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ABSTRACT

A study developed and validated a set of curriculum guidelines for the communication technology area of teacher preparation programs in technology education. The initial curriculum guidelines were established through personal interviews with three groups of professionals: five technology education teacher preparation professionals, five communication technology professionals, and five state and local technology education supervisors. Interview data were edited and analyzed for content. A list of 20 curriculum guidelines was generated and used as the initial curriculum guidelines from which the Delphi panel experts evaluated their importance. The Delphi panel consisted of 12 identified experts in both communication technology and technology education teacher preparation. Rounds were conducted by postal service and electronic mail. A change of less than 15 percent in ratings between Delphi Round One and Delphi Round Two was determined to indicate stability. Research findings were presented to the panel of three experts for validation. The validation panel reviewed research findings and determined that 19 of the 20 guidelines were valid as a basis for developing curriculum for the communication technology area of technology education teacher preparation programs. (Contains 20 references.) (YLB)

# Curriculum Guidelines for the Communication Technology Area of Technology Education Teacher Preparation Programs

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# Curriculum Guidelines for the Communication Technology Area of Technology Education Teacher Preparation Programs

The American Industrial Arts Association (AIAA) changed it's name to the International Technology Education Association (ITEA) in 1985. This move represented the profession's desire to more accurately reflect the technological changes within society. The transition from Industrial Arts to Technology Education requires new content and curriculum consideration.

The problem of this study was to develop and validate a set of curriculum guidelines for the communications technology area of Technology Education teacher preparation programs.

The purpose of this study was to provide educators and curriculum planners with curriculum guidelines that would be useful in the development and evaluation of curriculum material for the communications technology area in Technology Education teacher preparation programs.

**Background to the Study**

The information age was spawned primarily because of advancing communication technology and the human desire to efficiently produce, disseminate, and consume information. According to Johnson (1989) "Innovations in communications technology have transformed almost all technical and social systems" (p.21). Communication and information technology may be thought of as technologies that extend the human sensory potential primarily concerned with the creating, transmitting, receiving, processing, storing and retrieval of knowledge ("Communication," 1990).

The study of communication technology is essential to all people and 'basic' for one to be considered technologically literate. According to Richter (1980), "knowledge of communication technology is crucial to an individual's overall technological literacy" (p. 8). A review of the related literature suggested that the study of technology is necessary for all students as part of a holistic education preparing for life as a contributing member of society. Specifically addressing and supporting the study of communication technology, Johnson (1989), stated,

> to participate fully in the information age, young adults should understand-at least conceptually-the technologies that are behind modern communications. Further, they should be aware of the ideas, risks, and benefits of information management that are made possible by advancing communications technology. (p.23)

Many curriculum efforts during the Industrial Arts era identified communications to be course work in the graphic arts and drafting. Recognizing the need for curriculum change toward technology education Sterry & Hendricks (1990) stated,

> we can no longer teach graphic arts, electronics, and drafting as separate subjects if we expect students to see, much less understand, the dynamic interrelationships that exist within these fields. If we want students to see relationships between various related technologies in the field of communication, then we have to teach relationships. We cannot continue to teach different technologies in isolation and expect students to somehow pull these segments of instruction together into a holistic understanding of communications systems. (p.103)

The transition to Technology Education embraced The Jackson's Mill Curriculum Theory (Snyder & Hales, 1981) as a major curriculum interpretation effort which identified communication technology as one of four content organizers.

A review of related literature revealed a lack of research directly addressing the communications technology area of Technology Education teacher preparation programs. Referring to research in Technology Education, Dugger (1990) stated that "most of the research has been generic and has not been specific to subject matter or cluster curriculum areas . . . such as communication" (p.168). Also identifying the lack of research in the communication technology area of Technology Education teacher preparation programs, Hendricks (1986) states that "curriculum development in communication technology continues to struggle in terms of a clear organizational outline. This is evidenced by the lack of research conducted in the area". (p. 46) As stated by Sterry & Hendricks (1990) curriculum change is often slow. More specifically they noted that "teacher education has been slow to adopt change. Teacher educators have made great speeches, developed good models, and prompted others to change, but they, themselves, have been reluctant to change" (Sterry & Hendricks, 1990). Leaders and professionals in Industrial Arts identified the need to change toward Technology Education. Change was targeted initially at the middle school curriculum and later at the high school curriculum.

The Jackson's Mill Curriculum Theory identified four technological areas for study in Technology Education. These technological areas included: manufacturing, communications, construction, and transportation (Snyder & Hales, 1981). These four areas served as content organizers for curriculum derivation at the middle and high school level. Noticeably missing from the literature was information or research concerning curriculum for Technology Education teacher preparation.

Referring to the study of communication technology, Sterry & Hendricks (1990), indicated that "if communication is identified as appropriate content for elementary and secondary education, then it seems only logical that it become a part of teacher education and especially technology teacher education" (p.104).

**Research Methodology and Design**

A combination of two research methods were used to address the research problem. The two research methods were the personal interview and the Delphi technique. The personal interview research method was used to generate the initial list of curriculum guidelines. The Delphi technique was used to determine consensus of the curriculum guidelines by identified Delphi panel experts.

**Conducting Personal Interviews**

Personal interviews were conducted with three groups of professionals; five Technology Education Teacher Education professionals, five communication technology professionals, and five state and local Technology Education supervisors. A total of fifteen interviews were conducted.

**Selecting the Sample.** The three groups of professionals were consulted for their expertise and input in the generation of the communication technology curriculum guidelines. The three categories of professionals to be interviewed were recommended by the researcher. The selection of each professional to be interviewed was based on peer recommendation. After an initial professional was identified in each group, they were asked to identify another professional of equal qualifications, who would be capable of providing the required assistance for the proposed research.

The initial professionals to be interviewed were identified by the researcher.

Each professional was asked to address the following questions based upon the design of the research;

1. What should the curriculum of the communications cluster in a technology teacher education program involve?
2. What should be emphasized for the future communication technology teacher to be successful in delivering instruction?

**Analysis of Interview Data**

For the purposes of this study, the researcher analyzed the interview data for recurring words and associated themes and grouped them into categories of similar words and themes (Berelson,1971). Through further analysis of the categories, curriculum guideline statements were formulated.

**Delphi Panel Expert Selection**

Technology Education teacher education and communication technology experts were identified by peer review of college and university department chairpersons. Forty college and university department chairpersons were randomly selected from the 1990-91 Industrial Teacher Education Directory (Dennis, 1991). Department chairpersons were asked to identify three individuals who they believed, based on publications, presentations and scholarship, were experts and worthy of making curriculum judgements concerning the communication technology area of Technology Education teacher preparation programs. The chairperson's response generated 61 experts with a return rate of 80%. Of the 61 experts identified, nine experts were identified more than once.

An additional nine experts were randomly selected from the remaining list of experts.

**Panel Expert Participation**

One of the terms for participation was that the expert must be able to access and utilize electronic mail since the study would be conducted by electronic mail. Initial response yielded two experts agreeing to participate and hailed the idea of a Delphi study utilizing electronic mail. The two experts were familiar with electronic mail and worked with it regularly. After the eight weeks only the two previous experts were on line and communicating, while two experts wrote letters explaining why they could not participate, and one telephoned to decline participation.

Following further analysis it was concluded that the experts input was more important than the medium the expert used to respond to the instrument. In order to allow all experts the opportunity to participate in the Delphi rounds it was decided to use the postal service and electronic mail. In a follow-up letter it was disclosed that the original stipulation for expert participation requiring the ability to access and utilize electronic mail was dropped. A Delphi round one instrument was provided with the follow-up letter to expedite the research process. This yielded ten experts in addition to the two on electronic mail, bringing the total number of experts to twelve.

**Administering the Delphi Round One Instrument**

The twelve panel experts, ten through postal service and two by electronic mail, were administered the Delphi round one instrument. Instructions for completing the round one instrument asked the panel expert to rate each curriculum guideline from one (1) not important, to five (5) very important on the Likert scale as shown below:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not Important | Vaguely Important | Somewhat Important | Important | Very Important |

A Likert Scale was used to rate the degree of importance of each curriculum guideline. The Likert scale was used as a technique which permitted the expert to examine and respond to the curriculum guideline statements and indicate the extent withwhich the panel expert believed an item was important or unimportant.

The Delphi round one data were gathered and the mean and standard deviation were calculated (See Table 1 Below). Space was provided for additional curriculum guidelines and comments. Panel experts responding by electronic mail returned the round one instrument in two days. Panel experts using the postal service required five weeks total.

**Table 1. - Delphi Round One Findings**

The study of communication technology for Technology Education teacher preparation should:

A -emphasize the role of communication technology in present and future societies (M 4.417, SD 0.515).

B -be a relevant, experiential based, hands-on application of knowledge (M 4.500, SD 0.798).

C -emphasize the concepts and techniques of encoding, decoding, transmitting, receiving, storing and retrieving graphic and electronic messages (M4.500, SD 0.522).

D -evaluate the impact communication technology has on society, the workplace, the home, and how one communicates (M 4.500, SD 0.674).

E -emphasize a conceptual framework for greater technological understanding of communication technology (M 4.083, SD 0.793).

F -encourage self-directed, lifelong learning through technological understanding of communication technology (M 3.830, SD 0.830).

G -explore technological alternatives in communication applications, at work, in the home, and for the individual (M 3.830, SD 0.577).

H -investigate technological spinoffs from communication technology for use at work, in the home, and for the individual (M 3.667, SD 0.778).

I -provide structured, school-based experiences, with frequent student evaluation of the experience (M 3.500, SD 1.000).

J -provide opportunity for students to learn various delivery systems for teaching communications technology such as; formal presentations, demonstrations, group interaction, simulations, games, independent study, and research and experimentation (M 4.417, SD 0.996).

K -involve problem solving, critical thinking, decision making and analytical skills (M 5.000, SD 0.000).

L -utilize a multi-disciplinary approach including math and science principles, history, geography, chemistry, etc., to solve communication problems (M 4.417, SD 0.669).

M -utilize the system approach as a model for greater understanding and interpretation of technological systems (M 4.250, SD 0.754).

N -utilize the entire school and community resources, including team teaching and co-operative learning (M 3.750, SD 1.055).

O -provide opportunity for students to learn various multimedia presentation techniques for addressing individual differences and learning styles (M 3.833, SD 0.937).

P -provide instruction in communication laboratory facility design (M 3.833, SD 1.030).

Q -utilize laboratories that are capable of computer and telephone connections for data transmission/reception (M 4.083, SD 0.793).

R -utilize laboratories that are flexible and easily modifiable (M 4.333, SD 0.788).

S -promote a safe and secure working environment (M 4.417, SD 0.515).

T -include performance based assessment for demonstration of knowledge and skills. These may include; portfolios, presentations, interviews, oral and written exams (M 4.500, SD 0.520).

**Administering the Delphi Round Two Instrument**

The Delphi round two instrument was completed by the twelve panel experts, ten through postal service and two by electronic mail. The instructions for completing the Delphi round two instrument asked the panel expert to rate each curriculum guideline from one (1) not important, to five (5) very important on the Likert scale. Panel experts were asked to review their initial Delphi round one response and compare it with the group mean. Based upon that information the panel experts could leave their response as indicated or change their response in light of the emerging group response. Panel experts who chose not to change their round one response and their score was more than 1.0 (above or below) the group mean were asked to provide a brief explanation concerning their reasoning for maintaining their rating. The Delphi round two data were gathered and the mean and standard deviation were calculated (See Table 2 Below).

Analysis of the Delphi Round Two data indicated a unanimous consensus of Very Important (5.0) for curriculum guideline **K**. Curriculum guideline **K** stated that the study of communication technology for Technology Education teacher preparation should involve problem solving, critical thinking, decision making and analytical skills. Other curriculum

guidelines receiving high consensus for Delphi Round Two were guidelines **B**, and **S**. Both of the curriculum guidelines rated a 4.667 group mean indicating a degree of importance between Important and Very Important. The lowest rated curriculum guideline receiving a group mean of 3.500, was guideline **H**. Curriculum guideline **H** stated that the study of communication technology for Technology Education teacher preparation should investigate technological spinoffs from communication technology for use at work, in the home, and for the individual. Other curriculum guidelines receiving low group mean ratings include **P** (3.583), **G** (3.667), and **I** (3.667). The ratings for these curriculum guidelines indicated a degree of importance between Somewhat Important and Important.

**Table 2. - Delphi Round Two Findings**

The study of communication technology for Technology Education teacher preparation should:

A -emphasize the role of communication technology in present and future societies (M 4.500, SD 0.522).

B -be a relevant, experiential based, hands-on application of knowledge (M 4.667, SD 0.492).

C -emphasize the concepts and techniques of encoding, decoding, transmitting, receiving, storing and retrieving graphic and electronic messages (M 4.417, SD 0.515).

D -evaluate the impact communication technology has on society, the workplace, the home, and how one communicates (M 4.500, SD 0.674).

E -emphasize a conceptual framework for greater technological understanding of communication technology (M 4.250, SD 0.622).

F -encourage self-directed, lifelong learning through technological understanding of communication technology (M 3.830, SD 0.830).

G -explore technological alternatives in communication applications, at work, in the home, and for the individual (M 3.667, SD 0.492).

H -investigate technological spinoffs from communication technology for use at work, in the home, and for the individual (M 3.500, SD 0.674).

I -provide structured, school-based experiences, with frequent student evaluation of the experience (M 3.667, SD 0.778).

J -provide opportunity for students to learn various delivery systems for teaching communications technology such as; formal presentations, demonstrations, group interaction, simulations, games, independent study, and research and experimentation (M 4.417, SD 0.793).

K -involve problem solving, critical thinking, decision making and analytical skills (M 5.000, SD 0.000).

L -utilize a multi-disciplinary approach including math and science principles, history, geography, chemistry, etc., to solve communication problems (M 4.583, SD 0.515).

M -utilize the system approach as a model for greater understanding and interpretation of technological systems (M 4.083, SD 0.515).

N -utilize the entire school and community resources, including team teaching and co-operative learning (M 4.000, SD 0.739).

O -provide opportunity for students to learn various multimedia presentation techniques for addressing individual differences and learning styles (M 4.000, SD 0.739).

P -provide instruction in communication laboratory facility design (M 3.583, SD 0.669).

Q -utilize laboratories that are capable of computer and telephone connections for data transmission/reception (M 4.167, SD 0.718).

R -utilize laboratories that are flexible and easily modifiable (M 4.417, SD 0.515).

S -promote a safe and secure working environment (M 4.667, SD 0.492).

T -include performance based assessment for demonstration of knowledge and skills. These may include; portfolios,

presentations, interviews, oral and written exams (M 4.42, SD 0.510).

**Determining Delphi Stability**

Stability of consensus was determined by two methods. The first method consisted of a percentage of change in the total mean response from Delphi round one and round two. This supported Dajani, Sincoff and Talley (1979), who stated that "consensus is assumed to have been achieved when a certain percentage of the responses fall within a prescribed range (p.83)." For the purposes of this study a change of less than 15% was predetermined to indicate stability. (See Table 3. Below)

Analysis of the group average percent of change from Delphi Round One compared to Delphi Round Two indicated three curriculum guidelines which remained unchanged. This means the rating the curriculum guidelines received in Delphi Round One was the same rating the curriculum guideline received in Delphi Round Two. The three guidelines included **K**, **D**, and **J**. The highest percent of change occurred in curriculum guideline **N** (6.667%), which states that the study of communication technology for Technology Education teacher preparation should utilize the entire school and community resources, including team teaching and co-operative learning. The percent of change moved the curriculum guideline rating from 3.75, between Somewhat Important and Important, in Delphi Round One to a rating of 4.00 indicating a solid rating of Important, in Delphi Round Two.

Other curriculum guidelines with a high percent of change included curriculum guideline **P** (6.522%), **S** (5.660%), and **I** (4.771%). The group average percent of change for the curriculum guidelines from Delphi

Round One to Delphi Round Two was 3.092%, well below the predetermined 15%.

**Table 3.** - Comparison of Guideline Statement Ratings Between Delphi Round One and Delphi Round Two.

| Statement Letter | Round One Mean Response | Round Two Mean Response | Percent Change |
|---|---|---|---|
| A | 4.417 | 4.500 | 1.879 |
| B | 4.500 | 4.667 | 3.711 |
| C | 4.500 | 4.417 | 1.844 |
| D | 4.500 | 4.500 | 0.000 |
| E | 4.083 | 4.250 | 4.090 |
| F | 3.830 | 3.830 | 0.000 |
| G | 3.833 | 3.667 | 4.331 |
| H | 3.667 | 3.500 | 4.554 |
| I | 3.500 | 3.667 | 4.771 |
| J | 4.417 | 4.417 | 0.000 |
| K | 5.000 | 5.000 | 0.000 |
| L | 4.417 | 4.583 | 3.758 |
| M | 4.250 | 4.083 | 3.929 |
| N | 3.750 | 4.000 | 6.667 |
| O | 3.833 | 4.000 | 4.357 |
| P | 3.833 | 3.583 | 6.522 |
| Q | 4.083 | 4.167 | 2.057 |
| R | 4.333 | 4.417 | 1.939 |
| S | 4.417 | 4.667 | 5.660 |

| | | | |
|---|---|---|---|
| T | 4.500 | 4.420 | 1.778 |
| Average Percent Change From All Statements | | | 3.092 |

The second method used to determine stability of consensus was a comparison of the group standard deviation between Delphi rounds one and two. A decrease in the group standard deviation between Delphi rounds one and two was an indicator of stability. (See Table 4. Below) The analysis of the data indicated three curriculum guideline with no standard deviation movement between Delphi Round One and Delphi Round Two. These included guideline **D**, **F**, and **K**. The largest change in standard deviation occurred with curriculum guideline **P**, with a change of -.361. Curriculum guideline **P** stated that the study of communication technology for Technology Education teacher preparation should provide instruction in communication laboratory facility design. Other curriculum guidelines with a large change in standard deviation included guideline **N** (-.316), and **B** (-.306). The group average standard deviation for the curriculum guidelines decreased from .737 in Delphi round one, to .590 in Delphi round two, a decrease of -.147.

Based upon the two methods used to determine stability it was concluded that stability of consensus was achieved.

**Table 4.** - Comparison Between Delphi Round One and Two Standard Deviations

| Statement Letter | Round One Standard Deviation | Round Two Standard Deviation | Difference |
|---|---|---|---|
| A | .515 | .522 | +.007 |

| | | | |
|---|---|---|---|
| B | .798 | .492 | -.306 |
| C | .522 | .515 | -.007 |
| D | .674 | .674 | .000 |
| E | .793 | .622 | -.171 |
| F | .830 | .830 | .000 |
| G | .577 | .492 | -.085 |
| H | .778 | .674 | -.104 |
| I | 1.000 | .778 | -.222 |
| J | .996 | .793 | -.203 |
| K | 0.000 | 0.000 | .000 |
| L | .669 | .515 | -.154 |
| M | .754 | .515 | -.239 |
| N | 1.055 | .739 | -.316 |
| O | .937 | .739 | -.198 |
| P | 1.030 | .669 | -.361 |
| Q | .793 | .718 | -.075 |
| R | .778 | .515 | -.263 |
| S | .515 | .492 | -.023 |
| T | .520 | .510 | -.010 |
| Average of all Statements | .737 | .590 | -.147 |

**Validation of Research Findings**

The research findings were presented to a panel of experts to validate the results. The validation panel consisted of three professionals who were identified through the initial search for Delphi panel experts. The professionals were identified as experts in both communication

technology and Technology Education teacher preparation. The validation panel was asked to review the research findings and provide comments regarding whether or not the curriculum guidelines were valid as a basis for developing curriculum for the communication technology area of Technology Education teacher preparation programs. It was predetermined that agreement between two of the three members of the validation panel would constitute a valid curriculum guideline. It was concluded that nineteen of the twenty curriculum guidelines were valid. The one curriculum guideline determined not be valid was curriculum guideline **I**, which stated that the study of communication technology for Technology Education teacher preparation should provide structured, school-based experiences, with frequent student evaluation of the experience. Two of the three members of the validation panel indicated that the curriculum guideline was too vague, and that the experiences ought to go beyond the classroom and utilize the community. The remaining member of the validation panel thought the curriculum guideline was a valuable learning method. In addition to the one curriculum guideline determined to be not valid, five other curriculum guidelines received a rating of not valid by one of the three validation panel members. The five curriculum guidelines were **E**, **H**, **M**, **P**, and **Q**. Based on the validation panels results, it was concluded that nineteen of the twenty curriculum guidelines were valid for developing curriculum material for the communication technology area of Technology Education teacher preparation programs.

**Final Research Findings**

The following list of curriculum guidelines are a result of the research and are presented in accordance with the problem of the study.

The study of communication technology for Technology Education teacher preparation should:

A -emphasize the role of communication technology in present and future societies.

B -be a relevant, experiential based, hands-on application of knowledge.

C -emphasize the concepts and techniques of encoding, decoding, transmitting, receiving, storing and retrieving graphic and electronic messages.

D -evaluate the impact communication technology has on society, the workplace, the home, and how one communicates.

E -emphasize a conceptual framework for greater technological understanding of communication technology.

F -encourage self-directed, lifelong learning through technological understanding of communication technology.

G -explore technological alternatives in communication applications, at work, in the home, and for the individual.

H -investigate technological spinoffs from communication technology for use at work, in the home, and for the individual.

I -provide structured, school-based experiences, with frequent student evaluation of the experience.

J -provide opportunity for students to learn various delivery systems for teaching communications technology such as; formal presentations, demonstrations, group interaction, simulations, games, independent study, and research and experimentation.

K -involve problem solving, critical thinking, decision making and analytical skills.

L -utilize a multi-disciplinary approach including math and science principles, history, geography, chemistry, etc., to solve communication problems.

M -utilize the system approach as a model for greater understanding and interpretation of technological systems.

N -utilize the entire school and community resources, including team teaching and co-operative learning.

O -provide opportunity for students to learn various multimedia presentation techniques for addressing individual differences and learning styles.

P -provide instruction in communication laboratory facility design.

Q -utilize laboratories that are capable of computer and telephone connections for data transmission/reception.

R -utilize laboratories that are flexible and easily modifiable.

S -promote a safe and secure working environment.

T -include performance based assessment for demonstration of knowledge and skills. These may include; portfolios, presentations, interviews, oral and written exams.

**Discussion**

Using electronic mail to conduct a Delphi study consist of the same advantages normally associated with the Delphi technique; anonymity of response, multiple iterations with a structured format, and statistical group response. Additional advantages of electronic mail are 1.) dialog can take place between parties at their convenience and 2.) correspondence between parties has a quicker turn-around time.

The use of microcomputer telecommunication has added a whole new dimension to the way humans communicate. The integration of microcomputers has had an impact on the communication technology area of Technology Education not only in the form of content but also as a tool

for managing and organizing the teacher's work load. With the added application of telecommunication, the microcomputer has evolved into a communication medium capable of storing, sending, and forwarding messages or what is commonly known as 'electronic mail'.

It has been speculated that the use of microcomputers as a telecommunication medium offers a potential means of reducing the amount of paper shuffled by society (Post, 1991). It was the intent of the researcher to utilize electronic mail to collect the data necessary for this study. One of the disadvantages of the Delphi technique is the management of the data and the administrative paperwork of sending out various rounds of surveys and analysis forms. According to Preble (1983) the "Delphi tends to be administratively complex and often takes several weeks or months to complete."(p.76) It was felt that by conducting a Delphi study by electronic mail it would take advantage of the microcomputer technology and also ease the disadvantages of conducting the Delphi Technique. According to Post (1991) there are many advantages and disadvantages to electronic mail.

**Electronic Mail Advantages**

- Conversation may take place at the convenience of each communicator.(p. 13)

- Information can be easily copied, stored, reworked or sent to other parties that my be interested.(p. 13)

- Geographical distance and isolation boundaries are reduced.(p. 13)

- Through electronic mail you can expand the number of colleagues you have.(p. 13)

- Classroom use allows your students to make friends around the country or the world.(p. 13)

**Electronic Mail Disadvantages**

- Not for very time sensitive messages since receiver may not be using their computer or checking their mail frequently enough.(p. 13)

- It is difficult to convey emotions and body language through electronic mail.(p. 13)

- Currently the legal status of privacy rights for electronic mail is not well defined.(p. 13)

- Electronic Mail can be addictive.(p. 13)

The use of electronic mail is recommended for further exploration in various types of research.

**Summary**

The problem of this study was to develop and validate a set of curriculum guidelines for the communication technology area of Technology Education teacher preparation programs. The initial curriculum guidelines were established through personal interviews with three groups of professionals. Personal interviews were conducted with five Technology Education teacher preparation professionals, five communication technology professionals, and five state and local Technology Education supervisors. A total of fifteen interviews were conducted. The interview data was edited and analyzed for content. A list of 20 curriculum guidelines were generated from the interview data.

The curriculum guidelines developed through the personal interviews were used as the initial curriculum guidelines from which the Delphi panel experts evaluated their importance. Delphi panel consisted of 12 identified experts in both communication technology and Technology Education teacher preparation. The Delphi rounds were conducted by

postal service and electronic mail. Ten Delphi panel experts participated by postal service and two Delphi panel experts participated by electronic mail.

Delphi Round One material was sent to Delphi panel experts and returned. The Delphi Round One data were gathered and the mean and standard deviation were calculated. Delphi Round Two material was sent to Delphi panel experts. Delphi panel experts were asked to review their initial Delphi Round One responses and compare them with the group mean. Based upon that information the Delphi panel experts could choose to leave their response as indicated or change their response in light of the emerging group response. Delphi panel experts who chose to maintain their Round One rating and their score was more than 1.0 (above or below) the group mean were asked to provide a brief explanation concerning their reasoning for maintaining their rating. The Delphi Round Two data were gathered and the mean and standard deviation were calculated. Delphi Round Two was analyzed for stability of consensus. Two methods were used for indicating stability of consensus. The first method consisted of a percentage of change in the total mean response from Delphi Round One and Delphi Round Two. For the purposes of this study a change of less than 15% was predetermined to indicate stability. The group average percent of change for the curriculum guidelines was 3.092%, well below the predetermined 15%. The second method of stability of consensus was a comparison of the group standard deviation between Delphi Round One and Delphi Round Two. A decrease in the group standard deviation between Delphi Rounds One and Delphi Round Two was an indicator of stability. The group average standard deviation for the curriculum guidelines decreased from .737 in Delphi Round One, to .590 in Delphi

Round Two a decrease of .147. It was determined that stability of consensus was reached.

The research findings were presented to a panel of experts to validate the findings. The validation panel consisted of three professionals who were identified through the initial search for Delphi panel experts. The validation panel was asked to review the research findings and provide comments regarding whether or not the curriculum guidelines were valid as a basis for developing curriculum for the communication technology area of Technology Education teacher preparation programs. Nineteen of the twenty curriculum guidelines were determined to be valid as a basis for developing curriculum for the communication technology area of Technology Education teacher preparation programs.

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