): _____

6.   **Track:**   Elementary   Secondary

7.   **Subject specialization (specify):_____**

8.   **Teaching Experience:**   _____years

9.   **Year of Graduation:** _____

10.   **Institution from which you received your teaching degree:**

MSU Other (specify)_____

11.   **School District in which you work:** _____

APPENDIX B

ETS-S: Shareholder Survey

Minnesota State University, Mankato
College of Education
Center for School-University Partnerships

Dear Participant:

Enclosed is a short questionnaire asking for your perceptions and opinions about technology and teacher preparation. The purpose of this questionnaire is to examine how prepared you believe beginning teachers are to infuse technology into the curriculum. The questionnaire should take approximately 15 minutes to complete.

The information from the questionnaire will be used to provide direction for the College of Education future technology directives and interventions. Based on your responses, recommendations to prepare teachers with the technological skills required for the new millennium will be developed. Directions can be found on the first page of the enclosed questionnaire. If you would like to receive a copy of the results please provide your name and address on the attached index card.

Thank you for you time in responding to this questionnaire.

Sincerely,

Leroy Kemp, Dean
College of Education

Directions to Survey Participants
(Supervising Teachers, Cooperating Teachers, Parents and Community Representatives)

This survey will examine how prepared you believe beginning teachers are to infuse technology into the curriculum. Participation is voluntary. If you wish to participate, please complete and return the survey. No identifying information is requested so your responses are anonymous and confidential. You may choose to withdraw from the study by not returning the survey.

Please Return Surveys by April 15, 1999

Return Surveys to:
Dottie Engan-Barker
Director of Center for School-University Partnerships
Box 52
Minnesota State University, Mankato
Mankato, Minnesota 56002-8400

Technology in Teacher Education

Please indicate how well you believe beginning teachers in the district in which you live can infuse technology into the curriculum. There are no right or wrong answers. Please indicate your answer by **circling** the appropriate response.

1.   **Beginning teachers can install a variety of software packages on a computer to use in teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

2.   **Beginning teachers can use a variety of software packages to teach in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

3.   **Beginning teachers can implement basic trouble-shooting techniques (e.g., resolve printing problems) on computers.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

4.   **Beginning teachers can use a scanner with a computer to develop and deliver instructional units in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

5.   **Beginning teachers can use digital cameras with a computer to develop and deliver instructional units in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagrec	Don't Know

6.   **Beginning teachers can use video cameras with a computer to develop and deliver instructional units in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

7. **Beginning teachers can use LCD projection cameras with a computer to develop and deliver instructional units in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

8. **Beginning teachers are aware of how computers and related technology are used in business, industry and society.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

9. **Beginning teachers can use word processing for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

10. **Beginning teachers can use spreadsheet applications for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

11. **Beginning teachers can use multimedia software (HyperStudio, HyperCard) for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

12. **Beginning teachers can use assistive technology (e.g., voice recognition software) to promote learning for students with special needs.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

13. **Beginning teachers can evaluate and recommend educational software to use for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't

| Agree | Agree | Agree | Disagree | Disagree | Disagree | Know |

14. **Beginning teachers can use technology for distance education to teach in their subject area.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

15. **Beginning teachers can use video conferencing to teach in their subject area.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

16. **Beginning teachers can develop instructional units that require the use of educational software (e.g. Inspiration, Teacher Helper Plus) in their subject area.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

17. **Beginning teachers can assess student learning through activities that integrate computers and related technology (e.g., electronic portfolios and electronic grade books).**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

18. **Beginning teachers can develop activities that are designed to teach students about the equitable, ethical and legal use of computers and related technology in their subject area.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

19. **Beginning teachers can design instructional units in their subject area that uses computers to promote critical thinking, problem solving and decision making among students.**

6	5	4	3	2	1	0
Strongly	Moderately	Slightly	Slightly	Moderately	Strongly	Don't
Agree	Agree	Agree	Disagree	Disagree	Disagree	Know

20. **Beginning teachers can can design instructional units in their subject area that uses computers to facilitate learning for students with diverse learning needs.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

21. **Beginning teachers are aware of the opportunities and professional organizations that promote continuing professional development in computers and related technology.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

22. **Beginning teachers can develop learning opportunities in their subject area that integrate computers and related technology that require students to cooperate and work as a team.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

23. **Beginning teachers can use the Internet in an informed manner and critically evaluate the information it provides for use in teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

24. **Beginning teachers can develop instructional units in their subject area that teach students computer-related skills such as keyboarding.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

25. **Beginning teachers can develop instructional units in their subject area that teach students computer-related skills such as word processing.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

26. **Beginning teachers can develop instructional units in their subject area that teach students computer-related skills such as use of the Internet.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

27. **Beginning teachers can use software, graphics and digital images to create a multimedia presentation for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

28. **Beginning teachers can use graphics and digital images to create a web page for teaching in their subject area.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

29. **Beginning teachers in my school district are well prepared to infuse technology in the curriculum.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

30. **The College of Education should provide beginning teachers with greater access to computers and related technology.**

6	5	4	3	2	1	0
Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Don't Know

We would appreciate your responses to the following questions.

1. **How can teacher education programs better prepare teachers to use technology?**

2. **What kind of computer and related technologies should be included in teacher education programs?**

3. **What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?**

Demographic Information

Please **check or circle** the most appropriate response.

1. **Gender:**   Female   Male

2. **Age (specify):**_____

3. **Race/Ethnicity:**

   African American   Asian American   Bi-racial   Caucasian

   Hispanic/Latino   International student   Native American

Other(specify)_____

4. **Are you a supervising teacher?**   Yes ____   No ____

5. **Are you a cooperating teacher?**   Yes ____   No ____

6. **Are you the parent or guardian of a school age child?** Yes ____ No ____

7. **Do you represent the business community in your district?**

Yes ____   No ____

8. **Teaching Experience:**   _____years

9. **School District in which you reside:** _____

APPENDIX C

Tables

Table 1: *Means & SD of Beginning & Pre-service Teacher Responses*

Item	Mean	SD
Install software on a computer in subject area	2.78	1.69
Use software in subject area	3.35	1.55
Implement trouble-shooting techniques	2.83	1.63
Use a Scanner with a computer	2.78	1.87
Use Digital Cameras with a computer	2.61	1.77
Use Video camera with a computer	2.53	1.70
Use LCD Projection equipment with computer	2.47	1.59
Aware of computer use in business, industry, society	4.7	1.39
Use word processing for teaching	5.03	1.44
Use spreadsheet applications	3.00	1.66
Use Multimedia software	3.13	1.87
Use assistive technology	1.83	1.24
Can evaluate & recommend educational software in subject area	3.30	1.83
Use technology for distance education	2.10	1.45
Use videoconferencing in subject area	1.66	1.09
Develop instructional units that use educational software	2.22	1.50
Assess learning through technology	3.67	1.60
Develop activities that teach equitable, legal use of technology	3.55	1.52
Design units that use technology to promote critical thinking	4.28	1.56
Design units that use computers to address diverse learning needs	3.85	1.55
Aware of professional opportunities for professional development	3.52	1.54
Require cooperation & teamwork	4.43	1.28
Use Internet in an informed manner in teaching	5.20	0.82
Develop instructional units that teach students keyboarding skills	4.45	1.42
Develop instructional units that teach students word processing	4.82	1.2
Develop instructional units that teach students to use Internet	4.85	1.06
Create multimedia presentations	4.05	1.60
Create a web page	3.35	1.72
COE provide new teachers with greater access to technology	3.48	1.44
Infuse technology into the curriculum	5.43	0.89

Table 2: *Means & SD of Shareholder Responses*

Item	Mean	SD
Install software on a computer in subject area	3.82	1.61
Use software in subject area	4.28	2.63
Implement trouble-shooting techniques	3.54	1.30
Use a Scanner with a computer	2.39	1.69
Use Digital Cameras with a computer	2.32	1.61
Use Video camera with a computer	2.66	1.86
Use LCD Projection equipment with computer	2.91	1.71
Aware of computer use in business, industry, society	4.26	1.42
Use word processing for teaching	5.51	0.93
Use spreadsheet applications	3.91	1.72
Use Multimedia software	3.3	1.74
Use assistive technology	2.27	1.77
Can evaluate & recommend educational software in subject area	3.19	1.59
Use technology for distance education	2.07	1.80
Use videoconferencing in subject area	1.97	1.74
Develop instructional units that use educational software	2.76	1.85
Assess learning through technology	3.35	1.74
Develop activities that teach equitable, legal use of technology	3.34	1.77
Design units that use technology to promote critical thinking	3.45	1.62
Design units that use computers to address diverse learning needs	3.92	1.61
Aware of professional opportunities for professional development	3.50	1.81
Require cooperation & teamwork	3.88	1.55
Use Internet in an informed manner in teaching	4.51	1.21
Develop instructional units that teach students keyboarding skills	4.03	1.62
Develop instructional units that teach students word processing	4.41	1.38
Develop instructional units that teach students to use Internet	4.49	1.21
Create multimedia presentations	2.95	1.88
Create a web page	2.53	1.71
COE provide new teachers with greater access to technology	3.49	1.47
Infuse technology into the curriculum	5.27	1.41

Table 3: *Response Percentages by Beginning Teachers*

Item	Strongly Agree	Moderately/ Slightly Agree	Moderately/ Slightly Disagree	Strongly Disagree	Don't Know
Install software on a computer in subject area	5.00	31.67	26.67	36.67	N/A
Use software in subject area	5.00	51.67	23.34	20.00	N/A
Implement trouble-shooting techniques	3.33	35	30	31.67	N/A
Use a Scanner with a computer	10.00	31.66	13.34	45	N/A
Use Digital Cameras with a computer	10.00	25	21.67	43.33	N/A
Use Video camera with a computer	8.33	21.67	25	45.00	N/A
Use LCD Projection equipment with computer	5.00	25	26.66	43.33	N/A
Aware of computer use in business, industry, society	33.33	50	11.67	5.00	N/A
Use word processing for teaching	56.67	30	6.67	6.67	N/A
Use spreadsheet applications	5.00	33.34	33.33	28.33	N/A
Use Multimedia software	10.00	41.67	13.33	35.00	N/A
Use assistive technology	0	15	25	60	N/A
Can evaluate & recommend educational software in subject area	15	35	21.66	28.33	N/A
Use technology for distance education	5.00	11.67	30.00	51.67	1.67
Use videoconferencing in subject area	0.00	20.00	21.67	66.67	1.67
Develop instructional units that use educational software	5.00	13.33	33.33	48.33	N/A
Assess learning through technology	15.00	45.00	26.66	13.33	N/A
Develop activities that teach equitable, legal use of technology	8.33	46.66	31.66	13.33	N/A
Design units that use technology to promote critical thinking	28.33	43.34	18.34	10.00	N/A
Design units that use computers to address diverse learning needs	11.67	55.00	21.67	11.67	N/A
Aware of professional opportunities for professional development	10.00	41.67	35.00	13.33	N/A
Require cooperation & teamwork	20.00	58.34	18.33	3.33	N/A
Use Internet in an informed manner in teaching	43.33	55.00	1.67	0	N/A

Item	Strongly Agree	Moderately/ Slightly Agree	Moderately/ Slightly Disagree	Strongly Disagree	Don't Know
Develop instructional units that teach students keyboarding skills	26.67	53.33	13.33	6.67	N/A
Develop instructional units that teach students word processing	35.00	53.33	8.33	3.33	N/A
Develop instructional units that teach students to use Internet	35.00	55.00	10.00	0	N/A
Create multimedia presentations	21.67	46.66	21.67	10.00	N/A
Create a web page	13.33	38.33	25	23.33	N/A
COE provide new teachers with greater access to technology	6.67	45.00	38.33	10.00	N/A
Infuse technology into the curriculum	65.00	30	5.00	0	N/A
Level of media technology at my school is highly sophisticated	10.00	56.66	21.66	5.00	6.67
Media technology at my school is readily available	16.67	48.33	21.67	5.00	8.33

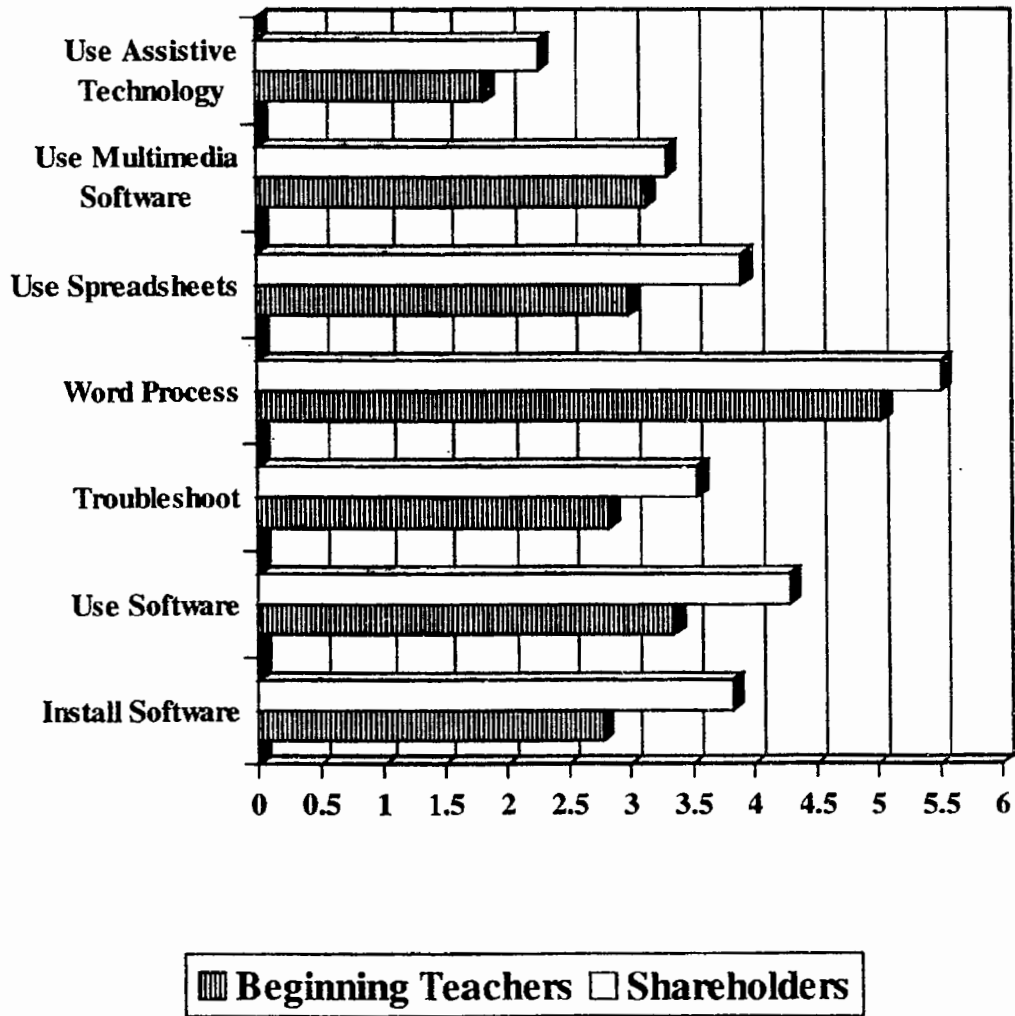## Table 4: *Response Percentages by Shareholders*

Item	Strongly Agree	Moderately/ Slightly Agree	Moderately/ Slightly Disagree	Strongly Disagree	Don't Know
Install software on a computer in subject area	8.11	64.86	16.22	4.05	6.76
Use software in subject area	6.76	72.98	10.71	4.05	5.41
Implement trouble-shooting techniques	2.7	59.46	29.73	5.41	2.7
Use a Scanner with a computer	1.35	29.73	39.19	6.76	22.97
Use Digital Cameras with a computer	1.35	22.97	45.94	9.46	20.27
Use Video camera with a computer	5.41	31.08	32.43	12.16	18.92
Use LCD Projection equipment with computer	1.35	50.00	22.97	9.46	16.22
Aware of computer use in business, industry, society	17.57	59.46	17.57	2.7	2.7
Use word processing for teaching	64.86	31.08	4.05	0	1.35
Use spreadsheet applications	12.16	63.51	12.17	1.35	10.81
Use Multimedia software	5.41	52.7	22.98	5.41	13.51
Use assistive technology	1.35	24.32	35.13	16.22	22.97
Can evaluate & recommend educational software in subject area	8.11	41.9	36.49	4.05	9.46
Use technology for distance education	2.7	20.27	33.79	14.86	28.38
Use videoconferencing in subject area	1.35	21.98	32.43	14.86	28.38
Develop instructional units that use educational software	4.05	40.54	29.72	2.7	22.97
Assess learning through technology	5.41	54.05	24.32	2.7	13.51
Develop activities that teach equitable, legal use of technology	5.41	54.05	20.27	8.77	12.16
Design units that use technology to promote critical thinking	6.76	48.65	31.08	5.41	8.11
Design units that use computers to address diverse learning needs	4.05	54.05	27.03	5.41	9.46
Aware of professional opportunities for professional development	10.81	47.29	25.67	5.41	10.81
Require cooperation & teamwork	14.86	59.45	16.22	2.7	6.76
Use Internet in an informed manner in teaching	22.97	66.4	6.76	2.7	1.35
Develop instructional units that teach students keyboarding skills	12.61	59.46	18.91	1.35	8.11

Item	Strongly Agree	Moderately/ Slightly Agree	Moderately/ Slightly Disagree	Strongly Disagree	Don't Know
Develop instructional units that teach students word processing	17.57	66.22	10.81	1.35	4.05
Develop instructional units that teach students to use Internet	17.57	70.27	9.46	0	2.7
Create multimedia presentations	9.46	35.13	30.18	9.46	16.22
Create a web page	2.7	29.73	39.18	12.16	16.22
COE provide new teachers with greater access to technology	66.22	24.33	5.4	0	4.05
Infuse technology into the curriculum	4.05	52.7	31.08	8.11	4.05

APPENDIX D

Graphs

Graph Table 1: Mean Ratings on Use of Basic Technology by Beginning Teachers & Shareholders

Horizontal bar chart with X-axis from 0 to 6 in 0.5 increments. Categories (top to bottom): Use Assistive Technology, Use Multimedia Software, Use Spreadsheets, Word Process, Troubleshoot, Use Software, Install Software.

Beginning Teachers ☐ Shareholders

Graph Table 2: Mean Ratings on Use of Emerging Technology by Beginning Teachers & Shareholders

Chart categories (top to bottom): Use Videoconferencing, Use Technology for Distance Education, Use LCD Projection Equipment, Use Videocamera w/Computer, Use Digital Camera, Use Scanner

X-axis: 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6

Legend: ▥ Beginning Teachers ☐ Shareholders
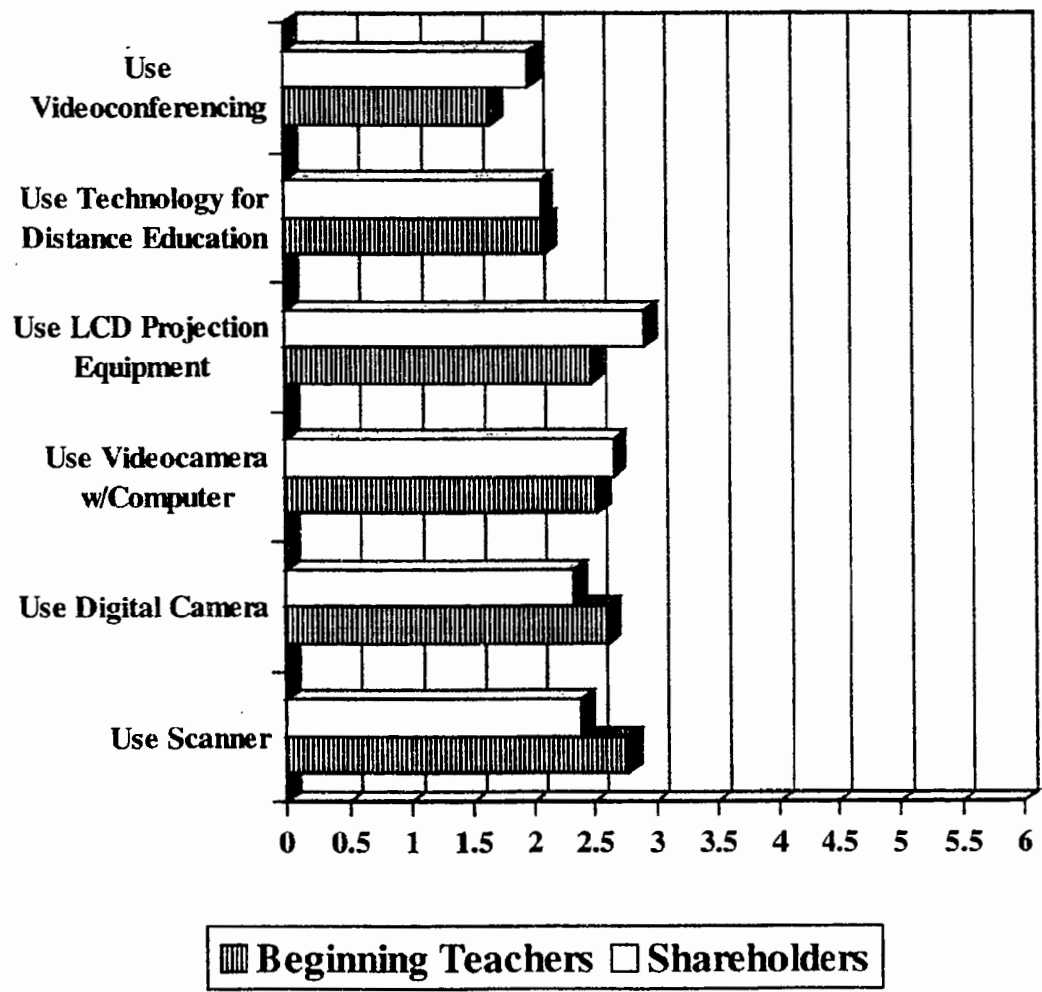
Graph Table 3: Mean Ratings on Technology Infusion by Beginning Teachers & Shareholders

| | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 |
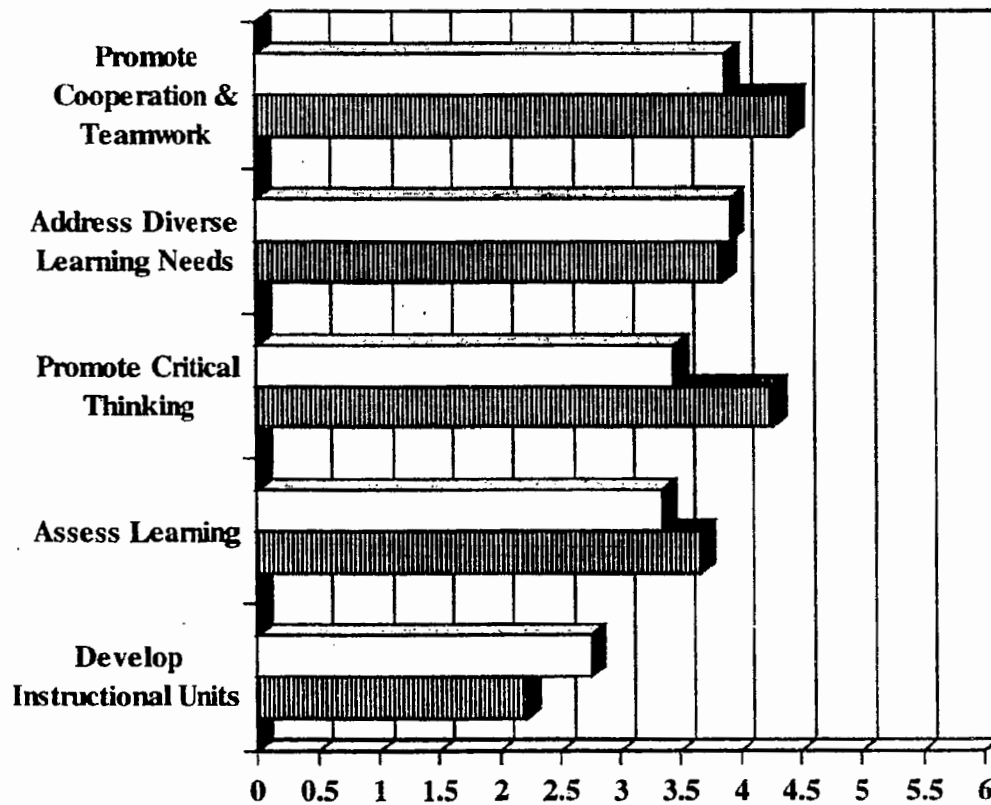
▦ **Beginning Teachers** ☐ **Shareholders**

Graph Table 4: Mean Ratings on Ability to Infuse Internet Technology by Beginning Teachers & Shareholders

Use Internet in an Informed Manner

Teach Students to use the Internet

Create Web Page

0   0.5   1   1.5   2   2.5   3   3.5   4   4.5   5   5.5   6

▥ **Beginning Teachers** ▢ **Shareholders**
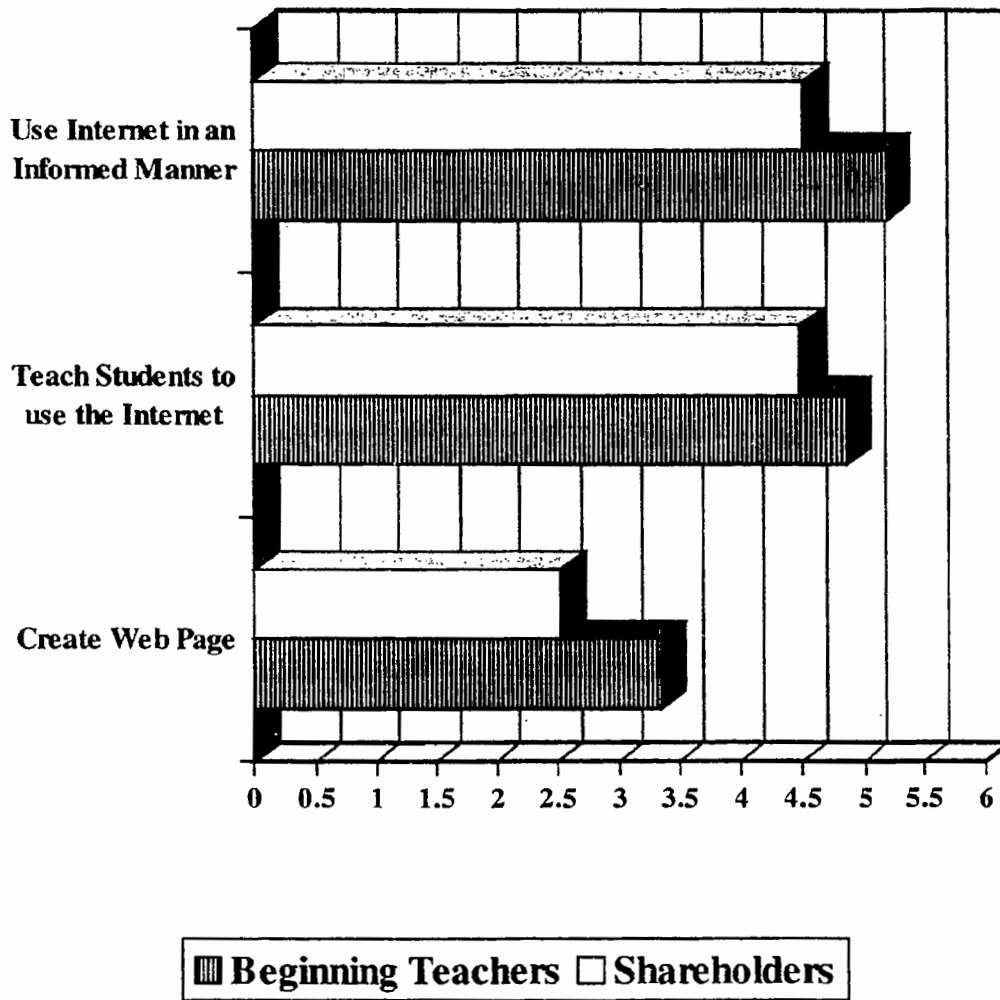
Graph Table 5: Beginning Teachers' Perceptions of their Ability to Use Emerging Technology

⊞ Beginning Teachers
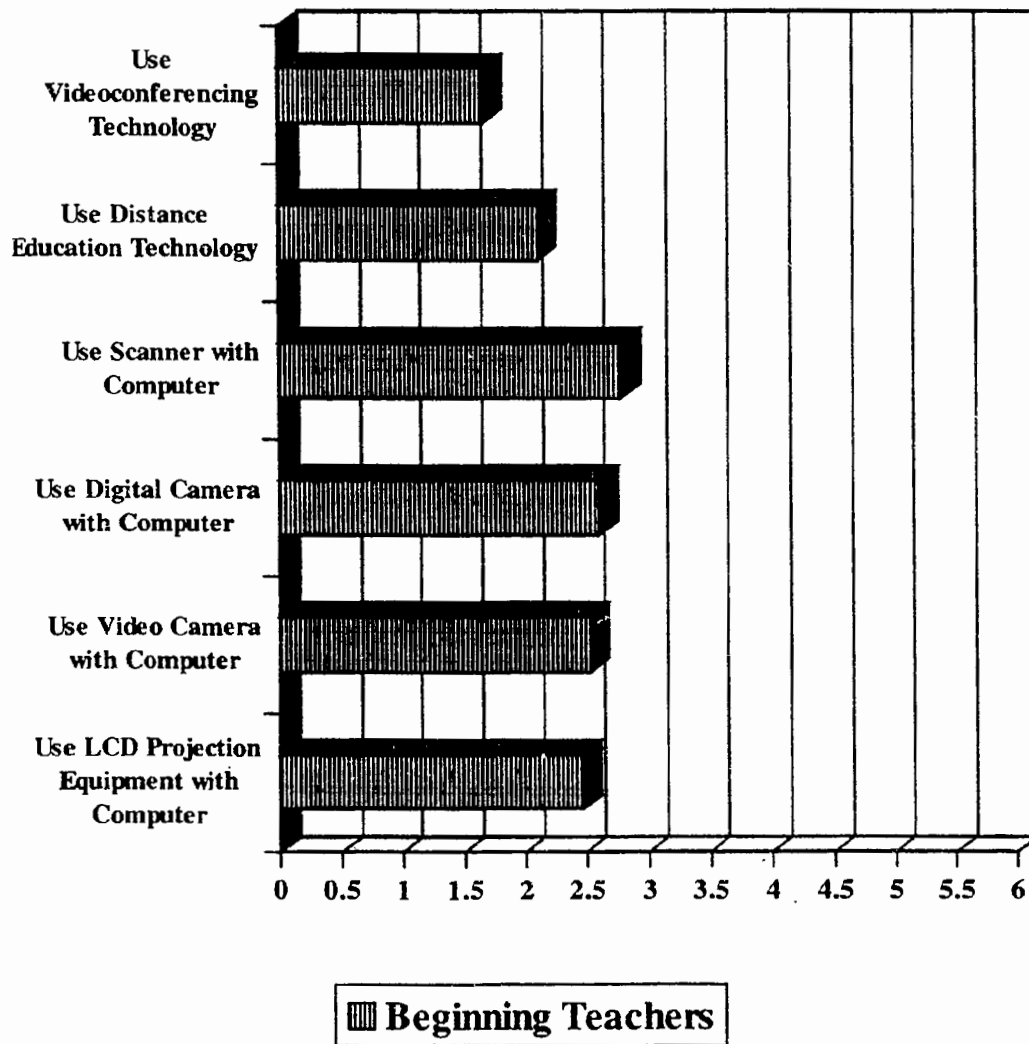
Graph Table 6: Shareholder Perceptions of Beginning Teachers' Ability to Use Emerging Technology
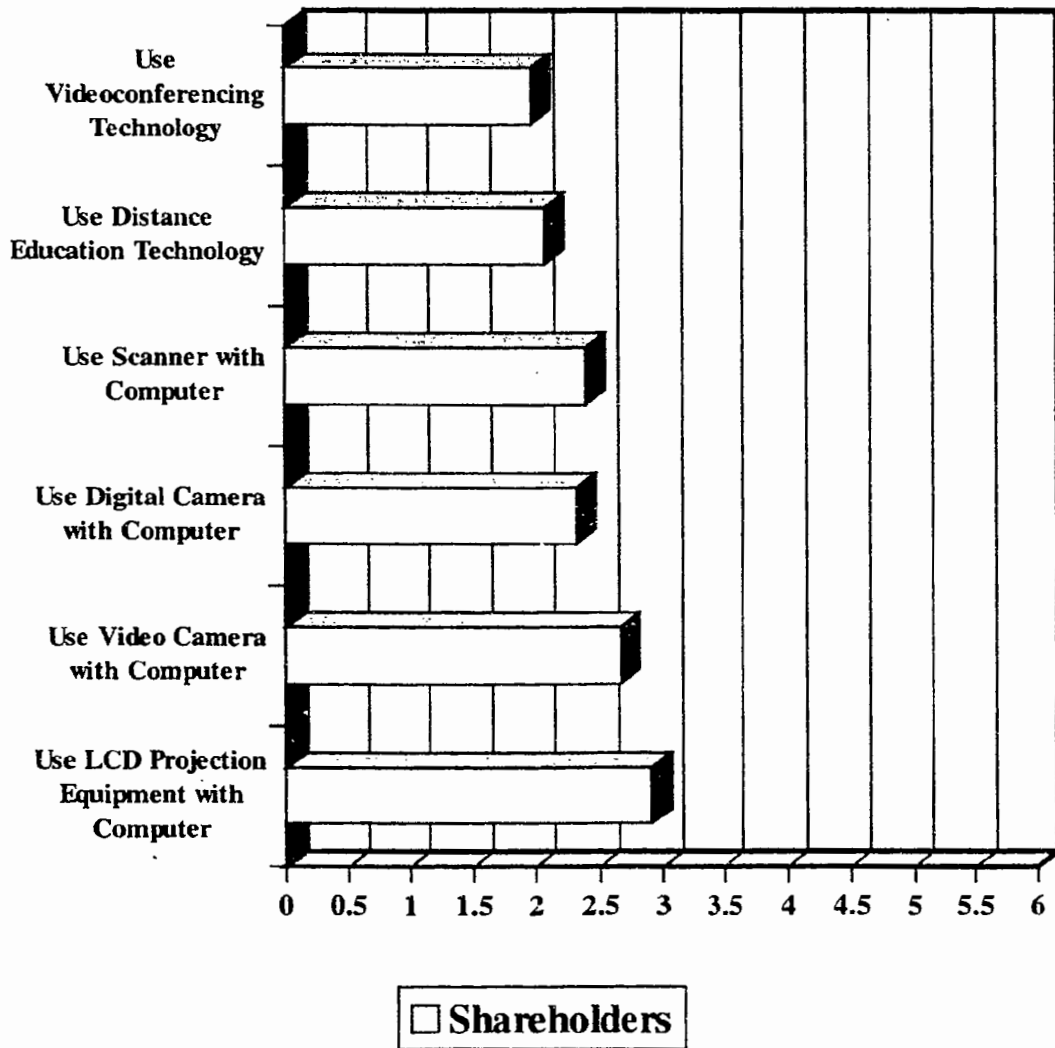
Graph Table 7: Beginning Teachers' Perceptions of their Ability to Use the Internet
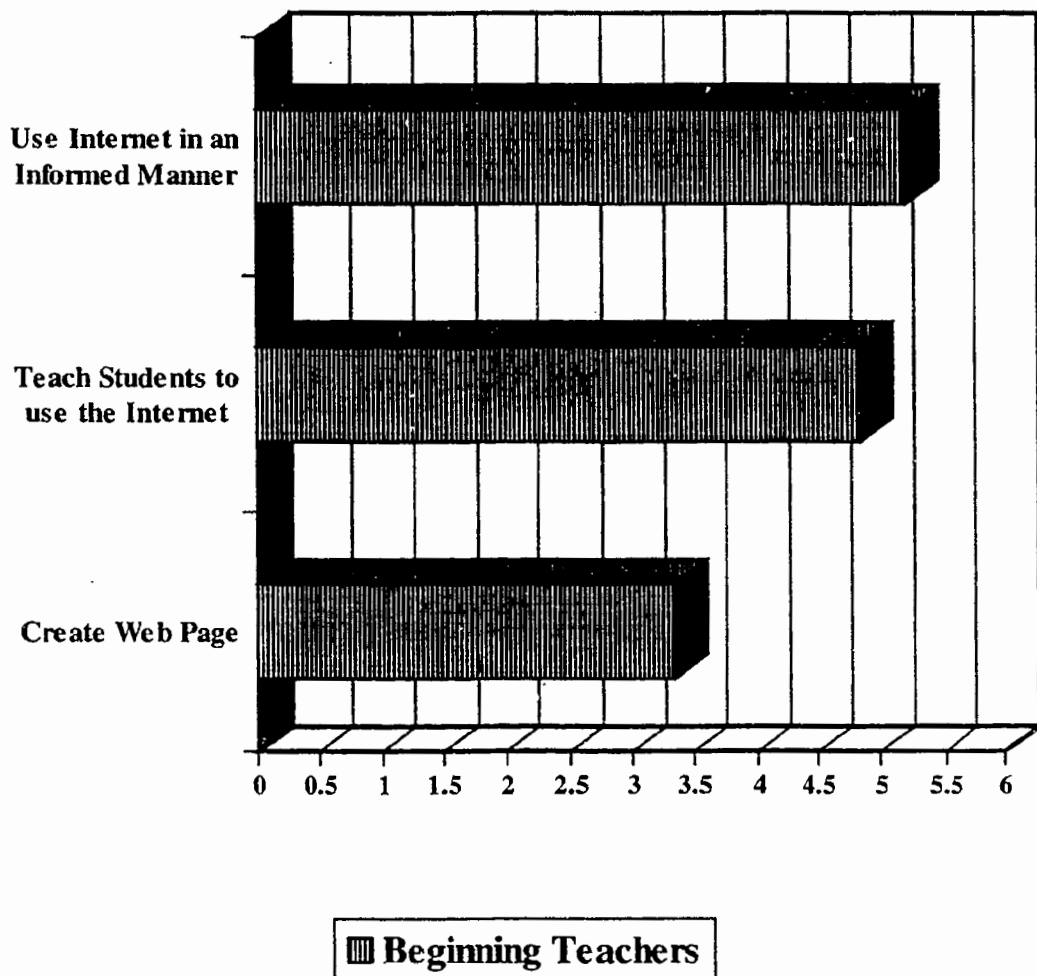
Graph Table 8: Shareholder Perceptions of Beginning Teachers' Ability to Use the Internet
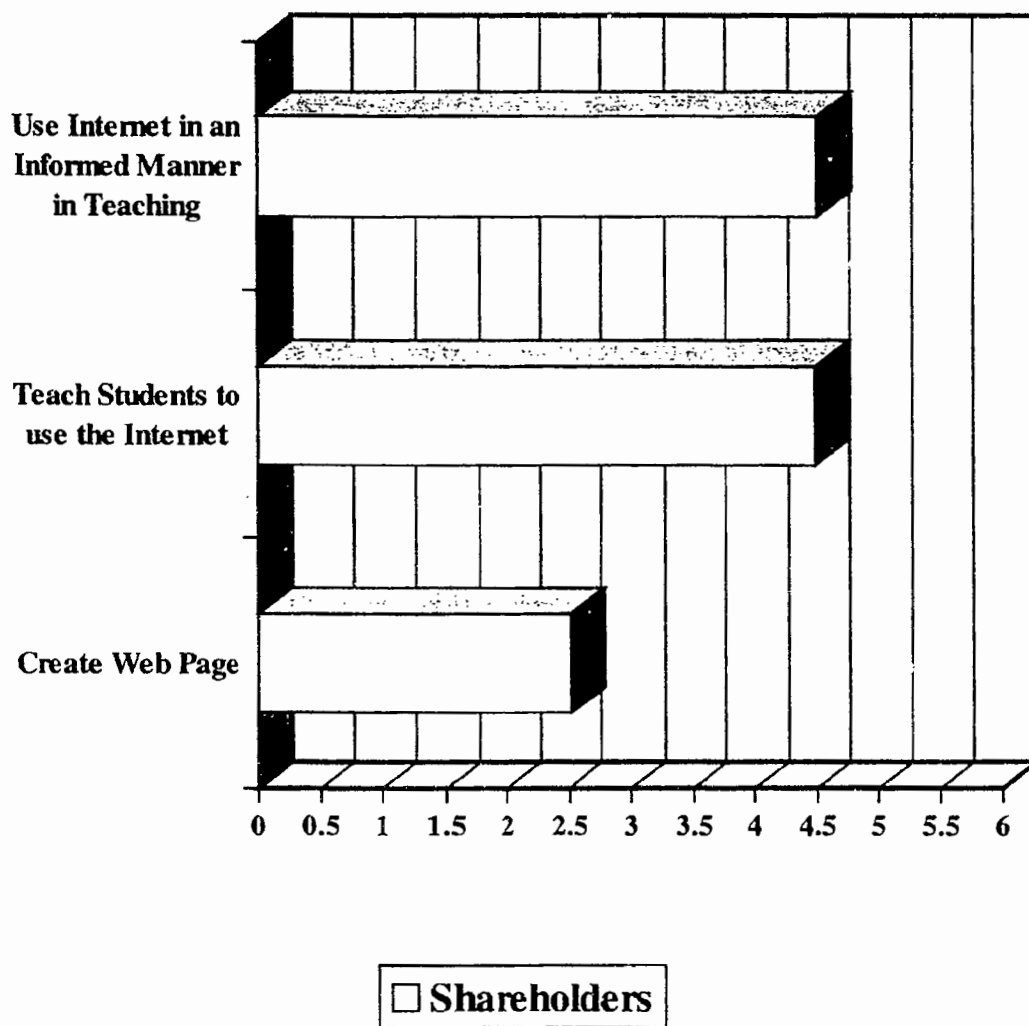
☐ **Shareholders**

APPENDIX E

Qualitative Response Summary

SHAREHOLDERS

1. How can teacher education programs better prepare teachers to use technology?

S2 More training in Ed programs, more courses.

S3 Allow teachers to have computers at home. Give teachers instruction during in-service time. Provide an 'expert' to answer questions without giving off poor attitude.

S5 By incorporating technology into classes taken and by designing computer classes specific to their subjects.

S6 Classes focused on teacher-friendly programs and Ed software.

S7 Hands-on experience. The best way to learn is to do it.

S8 Make them use it and be aware of in masters programs in order to take out fear.

S12 Designated courses on software packages.

S13 Hands-on practice with technology.

S17 New teachers need to have instruction in technology methods before they hit the classroom.

S18 More access and practice in the use of technology.

S19 Instruct teachers how to use the computer for grades, getting info, scanning and learning.

S20 Offer courses that highlight different areas of technology—more specific and in depth classes that cater to the teacher's interest and need. (Some teachers already know about some parts of technology, but may be 'beginners' in others.)

S25 Availability on campus. Requirements for course work. Inclusion during student teaching.

S26 Require students to use product-oriented computer curriculum in student teaching and share copies of what they have produced with other teachers (possibly at seminars).

S28 Develop activities/lesson in which they must use the internet and email. Require students to use technology when giving a presentation.

S30 Incorporate classes in technology in methods course.

S31 Give them hands-on time and have them prepare lessons that incorporate the use of technology within these classroom lessons.

S32 Hands-on experience! Require worthwhile classes to be taken that teach technology skills and introduce software that is available and that reinforces skills in the classrooms.

S34 Research and observe ways it is being used and skip the lessons on filmstrips and slide projectors.

S35 I think they are well-versed in using computers for their own use—perhaps application to subject taught could be worked on.

S44 Put technology in all methods classes.

S49 What programs/assesive (sic) tech is out and how to use it for special education.

S62 Application lessons to use the computer in content areas are growing stronger.

S65 Your premise is that technology is somehow vital. The beginning teachers in my district—a large urban school system—struggle to deal with kids whose skills are well below grade level. The absence of motivation is a profound barrier. Technology may indeed be a useful tool, but its emphasis is overstated.

S67 Have modem equipment on hand to use.

S68 Provide workshop days for technology.

S69 More college classes.

S70 Require its use in all phases of preparation. Not just one or two classes.

S71 Require assignments that infuse tech—but then the ACC has to have it or a separate educators tech lab.

S72 Require all students to take a computer tech class or classes.

S74 Incorporate LME class/info into other Ed classes and make them part of class requirements.

S76 This area is growing so quickly that I know it is difficult to instruct in all areas. Provide plenty of opportunity to explore software, to learn basic trouble-shooting and integration of the basics—keyboarding, word processing, and discriminatory internet use.

S77 More exposure; more assignments, course requirement.

S79 Provide required courses in technology for all licensure areas.

S81 Direct application to teaching/educational uses—teach teachers using educational (not business) models. My son's 5th grade teacher can't use the internet!

S82 They need to do a unit using technology. They need to use software related to teaching field. They need to learn how to use equipment. Some different for elementary and secondary.

S83 Have them observe teachers using technology in their subject so they see how it works in the 'real world.'

S84 More required classes—requiring assignments that require the use of technology.

S85 Teach them and their district personnel/colleagues how to do these things.

S87 No complaints! Site-related.

S88 More hands-on actual experiences, for example, create a web page.

S91 Make it a strong requirement of all teachers.

S93 More access to computers.

S95 They can 1) give students the opportunity to become aware of software in the field, 2) give the opportunity to teach using software and being taught how to teach using computer tech (more than just for reward), and 3) have students use presentation software often in their classroom experiences.

S96 Allow more hands-on application.

S97 Make sure the professors know the software and can provide examples of using technology in the classroom (e.g., how's industry using the software?). Provide hands-on and not just theory.

S100   Teach to use variety of applications.

S101   Practical lessons/practice.

S102   Require technology courses, not if you want to [sic, not optional].

S103   I think that they are much more prepared and eager to learn than the 'seasoned' teachers.

S104   Have classes for them to use the new technology.

S105   I think the LME course does a good job preparing new teachers and would like to see a course on how to integrate computers into existing curriculum.

S107   Infusion into training and licensure curriculum.

2. **What kind of computer and related technologies should be included in teacher education programs?**

S2 All the different systems—PowerPoint. Microsoft, DOS, teach a variety of skills so teachers can be knowledgeable in different programs.

S3 All kinds of variety and type.

S5 By incorporating technology into classes taken and by designing computer classes specific to their subjects.

S6 PCs and Macs. Real world uses PCs, education uses Macs.

S7 A relatively newer computer model along with somewhat new software.

S8 Internet, PowerPoint, all latest technology, etc.

S12 Projectors

S13 Web, digital camera, electronic grading.

S16 Internet training, web page set-up.

S17 All

S18 Multi-media presentations, evaluations of.

S19 Schools should keep up to date with the rest of world.

S20 Use of the internet; moral/ethical.

S26 Grade books, multimedia presentations, spreadsheets, word-processing, art programs, email.

S28 Internet search, email, LCD, Hyper studio/card, word processing, spreadsheets.

S30 Review software packages, use of video cameras, digital cameras, scanners, LCD projection equipment, Hyper studio.

S31 All schools use a different kind of computer, but most schools use the Mac, so I feel there needs to be a variety of hardware in which to prepare on.

S32 How to load software. Word processing, spreadsheets, Quick Cam, scanner, presentations. A knowledge of software that is available.

S34 Creative open-ended programs; work with digital cameras and scanners; programs that are integrated with curriculum like writing, reading and math areas.

S35 We use Apples in District 77.

S44 Word processing, keyboarding, spreadsheets, databases, internet basics, evaluating software.

S62 Mac and PC

S65 This question assumes that universal technologies are employed in schools. In my school—and in all that I have worked in: suburban/urban—new and old computers are the norm. Different software packages. Different platforms, etc. make it very difficult. I've learned four different electronic grade books, 3 different email programs, and more. You would be wasting time teaching students how to use PowerPoint, for example, if the future teacher never gets to use it.

S68 All included in your survey.

S69 Kid Pix, Hyper studio, Writing Center, Electronic Grade book, Internet.

S70 Evaluation of software. Lesson plans, which include use of tech in the classroom activity.

S71 Using PowerPoint for more than just a replacement for overheads. Having K-12 students use tech to produce.

S72 1. Developing a web page; 2. PowerPoint (windows); 3. Developing inquiry skills.

S76 The Macs are the predominant computers at elementary level. Most schools don't have the most current models.

S77 Internet, create web pages, software, programs.

S79 Databases, newsletter, spreadsheets, internet knowledge, Hyper studio—once immersed in your full-time job, it is virtually impossible to squeeze in time for one more thing.

S81 Not programming. I think only an introductory or survey class should be part of the university experience. Site-specific (equipment specific) training would be better done at the school. Outside trainers can come in but on-site people must be well-trained and available.

S83 Presentation software (Hyper studio, PowerPoint, etc.); trouble-shooting; how to use LCD panels and projectors.

S84 Hyper studio, PowerPoint, internet, web publishing.

S85 All mentioned in the survey. Districts may make the technologies available, but ours is leaving us to teach ourselves. This means it's not being done because of a lack of time, personal initiative or skill-level. I'm entirely self-taught. I was/have been forced to become the expert in my area (desktop publishing). Not even our technicians know what I do exactly.

S88 Internet and uses, multimedia software, scanners, digital cameras.

S91 Research and communication productivity tools.

S93 Webpage creation, PowerPoint, digital camera.

S95 Presentation software--internet for curriculum use--software that meets educational needs (math, reading, geography, etc.)

S96 Both Mac and IBM; use of equipment--digital camera, ITV; and trouble-shooting.

S97 Windows, databases (not Access), digital imaging.

S100 Web applications.

S101 Web pages, PowerPoint, Hyper studio.

S102 Internet, minor trouble-shooting.

S103 Updating technology--all items that were mentioned--or a base knowledge of those used in discipline.

S107 All that are relevant at that time. Must consistently revise list as new technology arrives and others become obsolete.

3. What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?

S2 Better prepare them in college and hands-on training when they enter the profession—teach what the school is offering.

S3 Each college of education should employ such skills in each class.

S5 Standardized class curriculum to teach technology.

S7 Profs who realize the importance of having these skills.

S12 Establish competencies.

S17 Required coursework!

S18 Basic level of skills...

S19 Teachers should be required to take a class to learn what's out there. More and more schools/jobs are asking for that knowledge.

S20 Embed into educational program without adding required courses—put into already existing classes or make optional (like in #1 above).

S25 Coursework or standards in other courses that must be met before graduation.

S26 Many opportunities to work in computer labs with students in: word-processing, art programs, email, and others. Familiarity with software

programs that teach the above skills and lots of practice.

S28 Technology needs to be incorporated in their education at MSUM.

S30 Offer and require technology education courses. Have access to computers while doing coursework.

S32 All of the above mentioned.

S34 Some prior practice. Time to research and observe programs and systems that are used in businesses, organizations and schools.

S35 Students seem very comfortable using computers—(that is the first step to success). Using it as a teaching tool seems somewhat restricted. They seem more uncomfortable doing that. Again, time, experience, and opportunity will elevate the comfort level.

S44 Put technology in all methods classes.

S49 I work with MMMI students—my student teachers have not used computer skills with students.

S62 Required background knowledge demonstrated by usage on a variety of objectives.

S65 Of all competencies necessary for good and meaningful teaching, technology (the use thereof) would be low on my list. Dealing with students, working with parents, and learning to adapt to changing communities are far more important. While I am generally very satisfied with the program and Mankato, I think greater attention ought to be paid to these areas. Regrettably, many faculty are not strong in these areas. To think that undergraduates are prepared (ill prepared) in large measure with such disordered priorities is disturbing.

S68 Entry-level requirements in individual buildings—check off system for all teachers.

S69 More instruction at MSU. The teachers I've worked with from [] are more prepared.

S70 1. College of Ed instructors who also know how to be competent in tech, so they can require students to show their proficiency prior to successfully completing their classes; 2. In some cases, the students have the competence, but not the intuition as to when and how to implement the technology in the classroom.

S71 Competency-based performance required (at a certain level) to be licensed.

S72 Stronger teacher prep program in computer technology

S73 I think MSUM beginning teachers are well prepared. Opportunity to demonstrate what they can do and encouragement may be the greater problem. Does the school curriculum/schedule encourage expanded uses of technology?

S74 More opportunities to actually use what they learn.

S75 Student background varies greatly from student to student!

S76 Provide a 'technology methods' class. Include technology integration in all other methods classes. The reality currently is that the teacher learns with his/her students.

S77 See #1.

S78 My student teacher that I am working with has been competent in using the computer. I don't know about other beginning teachers in this district.

S79 Districts need to offer mandatory in-services during their new teacher workshops to introduce people to widely used district technology.

S81 In-servicing teachers on site so that you know what information they're receiving. Media specialists on-site and available to teachers for on-going support and instruction.

S83 Just the above courses.

S84 Classes

S85 Require technology classes of education majors. It's a must; because of funding, districts are not doing it.

S88 Courses required; required facet of student teaching to show evidence of use of scanner, digital camera, etc.

S90 Beginning teachers (I think) could use info on computers generally and then zero in on the kind used by their district. My student teacher knew LOTS! I do not know what others have learned to prepare for their teaching careers.

S91 Portfolio assessment, college teachers who use and require computer skills.

S93 Time, training, access.

S95 Consistent use in classes--not just a one shot deal.

S97 Teach teachers how to learn to use the software efficiently--don't bog them down with all the bells and whistles of the software.

S101 Requirements.

S102 Require technology courses, not if you want to [sic, not optional].

S103 I am not sure--I am usually in awe of their enthusiasm and motivation to include technology...I have been impressed with what they have come with!

S105 Much instruction and practice time!

S107 Recognize that students are at different computing/technological levels. Do not make tech class mandatory. Perhaps have short, 1-credit, optional, enrichment classes to choose from according to need. Give students a checklist of necessary technology requirements that they must demonstrate competency in before they can graduate. For this to work, licensure professors must model the use of technology in their own courses.

BEGINNING AND PRE-SERVICE TEACHERS

1. How can teacher education programs better prepare teachers to use technology?

T2 They need to be as updated as possible. They need to be readily offered, if not even required.

T3 More access and education on all these things using situations that would occur in classrooms.

T4 Can't. Learning on the job is most practical. Different schools require different technology skills. Technology education doesn't guarantee a better teacher.

T5 Expose students to more software options.

T11 Need to know expected levels.

T13 By offering more courses that focus on implementing technology in the classroom.

T14 Start with the basics and use both Macs and PCs.

T15 By demonstrating them, then supporting students as they use them by being available to answer questions and assist with problems.

T17 Require computer courses that reflect educational practices (web design, spreadsheet, software).

T18 More hands-on classes, dealing with trouble-shooting.

T19 More hands-on activities with computers. Expose us to more advances in technology in related classes.

T20 The LME classes here are useful.

T21 Use technology in Methods, EdFn, and C&I classes.

T22 I think that they need to continue to change with the changing technology.... Too many teachers go into their classroom with students who know more than they do about running technology.

T23 Have a lab of computers for education students that have been accepted into the program, like engineering students have, so only education students can use them.

T24 Require a media technology course. Class assignments that require using computer technology.

T28 They could provide more opportunities to use technology.

T33 There should be more than one class. All the types of media were crammed into one class and were very overwhelming. Now much was learned about the specific things.

T44 Have professors use technology more in their teaching as well as their students.

T45 Have them available for teachers to use. Do more classes on how to use tech in your classroom and with different subjects.

T46 Require some technology classes even library media classes to talk about copyright.

T47 Class on how to integrate it into classroom. Ties teaches lots of programs that I have found very useful such as ClarisWorks, spreadsheet, DB and WP and beginning internet.

T48 I work with children birth to age 6 with developmental delays—not applicable for population I work with and I had no training in any of this grad or undergrad at MSU.

T49 Require a course in technology. At my school, technology is used daily in the classroom. If a beginning teacher had such a course, they would be more 'hirable' in my district.

T50 Make them more marketable for the future.

T53 More hands-on with the hardware and software.

T54 Education programs must treat the computer and related technologies as tools to be used in all subject areas—not as a separate class. Teachers at all levels and in all subject areas must utilize technology to help deliver the curriculum. Even with a CS concentration I could have used more course work involving technology to become better able to incorporate it into the curriculum.

T56 More tech classes—more specific.

T57 A class that offers more up to date info on the latest technology devices. Spend class time on older equipment—VCRs, filmstrip machines, video cameras, etc.

T59 Spend more class time focusing on using software instead of broadly touching on all aspects of technology—our media specialists handle majority.

T60 Require students to develop units, lessons that incorporate technology. We learn by <u>doing</u>. The asst needs to be 'realistic'—relative to curriculum.

T61 Just experimenting on all programs.

T62 To continue to integrate it through the college curriculum and to be sure students have the opportunity to apply it (hands-on activities).

T64 To gain better access to information, teachers should be trained and compensated.

T65 Show us how to do some things.

T66 Keep doing your best to stay informed of the most current tech issues.

T67 By having more 'hands-on' classes that deal with technology.

T68 Introduce and work with all types of technology that can be used in the classroom. The more a person works on or with technology, the more prepared they will be.

T69 Integrate course with other courses.

T71 More classes. Better computers.

T72 Offer more than one class. Too much information is jammed into the one class.

T73 Find out what programs and software most schools are using.

T74 I took most of these classes 10-15 years ago, therefore I am not completely aware of what MSU <u>does</u> do in terms of technology training.

T75 Train them on what is available.

T76 Actually talk about it for once.

T77 Have instructors model use in education classrooms.

T78 Have a class for just Micrograde, Claris, etc.

T79 Get students involved so they can have experiences before they graduate.

T80 Have more classes for teacher technologies and more equipment available.

T81 Installing new programs, new hardware (printers). More ideas to integrate computer use (other than educational games) with the students.

T90 Teach it/use it/incorporate it into our teaching courses consistently.

T91 Have students work hands-on and develop lessons using computer technology such as: web pages, Hyper studio, PowerPoint, scanners and more.

T82 More tech/comp courses required to take.

2. **What kind of computer and related technologies should be included in teacher education programs?**

T2 IBM (PC) and MAC, scanners, digital cameras, how to implement technology into curriculum, how to create curriculum using technology.

T4 Grade books, spreadsheet, graphic programs.

T5 Databases—more thoroughly. Teach both Mac and IBM comp.

T11 Programs that use methods that will not become obsolete.

T13 Multimedia presentations that can be used in the classroom. How to use projection equipment. How to install software programs. How to use a scanner with a lesson.

T14 Anything that is 'cutting edge' as well as the 'tried and true.'

T15 Creating and using multi-media presentations. How to teach computer skills to lower elementary students.

T17 LME is required—that's good. I haven't taken it yet but from what I've heard there needs to be better instruction.

T18 All of LME 402/401 times ten. More hours!

T19 Expose us to presentation techniques, available CD-ROMs, etc. I know very little.

T21 Internet, spreadsheets, finding good software.

T22 DVD and running equipment through computers. (e.g., running a VCR through computer systems.)

T23 Teach both Hyper studio, ClarisWorks, Micrograde, PowerPoint on MACS and IBM compatibles.

T24 Require computer tech classes that introduce a variety of programs.

T27 How to make a spreadsheet.

T28 As much as possible, every kind.

T33 All items discussed in survey should be taught with much time and detail

T44 One a student can use in their own classroom when they get a teaching job.

T45 Macs and Claris Works for kids. Hyper studio (more of), internet (how and what to do with).

T46 Intro to computers—all types. Software installation. Basic trouble-shooting.

T47 How to integrate tech into classroom.

T49 Internet, PowerPoint, LCD projectors, possibly software in subject area could be taught and discovered in methods courses.

T50 Everything.

T52 Internet—teacher/student web sites.

T53 Internet, web sites, web pages, PowerPoint, creating documents, adding scans, photos, etc.

T54 Students need more hands-on experiences utilizing technology and its use in education. Most districts are spending lots of $ upgrading tech equipment. With my concentration in CS, I gained experience in technologies related to my field as well as what is needed by adults entering the work force—computers are here to stay in every aspect of our lives.

T55 More basic trouble-shooting problems.

T56 Spreadsheets, databases.

T57 Adaptive technology for special needs students.

T59 Installing software, trouble-shooting tips, old as well and new machinery (we still have films!), internet usage.

T61 IBM and Mac and old Macs.

T62 I think you covered them all in the survey.

T64 Teachers should learn electronic record keeping, email, word processing, Hyper studio, digital camera, internet and video skills.

T65 All that was mentioned in this questionnaire.

T66 Macintosh—everything! It's all schools seem to use!

T67 I would have liked to learn a little bit more on technologies for special needs students and also on how to design a web page.

T68 They should learn to use computer programs that include word processing, spreadsheet, Hyper studio, digital camera, scanner, and trouble-shooting of computers. I also think it is very important to teach future teachers how to use VCRs, cameras, film projectors, overheads and other things that are used in the classrooms.

T69 All mentioned.

T71 Picture-taking, Kid Pix, activities students would like.

T72 Internet, email, Hyper studio, cameras, etc., everything that is currently in the one course, but divide into several courses.

T73 Netscape, email, word processing, grading programs.

T74 Multi-media, PowerPoint, internet, email.

T75 All.

T76 Everything—spreadsheets, PowerPoint, excel, etc. Web pages are extremely important—I wish I knew how to do it.

T77 Both PC and Mac.

T78 Micrograde, Claris.

T79 IBM training, scanners, cameras, web pages.

T80 Software and internet use.

T81 Grading programs and all that fit with #1.

T90 Everything computer/technology related in this survey.

T91 ClarisWorks homepage, Hyper studio, PowerPoint, scanners, LCD panels, and how to access sources on-line.

T82 PowerPoint, Hyper studio

3. What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?

T2 Make a class teaching it mandatory. Give chances to practice infusing technology. Have a large variety of programs available and have it be mandatory to try them.

T3 Required courses on tech.

T4 Nothing. You can teach technology competence and many districts don't have the technological resources to demonstrate competence.

T5 Performance test on the computer.

T11 Need to know expected levels.

T13 Requirements clearly state that students need to know certain technological teaching approaches. Make this requirement integral to the program.

T14 A beginning course on technical skills—how to use the equipment before learning how to integrate it within the curriculum and planning lessons, etc. The classes I took skipped the skills (you had to learn this on your own) and moved into lesson planning.

T15 More than one course that emphasizes technology and the support of instructors—this can help give the students the confidence they need to continue using the technology.

T17 Required technology classes and good instructors.

T18 More tech classes, computer science minors.

T19 More courses need to be required! More technology courses. I am interested in learning more. Please give us a chance. I have very little knowledge.

T21 Incorporate technology into Methods, EdFn, and C&I classes.

T22 Making sure that they are up to date on technology. Check with schools to find out what they are looking for and what is still needed.

T23 Make them create units such as a geography unit where they are to teach students to do Hyper studio or PowerPoint like shows on a country or web pages on a country.

T24 Required classes.

T28 More practice using it. Developing activities that include technology.

T33 Have materials more available. Spend more time on each. Apply technology to practicums and clinicals.

T44 To use technological experiences besides in LME.

T45 More practice and educating us about these programs.

T46 More computer and AV equipment usage. Then have them write lessons using technology.

T47 Require it to be taken so all have some knowledge. I need to use this knowledge all the time with my sixth graders.

T48 At least 1 tech question.

T49 A required course/part of methods course.

T50 More classes.

T52 Incorporate technology with the class being taught.

T53 Much more exposure and time on computer tech equipment.

T54 More credit hours can and should be obtained in computer related courses. A sound understanding of technology available should be addressed and used by college instructors in all subject areas. CIS offers a meaningful course in assisstive technologies that Ed students should take.

T55 LME 401 prepares students well enough.

T57 Assignments where knowledge of equipment is needed—using technology during student teaching.

T59 Make more media classes mandatory—I only had to take one and don't feel as comfortable as I should.

T60 I don't believe this should be a requirement for all...teachers learn most by doing as they develop specific curricula.   Performance Assessments for College of Ed grads might be appropriate.

T61 A course in only technology.

T64 Required assignments in their regular courses. No bulletin board (16 hrs)—do Hyper studio!

T66 Get into classrooms and see how technology can be used.

T67 More classes and exposure to different technologies.

T68 I think it is necessary to take a class that involves different types of technology. Then a least we know that some form of introduction and time was spent on working with computers and technology.

T69 Integrated within methods courses.

T70 More unit projects expected during methods—computer skills required.

T71 Ask schools what they use.   Observe media specialists.

T72 More courses!

T73 Netscape.

T74 Have a semester long course near the END of training that teaches technology education.

T75 Required classes and extra training.

T76 An actual class. No one has ever shown me what can be done with computers. I had to learn everything for myself.

T78 More access to computers.

T79 Technology related coursework.

T80 Assessment of teacher knowledge in technology.

T81 More ideas and examples!

T90 Teach it/use it/incorporate it into our teaching courses consistently.

T91 A class specializing in this subject located in the computer lab. Hands-on activities. Students should be able to use slideshow or PowerPoint

for lecture notes. It is difficult to keep students' attention, but with technology it is easier.

FOCUS GROUPS

1. How can teacher education programs better prepare teachers to use technology?

LME600 (Beginning teachers or in last year of teacher prep)

There should be more technology courses offered; it shouldn't all be crammed into one course.

Courses should start with basic skills; don't make assumptions about what students know.

Students should be exposed to both Macs and PCs.

EdFn610 (Beginning teachers and community members)

Start early!

Use of technology should be infused throughout the program—don't focus on a two-credit course.

Now, typing is the most you use for other classes.

Be consistent, i.e., have a scheme.

Infuse technology across the curriculum, but make sure that everybody knows what other instructors are doing so that many different skills are taught in context.

Supervising Teachers

Why is LME required for Elem Ed, but not secondary?

2. What kind of computer and related technologies should be included in teacher education programs?

LME600 (Beginning teachers or in last year of teacher prep)

Continue with what's currently offered but include components in trouble-shooting skills.

EdFn610 (Beginning teachers and community members)

Word processing programs.

Spread sheets.

Basic trouble-shooting!!!

LOTS of hands-on experience.

Infuse technology across the curriculum.

Offer refresher courses.

Supervising Teachers

"CAN vs. DO": Are the student teachers able, but just don't do it? Maybe cooperating teacher isn't allowing/encouraging use (intimidation, time constraints, lack of resources?).

Most student teachers already have good skills in: word processing, multi-media presentations, PowerPoint (especially the social studies/geography studer s), internet, and email.

Seem deficient in: electro... grade books.

3. What is needed to ensure that all beginning teachers have the expected levels of technological competence for infusing technology in their curriculum?

LME600 (Beginning teachers or in last year of teacher prep)

Faculty need to offer support.

Teach skills first, and then require students to infuse their skills into lesson planning and curriculum development.

Technology related skills should be required in a variety of courses.

The College should offer Continuing Ed courses for in-service teachers; technology changes so much from year to year, we need to continually update our skills.

EdFn610 (Beginning teachers and community members)

Access! Make sure students have the opportunity to practice their skills (not all schools have the equipment).

Faculty who teach regular courses must, themselves, be up-to-date.

Careful thought should go into how technology is infused APPROPRIATELY—it should be important to the instruction, not just add glitz.

Cooperative, willing students; publicize in many ways that students in education will be expected to embrace technology and demonstrate their skills.

There must be courses available that students can get into.

There needs to be a variety of software accessible.

Instruction must include ethical issues.

Supervising Teachers

Let cooperating teachers know what student teachers should already be capable of doing. (Should this be the student's responsibility or the teacher Ed programs?)

Put use of technology on the cooperating teacher's list of requirements for student teachers.

Reinforce the idea that the student-teaching process is a shared educational experience: student teacher and cooperating teacher should be learning from each other! Break down hierarchies.

Be specific!

Encourage textbook vendors to make technology more visible.

Abstract

Title: **Research in Teacher Education: Technology Competencies in Teacher Education**

Author: Leroy Kemp, Editor

This quantitative and qualitative study examined the self-reported perceptions of student teachers, in-service teachers, parents, and community members regarding beginning and pre-service teachers' levels of technological competence. The major foci were 1) How well are beginning teachers able to apply these technology competencies as judged by students, parents, teachers, faculty, and administrators? 2) Where are the gaps between the Teacher Education Curriculum and Beginning Teacher Technology Competence? How do we fill them? and 3) What support do higher education faculty, P-12 administrators, and policy-makers need to provide to ensure that beginning teachers can apply expected levels of technology competencies in teaching? To address these important questions, this research provides recommendations relative to 1) the requirements for teacher preparation in educational technology; 2) the assessment of beginning and pre-service teachers' technology competencies; and 3) resource needs for supporting improvement and assessment of the required competencies.

While the data suggest that beginning and preservice teachers are perceived to use and infuse technology throughout the curriculum, apparently all of these skills are not acquired during their professional education. In fact, the only skills they appear to acquire during their academic training are basic technology skills such as word processing and keyboarding. While these skills are clearly essential to a strong foundation in technology implementation, there is a definite need to introduce beginning and preservice teachers to emerging technologies. Knowledge of these emerging technologies will ensure that beginning and preservice teacher graduates are prepared to meet the constantly changing nature of technology in a global society.