The Relationship of Technology Use to Perception of Instructional Quality

A dissertation presented to

the faculty of

the College of Education of Ohio University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy

Albert S. Akyeampong

August 2008
This dissertation titled
The Relationship of Technology Use to Perception of Instructional Quality

by

ALBERT S. AKYEAMPONG

has been approved for
the Department of Educational Studies
and the College of Education by

________________________________________
Teresa J. Franklin
Associate Professor of Educational Studies

________________________________________
Renée A. Middleton
Dean, College of Education
Abstract

AKYEAMPOŃG, ALBERT S., Ph.D., August 2008, Curriculum and Instruction, Instructional Technology

The Relationship of Technology Use to Perception of Instructional Quality (228 pp.)

Director of Dissertation: Teresa J. Franklin

This study examined student’s perceptions of different forms of technology use for instruction purposes by faculty and whether these different forms of technology can predict instructional quality. The study sought to explore whether different forms of technology: Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools, reliably predict instructional quality. The study also aimed at examining which of the predictors is more important in predicting instructional quality.

Data were collected with an online questionnaire comprising three parts. Part I of the instrument collected demographic information. Part II was designed to measure faculty instructional quality as perceived by students. Part III of the instrument relates to the various forms of technology and the seven principles of good practice in undergraduate education (Chickering & Gamson, 1991). A large Midwestern University Teacher Education program was the accessible population from which a convenient sample was drawn. A total of 121 responses were used in the analysis. The response rate of the study was 56.6%. Descriptive statistics and inferential statistics were used to analyze the data.

Results of the analysis revealed that approximately 57% of the variance of the student evaluation of Instructional Quality can be accounted for by the linear combination of Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web
Tools. The analysis indicated that only two of the independent variables, Productivity Tools and Presentation Tools contributed significantly to the regression.

Findings from the supplementary multiple regression analysis of the independent variables: Faculty encourages student and faculty interaction scale - S1, Faculty promotes cooperation among students scale - S2, Faculty promotes active learning techniques scale - S3, Faculty gives prompt feedback scale S4, Faculty emphasizes time on task scale - S5, Faculty communicates high expectations scale - S6 and Faculty respects diverse talents and ways of learning scale - S7 was statistically significant in predicting Instructional Quality. Thirty seven percent of the variance of the student evaluation of Instructional Quality can be accounted for by the linear combination of; S1, S2, S3, S4, S5, S6 and S7 scale.

Findings from the null hypothesis and the supplementary analysis converge to indicate combination of Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools can predict Instructional Quality. Among the predictors Presentation Tool emerged as the most important predictor of Instructional Quality. The combination of the independent variables S1, S2, S3, S4, S5, S6 and S7 was statistically significant in predicting Instructional Quality.

Approved: 

________________________________________________________________________

Teresa J. Franklin

Associate Professor of Educational Studies
Acknowledgments

I would like to express my sincere appreciation to my dissertation chair, Dr. Teresa Franklin. You have provided me with direction for my dissertation and guided my development as an instructional technologist. I value the confidence and opportunity provided me throughout my stay in the IT program. Thank you for your mentorship, understanding and compassion. I would like to thank the members of my doctoral committee Dr. George Johanson, Dr. David Moore, and Dr. Greg Kessler who contributed immensely in the development and completion of this dissertation. Your time, expertise and much appreciated attention and direction on research and writing style is greatly appreciated. You made the dissertation process pleasant and less stressful.

I would like to acknowledge the contribution made by the College of Education’s Research Grant in financing some aspects of my research. I would also like to thank all the professors and students who participated in the research. Your support and contribution made the research possible.

I am grateful for my family. Your love, prayers and support is very much appreciated. Immense gratitude is extended to my parents, Samuel and Esther Akyeampong who instilled in me the love to pursue knowledge. You raised me to believe that I can achieve anything I put my mind to. I am grateful for my brother Edmund and my sister Joanna, my in-laws; Tony and Esther Gasu and all who provided support in their own special ways.

Very special thanks to my special friend and wife Abigail Akyeampong, my daughters Kesewa and Awo Akyeampong for their support, encouragement and unconditional love. I am grateful for each one of you. Finally, I thank God for granting me the strength and wisdom to complete the course.
To God be the Glory

This work is dedicated to my daughters - Kesewa and Awo Akyeampong

Your unconditional love saw me through some challenging times

May you achieve anything you put your mind to with God’s help
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>iv</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xiii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xv</td>
</tr>
<tr>
<td>Chapter 1: Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Background of the Study</td>
<td>1</td>
</tr>
<tr>
<td>Teacher Preparation</td>
<td>2</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>2</td>
</tr>
<tr>
<td>The Seven Principles for Good Practice in Undergraduate Education</td>
<td>3</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Research Question</td>
<td>5</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>6</td>
</tr>
<tr>
<td>Scope of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>8</td>
</tr>
<tr>
<td>Limitations and Delimitations of the Study</td>
<td>10</td>
</tr>
<tr>
<td>Summary</td>
<td>11</td>
</tr>
<tr>
<td>Organization of the study</td>
<td>12</td>
</tr>
<tr>
<td>Chapter 2: Review of Relevant Literature</td>
<td>13</td>
</tr>
<tr>
<td>Introduction</td>
<td>13</td>
</tr>
<tr>
<td>Teacher Preparation Programs and Technology Integration</td>
<td>13</td>
</tr>
<tr>
<td>The Seven Principles for Good Practice in Undergraduate Education</td>
<td>17</td>
</tr>
</tbody>
</table>
Good Practice Encourages Student – Faculty Contact .............................................. 19
Good Practice Encourages Cooperation Among Students .................................... 24
Good Practice Encourages Active Learning .......................................................... 27
Good Practice gives prompt feedback. ................................................................. 32
Good Practice Emphasizes Time on Task ............................................................ 35
Good Practice Communicates High Expectations .................................................. 38
Good Practice Respects Diverse Talents and Ways of Learning .......................... 42
Technologies Used to Support Teaching ............................................................... 46
Programs used to support teaching in Higher Education ..................................... 51
    The International Society for Technology in Education (ISTE) ...................... 52
    National Educational Technology Standards (NETS) .................................... 53
    The National Council for Accreditation of Teacher Education (NCATE) .... 59
Summary .................................................................................................................. 66
Chapter 3: Research Methodology ........................................................................ 76
    Introduction ........................................................................................................ 76
    The Research Question ..................................................................................... 76
    Research Design ............................................................................................... 77
    Operational Definitions of the Variables ......................................................... 79
        Independent Variables ................................................................................. 79
        Dependent Variable ..................................................................................... 79
    The Setting ........................................................................................................ 79
    Population of the Study .................................................................................... 82
ix
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Student Evaluation Form (Side A)</td>
<td>170</td>
</tr>
<tr>
<td>H</td>
<td>Student Evaluation Form (Side B)</td>
<td>171</td>
</tr>
<tr>
<td>I</td>
<td>IRB Approval Document</td>
<td>172</td>
</tr>
<tr>
<td>J</td>
<td>Figures</td>
<td>173</td>
</tr>
<tr>
<td>K</td>
<td>Tables</td>
<td>195</td>
</tr>
<tr>
<td>L</td>
<td>Factor Analysis</td>
<td>202</td>
</tr>
<tr>
<td>M</td>
<td>Descriptive Statistics for Questions</td>
<td>208</td>
</tr>
</tbody>
</table>
List of Tables

Table 1: Summary of the Seven Principles and Productivity Tools ................................................. 68
Table 2: Summary of the Seven Principles and Presentation Tools ................................................. 69
Table 3: Summary of the Seven Principles and Communication Tools - A ..................................... 70
Table 4: Summary of the Seven Principles and Communication Tools - B ................................. 71
Table 5: Summary of the Seven Principles and Communication Tools - C ..................................... 72
Table 6: Summary of the Seven Principles and World Wide Web Tools - A .............................. 73
Table 7: Summary of the Seven Principles and World Wide Web Tools - B .............................. 74
Table 8: Summary of the Seven Principles and World Wide Web Tools - C .............................. 75
Table 9: Demographic Information of Participants .......................................................................... 96
Table 10: Summary of the Seven Principles and Productivity Tools ............................................. 101
Table 11: Academic Level Information of Participants ................................................................. 102
Table 12: Characteristics of Sample: Academic Major ................................................................. 104
Table 13: Computer Ownership .................................................................................................... 105
Table 14 Descriptive Statistics .................................................................................................... 108
Table 15: Correlations - Predictors & Criterion Variables ............................................................ 109
Table 16: Regression Model One Summary .................................................................................. 112
Table 17: Regression Coefficients ................................................................................................. 112
Table 18: Reliability Analysis of Instrument - Supplemental ......................................................... 115
Table 19: Correlations - Predictors & Criterion Variables - Supplemental .................................. 116
Table 20: Descriptive Statistics - Supplemental ............................................................................ 117
Table 21: Regression Model Two Summary .................................................................................. 119
Table 22: Regression Coefficients ................................................................................................. 120
Table 23: Reliability Analysis of Instrument-Pilot Study .................................................. 159
Table 24: Descriptive Statistics-Pilot Study ....................................................................... 160
Table 25: Model Summary (without gender as predictor) -Pilot Study ......................... 161
Table 26: Model Summary (Gender included as a Predictor)- Pilot Study ..................... 162
Table 27: Correlations Among Predictors and Criterion Variables- Pilot Study ........... 163
Table 28: Collinearity Statistics ......................................................................................... 195
Table 29: Collinearity Statistics -Supplemental ................................................................ 196
Table 30: Multiple Regression Analysis - Case 44 Included ........................................... 197
Table 31: Multiple Regression Coefficients (N = 121) - Case 44 Included .................... 198
Table 32: Multiple Regression Analysis - Gender Included............................................. 199
Table 33: Multiple Regression Coefficients - Gender Included ...................................... 200
Table 34: Gender Difference Between Academic Levels ................................................. 201
Table 35A: Factor Analysis: Rotated Component Matrix ................................................. 202
Table 35B: Factor Analysis: Rotated Component Matrix Continued. ............................. 203
Table 35C: Factor Analysis: Rotated Component Matrix Continued. ............................. 204
Table 35D: Factor Analysis: Rotated Component Matrix Continued. ............................. 205
Table 36A: Analysis: Total variance Explained.................................................................. 206
Table 36B: Analysis: Total variance Explained Continued .............................................. 207
Table 37: Descriptive Statistics for Student Evaluation of Instruction ............................ 208
Table 38: Descriptive Statistics for Productivity Tools .................................................... 209
Table 39: Descriptive Statistics for Presentation Tools ..................................................... 210
Table 40: Descriptive Statistics for Communication Tools.............................................. 211
Table 41: Descriptive Statistics for World Wide Web Tools ............................................ 212
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Scatterplot of ZPPRED and ZRESID</td>
<td>164</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Normal Q-Q Plots for items on the Productivity Tools Scale</td>
<td>165</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Normal Q-Q Plots for Items on the Presentation Tools Scale</td>
<td>166</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Normal Q-Q Plots for Items on the communication Tools Scale</td>
<td>167</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Normal Q-Q Plots for Items on the World Wide Web Tools Scale</td>
<td>168</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Box Plots for A, B, C, D, and Quality</td>
<td>169</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Scatterplot of ZPPRED and ZRESID (for A, B, C and D scale)</td>
<td>173</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Scatterplot of ZPPRED and ZRESID (for S1 to S7 scale)</td>
<td>174</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Normal Q-Q Plots for Items on the Quality Scale</td>
<td>175</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Normal Q-Q Plots for Items on the Productivity Tools Scale</td>
<td>176</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Normal Q-Q Plots for Items on the Presentation Tools Scale</td>
<td>177</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Normal Q-Q Plots for Items on the communication Tools Scale</td>
<td>178</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Normal Q-Q Plots for Items on the World Wide Web Tools Scale</td>
<td>179</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Normal Q-Q Plots for Items on the S1 Scale</td>
<td>180</td>
</tr>
<tr>
<td>Figure 15</td>
<td>Normal Q-Q Plots for Items on S2 Scale</td>
<td>181</td>
</tr>
<tr>
<td>Figure 16</td>
<td>Normal Q-Q Plots for Items on the S3 Scale</td>
<td>182</td>
</tr>
<tr>
<td>Figure 17</td>
<td>Normal Q-Q Plots for Items on the S4 Scale</td>
<td>183</td>
</tr>
<tr>
<td>Figure 18</td>
<td>Normal Q-Q Plots for Items on the S5 Scale</td>
<td>184</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Normal Q-Q Plots for Items on the S6 Scale</td>
<td>185</td>
</tr>
<tr>
<td>Figure 20</td>
<td>Normal Q-Q Plots for Items on the S7 Scale</td>
<td>186</td>
</tr>
</tbody>
</table>
Figure 21: Box Plots for A, B, C, and D ................................................................. 187
Figure 22: Box Plots for S1, S2, S3, S4, S5, S6, and S7 ............................................. 188
Figure 23: Box Plots Showing Item 44 as Extreme Value ........................................... 189
Figure 24: Histogram for Productivity Tools ............................................................. 190
Figure 25: Histogram for Presentation Tools .............................................................. 191
Figure 26: Histogram for Communication Tools ....................................................... 192
Figure 27: Histogram for World Wide Web Tools ....................................................... 193
Figure 28: Scatterplot of ZPPRED and ZRESID – Gender included ......................... 194
Chapter 1: Introduction

Background of the Study

Educational technology has been a major focus of policy reform over the past two decades (U.S. Department of Education, 2000). In 1996, President Clinton made a call for every classroom in the United States to have Internet connectivity (Coley, Cradler, & Engel, 1997). It is the aim of most education colleges, to prepare graduates who are capable of incorporating technology in their lessons. The expectation is that education graduates would be both capable and committed to using technology as a tool for enhancing lessons plans that facilitate student learning. Faculty’s use of technology when instructing students has a direct bearing on the overall performance of teacher preparation programs (U.S. Department of Education, 2000). In the case of this dissertation, the focus was on a large Midwestern University College of Education teacher preparation program.

A study by Blankson (2003) noted that the majority of faculty members at a large Midwestern University use the internet, word processing, and powerpoint for instruction. The study also indicated that faculty members prefer teaching and learning approaches that encourage active learning techniques and promote faculty-student interactions. Findings from the study further indicated that Ohio University faculty members use teaching and learning strategies that are in accordance with the Seven Principles of Good Practice in Undergraduate Education (Chickering & Gamson, 1991). This dissertation seeks to examine students’ perception of technology integration in the College of Education and the extent to which the technologies can predict instructional quality.
Teacher Preparation

Institutions of higher education have come under pressure from outside constituencies’ to show that their students have acquired technological skills that are needed for survival in the working environment in this 21st century (Smith, Bregman, & Moore, 2001). One way of demonstrating that an educational institution is preparing students with the requisite skills necessary for the 21st Century is to gain accreditation from a well acclaimed accreditation agency such as The National Council for Accreditation of Teacher Education (NCATE) which has as an affiliate, the International Society for Technology in Education (ISTE). For programs in educational computing and technology in teacher preparation, the International Society for Technology in Education (ISTE) is the main professional education organization responsible for recommending technology guidelines for accreditation to NCATE (ISTE, 2007). ISTE is a non-profit organization that is devoted to supporting the use of information technology in teacher education programs and in K-12 classrooms (ISTE, 2007).

Statement of the Problem

Teacher preparation in higher education programs must prepare preservice teachers to use technology in K-12 classrooms. In a large Midwestern University’s College of Education, technology is an integral part of the teacher education preservice program. Technology is being used to prepare prospective teachers to integrate technology into their curricula, thereby adding to the overall teacher preparation process. Integration of technology into teacher education programs is the beginning of the
integration of technology into K-12 classroom courses. Today preparing graduates who are capable and committed to using technology as a learning tool is a major task for teacher education programs (Howland & Wedman, 2004). Many colleges of education have identified ways of increasing students’ knowledge of technology through independent courses (Bucci, 2003).

It is imperative that preservice teachers graduate from their programs with a higher level of technological literacy (Coverdale, 2000). Indeed, teacher preparation programs should heed the call to effectively integrate technology in their programs (Beach & Franklin, 2002). For technology integration to become effective, preservice teachers need to observe and practice instruction using new technologies in their content area to facilitate technology integration in the classroom. Teacher educators are increasingly expected to train preservice teachers to improve their technology skills (Giles, Shaw, & Baggett, 2003). Results from research on teacher perceptions of school technology indicate that availability and accessibility of technology resources is the prime factor to influence teachers’ use of technology in their classroom instruction (Chang, 2002). One may ask, is availability and accessibility of technology resources enough to ensure good instruction quality? What forms of technology can best predict instructional quality?

The Seven Principles for Good Practice in Undergraduate Education

The training of Preservice teachers to use technology alone cannot make a good teacher. How a teacher encourages interaction among students and faculty, promotes cooperation among students and gives prompt feedback to others is vital (Chickering &
Gamson, 1991). Undergraduate educators in Colleges of Education support pedagogy that can be identified in Chickering and Gamson’s Seven Principles for Good Practice in Undergraduate Education. Chickering and Gamson (1991) report that over fifty years of research on how teachers teach and students learn was the basis for the development of the Seven Principles for Good Practice in Undergraduate Education. Good practices in undergraduate education according to the seven principles:

1. Encourages student and faculty interaction,
2. Promotes cooperation among students,
3. Promotes active learning techniques,
4. Gives prompt feedback,
5. Emphasizes time on task,
6. Communicates high expectations and

Research on the use of technology programs, has been reported by Boling (2003). The study looked at the impact of technology on instructors and their teaching. Findings from the study reveal that instructors who are new to integrating technology in teaching would greatly benefit by taking time to acquaint themselves with programs that they are using. Again, the findings alluded to the fact that provision of support to teacher educators, especially beginner teacher educators, is essential for the successful integration of technology in teacher education courses. To achieve good practice in technology education, it is imperative for the instructor to be able to encourage student and faculty
interaction, promote cooperation among students, promote active learning techniques, give prompt feedback, emphasize time on task, communicate high expectations and respect diverse talents and ways of learning as suggested by Chickering and Gamson (1991).

Purpose of the Study

The purpose of this study was to examine to what extent students’ perceptions of different forms of technology use for instruction purposes predict instructional quality. The researcher was motivated by the belief that through this study it would be determined the extent to which various forms of technology namely; productivity tools, presentation tools, communication tools and the World Wide Web tools can predict instructional quality using the Chickering and Gamson (1991) Seven Principles of Good Practice in Undergraduate Education as a guide. The study outcome should inform and guide faculty administrators and other stakeholders in higher education as to which technologies are more likely to predict instructional quality.

Research Question

The following research question guided the study:

Q1. To what extent do student perceptions of different forms of technology use for instruction purposes predict instructional quality?

To answer the research question above the following hypothesis was tested:

$H_0: R^2 = 0$

$H_A: R^2 \neq 0$
Significance of the Study

Educational institutions need to know the effect of technology integration into the curriculum and to keep up with the advancement of technological development. Colleges have over the years invested significantly in technology.

The research would inform the University authorities, the dean and other administration, faculty, technical support and academic staff, of Colleges of Education regarding the following:

1. Relevant information on perceptions of undergraduate students at the college level on technology use.
2. Valuable information about technology integration in the College of Education programs as perceived by students.
3. The data analysis and findings may set the stage for further research on the effects of technology integration on instructional quality.
4. This study would also support the effective use of technology by College students as required by NCATE.

Teacher Education programs are challenged to prepare graduates who are capable and committed to using technology as a tool to enhance learning (Howland & Wedman, 2004). For example many colleges of education have identified ways of increasing students’ knowledge of technology through independent courses (Bucci, 2003). The study would further contribute to knowledge concerning the use of technology in higher education. It would also serve as a reference point for further studies on students’ use of technology in teacher preparation programs.
Scope of the Study

The study included students from a large Midwestern University College of Education. Students from different majors in the departments within the College of Education were identified. These majors include:

1. Early Childhood Education
2. Middle Childhood Education
3. Special Education (Intervention Specialist)
4. Integrated Language Arts Education - Adolescent-to-Young Adult
5. Integrated Mathematics Education - Adolescent-to-Young Adult
6. Integrated Science Education - Adolescent-to-Young Adult
7. Earth Science Education - Adolescent-to-Young Adult
8. Life Science Education (Chemistry and Physics) - Adolescent-to-Young Adult
9. Integrated Social Studies Education - Adolescent-to-Young Adult
10. Physical Science Education - Adolescent-to-Young Adult
11. Family and Consumer Science Education - Adolescent-to-Young Adult
12. Multi-Age (Music Education)
13. Multi-Age (Art Education)
14. Multi-Age (Physical Education)
15. Multi-Age (Modern Languages Education)

Data collection involved conventional questionnaires. The self made instrument was used to develop surveys for students. Students in the second, third, and fourth year of college in the College of Education were the accessible population for the study. The
main reason for choosing this class level (sophomores, juniors, and seniors) of college students was that they begin taking their major courses in the College of Education in the second year and represent the bulk of students in the College of Education.

**Definition of Terms**

The following operational definitions were used in this dissertation to support the research.

*Active Learning:* This is learning that promotes retention of information. This type of learning motivates student giving them some sense of ownership of the information they are presenting. Students are usually engaged in investigating, formulating and answering their own questions, inquiring and solving problems (Shelly, Cashman, Gunter, & Gunter, 2006).

*Computer:* A computer is an electronic device, operating under the control of instructions stored in its memory, that can accept data, process the data according to specified rules, produce results, and store the results for future use (Shelly et al, 2006, p. 4).

*Faculty:* This term refers to Group I tenure-track faculty members at a large Midwestern University (Blankson, 2004).

*Internet:* The Internet is a worldwide collection of networks, that links together millions of businesses, governments, educational institutions, and individuals using modems, telephone lines, and other communications devices and media (Shelly et al, 2006, p. 19)
**Personal Digital Assistant (PDA):** The Personal Digital Assistant (PDA) is a device that carries your personal information applications and data such as, notes, calendar, address book and tasks. You can browse the web, play games, work with MS office documents, make telephone calls, and take pictures with a PDA. “The PDA is a computer that fits in the palm of your hand” (Lee & Nelson, 2006, p. 1).

**The NET generation:** The NET generation is the generation that was born around the period Personal Computers was introduced. This generation is said to be more visually literate than their previous generation. Many in this generation prefer expressing themselves using images. They have the natural ability to put together text, images, and sound. They possess the ability to move between the real and virtual world with ease on the Internet (Oblinger & Hawkins, 2005).

**Technology:** In this study the term technology refers to both computer and communication technology. The term when applied broadly may include computer software and hardware, input and output devices, communication hardware and software (Davis & Naumann, cited in Blankson, 2004).

**Technology Integration:** Refers to how transparently technology was blended into the lesson, and whether it was used to convey content in ways not easily done without technology (Baylor & Ritchie, 2002). In this study the term also refers to “the combination of all technology parts, such as hardware and software, together with each subject-related area of curriculum to enhance learning” (p. 366). “Technology integration is using technology to help meet the curriculum standards and learner outcomes of each lesson, unit, or activity” (Shelly et al., 2006, p. 366).
Technology Tools: These include:

A. Productivity Tools - In this research, the term productivity tools refers to software “designed to make people more effective and efficient while performing daily activities”. Examples include word processing, spreadsheet, and Blackboard tools, database software such as Microsoft Access (Shelly et al., 2006, p. 150).

B. Presentation Tools - In this research the term presentation tools refers to tools used to facilitate presentation e.g. video, films, slides.

C. Communication Tools - In this research the term communication tools refers to Tools/Software used in communication e.g. email, chat, discussion board in Blackboard, video conferencing, instant messaging. Data transmissions between computers are managed by these Communication Tools/softwares (Shelly et al., 2006).

D. World Wide Web Tools - In this research the term World Wide Web Tools refers to tools found on the internet that can be used as internet searches, wikis, blogs, and other software for creating WebPages.

Wiki: A wiki is a collaborative web application developed by Ward Cunningham. Wiki is a Hawaiian word meaning quick that allows the visitor to easily add, remove, or edit and change existing content. This ease of interaction and operation makes a wiki an effective tool for mass collaborative authoring (Augar, Raitman, & Zhou, 2004).

Limitations and Delimitations of the Study

Limitations: Recognized limitations of this study include:

1. The use of questionnaire as an instrument for data collection. The limitation comes from deficiencies associated with questionnaire method for research
specifically for data collection. These deficiencies include respondents’ honesty and their differences in the interpretation/understanding of the questions.

2. Problems with individual response. The responses represent perceptions of participants. This may have been influenced by other variables not included in the study.

**Delimitation:** The study focused on college students and faculty in a large Midwestern University College of Education on the Athens Campus. The study was thus limited to one college within a university making generalization somewhat difficult.

**Summary**

The growing interest in technology use in higher education by students or faculty is reflected in a number of studies. Many researchers have reported on technology use by either students or faculty in one form or the other. Indeed, technology has opened new areas for instruction (Baylor & Ritchie, 2002). Not only has new avenues been opened it has also been linked to student learning. Wepner, Tao and Ziomek (2003) argues that “If teacher education programs hope to keep up with the changes that are occurring as result of the new digital society, then it is imperative that we take a closer look at the role that technology can have in transforming teacher preparation” (p. 72). Very little has been reported by way of quantitative studies to examine the perception of preservice teachers towards the integration of technology into the curriculum. The answer may lie not just in the provision of technology to these schools, but what technology these preservice
teachers may be using and consider important. This study would therefore aim at gaining an insight into various forms of technologies and the extent to which they can predict instructional quality.

**Organization of the study**

This dissertation is organized into five chapters as follows:

Chapter one include the background of the study, the statement of the problem, the research questions, significance of the study, limitations of the study, definition of terms, summary and organization of the study.

Chapter two provides a critical review of the literature pertinent to the study together with a summary and conclusion.

Chapter three provides details on the methodology used for the study, including the identification of the population, the development of a pilot study, the research instruments, the description of the research procedure and a thorough explanation of the analysis of data.

Chapter four describes the results for the study. This includes the analysis of data and the presentation of the findings.

Chapter five contains the discussion, summary, conclusions and recommendations for further research.
Chapter 2: Review of Relevant Literature

Introduction

In this chapter how the Technology Tools namely – Productivity Tools, Presentation Tools, Communication Tools and World Wide Tools are used to accomplish technology integration is explored through the Seven Principles for Good Practice in Undergraduate Education which is the theoretical framework for this research. This chapter provides a review of the literature relevant to the study. The study was to examine to what extent students perceptions of various forms of technology namely; productivity tools, presentation tools, communication tools and the World Wide Web tools can predict instructional quality using the Chickering and Gamson (1991) seven principles of good practice in undergraduate education as a guide. This review consists of five sections. The first section focuses on teacher preparation programs and technology integration, the second focuses on The Seven Principles for Good Practice in Undergraduate, the third deals with technologies used to support teaching, the fourth focuses on programs used to support teaching in higher education, the fifth discusses the survey instrument, and a summary of the chapter completes the review.

Teacher Preparation Programs and Technology Integration

Technology has permeated into different facets of our lives whether in homes, at work, or in schools. Remarkable progress has been in the expansion of technology capacity of institutions of higher education and incorporating technology into teaching (Brzycki & Dudt, 2005). Adequate technology skills are essential for the 21st Century job market. It is therefore necessary for students to acquire skills necessary to enable them to
function well in today’s technological world. The best strategy of ensuring technology integration is to make the technology easily available to the trained teacher who would decide how and when to use it in the classroom (Shelly, Cashman, Gunter, & Gunter, 2006).

The need to integrate technology in teacher education programs has already been established (Murphy, Richards, Lewis, & Carman, 2005). To become properly functional in today’s society acquiring basic computer skills has become essential. Students must learn these skills if they are to survive and make a positive impact in today’s world (Wulf, 1996). For example, the Internet is a fundamental medium for teaching and learning and this has evolved into a more popular means of reaching students (Wulf, 1996). The question now is how the technology is used, and is the technology used in a manner so as to encourage learning? Teacher education programs need to stay abreast with changes that are occurring in today’s new digital age. This assertion is further supported by Wepner, Tao, and Ziomek (2003) who make the point that teacher education programs must take a careful look at the role technology can play in changing teacher preparation. William (2004) indicates a concern that the design method of teaching technology may not necessarily be the only way. The development of teachers is a concern that needs to be examined critically. The integration of technology in the classroom has become a top agenda in this country. Indeed teachers are now expected to become competent users of technology. This demands that teachers be trained to play this new role of using technology as a productivity tool to enhance learning (William, 2004).
The incredible speed of technological advancement has added to the challenges facing preservice teachers (Hattler, 1999). Elementary teachers are expected to integrate technology in the classrooms, however, integration of technology to most elementary teachers entails teaching students how to use software or equipment (Lund & Runyon, 2002). Even though nearly all elementary and secondary schools are now connected to the Internet, most teachers still feel uncomfortable using technology in their teaching (Thompson, 2005).

Preservice teachers have traditionally been reluctant in using technology (McCarthy, 2004). One way of teaching preservice teachers how to integrate technology into their classroom curriculum would be to have technology integrated into their field experience. Integrating technology into the field experience of preservice teachers’ would require collaborative efforts with local school districts to ensure opportunity not only to observe but to apply technology in the K-12 classroom (McKinney, Jones, Strudler, & Quinn, 1999).

Integrating technology in the classroom goes beyond learning specific software. Technology integration also includes using technology to help meet not only curriculum standards but learner outcomes of activities and lessons (Shelly et al., 2006).

Research has shown that when preservice teachers are given the opportunity to use technology for their own learning they are more likely to use technology in their classroom to teach (McCarthy, 2004). Technology should be used to support research and teaching that does not hinder faculty work. Promoting technology integration is therefore a step in the right direction (Franklin & Sexton, 2006).
Students may use technology primarily for convenience and connection whether in academic or social activities. Instructors perceived by students to be effective users of technology had students reporting on more engagements in the course, showing more interest in the subject matter, and better understanding of complex concepts (Kvavik & Caruso, 2005).

Before students can use technology teachers must have access to the technology first. Computer and video technologies used in instruction in schools has increased considerably in recent times. Preparing future teachers to use technology in their curriculum demands the integration of technology into teacher education programs (Franklin, 2004).

The pervasiveness of technology is there for all to see, in cars, schools, homes, everywhere. The demand for technology to become part of the educational process has been made by students, faculty, parents, employers, and the general public. Elementary school teachers often are required not only to integrate technology into teaching but to teach students how to utilize technology (Runyon & Lund, 2000). Educational technology has been a major focus of policy and reform over the past 20 years, at the federal, state and local levels. Providing or assisting schools to acquire computers and Internet access are all part of the ongoing focus on technology integration in education (U.S. Department of Education, 2000). The question is, are faculty and students using technology to support pedagogy? Ohio University faculty use various technologies to enhance their teaching, according to Blankson (2004).
The potential of technology to affect teaching cannot be appreciated unless serious efforts are made to integrate it into the subjects taught by teachers. Integrating technology in the curriculum appears an intimidating task for many teachers. Provided the requisite resources are available to the teacher, integration of technology into teaching and learning, demands that teachers acquire the skills to do so. Goetze and Stansberry (2003) allude to this and believe the problem is overwhelming not only to preservice teachers but also teacher education programs facing problems emanating from the implementation of instructional technology and also programs that turnout preservice teachers with few technology experiences and administrators who are under pressure to meet national standards (Goetze & Stansberry, 2003). Various approaches have been suggested as possible solutions to this problem. One such approach is reported by Bucci (2003) in which a technology teaching lab program was used to give students the experiences necessary to integrate technology into the classroom. The technology teaching lab program was a series of two hour labs organized alongside preservice methods class. Students are provided with the necessary equipment, instructions and opportunity to practice their technology enhanced lessons directly in the field.

*The Seven Principles for Good Practice in Undergraduate Education*

Research on how teachers teach and students learn has been carried out by a number of researchers in the past. Chickering and Gamson (1991) reviewed research on how teachers teach and students learn analyzing over fifty years of research. Their findings formed the basis for the development of The Seven Principles for Good Practice in Undergraduate Education.
The Seven Principles for Good Practice in Undergraduate Education seek to establish institutional conditions, practices and policies whose outcome would be a powerful and enduring undergraduate education. The Seven Principles are a result of a review of 50 years of research on the way teachers teach and students learn (Chickering & Gamson, 1991). Good practice in undergraduate education according to the researchers:

1. Encourages student and faculty interaction,
2. Promotes cooperation among students,
3. Promotes active learning techniques,
4. Gives prompt feedback,
5. Emphasizes time on task,
6. Communicates high expectations and
7. Respects diverse talents and ways of learning (Chickering & Gamson, 1991, p. 5)

Technology has become an integral part of most classrooms. Indeed integration of technology can enhance students’ participation, understanding, learning in significant and meaningful ways (Pedretti, Mayer–Smith, & Woodrow, 1998). If the power of new technologies is to be realized there is the need to employ ways consistent with the Seven Principles of Good Practice in Undergraduate Education to integrate technology into preservice teaching and learning for preservice teachers to gain a comfortable ability (Chickering & Ehrmann, 1996).
In a study on the effects of using instructional technology in colleges and universities, Kulik (2003) conducted a computerized search of three library databases from the past decade. The search conducted was on the effects of instructional technology in college courses. Each search yielded 46 studies from the past decade in the areas of computer and calculator tools in mathematics, computer tutoring in science, computer simulations in science, computer animation and computer assisted language learning. The instructional outcomes for students taught with computer help was compared to outcomes for students taught without help. The researcher concluded that computers indeed contributed enormously towards the improvement of college teaching (Kulik, 2003).

With technology invading all aspect of our life it is not surprising that schools are integrating technology into their classroom. There are advantages and disadvantages in integrating technology into the classroom. In an article titled *No Teacher Left Behind, How to Teach with Technology*, Efaw (2005) presents the advantages of using technology in the classroom as a decrease in the educator’s workload, and an increase in student learning, motivation, and knowledge of tools and skills. Technology can be used to support the Seven Principles for Good Practice in Undergraduate Education.

*Good Practice Encourages Student–Faculty Contact*

The importance of students-faculty contact cannot be overemphasized. Student motivation, intellectual commitment, and personal development are enhanced when faculty encourage contact with student. Research on the importance of student-faculty contact has been undertaken (Cohen, 1981; Marsh, 1984; McKeachie, Pintrich, Lin, &
Smith, 1986). All the researchers emphasize command and organization of the subject matter, expressiveness and enthusiasm, and interactions and rapport with students by faculty.

Faculty considered effective by students and their colleagues report more interactions with students beyond the classroom (Wilson & Gaff, 1975). This study is further collaborated by Pascarella (1980). According to Pascarella informal contacts with emphasis on intellectual, literary, or artistic interests, value issues, or future concerns is more inclined to have the greatest impact. Interaction between faculty and students would help generate an effective learning environment. According Khan (1997) when a mutual support and a platform for learning and performance are provided then one is dealing with an environment with effective support for a learning community. Stronger student faculty interaction leads to a more effective support environment for a learning community. Key indicators of the presence of an effective learner support environment include:

1. Students solving their own problems and sharing solutions with other students.
2. Presentations of findings relating to solutions of a common problem that has been identified by students.
3. Entire learning communities have access to effective learning resources.
4. Rewards offered to students who take initiative.
5. Multiple sources of technical support which may include person-person, online, and print. (Khan, 1997, p. 69)
The most important factor in student motivation and involvement is student-faculty interaction (Chickering & Gamson, 1991). The question is, can technology facilitate student-faculty interaction? Marbach-Ad and Sokolove (2002) examined the use of email and in-class writing to facilitate interaction in traditional and active learning classes. Email communication allowed students to locate the instructor without having to track him down physically according to the instructor. To promote student participation in the active learning class, innovative methods such as the use of email for out-of-class, student-instructor communication and in-class student-instructor communication through handwritten notes were employed by the instructor. The communication channel of in-class writing was not discouraged in the traditional class, however, in the active learning class it was particularly encouraged. Students in both classes had an email address from the university since every student who matriculates from the University is given a personal email address. The results indicate that 150 email messages were sent by a total of 66 students from the active learning class and 33 written notes. A total of 71 email messages were sent by 39 students in the traditional class. According to Marbach-Ad and Sokolove (2002), email and in-class notes provided an opportunity for the students to ask questions, ask for help or ask for additional information about out-of-class assignment or a class lecture. The use of email allowed students and the instructor to compose clearer, more focused messages. The email was a good way to clarify ideas from both students and instructor. The results also indicate that an active learning environment can promote higher rates of out-of-class email and in-class written notes than a traditional class, which implies high interaction between student and instructor via email. The qualities of
students’ questions were higher in the active learning class than the traditional class. The researchers found that in the active learning class a significantly higher proportion of all messages were content related than in the traditional class (Marbach-Ad & Sokolove, 2002).

Findings by Jin (2005) analyzing student-student and student-instructor interaction through multiple communication tools in web-based learning indicated that technology can facilitate interaction among students and between students and instructor. The study took place in a web-based teacher education course in Northeast Ohio. The participants comprise 4 in-service teachers from elementary, 12 in-service teachers from secondary schools, and 2 in-service adults. Fifty percent of the students had extensive experience with technology and 39 percent had a fair level of experience. Two of the students were the only ones who expressed fear of the online format. The instructor used WebCT, a content delivery software. The WebCT offered an environment where students could post comments on discussion boards and read comments and postings from other students. The online asynchronous discussions email and threaded discussions allowed students the added flexibility to participate at their own time. Assignments encouraged students to apply their knowledge and skills and tie it to their personal or professional experiences. Some projects and assignments required students to work in collaborative small groups. Some assignment and projects required feedback from students or peer groups. Sometimes individuals with varying ability were assigned to groups. These grouping arrangements allowed students to learn from each other. The interactions the research focused on were:
1. interactions via email between the students and the instructor,
2. interactions through asynchronous threaded discussions,
3. interactions through synchronous text chat sessions, and
4. interactions between the students and materials. (Jin, 2005, p. 62)

Within one semester a total of 700 messages (threaded discussions) were posted into 19 different threads. WebCT email received by the instructor during the one semester was 343, against 459 WebCT emails sent by the instructor. 31 regular emails were received by the instructor, while 25 were sent by the instructor, 4 chat sessions totaling 2 hours was reported. Average of accessing the WebCT by each student was 591, with minimum accessing by an individual 42, and the maximum accessing by an individual 875.

The findings indicated students were very satisfied with learning in a highly interactive environment through synchronous means as chat sessions and asynchronous means such as email and threaded discussions. Students were more engaged in online class activities such as discussions when it was relevant to them or their learning could be applied to classroom practice. Through interactions among students and between student and instructor, initial fear and frustrations expressed by a few students due to technical problems completely changed. By the end of the semester students indicated that they learned better than when they took the traditional approach, the students attributed this to interactivity and learning flexibility and indicated their wish to take more courses in web-based learning environment (Jin, 2005).
Good Practice Encourages Cooperation Among Students

Students are often encouraged to work in groups at school (Johnson & Johnson, 1989). There is a growing trend in research that supports cooperative learning techniques. Research findings from 137 studies on cooperative learning methods at college level supports cooperative learning groups for developing committed and positive relationships among members, increasing productivity and social support, and enhancing self-esteem (Johnson, Johnson, & Smith, 1990).

Goldschmid and Goldschmid (1976) examined discussion groups led by undergraduate students in a review of a number of peer teaching models. Their findings indicated that peer teaching is best used in conjunction with other teaching and learning methods. They agreed that peer teaching had enormous potential for both student teacher and student learner especially if one encourages active participation. Whitman (1988) indicated that peers of teachers and learners gain a better understanding of the subject matter and benefit from the cooperative relationships that peer teaching generates. Active participation by students and instructors is thus paramount in the learning process. The question is, do instructors participate actively in the learning process?

According to Khan (1997) instructors are not only in the classroom to provide knowledge but they participate actively in the learning process by creating a community of learners. The instructor’s role in situations of this nature includes a shift from instructor-dominated instruction to transformative communication. In transformative communication the focus is on the learner and genuine problems. The student is challenged, empowered and inspired with a clearly directed focus. The following are
some key indicators that transformative communication is occurring according to Khan (1997):

1. The student teaches the instructor something he or she didn’t know before about the technology.
2. The student goes beyond the textbook or the lecture to reveal differences of opinion among the experts.
3. More emphasis is placed upon finding support or backing for a position than on conforming to authority.
4. Students participate in setting the agenda for the class by helping to choose content or learning methods or booth.
5. Students are calling the instructor’s attention to valuable learning resources.
6. Students are having conversations with knowledgeable people the instructor doesn’t know.
7. While the instructor helps establish expectations and sets a clear assessment standard, the students collaboratively guide much of their own learning.
8. The instructor finds himself or herself saving student work or merely as examples of student work, but as content resources for future reference. (p. 69)

Technology can also promote cooperation among students. In the findings from a case study examining mobile technology integration involving PDA’s in Teacher Education, Franklin, Sexton, Lu, and Ma (2007) observed that “the sharing of Palm information and beaming allowed some students the opportunity to risk meeting someone
they did not know and form new friendships” (p. 53). The activity of beaming
information and the problem solving that frequently accompany using the Palms enabled
students to interact with more people in class. This act of beaming information to other
students encourages interaction and cooperation among the students (Franklin et al.,
2007). In this context, the PDA was used both as a productivity tool and a
communication tool to enhance cooperation among the students.

When students work with others, it enhances involvement in sharing new ideas,
reacting to other peoples ideas, and learning (Chickering & Gamson, 1991). Hewitt,
Peters, and Brett (2006) reported a wiki experiment involving a graduate distance
learning course at the Ontario Institute for Studies in Education at the University of
Toronto. Course participants consisted of Master of Arts and Master of Education
students. As part of their assignment students were to contribute one or more pages to the
class wiki over a period of approximately one month. The assignment was worth 50
percent of the final grade. Each participant was to choose a problem that related to the
core course theme. Students were also expected to help their class mates develop their
wiki pages by providing suggestions and comments. Results from the Wiki indicate that:

1. A total of 76.9% of the participants either agreed, or strongly agreed, that
discussions in the wiki were more focused (i.e., less likely to go off-track)
than discussions in the regular computer conference. As one student
commented, the “structure of the wiki is more likely to focus discussion.
There is not as much opportunity for random discussions”.


2. When asked whether information overload was a bigger problem in the computer conference or in the wiki, 23.1% chose the wiki, and 38.5% chose computer conferencing. The remaining students either felt that the level of information overload was the same, or were unsure which environment was worse in this respect.

3. An analysis of the contents of the wiki and tracking data associated with the wiki revealed that the average web page was edited 28 times. In comparison, the average message in the computer conference was only edited 1.2 times. (Hewitt, Peters, & Brett, 2006, p. 3)

The results collectively indicate that wikis may serve as useful environments for engaging students in collaborative activities that involve in-depth analysis of particular problems that promotes cooperation among participants (Hewitt et al., 2006).

**Good Practice Encourages Active Learning**

Active learning is a type of learning that occurs when students become engaged in inquiring, investigating, solving, problems, formulating and answering their own questions. Active learning involves the process of students’ discussion, brainstorming, explaining, and debating issues with each other and with their teacher, both to determine solutions as well as to identify their own questions (Shelly et al., 2006).

Active learning implies the learner is actively engaged in the learning process, the learner is thus not passive. Student attributes of active learning include student, discussion, challenging ideas, analyzing and solving problems (McKeachie, Pintrich, Lin, & Smith, 1986).
Teaching is becoming increasingly complicated and to stay effective, teachers have to share in-depth knowledge with students and learn how students learn. There is the need for all instructors to develop far-reaching active learning approaches in their class. A conceptual framework has been developed by Sutherland and Bonwell (1996) that allows all instructors to find ways to look for appropriate active learning activities in their classes irrespective of their teaching style or course objectives. There is compelling evidence to support the assertion that active learning approaches are an effective way to facilitate learning. One vital role that active learning plays in the classroom to enhance lecture is to provide a mechanism that enables the instructor to see how students understand the lecture. Some activities that may be included in a lecture to enhance it are the Pause Procedure, Short Writes, Think-Pair-Share, Formative Quizzes, Lecture Summaries and, Classroom Assessment Technique (Bonwell & Sutherland, 1996). An explanation of each activity follows.

The pause procedure. There are basically two factors which account for the pause procedure’s effectiveness as a tool for active learning. First it deals with the psychological and physical responses that do not allow students to concentrate and listen effectively for longer periods of time; this is achieved by stopping the lecture every thirteen to eighteen minutes which allows students to do something else. The short breaks enable students to return to efficient listening peak. For example, two students may work together comparing notes which usually gives a more positive outcome than one person. The effectiveness of this tool is enhanced by varying the activity with others such as short write (Bonwell & Sutherland, 1996).
Short writes. Lectures can be interspersed with short one-minute writing assignment. This is a good way to assess the level to which students understand presented material. Numerous questions relating to the course could be asked during such times (e.g. What main ideas have been presented so far in the lecture. What important things were learned in the class?) (Bonwell & Sutherland, 1996).

Think-pair-share. With this technique usually two students share the results of their two-three minutes discussion during which time they decide on what would be an appropriate answer to a question with the entire class. This is a technique that has been widely used. Where there is time students are asked to initially write down their answer to the questions before they collaborate and arrive at a consensus. It is believed that writing makes students write more during the collaboration. The tool is very effective because it allows students who are reluctant to contribute especially at the beginning of the quarter because not enough rapport has been created among them and the instructor to contribute. The idea is that students are more likely to share a joint answer than to be individually held accountable for a particular response (Bonwell & Sutherland, 1996).

Formative quizzes. In this contest formative means ungraded quizzes. These ungraded quizzes are used to determine how students understand the materials being presented. Questions presented are similar o questions that would typically be used in an examination. Questions are placed on overhead projector or on the board and specific time are given for responses to be made by students. Complex essays can be broken down into smaller component. This approach allows students to seek clarifications on questions and the instructor obtains feedbacks on the various questions and how students
understand them. This lessens student anxiety as they learn of problem areas they need to study. This activity allows students to have an idea of what to expect during the examination. The instructor’s expectations are made clear (Bonwell & Sutherland, 1996).

*Lecture summaries.* Students tend to synthesize course materials better if they are given the opportunity to summarize lectures during class. This can be done informally where students do short writes, or students form small groups to share notes. A more formal process involves an instructor presenting the objectives of a lecture and asking students not to take notes but to listen to an entire lecture for about an hour. Thereafter, students are put into small groups and tasked to write all that they can remember about the lecture while consulting the instructor where necessary. Lecture notes produced by the groups is said to be more superior to individual lecture notes (Bonwell & Sutherland, 1996).

*Classroom assessment technique.* Some classroom assessment techniques can assess students’ recall of information presented in a class. The authors mention three assessment techniques that can be used in this activity. For example focused listings could be used at any stage of the lecture and is designed to see if students can recall the most salient points associated with a specific topic. Students may be asked to create a list of the advantages of both the north and the south going into civil war. The second assessment involves providing students with an empty or partially filled outline of the lecture and then students being asked to fill in the blanks in a limited amount of time. The third technique involves a two–dimensional table with rows and columns that are used to organize relationships and information. For example, students may be asked to list one
major political, economic and social outcome of World War II for each of the specific number of countries listed. The instructor would determine whether the techniques should be implemented in groups or individually. The decision of the instructor is usually guided by the goals the instructor hopes to achieve (Bonwell & Sutherland, 1996).

Active learning is encouraged by team projects, peer critiques, and challenging discussions. Students learn by writing about what they learn, applying it to their daily lives, and relating it to their past experiences (Chickering & Gamson, 1991). According to Mitchell (1997) an attempt to systematically incorporate active learning into the structure of an elective course designed to instruct students in a computer–based approach to statistics resulted in students becoming actively involved in the process of mathematical story telling. Students were expected to create educational worksheets which would instruct a novice about a specific statistical concept. The use of text, graphics and sound combined with their creativity enabled students to produce very interesting interactive worksheets. By creating the educational worksheet, students actively learned the material in the process.

When preservice teachers were exposed to a leaner-centered environment to encourage active learning through calculator-based laboratory (CBL) activity the preservice teachers found the activities easy to understand as learners and believed such a method would be productive and useful in their own teaching. The calculator-based laboratory activity is an extension to the graphing calculator, which provides learners with a mini laboratory through which they can collect data, analyze data, and give personalized meaning to their mathematics calculations and exercises (Shamatha,
The use of the calculator as a productivity tool in the Peressini and Meymaris (2004) research did encourage active learning.

In 2002, Texas Instrument commissioned a survey of research on handheld graphing technology in secondary mathematics. The results of the research show that handheld graphing technology can have a positive impact on student learning in a variety of instructional approaches. Specific finding of the research indicated that the use of an Algebra 2 reform curriculum incorporating graphing handhelds resulted in significant improvement in overall student performance (Thompson & Senk, cited in Texas Instrument Incorporated, 2006).

Incorporation of graphing handhelds as an integrated part of an existing precalculus-level curriculum lead to; low performing students being able to attain higher achievement, improved performance by students which was linked to increased student use of graphical solution strategies, better understanding of functions and teachers were able to spend more time on problem solving activities (Harskamp, Suhre, & Van Streun, cited in Texas Instrument Incorporated, 2006). In all the above research active learning was encouraged through the use of technology.

*Good Practice gives prompt feedback.*

Prompt feedback on performance of students is essential for students to benefit from courses. Feedback of such nature could include diagnosis at the beginning of a semester, a frequent test with prompt feedback throughout the term and assessment at various points. The content of classroom presentation is better remembered when it is
followed by a test. This conclusion was arrived at after Menges and Mathis (1988) reviewed key resources on instruction.

The use of prompt feedback in college courses shows a clear and positive relation to student achievement and satisfaction (Dunkin, 1986; McKeachie et al., 1986).

Feedback is necessary because it allows students to learn from the mistakes. It is imperative that feedback is given for assignments, projects etc. Prompt feedback is important and it emphasizes the theory of mastery learning. According to this theory given sufficient time and quality instruction, nearly every student can learn. The blame for a student failure rests with the instruction and not a lack of ability on the part of the student. The challenge is to offer students sufficient time and employ instructional strategies such that all students may achieve the same level of learning (Bloom, 1981; Levine, 1985).

In the quest to answer the research question “how would online discussions contribute or hinder teachers’ learning in mathematics methods course?” Li (2006) shares experiences on integrating technology into teaching mathematics in teacher education methods course using asynchronous online discussions. Li (2006) observed that online discussion offered a useful assessment tool that provided prompt feedback. The author gained a broader awareness about the teacher’s thoughts and beliefs through the online discussion which was useful in refining, changing or enhancing the course.

In a report on interactive assessment, Byers (2001) reports that in the feedback process every student and teacher is continuously in the loop as feedback flows from leaner to teacher to leaner. The instrument that was developed for the assessment allows
students to anonymously fill out the instrument online while the instructor is not present. There were two assessment types: a class survey and end of course evaluation. For the class survey students were given an agenda for the day for every class. The survey header listed the class objectives, and the students were asked to answer five questions in relation to the class objectives. The survey questions which were the same for each class meeting included:

1. How do you rate the class dynamics?
2. How do you rate the instructional strategy used?
3. How do you rate the amount of material covered?
4. How do you rate the use of technology?
5. How do you rate the class pace? (Byers, 2001, p. 364)

Students were offered a five–item Likert scale: Very good, Good, Neutral, Bad, Very bad as possible answers. Five percent of the course grade was determined by electronic participation, which included answering surveys. This was to stimulate group participation on the surveys. The class survey results made it possible for the instructor to react to student’s perception of effectiveness of delivery of content and to make necessary adjustments. Technology made it possible to instantaneously collect results from students through the survey thus enhancing feedback (Byers, 2001).

Buchanan (2000) discusses how technology was used to provide prompt feedback on student performance in undergraduate psychology courses at the University of Sutherland. According to Buchanan (2000) the study evaluated the effectiveness of a world wide web-based formative assessment package used in undergraduate psychology
courses. In the first study, students used the package as an integral part of their course syllabus. In the second study, the use of the package was optional. One important feature of the system is that the correct answers are not given (this was deemed to discourage rote memorization). Instead for each incorrect answer a reference to the appropriate topic in one or more text books is given for students to consult to find the right answer. Students are required by this process to engage more fully with course material. In a test-learn-retest cycle, the students are advised to repeat the test after doing the suggested reading.

Students who took the online multiple-choice tests receive instant feedback on areas of weakness and how to address them. Both studies found that students who used the package performed better than those who did not. Such systems according to the study could be useful learning tools which students may use to enhance performance (Buchanan, 2000). Technology was used to provide prompt feedback on student performance (Chickering & Gamson, 1991). The system provided a meaningful interaction between the student and the instructional materials which is an essential element (which can be provided through technology) for the success of pedagogy (Buchanan, 2000).

Good Practice Emphasizes Time on Task

Reports on a large scale study which was based on student evaluations of teaching showed steadily significant correlations between effective use of class time and overall ratings of courses, instructors, and amount of learning (Chickering & Gamson, 1991).
There is a strong empirical evidence of a direct relationship between time allocation (for subject matter areas, learning) time management after it has been allocated, and time on task, on the one hand, and student achievement on the other (Berliner, 1984).

McKeachie et al. (1986) reviewed time spent in class with a teacher and came to the conclusion that college courses requiring more class periods (meeting four times a week rather than once) and longer class periods (periods of fifty-five rather than thirty minutes) proved superior, as measured by student achievement. These assertions supports Chickering and Gamson’s (1987) argument that time on task must be addressed at an institutional as well as course level. Universities should review such findings and design courses in a way so as to ensure that students, especially the undergraduate student derive optimum benefit from the courses offered.

Technology does provide various tools to support instruction and learning. For example, BodyWorks and Microsoft Encarta are two software packages that can be integrated into a lesson by a teacher. BodyWorks is a digital media product for use in the teaching of concepts related to the human body. Microsoft Encarta is also an interactive multimedia encyclopedia. These applications provide working visual models of how various parts of the human heart interact. Students can see and experience much more clearly than they would from a text book. The software allows students to utilize their time on task well. The interactive nature of the software engages students enabling them to concentrate better on the task or exercise at hand. Another benefit of integrating technology is that they encourage students to assemble their thoughts not only in words but also in sounds, color and animation (Shelly et al., 2006).
Effective time management is essential to student learning. “Allocating realistic amounts of time means effective learning for students and effective teaching for faculty” (Chickering & Gamson, 1991, p. 67). In a large lecture course in chemistry at the University of California, Berkeley, Harley and Maher (2003) report that the deployment of online quizzes, conversion of chalkboard content to Powerpoint slides and the broadcast of video lectures with synchronized and indexed slides over the Internet for on-demand replay resulted in positive time utilization. Students had the opportunity to replay as many times as they wish the on-demand replay of video of the lectures. This allowed students to spend more time on task. Students found the technologies exceptionally useful. Instructors spent less time answering questions in the technology enhanced class because students could find the necessary information online. The saved time by the instructors was used on developing the course. “Of the almost 500 students who wrote comments on the survey, 98 percent thought that the use of technology increased the availability of and access of resources, helped them prepare for class, improved the course, promoted learning and understanding of course material, was helpful, useful, or convenient” (p. 31).

The amount of time a student spends on learning does impact how much the student learns (Nail, Alajimi, Alshammari, & Aldoukhi, 2006). In a paper on exploring the impact of technology integration on elementary learning environments, Nail (2006) conducted a study using Powerpoint presentations. Identical information was presented through two different slide show formats. One of the formats was linear whereas the other was branching. The powerpoint with the linear format allowed students to click and
proceed through the presentation at their own speed. The presentation with the branching format allowed students to click on buttons and select the order of presentation and proceed at their own speed. There were buttons for students to click on and listen to related sounds and graphics. Findings from the research indicate that the students spent more time on the branching presentation which was more interactive. Students reported that they perceived the interactive presentation to contain less information for them to read, however, students also indicated that they felt they learned more from the interactive presentations. The teacher recorded more on-task behaviors during the interactive slide shows than the linear slide show. The outcomes of the research according to Nail (2006) indicate that interactive Powerpoint can be a useful tool to promote and maintain on-task behaviors of fifth grade students as they developed content knowledge in the social studies curriculum. The study concluded that technology integration can be a great resource to address the diverse learning needs of elementary students and help teachers to address the challenges of time management and motivation that face teachers on daily basis (Nail, 2006).

*Good Practice Communicates High Expectations*

There is evidence that schools and colleges that communicate high expectations enjoy beneficial effects (Rutter, Maughan, Mortimore, & Ousten, 1979). According to Chickering and Gamson (1991), high expectations are important for everyone. Research indicates that if teachers set high but achievable goals for academic performance, academic achievement, generally increases. When teachers set low goals, academic achievement usually decreases contrary to faculty belief (Berliner, 1984).
Students are reported to give higher ratings to difficult courses which demand them to work harder (Cashin, 1988; Cashin & Slawson, 1977; Marsh, 1984). Cashin found that items such as workload which includes amount of reading, amount of other assignments, and difficulty of subject matter correlated positively with student ratings. On the other hand, Cross (1987) surmised low expectations by college teachers communicated to students lead to insignificant student growth, improvement and satisfaction. Institutions that communicate high expectations tend to observe positive results in areas such as student attendance and sense of responsibility (Cross, 1987; Rutter, Maughan, Mortimore, & Ousten, 1979). Technological advancement has resulted in new versions of word processors that have spell check and auto-correct functions. Such advancement in technology makes it possible for faculty to communicate high expectations. Students are generally expected to prepare their projects and assignments and submit them to instructors or professors without errors (Testa, 2001).

Students are usually expected to do presentations in the classroom using presentation software such as Microsoft PowerPoint. Student may be expected to either incorporate graphics, whether from a scanned photograph, the web or Microsoft clip art to enhance their presentations in Microsoft PowerPoint. Students are often expected to be able to use a word processor to present their work in a specified format.

Setting high expectation for anyone including students is important. Expecting students to perform well can motivate them to work hard and therefore perform well. Expectations can also be seen from the student’s point where students may have different expectations before and after a course.
A study was conducted by Resta and Sae-Chin (2002) to determine student expectations of an online collaborative learning environment, and to examine how students adjust their expectations when a course ends. Students’ entries were posted on Teachnet. Teachnet is “a primary communication tool based on FirstClass Groupware” (p. 1). In their findings, Resta and Sae-Chin (2002) reported that the students expectations before and after the course were different. Students raised their expectations at the end of the course. Students came to the course with the expectation that the course would provide them with hands on experience, in-depth knowledge of the course subject matter in the online environment. At the end of the course in their final reflection papers most students expressed positive impressions about working collaboratively with their online team members. Three main areas where student’s expectations were raised at the end of the course were expectations of learning outcomes, understanding of the course content, and online community. The results suggest students gained a greater understanding of online collaborative learning environment and had higher expectations about the online course when it was completed. This demonstrates how technology can influence expectations (Resta & Sae-Chin, 2002).

In a study on the effects of technology-mediated instructional strategies on motivation, performance, and self-directed learning, Gabrielle (2006) findings revealed that when technology-mediated instruction is carefully designed it can be efficient and effective in improving performance, student self-directed learning and performance. New technologies including handheld devices such as PDAs (presentation tool) can be effective means of delivering instruction (Gabrielle, 2003). Institutions of higher
education have made significant progress in the expansion of technology capacity (Brzycki & Dudt, 2005). The ability of technology to improve learning comes with expectations from both instructors and students. Effective and efficient teachers must be proficient in both content knowledge of their subject matter as well as be able to demonstrate proficiency in various teaching skills, of which technology is no exception (Young, 2001).

In the findings from a research on asynchronous online discussion as a tool for learning students attitudes, expectations, and perceptions Pena-shaff, Altman, and Stephenson (2005) used a case study approach in which data was collected during one semester from a three credit elective communication course. Students were required to work collaboratively, keep an on-going journal, complete individual assessment and discuss course reading via the bulletin board system (BBS). “The BBS provided an asynchronous, text-based, environment for students to discuss weekly topics” (Pena-shaff, Altman, & Stephenson, 2005, p. 413). The use of the BBS promoted cooperation among the students. Each week one or two students were selected as moderators to promote interaction. Pre and post questionnaires designed to gather information on participant’s perceptions, expectations and altitudes about the BBS was used to gather the quantitative data. Results indicated that students posted an average of 13.73 messages per week which was slightly over the one required. Fifty percent of the students participated 13 times or more during the semester. Twenty–four percent of the students participated 8 or fewer times in the online discussions. Overall the post-course perceptions of the BBS attributes by students had slightly improved from pre-course perception. Students
perceived several attributes of the BBS as being a rich learning environment. For example, BBS allowed students to check on comments of other students, ponder on the comments before contributing. Student felt the need to meet the expectations of their colleagues by pondering over comments before posting (Pena-shaff, Altman, & Stephenson, 2005).

*Good Practice Respects Diverse Talents and Ways of Learning.*

This principle is seen by Chickering and Gamson (1991) as the main link that holds the other principles together. Chickering and Gamson (1991) assert that students bring different talents and styles of learning to college. Faculty who show regard for student exceptional talents are likely to facilitate student growth and development in different spheres of endeavor such as social, personal vocational and academic.

Technology today has provided a broad spectrum of resources from which students can chose. In a way, technical resource makes possible different methods of learning by way of powerful visuals and well-organized print (Chickering & Ehrmann, 1991). It is important for instructors to recognize that students come from different socio-economic backgrounds which may influence their access to technology such as computers. Access to such technology both at home and at school would invariably affect the perception and attitudes of these students. For example, if assignments are given to students on regular basis which requires the use of a computer, the instructor may have to consider spending more time with those students who may be less comfortable with the computer program. Even though the current generation is referred to as the ‘NET
‘NET generation’, it is important for instructors to know that not all students are computer savvy (Oblinger & Hawkins, 2005).

There may be the need to restructure curriculum in order to incorporate technology to meet the needs of the NET generation of students today. The benefits of using technology in the classroom cannot be overemphasized. Efaw (2005) recounts some of the advantages of using technology in the classroom as: a decrease in the educator’s workload, increase in student motivation and learning, as well as acquiring knowledge of tools and skills needed to equip them to become life long learners in a technological age.

Technology can be used to cater to diverse student talents and ways of learning. Students have diverse talents and the way students learn may differ. Some students may be more visually gifted but might have difficulty understanding abstract concepts. Lemon (2005) reported enhancing biology lessons by integrating technology into an applied biology class. For example, a Flash-based interactivity of photosynthesis was used to make it easier for students who have difficulty understanding abstract concepts of sequential steps in the light reactions of photosynthesis. Appropriate web-based simulations were provided to engage learners in exploring complex phenomena when materials could not be duplicated in the laboratory. Students were given the task to complete a simulated experiment that involved measuring the amount of oxygen produced by plants after exposing the plants to specific wavelengths of light. The use of the simulation activity enabled students to understand how different wavelengths of light affect biochemical reactions in a plant. The diverse talent of the students was taken into
consideration and technology was used to create an activity that helped the students to better understand the lesson (Lemon, 2005).

Students bring different talents and learning styles to school. To be able to get the most from students, students need to be given the opportunity to show and use their talents and learn in ways that work best for them (Chickering & Gamson, 1991).

Effective communication is necessary to establish an equitable environment for learning (Burris & Satyanarayanan, 1999). According to Burris and Satyanarayanan (1999), educators today are faced with the challenge of how to accommodate students with different levels of preparedness. In many courses, a gap exists between students who are well prepared and those who are least prepared. This was the case in an introductory computer course where the class regularly had a mix of students with several years of computer experience and those who were just learning to use the mouse. Since it was an introductory computer class, the instructor couldn’t assume any prior knowledge so instruction for everyone had to start from the beginning. The situation got worse each year as the gap between students with computer and Internet experience was growing exponentially. This means that for each year the computer and Internet skill level of the best students kept getting better. To address this challenge, the course was put online and a number of changes were made. This included putting all instruction and evaluation online in an asynchronous format. This allowed students to work at their own pace and skip topics or lessons they already knew. Multiple multimedia softwares were used to accommodate different learning preferences. Assigning grade, collecting assignments and other course administrative functions were automated so instructors could spend more
time working with students. The course had been offered for two years when the report was compiled. The experiment had been deemed a success. Enrollment had gone up 400 percent since the course was offered in a traditional classroom. The course exists in 4 different versions and has attracted students from around the United States. Reports from students indicate a high level of satisfaction in delivery method and what they learn. Some features of the course helped in catering for the diverse needs of the students. These included the fact that most of the content of the course is online in multiple formats. Students can learn by reading about the topic online. For example, students can read about how to use a command in word processing or watch an animated show on how to use the command. AdaptiveLecture™ is an example of the ways the content of the course was placed online. How does an Adaptive Lecture™ work?

An AdaptiveLecture™ works like this: Before the lecture the student takes a quiz. The lecture is then generated dynamically and includes only the content necessary to answer the questions that were missed. This is better than the student using his/her judgment about the topics to skip, because it directly links topics to competencies from the quiz. (Burris & Satyanarayanan, 1999, p. 162)

Various methods for obtaining feedback from students have been incorporated into the course. Comments are solicited from students in one of the courses and students are asked to complete a short survey on entrance and exit of the course. Overall, the online format of the course has helped immensely to manage the diverse students needs (Burris
& Satyanarayanan, 1999). Instructors and designers of courses should explore and avail themselves of all the necessary tools that are available to facilitate delivery of instruction because the instructional technology landscape provides all of us with various ways by which “technologies can be used for instructional purposes” (Moore, 2006, p. 406).

**Technologies Used to Support Teaching**

In recent years, schools have witnessed widespread introduction of computers. In 2003, the average public school contained 136 instructional computers. In 1995, there were 5,621,000 computers for instructional purposes in all public schools. This number increased to 11,180,000 by 2003. In 1994, only 35 percent of all public schools had access to the Internet compared to 100 percent in 2003. The increase in the number of computers in schools reflects on the rising proportions of students using computers. The proportion of elementary and secondary school students using computers at school rose from 70 percent in 1997 to 83 percent in 2003. Eighty percent of children from families with incomes of $20,000 to $24,999 have used computers at school compared to 86 percent of children from families with incomes of $75,000 or more. The majority of students in 2003 used computers not only at school but also at home. In 1997, 43 percent of elementary and secondary school students used computers at home, compared to 68 percent in 2003. There was a corresponding increase in the number of students using computers at home for school work from 25 percent in 1997 to 47 percent in 2003 (Snyder, Tan, & Hoffman, 2006). It is these students who graduate from high school and gain admission to colleges. Knowing the technologies and software applications they have been exposed to could provide information about their technology skill levels.
Among elementary/secondary school students in 2003, 68 percent used the computer for school assignments, 43.1 percent used it for email, 44.2 percent used the computer for word processing, and 84.9 percent used it for games. Data was not available for spreadsheets and graphics (Snyder et al., 2006).

Public schools have made steady progress in expanding Internet access in instructional rooms. In 1994, 3 percent of public school instructional rooms had Internet access compared with 93 percent in 2003 (Parsad & Jones, 2005).

The percentage of schools using broadband connections in 2001 and 2000 were 85 percent and 80 percent respectively. In 2003, there was an increase to 95 percent from 2001 (85 percent) in the schools using broadband connections to access the Internet. In 2003, thirty-two percent of public schools with Internet access used wireless connections, an increase from 23 percent in 2002. The proportion of public schools with wireless Internet connections increased with school size but decreased as poverty concentration (this is percent of students eligible for free or reduced-price lunch) increased in 2003. Twenty-five percent of schools with the highest poverty concentration had wireless connections, compared with 36 percent of schools with the lowest poverty concentration. “Secondary schools were more likely than elementary schools to use wireless Internet connections (42% compared with 29%)” (Parsad & Jones, 2005, p. 5).

Handheld computers have also become a part of most schools in the US. According to Parsad and Jones (2005) in 2003, 10% of public schools provided hand-held computers to students or teachers for instructional purpose. This represented an increase of 7% over the previous year. Handheld devices can be used to support teaching and
research. Faculty have used handheld devices successfully in lessons they have created (Franklin & Sexton, 2006).

When preservice teachers are given the opportunity to use technology for their own learning they are more likely to use technology in their classroom to teach (McCarthy, 2004). Integrating technology into the curriculum has sometimes involved the design of programs that provide preservice teachers the opportunity to observe skilled teachers integrate technology in their elementary classroom (Vannatta & Reinhart, 1999).

There are newer technologies in schools today, with an extensive range of applications to teaching and learning (Shelly et al., 2006). Modern technologies have transformed various aspects of American life over the last decade. This can be seen in how people communicate, work or spend leisure time. These changes have invariably resulted in demands for certain skills in workplace. For students to become successful adults, they are required to acquire certain technological skills. Educational policy and reforms in recent years have focused on this issue, providing schools with computer hardware and software (Coley, 1997; U.S. Department of Education, 2000).

Children are now becoming exposed to technologies at an earlier age. Many technologies are making their way into the early childhood classroom. Many parents expose their children to most of these technologies before the child come across them in formal schooling. These parents serve as the first teachers of technological literacy of these children. Cell phones, Internet, personal computers are some of the technologies that children are exposed to by age 6 (Beals & Bers, 2006). The question is how can educators take advantage of this exposure to technologies at such an early age and build
upon to successfully integrate technology in the curriculum? What technologies can be found in schools that are used to enhance learning?

The most common technology used for instruction in schools is video and the television. This could be from sources such as direct broadcast, cable television and or satellite (distance learning). Almost every school in the country has at least one television set for instructional use. Forty percent of all the public schools receive broadcast television from popular networks such as ABC, NBC, and CBS. Cable television which includes subscription television like Discovery, the learning channel and CNN is available to 74% of all public schools. Eighty-five percent of these schools report access in the library/media centers while 70% say access is available in the classroom. Twenty-five percent of the schools say closed circuit television (neither broadcast/cable, but in-house transmission on commercial lines) is available. Eight-nine percent report they have access in the library/media centers, and 94% say classrooms have access (OTA, 1995).

Educational uses of wikis are just beginning to emerge according to Dodge (2005). A wiki is a collaborative web application developed by Ward Cunningham. Wiki is a Hawaiian word meaning quick that allows the visitor to easily add, remove, or edit and change existing content. This ease of interaction and operation makes a wiki an effective tool for mass collaborative authoring (Augar, Raitman, & Zhou, 2004). The most widely known example of a wiki is Wikipedia, an online encyclopedia (Dodge, 2005).

A wiki experiment involving a graduate distance learning course at the Ontario Institute for Studies in Education was undertaken at the University of Toronto. According to Hewitt, Peters, and Brett (2006) the results collectively indicated that Wikis may serve
as useful environments for engaging students in collaborative activities that involve in-depth analysis of particular problems that promotes cooperation among participants (Hewitt et al., 2006)

An investigation-based approach utilizing graphing handhelds resulted in improvement of student knowledge of functions. According to the researchers using technology (graphing handhelds) in an investigation-based approach can also lead students to include significantly more ideas in their justifications of answers, a trait that correlates with correct student responses (Texas Instrument Incorporated, 2006).

In a paper which explores the variety of teaching applications, methods and techniques used to integrate interactive white board, smartboard, into the classroom to teach art, Miller (2003) sees the interactive white board as presentational tool that is worthy of investigating and employs educators to provide the necessary environment for exploration. Miller (2003) mentions the cell phone, PDA’s, email and web as tools used by the current generation as lexicon. Handheld tools are changing how people access and work with information. Currently one mobile computing technology that has the potential to transform the face of learning is PDAs. For teachers and students, handhelds such as Palms and Pocket PCs have made technologies more accessible and affordable. The handhelds are portable, have various third-party software, and have intuitive interface which makes it ideal as an educational tool (Yuen & Yuen, 2002).

The Personal Digital Assistant (PDA) carries your personal information applications and data such as, notes, calendar, address book and tasks. Today, you can browse the web, play games, work with MS office documents, make telephone calls, and
take pictures with a PDA. With the PDA, one has a computer that fits in the palm just like a cell phone (Lee & Nelson, 2006). One barrier to technology integration is access and the personal digital assistants can solve this problem. Students can be provided with a PDA, black and white camera and a keyboard for approximately $250 (Figg & Burson, 2002).

The creative use of handhelds and other mobile technology coupled with a good sound curriculum would provide a good prospect to extend traditional teaching and creating a learning environment that would be conducive to students’ reception. This device when properly used can facilitate instructional learning by putting the resource directly in the hands of the student (Csete, Wong, & Vogel, 2004).

Given that all resources are made available in the classroom, are teachers comfortable with technology to be able to integrate it in their teaching? Are teachers well trained for this uphill task? What programs have been put in place to help the integration of technology in the classrooms?

*Programs used to support teaching in Higher Education*

The advent of electronic technology has been a significant event in the history of human civilization. Indeed contemporarily society has witnessed a dramatic upsurge of technological development. The television, computer, Internet and other electronic media have contributed in no small way towards the transformation in the lifestyle of most people in the developed world. Students are becoming more and more familiar with technology. Technology is being infused into all spheres of our lives, resulting in students becoming more proficient at using technology as an educational resource (Efaw, 2005).
In today’s world technology affects every sphere of our lives. The effect of technology can be seen in the way we communicate, research information. The discourse on the impact of technology on teaching and learning has been on-going for several decades.

Keeping pace with the growth of technology hasn’t been easy for most faculty who have the responsibility of educating students. According to Efaw (2005) faculty feel increasingly unprepared to integrate technology into the classroom. Certainly the rapid advancement in technology in today’s world has given rise to challenges to the colleges of education in the preparation of their preservice teachers (Hattler, 1999). The gap that exists between what is taught preservice teachers and what they are expected to teach can be likened to the digital divide existing between those who have technology and those who do not (Hare, Howard, & Pope, 2002).

Various organizations and programs have evolved or been established to help technology integration in schools. Three of such programs are The International Society for Technology in Education (ISTE), The National Council for Accreditation of Teacher Education (NCATE) and Preparing Tomorrow's Teachers to Use Technology (PT3).

The International Society for Technology in Education (ISTE)

The International Society for Technology in Education (ISTE) is a non-profit organization that is devoted to supporting the use of information technology to assist in learning, teaching students from K-12 and teachers. ISTE offers leadership and service to improve teaching, learning, and school leadership by advancing the effective use of technology in PK–12 and teacher education programs. ISTE is “home of the National
Educational Technology Standards (NETS), the Center for Applied Research in Educational Technology (CARET), and the National Educational Computing Conference (NECC), ISTE represents more than 85,000 professionals worldwide” (ISTE, 2007, ¶ 1). ISTE is the professional education organization responsible for recommending guidelines for accreditation to NCATE for programs in educational computing and technology teacher preparation (ISTE, 2007). For programs in educational computing and technology teacher preparation, ISTE is the main professional education organization responsible for recommending guidelines for accreditation to NCATE (ISTE, 2007).

*National Educational Technology Standards (NETS)*

The National Educational Technology Standards (NETS) standards have two main foci; NETS for Students and NETS for Teachers. The National Educational Technology Standards for Students is designed to provide teachers, technology planners, teacher preparation institutions, and educational decision-makers with frameworks and standards to guide them in establishing enriched learning environments supported by technology. NETS for Students provide frameworks and standards to teachers, technology planners, educational decision-makers, and teacher preparation institutions, to guide them in establishing enriched learning environments that is supported by technology (NETS for Students, 2007).

The technology foundation standards for students are divided into six broad categories. The standards in each category have to be mastered by students. Teachers are to use the standards as guidelines for planning technology-based activities for students (NETS for Students, 2007).
The Technology Foundation Standards for Students are:

1. Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

   a. apply existing knowledge to generate new ideas, products, or processes.
   b. create original works as a means of personal or group expression.
   c. use models and simulations to explore complex systems and issues.
   d. identify trends and forecast possibilities.
   e. communication and collaboration

2. Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:

   a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
   b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
   c. develop cultural understanding and global awareness by engaging with learners of other cultures.
   d. contribute to project teams to produce original works or solve problems.

3. Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students:

   a. plan strategies to guide inquiry.
b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

d. process data and report results.

4. Critical Thinking, Problem Solving, and Decision Making

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Students:

a. identify and define authentic problems and significant questions for investigation.

b. plan and manage activities to develop a solution or complete a project.

c. collect and analyze data to identify solutions and/or make informed decisions.

d. use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:

a. advocate and practice safe, legal, and responsible use of information and technology.

b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
c. demonstrate personal responsibility for lifelong learning.

d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

a. understand and use technology systems.

b. select and use applications effectively and productively.

c. troubleshoot systems and applications.

d. transfer current knowledge to learning of new technologies. (NETS for Students, 2007, ¶ 1)

NETS for Teachers

I. Technology Operations and Concepts

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Educational Technology Standards for Students).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

2. Planning and Designing Learning Environments and Experiences

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:
A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

3. Teaching, Learning, and the Curriculum

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

B. use technology to support learner-centered strategies that address the diverse needs of students.

C. apply technology to develop students' higher-order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

4. Assessment and Evaluation
Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.

B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

5. Productivity and Professional Practice

Teachers use technology to enhance their productivity and professional practice.

Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.

B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.

C. apply technology to increase productivity.

D. use technology to communicate and collaborate with peers, parents, and the larger community to nurture student learning.

6. Social, Ethical, Legal, and Human Issues

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:
A. model and teach legal and ethical practice related to technology use.

B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.

C. identify and use technology resources that affirm diversity.

D. promote safe and healthy use of technology resources.

E. facilitate equitable access to technology resources for all students. (NETS for Teachers, 2000, ¶ 1)

*The National Council for Accreditation of Teacher Education (NCATE)*

NCATE is authorized by the U.S. Department of Education as a national accrediting body for schools, colleges and departments of education. In preparing teachers and other school specialist for the classroom, schools, colleges, and departments of education are expected to meet rigorous national standards (NCATE, 2006a). NCATE through its standards setting and review process helps to raise the teaching profession by instituting high quality teacher preparation. The NCATE accreditation process establishes rigorous standards for teacher education programs. Accredited institutions are held accountable for meeting the standards. Unaccredited institutions are encouraged to demonstrate the quality of their programs by working towards achieving professional accreditation. NCATE’s performance based accreditation system obliges institutions to provide evidence of competent teacher candidate performance. This means that accredited institutions are expected to make sure teacher candidates know their subject matter and how to teach it well (NCATE, 2006a).
NCATE standards were reached through consensus building by representatives of all stakeholders in education nationwide. These stakeholders included: local and state policy makers, teachers, school specialists, and teacher educators. The process of accreditation involves visits to colleges and schools by representatives of these stakeholders to review the performance of programs, governance, structure, and candidates to determine if the colleges meet the NCATE standards. NCATE through its standards setting and review process helps to raise the teaching profession. This is because it helps to institute high-quality teacher preparation (NCATE, 2006b).

Faculty integration of technology into their teaching is essential if any headway is to be made in today’s technologically advanced world. Enough has not been done to prepare faculty hesitant to use technology considering the number of computers in schools (McKenzie, 1999). Efaw (2005) sums it all up thus, “simply put, the world around us continues to evolve at an immensurable pace while the tried-and-true practices of traditional lecture-style approaches to teaching feel safe and comfortable, we may actually be doing a disservice to our technologically advanced students. Rather than being intimidated by available technological advances in our field, we owe it both to ourselves as instructors and to our students to incorporate these changes into our everyday practices” (p. 32).

*Preparing Tomorrow's Teachers to Use Technology (PT3)*

Preparing Tomorrow's Teachers to Use Technology (PT3) grant program aims at transforming teacher education to technology throughout their teaching and learning.
Their goal has been to ensure that Preservice teachers enter the classroom prepared to effectively use technology in their teaching (PT3, 2007).

The PT3 program has been created by the United States Department of Education to ensure that Preservice teachers enter the classroom prepared to effectively use technology in their teaching. A number of projects have been sponsored by the PT3 program with interesting results. One such project is to prepare educators to use and integrate instructional technologies in their teaching and learning. Findings from its implementation indicated improvements not only in skills but in confidence and comfort with instructional technology. The educators were motivated in their desire to integrate technology in the classroom as a result of their students’ own motivation to the different teaching approach involving the integration of technology. The majority of the teachers reported an increase in student engagement when hands on opportunities were provided (Adams, Dunham, Wells, & Shambaugh, 2001).

A PT3 funded program which provided Apple iBook laptops, software, and training to students and instructors, reports that whereas majority of the students entered the course with limited experience with laptops, most students exited the course with valuable computer skills and a positive attitude toward technology (Bales, Colombo, Waker, & Carroll, 2004).

MentorNet, a program led by NC State University is a 1999 PT3 implementation grant project designed to improve proficiency with instructional technology of preservice teachers and the faculty who instruct them and to help both groups gain a better understanding of classroom uses of technology. Simply exposing the preservice teachers
to more technology did not automatically lead to positive attitudes to instructional technology; however when students were engaged in developing lessons using technology or preparing webpages they had a more positive attitude towards the experience (Brawner, Brent, & Van Dyk, 2004). A number of lessons were learned from the PT3 funded projects.

Some lessons learned from the U.S. Department of Education's PT3 Grant Program on how to integrate technology into teacher education include:

a) How to encourage more faculty to use technology in their teaching
b) How to encourage more students to use technology
c) How to sustain technology integration strategies. (PT3, 2007).

To encourage faculty to use technology in their teaching, the report made a number of recommendations including the hiring of students and in-service teachers to offer technology support to faculty on an individual basis and conducting needs assessment to make sure that all faculty development activities would meet the genuine needs of the faculty. Faculty can be motivated by providing free or loaned technology equipment, stipends and mini-grants.

To encourage more students to use technology the report made a number of recommendations including the need for students to be encouraged to create products using technology, and faculty to model technology integration in their courses on a regular basis. In order to sustain technology integration strategies the report made a number of recommendations including linking courses to NCATE accreditation process.
by ensuring that they meet ISTE's National Educational Technology Standards (PT3, 2007).

These are useful lessons that could aid most teacher education institutions that are either in the process of integrating technology in the curriculum or have already initiated the process of integrating technology. It offers invaluable information on how faculty can improve student’s technology integration. Integrating technology into the curriculum can be daunting, however given the above lessons faculty and students can benefit enormously if they take advantage of the lessons enumerated above.

It is often quite difficult for educators to step out of the comfort of the traditional classroom into the often intimidating technology-enhanced classroom. The challenge of enhancing the traditional courses with an array of technology can be daunting. With the increasing availability of multimedia tools in the classroom, many instructors have begun accepting the challenge (Rickman & Grundzinski, 2000).

Numerous assumptions about students are not supported by reality. According to Oblinger and Hawkins (2005), instead of assuming universities and colleges should perhaps ask themselves some strategic questions such as:

1. Do we know our students and their preferences, or do we assume we know? It appears many decisions taken by institutions are based on the belief that the decision makers understand their students’ needs and preferences. Is this what the research data says?
2. How are we adapting programs to students needs?
3. When technology is incorporated into teaching does it add value?
4. Is technology being used in ways that imitate rather than enhance lectures?

5. What balance of physical and virtual would best serve our student populations? Even though technology is being utilized extensively by students what balance of face-to-face and online is best for their Academic program? Perhaps some students may thrive on the virtual whereas others may need the traditional face-to-face environment.

6. Are our building and renovation plans based on outdated assumptions? Does the current classrooms design help or inhibit learning? Do students as experiential learners, faculty and administrators are experts in the various disciplines (fields of endeavor) as well as how to teach the discipline. On what subject should student input be sought/solicited? In which areas should faculty have the domain voice/say. (Oblinger & Hawkins, 2005)

Teachers who have been taught to teach their subject matter with technology are few. This assertion is supported by a survey by the National Center for Educative Statistics which found only 20% of the current public schools teachers feel comfortable using technology in their teaching (Rosenthal, 1999).

Technology is not just for delivery. Technology should be seen as a means to improve learning. Technology has the potential to transform as well as expand the educational knowledge by augmenting real world, lifelong learning and problem-solving skills (Warren, 2003). Technology, if well integrated into teaching, does have a positive impact on students learning and attitude towards technology.
Results from research projects on educational technology revealed students expressed the desire to have technology constantly utilized throughout the university. In addition students gave high rating to their ability to critically evaluate information they find on the web (Gustafson & Kors, 2004). To increase the use of technologies widely accepted and preferred by faculty and students requires institutional change. This includes drafting of institutional mission statements and campus-wide agendas for technology adoption (Gustafson & Kors, 2004).

Studies have shown that preservice teachers’ level of confidence increases when they are exposed to various technologies while learning teaching practices in their methods courses and when they see technologies modeled by faculty (Hare, Howard, & Pope, 2002). There have been suggestions on how to enhance technology integration.

1. To increase faculty and teachers’ ability to integrate technology in their instruction, a training program should be designed that provides faculty and teachers with technology-rich site visits as well as facilitates proficiency in 2-3 personally selected technology applications and development of classroom activities that utilize those applications. (Vannatta & Reinhart, 1999, p. 1215)

2. In order to improve the modeling of technology integration in education courses, faculty should: model integration themselves, require assignments that integrate technology, have students develop lessons that integrate technology, discuss technology integration throughout the course, discuss different uses of technology (tutorial vs. productivity), and provide
opportunities for students to share technology rich lessons with each other.

(Vannatta & Reinhart, 1999, p. 1215)

3. Participating classroom teachers should “develop a personal technology integration plan and have teachers visit the education courses to share their experiences with technology integration. (Vannatta & Reinhart, 1999, p. 1215)

University faculty and administrators cannot assume that they understand their students simply because they were once the same age, since this could be very misleading. Technology is dynamic and so are students, both change over time (Oblinger & Hawkins, 2005).

Summary

There is mounting evidence to suggest that preservice teachers are not receiving adequate preparation to teach with computers and other related technologies (McKinney, Jones, Strudler, & Quinn, 1999). There is a gap existing between what preservice teachers are taught about technology and what they are expected to do with the technology in the classroom (Hare et al., 2002).

In order to derive beneficial results a new mind set is needed to integrate technology in preservice teacher programs (Lund & Runyon, 2002).

Becoming technologically literate would help boost the confidence with which preservice teachers would teach their lessons using technology in the classroom. Colleges in the past have made commitments to train and graduate students who are technologically literate (Hattler, 1999).
Even though nearly all elementary and secondary schools are now connected to the Internet, most teachers still feel uncomfortable using technology in their teaching (Thompson, 2005). Improving the quality of teaching is possibly one of the driving forces for the integration of technology into curriculum. Using new tools in the classroom does not guarantee an improvement in teaching nor whether students would learn. Building an invigorating learning environment, a thoughtful pedagogical strategy is needed for educational technology to succeed (Ehrmann, 1995).

This chapter presented a review of the literature for the research. The chapter began with an overview on teacher preparation programs and technology integration. The Seven Principles for Good Practice in Undergraduate Education which is the theoretical framework around which the four Technology Tools – Productivity Tools, Presentation Tools, Communication Tools and World Wide Tools are explored. Technologies used to support teaching, programs used to support teaching in higher education and the survey instrument were all discussed.
### Table 1

**Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education – Productivity Tools**

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity Tools</strong></td>
<td>Students created information on a PDA and shared with classmates.</td>
<td>Promotes cooperation among students</td>
</tr>
<tr>
<td></td>
<td>Students were actively involved in the process of mathematical story telling. Students created educational worksheets which would instruct a novice about a specific statistical concept. The use of text, graphics and sound combined with their creativity enabled students to produce very interesting interactive worksheets. By creating the educational worksheet, students actively learned the material in the process.</td>
<td>Promotes active learning techniques</td>
</tr>
<tr>
<td></td>
<td>Preservice teachers were engaged in the calculator-based laboratory activity - an extension to the graphing calculator, which provides learners with a mini laboratory through which they can collect data, analyze data, and give personalized meaning to their mathematics calculations and exercises. The use of the calculator as a productivity tool did encourage active learning.</td>
<td></td>
</tr>
</tbody>
</table>
Table 2

Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education – Presentation Tools

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation Tools</td>
<td><em>BodyWorks</em> and <em>Microsoft Encarta</em> are two applications that provide working visual models of how various parts of the human heart interact. The interactive nature of the software engages students enabling them to concentrate better on the task or exercise at hand. The software allows students to utilize their time on task well. The conversion of chalkboard content to PowerPoint slides gave students the opportunity to replay as many times as they wish the PowerPoint slides. This allowed students to spend more time on task. Students worked with linear and interactive Powerpoint presentations. The students spent more time on the presentation which was more interactive. The students perceived they learned more from the interactive presentations. The teacher recorded more on-task behaviors during the interactive slide shows than the linear slide show. The outcomes of the research indicate that interactive Powerpoint can be a useful tool to promote and maintain time-on-task behavior.</td>
<td>Emphasizes time on task</td>
<td>Shelly, Cashman, Gunter, &amp; Gunter, (2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Harley and Maher (2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nail (2006)</td>
</tr>
</tbody>
</table>
### Table 3

*Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education – Communication Tools – A*

<table>
<thead>
<tr>
<th>Communication Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email communication; Out of class, student – faculty communication</td>
<td>Student – faculty interaction</td>
<td>Marbach-Ad and Sokolove (2002)</td>
<td></td>
</tr>
<tr>
<td>Chat sessions on WebCT between student and faculty</td>
<td>Student – faculty interaction</td>
<td>Jin (2005)</td>
<td></td>
</tr>
<tr>
<td>Email communication via WebCT between student and faculty</td>
<td>Student – faculty interaction</td>
<td>Jin (2005)</td>
<td></td>
</tr>
<tr>
<td>Threaded sessions on WebCT between student and faculty</td>
<td>Student – faculty interaction</td>
<td>Jin (2005)</td>
<td></td>
</tr>
<tr>
<td>Students Beamed information from one PDA to another</td>
<td>Promotes cooperation among students</td>
<td>Franklin, Sexton, Lu, and Ma (2007)</td>
<td></td>
</tr>
<tr>
<td>Students kept an on-going journal, completed individual assessment and discussed course reading via the bulletin board system (BBS). The BBS provided an asynchronous, text-based, environment for students to discuss weekly topics. BBS allowed students to check on comments of other students, ponder on the comments before contributing. Student felt the need to meet the expectations of their colleagues by pondering over comments before posting</td>
<td>Communicates high expectations</td>
<td>Pena-shaff, Altman, and Stephenson (2005)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 4

**Summary of the Seven Principles of Good Undergraduate Education and Technology**  
*Tools in Higher Education - Communication Tools Continuation - B*

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Tools</td>
<td>Students entries were posted on Teachnet - a primary communication tool based on FirstClass Groupware. Student expectations of an online collaborative learning environment, before and after the course were different. Students raised their expectations at the end of the course. At the end of the course in their final reflection papers most students expressed positive impressions about working collaboratively with their online team members. Three main areas where student’s expectations were raised at the end of the course were expectations of learning outcomes, understanding of the course content, and online community. The results suggest students gained a greater understanding of online collaborative learning environment and had higher expectations about the online course when it was completed. This demonstrates how technology can influence expectations.</td>
<td>Communicates high expectations</td>
<td>Resta and Sae-Chin (2002)</td>
</tr>
</tbody>
</table>
Table 5

Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education - Communication Tools Continuation - C

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Tools Continuation</td>
<td>Students worked collaboratively via the bulletin board system (BBS). The BBS provided an asynchronous, text-based, environment for students to discuss weekly topics. BBS allowed students to check on comments of other students, ponder on the comments before making the contribution. The use of the technology promoted cooperation among the students.</td>
<td>Promotes cooperation among students</td>
<td>Pena-shaff, Altman, and Stephenson (2005)</td>
</tr>
</tbody>
</table>
Table 6

Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education - A

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Tools</td>
<td>Students contributed one or more pages to the class wiki and helped classmates to develop their wiki pages by providing suggestions and comments. Asynchronous online discussion offered a useful assessment tool that provided prompt feedback. This was in a teacher education methods course using online discussions. Interactive assessment was used to gather feedback. The instrument that was developed for the assessment allows students to anonymously fill out the instrument online while the instructor is not present. Technology made it possible to instantaneously collect results from students through the survey thus enhancing feedback. A world wide web-based formative assessment package used in undergraduate psychology courses to provide prompt feedback. The system provided a meaningful interaction between the student and the instructional materials. Technology was used to provide prompt feedback.</td>
<td>Promotes cooperation among students Gives prompt feedback Gives prompt feedback Gives prompt feedback</td>
</tr>
</tbody>
</table>
### Table 7

*Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education – World Wide Web Tools Continuation - B*

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Tools Continuation</td>
<td>Deployment of online quizzes Technology was used to increase the availability of resources and access to the quizzes. This helped them prepare (by taking the quizzes multiple times), promoted learning and understanding of course material. This resulted in students doing well in the course and giving positive feedback. The technology allowed students to spend more time on task. The broadcast of video lectures with synchronized and indexed slides over the Internet for on-demand replay resulted in positive time utilization. Students had the opportunity to replay as many times as they wish the on-demand replay of video of the lectures. This allowed students to spend more time on task. Using WebCT, some projects and assignments required students to work in collaborative small groups. Interactions between students were achieved through synchronous text chat sessions, and asynchronous threaded discussions and email. Findings indicated students were very satisfied with learning in a highly interactive environment. Technology was used to promote cooperation among students.</td>
<td>Emphasizes time on task</td>
<td>Harley and Maher (2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jin (2005)</td>
</tr>
</tbody>
</table>
Table 8

Summary of the Seven Principles of Good Undergraduate Education and Technology Tools in Higher Education - World Wide Web Tools Continuation - C

<table>
<thead>
<tr>
<th>Technology Tools</th>
<th>How Used to Supplement Lecture</th>
<th>Seven Principles</th>
<th>Literature Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Tools Continuation</td>
<td>A Flashed-based interactivity of photosynthesis was used to make it easier for students who were more visually gifted but had difficulty understanding abstract concepts of sequential steps in the light reactions of photosynthesis. Appropriate web-based simulations were provided to engage learners in exploring complex phenomena when materials could not be duplicated in the laboratory. The use of the simulation activity enabled students to understand how different wavelengths of light affect biochemical reactions in a plant. The diverse talent of the students was taken into consideration and technology was used to create an activity that helped the students to better understand the lesson.</td>
<td>Respects diverse talents and ways of learning</td>
<td>Lemon (2005).</td>
</tr>
<tr>
<td></td>
<td>The problem of teaching students with diverse computer and Internet experience was solved using technology. To address this challenge, the course was put online. Putting all instruction online in an asynchronous format allowed students to work at their own pace and skip topics or lessons they already knew. Multiple multimedia softwares were used to accommodate different learning preferences. Technology was used to cater for the diverse needs of the students.</td>
<td>Respects Diverse Talents and Ways of Learning</td>
<td>Burris and Satyanarayanan (1999)</td>
</tr>
</tbody>
</table>
Chapter 3: Research Methodology

Introduction

Computers and technology are a great addition to the classroom and to the learning process. The ability to use the computer is becoming increasingly important. Many teachers today are not integrating technology into their teaching because they have no knowledge or have very little idea about technology. School systems need to recognize this and address the issue by training teachers and providing the needed support by way of a technology specialist. Integrating technology in preservice teacher preparation programs through a carefully designed system that varies over a period of time would enable future teachers to be effectively prepared for the challenges ahead (Pierson, 2004). Buying new computer is a great idea but to derive its full potential teachers would have to know how to use them for the purpose for which they were purchased. This would entail a clear vision of technology integration that would not constrain but empower preservice teachers as active rather than passive participants in their own learning (Vannatta, Beyerbach, & Walsh, 2001).

The Research Question

The following research question guided the study:

Q1. To what extent do student perceptions of different forms of technology use for instruction purposes predict instructional quality?

To answer the research question above the following hypothesis was tested:

\[ H_0: R^2 = 0 \]

\[ H_A: R^2 \neq 0 \]
H₀: The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and World Wide Web tools are not significant predictors of the dependent variable, instructional quality.

Hₐ: The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and world wide web tools are significant predictors of the dependent variable, instructional quality.

Research Design

The purpose of this study was to investigate to what extent student perceptions of different forms of technology use for instruction purposes can predict instructional quality. In other words, the study seeks to explore whether different forms of technology: productivity tools, presentation tools, communication tools, and World Wide Web tools, reliably predict instructional quality. The study analyzed which of the predictors, productivity tools, presentation tools, communication tools, and World Wide Web tools is more important in predicting instructional quality.

The research is a quantitative. The design is correlational rather than experimental. To investigate to what extent student perceptions of different forms of technology use for instruction purposes predict instructional quality, undergraduate students from the a large Midwestern University College of Education were the accessible group from which a sample was drawn. There are 1,396 undergraduate students in the College of Education (College of Education Annual Report 2006 – 2007, 2007).
Data were collected with an online questionnaire. The instrument site was located at the SurveyMonkey website http://www.surveymonkey.com. This site linked the respondents to all the sections of the instrument hosted on the SurveyMonkey server. A list containing names and the email address of students in a large Midwestern University, College Education was obtained from the Office of Institutional Research. A survey instrument used for collecting data was developed by the author. Items from part two of the instrument were obtained from the student evaluation of instruction form from the department of Teacher Education in the College of Education, a large Midwestern University. Questions were selected from the instrument to evaluate the research questions in this study. Students selected for the pilot study were excluded from the main study to avoid any inconsistencies in the results.

Item 3 under Part I was used to filter by major so that any participant who fell outside the major was excluded. Only students who match with one of the majors were analyzed. Item 1, 2, 4 and other demographic variables were used to obtain a clear picture of the accessible population during analysis.

Part II of the survey gathered information regarding student evaluation of faculty instruction. Part III of the survey gathered information on student evaluation of technology with respect to the Seven Principles of Good Practice in Undergraduate Education.

The items in Appendix A, Part 1(items 1-6), Part II (item 1-18): Student evaluation of instruction (Instructional quality,) and Part III (A-D): Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools respectively on
the survey instrument were used to examine the research question. Both Part II and Part III involved the use of a 5-point Likert scale (SD = strongly agree to SA = strongly disagree). Analysis of responses involved the use of multiple regression.

**Operational Definitions of the Variables**

Based on the research hypotheses, the following independent and dependent variables were identified:

**Independent Variables**


**Dependent Variable**

2. Total Score of Part II of the survey (Student evaluation of faculty instructional quality).

**The Setting**

The research was conducted at the main campus at a large Midwestern University. The University was established in 1804 and is the oldest public institution of higher learning in the state and the first in the Northwest Territory. The University is fully accredited by a number of professional accrediting agencies including the North Central Association of Colleges and Schools and NCATE. The University has been cited for academic quality and value by such publications as Princeton Review's Best Colleges, U.S. News and World Report, America's 100 Best College Buys, and Peterson's Guide to
Competitive Colleges. Currently, the institution ranks first in the state for nationally competitive awards won by its students (Ohio University Factbook, 2006).

The 2005 Carnegie Foundation for the Advancement of Teaching classifications designated the University a Research University (high research activity) under the Basic Classification category. Only 103 schools (2.3 percent of the 4,383 schools assessed by the Carnegie Foundation) are classified as a research university - high research activity. Athens campus which is the main campus is made up of 20,000 students. Currently the University has five regional campuses. The regional campuses together enroll over 8,000 students, bringing the total enrollment for a large Midwestern University to over 28,000 (Ohio University Factbook, 2006). In addition to the above mentioned facts the university has:

1. 16,761 undergraduate students on the Athens campus
2. More than 250 majors
3. 869 full-time faculty (Athens campus)
4. 17:1 student to faculty ratio
5. 25 student average class size
6. 41 residence halls
7. 1,050 students from other countries
8. 81% freshman to sophomore year retention rate. (Ohio University, Just Facts, 2006, ¶ 2).

Information Technology at a large Midwestern University comprises nine functional areas namely:
1. Academic Technology
2. Support Services
3. Distributed IT Services
4. IT Strategy & Policy
5. Enterprise Application Solutions
6. Information Security Office
7. Networks & System Operations
8. IT Shared Services

Out of the nine functional areas, Academic Technology is responsible for promoting and supporting the use of information and communications technologies for teaching, learning, and scholarship at a large Midwestern University. Academic Technology co-sponsors the Academic Technology Studio in collaboration with Alden Library, the Center for Teaching Excellence, and the Center for Writing Excellence, Academic Technology. Academic Technology Studio is a resource for faculty, instructors, and graduate teaching assistants interested in using technology to enhance teaching and learning (Ohio University Academic Technology, 2007). There are 170 personal computers in the Academic Technology public computer labs comprising Boyd hall, Brown hall, Computer Services Center, and Baker University Center. There a total of 293 workstations in the Alden Library (Computers in the Libraries, 2007). There are 66 personal Computers and 12 Macintosh computers in the College of Education
Computer labs in McCracken Hall. Every room in the University residence halls has a computer connected to the Internet. A large Midwestern University offers free wireless Internet on the Athens and regional campuses. A wireless-capable computer, a valid Oak ID and password are needed to access the system (Ohio University Academic Technology, 2007).

Participants for the study were drawn from a large Midwestern University College of Education. The College of Education was the first public teacher preparation program in Ohio (College of Education, 2006.).

Population of the Study

The population of this study was all students of the Teacher Education Programs within the United States. A large Midwestern University, Teacher Education program was the accessible population from which a convenient sample was drawn.

Teaching is what most graduates from the College of Education aspire as their future profession. The College of Education offers undergraduate and graduate courses in many fields. Most of the programs, however, lead to careers in teaching, counseling, and public school, and higher education administration (College of Education, 2006).

Sampling

Studying a sample of the population is the strategy in nearly all social and behavioral science research (Aron & Aron, 2002). How many students one would need to include in the study in order to control a Type II error is known as the statistical power. “Statistical power is defined as one minus the probability of a Type II error, and it is the probability that you detect an effect that is really there. When you increase power, you
decrease the chances of making a Type II error and increase the chances of finding real
effects” (Light, Singer, & Willet, 1990, p. 191). Although there is no consensus with
regards to how much power one is to adopt when planning a study, the authors advocate
that researchers design their study to have at least moderate power between .70 and .90
(Light et al., 1990).

Sample Size Selection: To compute required sample size the G* Power software
version 3.0.3 was used (Faul, Erdfelder, Lang, & Buchner, 2006). Using the following
parameters was decided a priori:

1. Effect size $f^2 = 0.2886598$ (based on adjusted $R^2$ of the Pilot study .224)
2. $\alpha = 0.05$
3. Power = 0.90
4. Number of predictors = 4
5. Total sample size of at least 63 is required (Faul et al., 2006).

To select participants for the study, the researcher utilized the experience gained
from the pilot study. The researcher received a high response rate due to administering
the survey only after an introduction has been made to the students either by the class
professor or by the researcher. The respondents were possibly more comfortable after the
introduction and subsequent explanation of the research. The College of Education is the
accessible population out of which a convenient sample was drawn by purposefully
selecting 8 undergraduate classes in the College of Education. The selection was based on
classes which had a sizeable proportion of their students offering the listed majors under
item 5 of Part I of the survey. This represented a varied range of students in the
convenient sample. The researcher contacted the professors of the selected classes to request permission to administer the survey. The selection of 8 classes was informed by the pilot study response rate of 57%. Given a class size of 25 to 30 students, the initial 8 classes provided enough participants for the survey. The researcher sent hotlinks of the survey to all the students in the class after permission was given by the professor of the class. The researcher briefed students about the research prior to the hotlinks being sent. After the researcher has been given permission by the professor of the class to administer the survey, a specific date and time when the survey is taken was determined by the researcher and the professor. It was decided by the researcher that if any of the professors decided not to allow the research to be conducted using the class, the researcher would seek 2 more classes with representative sample, however, all the professors contacted agreed to the researcher’s request to conduct the study using the class.

**Instrumentation**

The study utilized an online survey methodology. Data were collected with an online questionnaire consisting of 52 items. The instrument site was located at the SurveyMonkey website [http://www.surveymonkey.com](http://www.surveymonkey.com). This site linked the respondents to all the sections of the instrument hosted on the SurveyMonkey server. Email addresses of students in the College of Education at a large Midwestern University were obtained from the Office of Institutional Research at a large Midwestern University. This was a web-based survey. To improve the response rate email reminders with links to the survey was sent out to all participants inviting those who may not have responded after two weeks of the first invitation to participate in the survey.
The instrument development was informed by literature on the Seven Principles of Good Practice in Undergraduate Education and the use of technology. Parts I of the instrument involved the academic and demographic information. The academic and demographic data collected helped the researcher to better describe the study participants.

Part II, was designed to measure faculty instructional quality as perceived by students. Part II of the instrument was adapted from the questionnaire titled ‘student evaluation of instruction’ by the department of teacher education, college of education in a large Midwestern University (Student Evaluation of Instruction, n.d.). The questionnaire ‘student evaluation of instruction’ has been modified from the original questionnaire in various ways to suit the objective of the current study. The original questionnaire contained 18 items on a 5-point Likert scale and 7 structured open ended questions measuring instructional quality. Some items were dropped from the original questionnaire. All the structured questions were dropped because they did not pertain to the research being conducted. The wording and language of the questionnaire were modified to correspond to the current study. Almost all the items have been modified to suit the current study, therefore, reliability and validity of the instrument was determined via a pilot study. Appendix A is the instrument. Appendix G is the original student evaluation form.

Part III of the instrument relates to the various forms of technology and the seven principles of good practice in undergraduate education. The forms of technology include productivity tools, presentation tools, communication tools, and World Wide Web tools.
The choice of these tools was informed by the literature as revealed in chapter two of this dissertation.

Pilot Study Results

A pilot study involving selected students from the College of Education was carried out to check the survey items for errors and ensure that the instrument was clearly understood by respondents. Conducting a pilot study may mean spending some time to sample and collect the initial data but “the time spent creating good instruments and ensuring variability in true scores across people in the sample has an exceptionally high payoff” (Light et al., 1990, p. 171). A sample for the pilot study was undergraduate students in Technology Applications in Education: EDCT 203 course in spring 2007. The pilot study was conducted in the a large Midwestern University College of Education on the Athens Campus in spring 2007. Email with hotlinks to the survey was sent out to a total of 56 students in two EDCT 203 classes. A total of 32 responses were received and analyzed. The response rate of the pilot study was 57 percent. The researcher believes the high response rate was due to the fact that the researcher had interacted and explained the research to the professors of the two EDCT 203 classes who had either introduced the researcher or the survey to the class. The researcher used a similar strategy in the main study.

The pilot questionnaire was distributed among five experts to judge if the items were stated appropriately, the language used is appropriate and the items relate to each component. Suggestions from the experts were used to modify the instrument before piloting. Results from the pilot study are displayed in Appendix F. Results from the pilot
study provided very useful information that influenced the sample size for the main study. For example, a medium effect size based on the pilot study was used to determine sample size of the main study. The effect size was derived using the adjusted $R^2$ value of 0.224 which is more conservative. Additional analysis indicated that gender bumped up the overall significance of the model from 0.047 to 0.038. The corresponding adjusted $R^2$ value changed from 0.186 to 0.224 when gender was introduced as a predictor.

Correlations among some of the independent variables were high indicating possible multicollinearity issues; however, the tolerance of all the independent variables were examined and found to be higher than 0.10, an indication that multicollinearity is not a problem. The data were screened for extreme values by examining standardized scores of the variables. Kurtosis (peakedness of the distribution) and skewness (symmetry of the distribution) of the data were reviewed (Tabachnick & Fidell, 2007). In addition the data were tested for normality using histogram, and the normal Q-Q plot indicate that the normality assumption was not violated. Scatterplot of ZPRED and ZRESID was used to assess homoscedasticity (This assumption means that the variance around the regression line is the same for all values of the predictor variable) and linearity.

Using the G*Power software version 3.03. An effect size of .288 (computed from the adjusted R value of the pilot study) indicated by the power of .90 at an alpha of .05, a minimum sample size of 63 individuals was required (Faul et al., 2006).
Validity and Reliability of the Instrument

Validity Issues

Validity tells the researcher how well a measure truly assesses what she or he wants it to. In other words, validity is a relative concept that describes how appropriate or sound a measure is for the purpose for which it is meant. Measures are not universally valid; if one researcher was able to establish the validity of a measure does not mean that it is valid for other purposes. A measure is content valid if its individual items as a group cover all the different domains you want to measure (Light et al., 1990).

If the sample of situations or performances a test measures is representative of the set from which the sample was drawn and about which the research would be able to make generalizations, then the test is said to have content validity. In order to determine how a subject would function in a set of actual situations, a researcher may administer a test. Instead of placing a person in each situation, a test would offer a shortcut to establish their behaviors and performances in the entire set of research situations (Tuckman, 1999).

As a precaution and to ensure content validity in the study the researcher distributed the instrument among five experts in the field to judge if the items are stated appropriately, the language used is appropriate and the items relate to each component. Suggestions from the experts were used to modify the instrument to ensure content validity.

A factor analysis was performed to support construct validity. Results of the factor analysis show all questions loaded on 4 dimensions which together explain 72% of
the variance. The items loaded well and appear to measure the true construct for which it
is intended. Results of the factor analysis are displayed in Appendix L.

Reliability Issues

According to Light et al. (1990) whenever data is collected, measurement errors
could occur. An instrument that contains errors would not yield the underlying true score
which is the information the researcher wants. Rather than talk about measurement errors
directly researchers usually assess their measurement in terms of reliability, which
“describes the extent to which sets of measurement of the same characteristics on the
same people duplicate each other” (Light et al., 1990, p. 165).

Reliability is a measure of the degree of stability or consistency in a test. In other
words it is the extent to which you get the same result if you were to give the same
measure again to the same person under the same circumstances. A statistic called
Cronbach’s Alpha (α) is commonly used to tell one the overall consistency in the test.
Generally though in the social and behavioral sciences, most measure should have a
Cronbach’s Alpha of at least .6 or .7 and preferably closer to .9 to be considered useful in
giving one a sense of how reliable the test is (Tuckman, 1999).

Numerous factors account for unreliability in a test. These factors include:

1. Familiarity with the particular test form (such as multiple-choice
   questions)
2. Subject fatigue
3. Emotional strain
4. Physical conditions of the room in which the test is given
5. Subject health

6. Fluctuations of human memory

7. Subjects practice or experience in the specific skill being measured

8. Specific knowledge gained outside the experience evaluated by the test.

(Tuckman, 1999, p. 198)

When using a self made instrument, it is imperative that a researcher assess its reliability either before or during the study. Some commercially available standardized tests have been checked for reliability (Tuckman, 1999). This researcher used Cronbach (\( \alpha \)) reliability for item analysis. The analysis indicated to the researcher how reliable the items within each component and reliability for the whole scale are. From the pilot studies Cronbach (\( \alpha \)) of .926 for instructional quality, .777 for productivity tools, .875 for presentation tools, .867 for communication tools and .923 for world wide web tools were found for the instrument (Appendix F, Table 23).

Data Collection Procedure

Data were collected through an online questionnaire hosted on SurveyMonkey website. Data were thus collected automatically for further analysis through the site. An email containing a link to the questionnaire was sent to all participants in the selected classes. Email addresses were obtained from a large Midwestern University Human Resource Technology and Information Services and professors of the selected classes.

Data collection is a very important step in any research. Measurement quality enormously can be improved not only through thoughtful design and instrument construction but also through data collection procedure (Light et al., 1990).
The questionnaire was initially sent to all the students in the selected classes in the College of Education via their personal oak email which is the official email system by a large Midwestern University. Two emails were sent as follow-ups to students who could not respond to increase the response rate. An incentive for participation included a lottery prize of 8 USB drives, 512 megabytes worth $20 each, to be won by participants at the end of the survey in each of the 8 classes.

The data collection for the pilot study was over 10 days period, starting April 17, to April 26, 2007. The data collection for the main study was over a two-week period beginning May 24, 2007 to June 6, 2007. The researcher contacted the professors of the selected classes to request permission to administer the survey between May 24 and May 28th, 2007. Permission was given and the researcher sent hotlinks to the survey to all the students in the class via email. After the researcher has been given permission by the professor of the class to administer the survey, a specific date and time when the survey is taken was determined by the researcher and the professor. The researcher briefed students about the research prior to the hotlinks being sent.

The reasons for collecting data online included the following:

1. This was in congruence with what Instructional technology advocates: the use of technology to enhance education. What better way to demonstrate this and set a good example than by using technology to collect data.

2. The instrument also uses an online format for those who prefer collecting data online.

3. Faculty may not be willing to use class time to collect data.
Data Analysis Procedure

Data analysis involved quantitative techniques. Statistical Package for Social Science (SPSS) program in the 14.0 version was used to analyze all the data generated. The study utilized correlation and multiple regression analysis to analyze the data. The enter method was used. Data were cleaned before running any analysis. Cleaning the data helped to get rid of errors that can result from recording, coding, missing information influential cases or outliers. The study used descriptive statistics, scatter plots and histograms. Descriptive statistics was run to check for minimum and maximum values and compare the results to the ones in the data. Items found to be above maximum or minimum values than the original questionnaire would be rechecked to ensure that the inconsistencies are not attributable to coding, recoding or data entry. Taking into consideration the response rate if coding, or data entry were found not to be responsible for the errors the case would be dropped from the analysis. The standardized Z scores tests would be performed to capture any further errors and or extreme values that were not detected by the descriptive statistics.

Assumptions and how to test for compliance

Possible violations of assumptions in multiple regressions can affect the generalizability of the finding. Assumptions of multiple regression techniques was taken into consideration and tested during data analysis. Three assumptions underlie the significance test for multiple correlation coefficients. The assumptions are as follows: All variables are multivariately normally distributed in the population, represent an independent random sample from the population, and lack multicollinerarity. Kurtosis,
histogram, and the normal Q-Q plot were used to test the normality assumption. The second assumption: independent random sampling implies that all cases represent a random sampling for the population and that the scores on the variables are independent of other scores on the same variable. This is a reasonable assumption as all the 63 study participants were randomly selected. As described above multicollinearity was assessed by examining the correlations between the independent variables (forms of technology use for instruction: Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools) and the dependent variable (Student evaluation of faculty instructional quality) and examining the tolerance scores.

Summary

Conducting research in higher education is important. Results from such research can be used to strengthen the quality of education (Light et al., 1990). Conducting a good research demands good planning and making a good choice of research methodology. We need to conduct research to be able to answer pertinent questions such as: “Which Professors are the most effective? What do they do that makes them effective? Could others become more effective by emulating them? Are students integrating modern technology into the way they work and the way they learn? Do students who use computers learn more than those who do not?” (Light et al., 1990, p. 1). This chapter provided a discussion of the methodology that would be used to investigate to what extent student perceptions of different forms of technology use for instruction purposes can predict instructional quality. The questionnaire in Appendix A was used in the survey. Data analysis was quantitative using multiple regression analysis.
Chapter 4: Results

Introduction

The purpose of this study was to examine to what extent students perceptions of different forms of technology use for instruction purposes predict instructional quality. The researcher was motivated by the belief that through this study the extent to which various forms of technology namely; productivity tools, presentation tools, communication tools and the World Wide Web tools can predict instructional quality using the Chickering and Gamson (1991) Seven Principles of Good Practice in Undergraduate education as a guide. This chapter begins with the research question followed by instrumentation, reliability analysis, a description of the sample with descriptive data are presented. Inferential statistics were used to test the null hypothesis. Results of the null hypothesis test are presented.

Research Question

The following research question guided the study:

Q1. To what extent do student perceptions of different forms of technology use for instruction purposes predict instructional quality?

To answer the research question above the following hypothesis was tested:

\( H_0: R^2 = 0 \)

\( H_A: R^2 \neq 0 \)

\( H_0: \) The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and World Wide Web tools are not significant predictors of the dependent variable, instructional quality.
Hₐ: The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and world wide web tools are significant predictors of the dependent variable, instructional quality.

*Instrumentation*

Part I of the instrument involved the academic and demographic information. Part II, was designed to measure faculty instructional quality as perceived by students. Appendix A provides the instrument. Part III of the instrument relates to the various forms of technology and the seven principles of good practice in undergraduate education. The forms of technology include productivity tools, presentation tools, communication tools, and World Wide Web tools. The choice of these tools was informed by the literature as revealed in chapter two of this dissertation. Part II and Part III of the survey contained items on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree.

*Reliability of the Instrument*

Cronbach (α) reliability for item analysis was used to examine how reliable the items within each component and reliability for the whole scale on the instrument. From the main studies overall reliability with Cronbach (α) of .968 was found. For instructional quality Cronbach (α) of .926 for instructional quality, .909 for productivity tools, .861 for presentation tools, .940 for communication tools and .948 for World Wide Web tools were found for the instrument (Table 9).
Table 9

*Reliability Analysis of Instrument*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Reliability: Cronbach’s Alpha</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>O: Overall</td>
<td>.968</td>
<td>121</td>
</tr>
<tr>
<td>Q: Instructional Quality</td>
<td>.926</td>
<td>121</td>
</tr>
<tr>
<td>A: Productivity Tools</td>
<td>.909</td>
<td>121</td>
</tr>
<tr>
<td>B: Presentation Tools</td>
<td>.861</td>
<td>121</td>
</tr>
<tr>
<td>C: Communication Tools</td>
<td>.940</td>
<td>121</td>
</tr>
<tr>
<td>D: World Wide Web Tools</td>
<td>.948</td>
<td>121</td>
</tr>
</tbody>
</table>
Validity of the Instrument

The instrument was distributed among five experts in the field to judge if the items are stated appropriately, the language used is appropriate and the items relate to each component. The instrument was modified based on suggestions from the five experts to ensure content validity.

A factor analysis was performed to support construct validity. The results of the factor analysis are displayed in Appendix L. The results of the factor analysis shows all questions loaded on 4 dimensions which together explain 72% of the variance. In other words four underlying component explains the data: components 1, 2, 3, and 4. All World Wide Web tools questions loaded on component 1. All communication tools questions loaded on component 2. All productivity tools questions loaded on component 3. All presentation tools questions loaded on component 4. This indicates the loading was perfect. The items loaded well and appear to measure the true construct for which it is intended. The results of the factor analysis support the construct validity.

Using the G*Power software version 3.03, an effect size of .288 (computed from the adjusted R value of the pilot study) indicated by the power of .90 at an alpha of .05, a minimum sample size of 63 individuals was required (Faul et al., 2006). The effect size was derived using the adjusted $R^2$ value from the pilot study ($R^2 = .224$) which is more conservative.

Data collection and Cleaning

Data were collected through an online questionnaire consisting of 52 items hosted on SurveyMonkey website. Data were thus collected automatically for further analysis.
through the site. Email containing a link to the questionnaire was sent to all participants in the selected accessible population, students in the College of Education. The College of Education is the accessible population out of which a convenient sample was drawn by purposefully selecting 8 undergraduate classes in the College of Education. Email with hotlinks to the survey was sent to a total of 235 students in 8 classes. The selection was based on classes which had a sizeable proportion of their students offering the listed majors under item 5 of Part I of the survey. This represented a varied range of students in the convenient sample. Given a class size of 25 to 30 students, the initial 8 classes provided sufficient participants for the survey.

The data collection for the main study was over 14 days period, beginning May 24, 2007 to June 6, 2007. The researcher contacted the professors of the selected classes to request permission to administer the survey between May 24 and May 28th, 2007. Permission was given and the researcher sent hotlinks to the survey to all the students in the class via email. After the researcher has been given permission by the professor of the class to administer the survey, a specific date and time when the survey is taken was determined by the researcher and the professor. The researcher briefed students about the research prior to the hotlinks being sent. Two weeks after the first contact via email there were a total of 75 responses out of which 5 had not completed the survey. A second contact was made with the participants via email reminding them to take the survey. The Professors whose classes were selected to participate in the survey were very helpful in reminding students in class to voluntary take the survey. The researcher had worked with all the professors during the past year in his capacity as the LiveText specialist for the
College of Education. LiveText is an assessment and data management system adopted by College of Education for collating data from students to build a database to inform policy and for external accreditation purposes. The researcher had the opportunity to work in different settings for the professors, performing a wide variety of duties. The researcher taught classes for some professors that involved creating electronic portfolios in LiveText. The researcher also taught Webpage design in some of the classes where students were required to design WebPages, post various assignments and their group work on the web. The initial opportunity to work with the professors may have created a better rapport between the professors and the researcher. The professors were thus all very helpful especially in reminding students to voluntary participate in the survey. Overall 133 responses were received.

Data were examined before running any analysis to determine possible errors that would result from recording, coding, missing information, influential cases or outliers. The data were screened for extreme values by examining standardized scores of the variables. The following items were removed because they were not needed in the analysis: email of responders, names of responders, survey id of responders, date of response, and time survey was taken. A total of 235 students were sampled out of which 133 responses were received. One hundred and twenty two participants successfully completed the survey out of the 133 received. Eleven cases were deleted because each responded to 3 or less items on the survey in the demographic section with no response in the other sections of the survey.
A number of outliers were identified. The outliers identified were further investigated. None of the outliers was automatically dropped from analysis. The decision to investigate the outliers supports Stevens’s (1999) recommendation not to drop outliers automatically but to investigate first. The outliers can provide interesting cases that may lead to further studies (Stevens, 1999). Case number 44 was found to be an outlier on Productivity and Communication Scale and an extreme value on the Presentation Scale (Appendix J: Figure 23). A further investigation of the case revealed that the majority of responses by case 44 were very high with the exception of one response which was ranked 1 on the Likert scale. As Krosnick, (1999) notes, this indicates that the respondent might not be optimizing on the response to the survey. The statistical analyses were run with and without case 44 and found to be significant in both cases. Results of the analysis with case 44 are presented in (Appendix K, Table 30 and Table 31). A total of 121 responses were used in the analysis. A statistic that is useful in detecting influential points is the Cook’s distance. The Cook distance for all variables was examined and all values found to be within range. An influential point will have a Cooks value >1. The response rate of the main study was 56.6 percent. The response rate of the pilot study was 57 percent.

Demographics of the Sample

Participants ranged from 18 years to 39 years of age, with a mean age of 20.96 years. One hundred and twenty-one participants responded to the questions regarding gender. Of the respondents 86 (71.1%) were female, and 35 (28.9 %) were male. One hundred and twenty-one participants responded to the question regarding race. Of the
respondents, 111 (91.7%) were Caucasian, 5 (4.1%) were Black/African American, 2 (1.7 %) were Asian/Pacific Islander, 1 (0.8 %) was a person of Hispanic origin, and 1 (0.8 %) was a person of Native American origin. One participant did not respond to the question regarding race (Table 10).

Table 10

Demographic Information of Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>121</td>
<td>100</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Female</td>
<td>86</td>
<td>71.1</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>28.9</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Age</td>
<td>121</td>
<td>100</td>
<td>20.96</td>
<td>2.97</td>
<td>18 - 39</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>121</td>
<td>100</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Caucasian</td>
<td>111</td>
<td>91.7</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>African American or Black</td>
<td>5</td>
<td>4.1</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2</td>
<td>1.7</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>.8</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1</td>
<td>.8</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>No Response to Question</td>
<td>1</td>
<td>.8</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
</tbody>
</table>
Academic Level Information of Participants

One hundred and twenty-one participants responded to the question regarding academic level. Of the respondents, 24 (19.8 %) were 1st year, 37 (30.6%) were 2nd year, 21 (17.4%) were 3rd year, 39 (32.2%) were 4th year (Table 11).

Table 11

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Level</td>
<td>121</td>
<td>100</td>
</tr>
<tr>
<td>Freshman – 1st year</td>
<td>24</td>
<td>19.8</td>
</tr>
<tr>
<td>Sophomore – 2nd year</td>
<td>37</td>
<td>30.6</td>
</tr>
<tr>
<td>Junior – 3rd year</td>
<td>21</td>
<td>17.4</td>
</tr>
<tr>
<td>Senior – 4th year</td>
<td>39</td>
<td>32.2</td>
</tr>
</tbody>
</table>
Academic Major Information of Participants

One hundred and twenty-one participants responded to the question regarding academic major. Of the respondents, 27 (22.3%) were middle childhood education, 18 (14.9%) were integrated social studies education, 16 (13.2%) were integrated language arts education- adolescent-to-young adult, 15 (12.4%) were early childhood education, 13 (10.7%) were special education (intervention specialist), 8 (6.6%) were integrated mathematics education - adolescent-to-young adult, 5 (4.1%) were multi-age - physical education, 5 (4.1%) indicated other - undecided about their major, 4 (3.3%) were integrated science education - adolescent-to-young adult, 3 (2.5%) were multi-age - art education, 2 (1.7%) were multi-age music education, 2 (1.7%) were family and consumer science education - adolescent-to-young adult, 1 (0.8%) were physical science education - adolescent-to-young adult (Table 12).
Table 12

*Characteristics of Sample: Academic Major*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>121</td>
<td>100.0</td>
</tr>
<tr>
<td>Early Childhood Education</td>
<td>15</td>
<td>12.4</td>
</tr>
<tr>
<td>Middle Childhood Education</td>
<td>27</td>
<td>22.3</td>
</tr>
<tr>
<td>Special Education (Intervention Specialist)</td>
<td>13</td>
<td>10.7</td>
</tr>
<tr>
<td>Integrated Language Arts Education - Adolescent-to-Young Adult</td>
<td>16</td>
<td>13.2</td>
</tr>
<tr>
<td>Integrated Mathematics Education - Adolescent-to-Young Adult</td>
<td>8</td>
<td>6.6</td>
</tr>
<tr>
<td>Integrated Science Education - Adolescent-to-Young Adult</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td>Integrated Social Studies Education - Adolescent-to-Young Adult</td>
<td>18</td>
<td>14.9</td>
</tr>
<tr>
<td>Physical Science Education - Adolescent-to-Young Adult</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>Family and Consumer Science Education - Adolescent-to-Young Adult</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Multi-Age (Music Education)</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Multi-Age (Art Education)</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Multi-Age (Physical Education)</td>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>Multi-Age (Modern Languages Education)</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Other - Undecided about major</td>
<td>5</td>
<td>4.1</td>
</tr>
</tbody>
</table>
**Computer Ownership**

One hundred and twenty-one participants responded to the question regarding computer ownership. Of the 121 respondents, 106 (87.6%) did own a computer, 15 (12.4%) did not own a computer (Table 13).

Table 13

<table>
<thead>
<tr>
<th>Computer Ownership</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>15</td>
<td>12.4</td>
</tr>
<tr>
<td>Yes</td>
<td>106</td>
<td>87.6</td>
</tr>
</tbody>
</table>

**Statistical Analyses to Test Null Hypothesis**

Statistical Package for Social Science (SPSS) program in the 14.0 version was used to analyze all the data generated. Descriptive statistics were computed to test for assumptions. The study utilized correlation and multiple regression analysis to analyze the data.

**Assumption Testing for Multiple Regression Analysis**

Assumptions of multiple regression techniques was taken into consideration and tested during data analysis. Three assumptions underlie the significance test for multiple correlation coefficients. The assumptions are as follows: all variables are multivariately
normally distributed in the population, represent an independent random sample from the population, and lack multicollinearity. Kurtosis, histogram, and the normal Q-Q plot were used to test the normality assumption. The second assumption: independent random sampling implies that all cases represent a random sampling for the population and that the scores on the variables are independent of other scores on the same variable. This is a reasonable assumption as all the study participants had an equal chance of responding to the survey. The College of Education is the accessible population out of which a convenient sample was drawn by purposefully selecting 8 undergraduate classes in the College of Education. The selection was based on classes which had a sizeable proportion of their students offering the listed majors under item 5 of Part I of the survey. This represented a varied range of students in the population. Multicollinearity was assessed by examining the correlations between the independent variables (forms of technology use for instruction: Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools) and the dependent variable (student evaluation of faculty instructional quality) and examining the tolerance scores.

*Analysis of the Descriptive Multiple Regression Data*

To test for normality the independent and dependent variable scores on kurtosis, the normal Q-Q plot, and histogram were examined. Kurtosis (peakedness of the distribution) and skewness (symmetry of the distribution) of the data were reviewed. The test for normality using histogram and the normal Q-Q plot indicate that the normality assumption was not violated in the Productivity scale, Presentation scale, Communication scale and World Wide Web scale (Appendix J). Scatterplot of ZPRED and ZRESID was
used to assess homoscedasticity (This assumption means that the variance around the regression line is the same for all values of the predictor variable) and linearity.

Multicollinearity was assessed by examining the correlations between the independent variables and the dependent variable, and examining the Variance Inflation Factor (VIF) and tolerance scores. Correlations among some of the independent variables were high indicating possible multicollinearity issues; however, the tolerance of all the independent variables were examined and found to be within range, an indication that multicollinearity is not a problem. The following correlations were found between the Instructional Quality Scale and Productivity Tools Scale ($r = .578$), Presentation Tools scale ($r = .745$), Communication Tools Scale ($r = .455$) and World Wide Web Tools Scale ($r = .393$) (Table 7). The correlation between Productivity Tools Scale and Presentation Tools scale was ($r = .655$) suggesting a violation of the multicollinearity assumption.

Correlation between Productivity Tools Scale and Communication Tools scale was ($r = .625$). The correlation between Presentation and communication Tools Scale was ($r = .623$). These high correlations suggest a violation of the multicollinearity assumption (Stevens, 1999). An examination of the tolerance and VIF indicated that there were no violations of the assumption of multicollinearity as the values were all within range (Appendix K). Scatter plot of the residual ZRESID versus the predicted values ZPRED was used to assess homoscedasticity. The results depicted a random variation of points about the horizontal line of 0 indicating no violation of the assumption (Figure 7).
Among the predictors Presentation Tool has the highest mean followed by Productivity Tool, Communication Tools and World Wide tool (Table 14).

Table 14

*Descriptive Statistics*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Instructional Quality</td>
<td>72.61</td>
<td>9.05068</td>
<td>120</td>
</tr>
<tr>
<td>A: Productivity Tools</td>
<td>26.59</td>
<td>4.50617</td>
<td>120</td>
</tr>
<tr>
<td>B: Presentation Tools</td>
<td>27.09</td>
<td>3.97470</td>
<td>120</td>
</tr>
<tr>
<td>C: Communication Tools</td>
<td>26.07</td>
<td>5.33919</td>
<td>120</td>
</tr>
<tr>
<td>D: World Wide Web Tools</td>
<td>25.40</td>
<td>5.81566</td>
<td>120</td>
</tr>
</tbody>
</table>

B has the highest mean of 27.0917 among the predictors with N = 120.
Table 15

*Correlations Among Predictors and Criterion Variables*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Quality</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.578*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.745*</td>
<td>0.655*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.455*</td>
<td>0.625*</td>
<td>0.623*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.393*</td>
<td>0.495*</td>
<td>0.487*</td>
<td>0.496*</td>
<td></td>
</tr>
</tbody>
</table>

Predictors: A, B, C and D.

Predictors: A: Productivity Tools, B: Presentation tools, C: Communication tools,

D: World Wide Web tools.

Dependent Variable: Quality = Instructional Quality

* * Significant at 0.01
Regression Analysis

A multiple regression analysis was conducted to evaluate how well Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools predict Student Evaluation of Faculty Instructional Quality. The direct entry method was used. The model as a whole was significant, $F(4, 115) = 38.543, p < .001$ (Table 16 and 17). An $R^2$ of .57 was obtained from the analysis indicating that approximately 57% of the variance of the student evaluation of Instructional Quality Scale can be accounted for by the linear combination of Productivity Tools Scale, Presentation Tools Scale, Communication Tools Scale, and World Wide Web Tools Scale.

The significant levels of the regression coefficients which are assessed through $t$ statistics indicated that only two of the Independent variables, Productivity Tools Scale, Presentation Tools Scale, contributed significantly to the regression with $t$ of 2.082 and 7.617 respectively. Presentation Tools Scale was more significant at predicting Instructional Quality. The prediction model is illustrated by Scatter plot of the residual ZRESID versus the predicted values ZPRED (Figure 7).

The adjusted $R^2$ gives one an estimate of the shrinkage. The adjusted $R^2$ (from SPSS print out) estimates how much variance on y would be accounted for if we had derived the equation in the population from which the sample was drawn (Stevens, 1999). The adjusted $R^2$ for the regression model 1 was .558.
In the regression equation we are modeling $y$, assuming it is linearly related to the predictors $X_1, X_2, X_3, X_4$

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e_i$$

$$\hat{y} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$$

$\hat{y} = $ predicted value

Where $y$ is the Instructional Quality - IQ

$\beta_0 = $ constant

$\beta_1$ to $\beta_4 = $ Coefficients of the regression (unstandardised)

$X_1, = A_{SUM}$ Productivity Tools

$X_2, = B_{SUM}$ Presentation Tools

$X_3, = C_{SUM}$ Communication tools

$X_4 = D_{SUM}$ World Wide Web Tools

The regression equation for model 1 is:

$$\hat{y} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$$

IQ = 24.590 + .369A + 1.521B – .144C + .030D
Table 16

*Multiple Regression Analysis (N = 120) - Model One*

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td>.757</td>
<td>.573</td>
<td>.558</td>
<td>4</td>
</tr>
</tbody>
</table>

Predictors (constant): D, B, C, and A.

A: Productivity Tools, B: Presentation tools, C: Communication tools,
D: World Wide Web tools.

Dependent Variable: Instructional Quality

Table 17

*Multiple Regression Coefficients (N = 120) - Model One*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>24.590</td>
<td>3.963</td>
<td>0</td>
<td>6.205</td>
</tr>
<tr>
<td>A_Sum Productivity Tools</td>
<td>.369</td>
<td>.177</td>
<td>.184*</td>
<td>2.082*</td>
</tr>
<tr>
<td>B_Sum Presentation Tools</td>
<td>1.521</td>
<td>.200</td>
<td>.668**</td>
<td>7.617**</td>
</tr>
<tr>
<td>C_Sum Communication Tools</td>
<td>-.144</td>
<td>.145</td>
<td>-.085</td>
<td>-.995</td>
</tr>
<tr>
<td>D_Sum World Wide Web Tools</td>
<td>.030</td>
<td>.115</td>
<td>.019</td>
<td>.262</td>
</tr>
</tbody>
</table>

* Significant at 0.05  
** Significant at 0.01  
B - Unstandardized Coefficients  
β - Standardized Coefficients
Supplemental Analyses

Supplemental regression analysis was conducted to further explore the data. The predictors for the regression analysis were Faculty: Encourages student and faculty interaction scale – S1, Promotes cooperation among students scale – S2, Promotes active learning techniques scale – S3, Gives prompt feedback scale S4, Emphasizes time on task scale - S5, Communicates high expectations scale - S6 and Respects diverse talents and ways of learning scale – S7.

The test for normality using histogram, and the normal Q-Q plot indicate that the normality assumption was not violated in the S1, S2, S3, S4, S5, S6, and S7 (Appendix J – Figure 14 to 20 ). Scatterplot of ZPRED and ZRESID was used to assess homoscedasticity and linearity.

Assessing multicollinearity involved examining the correlations between the independent variables and the dependent variable, and examining the Variance Inflation Factor (VIF) and tolerance scores (Appendix K – Table 29). Correlations among some of the independent variables were high, however the tolerance of all the independent variables were examined and found to be higher than 0.10, an indication that multicollinearity is not a problem.

A supplementary analysis was conducted to test whether or not Gender does predict Instructional Quality ( I.Q.). There results indicated no statistically significant difference in the way female and male perceive Instructional Quality. Gender was therefore not a predictor of instructional quality, Appendix K (Table 32 and Table 33).
A supplementary analysis was conducted to test whether or not differences existed between male and females in the 4 academic levels (Freshman- 1st year, Sophomore - 2nd year, Junior - 3rd year, Senior - 4th year) using a Chi-square Test (Crosstabulation). It was found that there was a significant difference between the two groups – male and females $\chi^2 (3, N = 121) = 16.591, \rho < .001$. There were more female respondents than are males at each academic level except the senior year. Results of the distribution of the male and females in the different academic levels were displayed in Appendix K (Table 34).

Reliability of the Instrument

Supplemental analysis conducted included reliability for the instrument. Cronbach ($\alpha$) reliability for item analysis was used to examine how reliable the items within each component and reliability for the whole scale on the instrument. From the analysis Cronbach ($\alpha$) of .753 for S1; .701 for S2; .739 for S3; .692 for S4; .810 for S5; .746 for S6; .696 for S7 were found for the instrument (Table 18).
Table 18

Reliability Analysis of Instrument

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Reliability: Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Encourages student and faculty interaction</td>
<td>.753</td>
</tr>
<tr>
<td>S2: Promotes cooperation among students</td>
<td>.701</td>
</tr>
<tr>
<td>S3: Gives prompt feedback</td>
<td>.739</td>
</tr>
<tr>
<td>S4: Promotes active learning techniques</td>
<td>.692</td>
</tr>
<tr>
<td>S5: Emphasizes time on task</td>
<td>.810</td>
</tr>
<tr>
<td>S6: Communicates high expectations</td>
<td>.746</td>
</tr>
<tr>
<td>S7: Respects diverse talents and ways of learning</td>
<td>.696</td>
</tr>
</tbody>
</table>

The following correlations were found between the Instructional Quality Scale (Q) and S1 (r = .539), S2 (r = .546), S3 (r = .550), S4 (r = .546), S5 (r = .506), S6 (r = .563), S7 (r = .539). Summary of all the correlations between the predictors are displayed in Table 19. Correlations between the predictors were high. Correlations between S1 and S4 scale was (r = .847). The correlation between S5 and S6 Scale was (r = .836). The correlations between S6 and S7 scale was (r = .833) suggesting a violation of the multicollinearity assumption (Stevens, 1999). An examination of the tolerance and VIF indicated that there were no violations of the assumption of multicollinearity as the values were all within range. Scatter plot of the residual ZRESID versus the predicted values ZPRED was used to assess homoscedasticity (This assumption means that the
variance around the regression line is the same for all values of the predictor variable).
The results depicted a random variation of points about the horizontal line of 0 indicating no violation of the assumption Appendix J (Figure 8). Respect diverse talents and ways of learning has the highest mean followed by Student Faculty Interaction (Table 20).

Table 19

*Correlations among Predictors and Criterion Variables*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Quality</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>.539*</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>.546*</td>
<td>.852*</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>.550*</td>
<td>.742*</td>
<td>.761*</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>.546*</td>
<td>.847*</td>
<td>.840*</td>
<td>.829*</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>.506*</td>
<td>.780*</td>
<td>.774*</td>
<td>.832*</td>
<td>.811*</td>
<td>__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>.563*</td>
<td>.760*</td>
<td>.818*</td>
<td>.786*</td>
<td>.765*</td>
<td>.836*</td>
<td>__</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>.539*</td>
<td>.803*</td>
<td>.800*</td>
<td>.807*</td>
<td>.882*</td>
<td>.780*</td>
<td>.833*</td>
<td>__</td>
</tr>
</tbody>
</table>

* * Significant at 0.01

Predictors: S1, S2, S3, S4, S5, S6 and S7.

Predictors: S1: Encourages student and faculty interaction, S2: Promotes cooperation among students, S3: Promotes active learning techniques, S4: Gives prompt feedback, S5: Emphasizes time on task, S6: Communicates high expectations, S7: Respects diverse talents and ways of learning.

Dependent Variable: Quality = Instructional Quality
Table 20

Descriptive Statistics

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mean</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Encourages student and faculty interaction</td>
<td>15.19</td>
<td>121</td>
</tr>
<tr>
<td>S2: Promotes cooperation among students</td>
<td>15.02</td>
<td>121</td>
</tr>
<tr>
<td>S3: Gives prompt feedback</td>
<td>14.61</td>
<td>121</td>
</tr>
<tr>
<td>S4: Promotes active learning techniques</td>
<td>15.17</td>
<td>121</td>
</tr>
<tr>
<td>S5: Emphasizes time on task</td>
<td>14.42</td>
<td>121</td>
</tr>
<tr>
<td>S6: Communicates high expectations</td>
<td>14.81</td>
<td>121</td>
</tr>
<tr>
<td>S7: Respects diverse talents and ways of learning</td>
<td>15.27</td>
<td>121</td>
</tr>
</tbody>
</table>

Respect diverse talents and ways of learning has the highest mean of 15.27 among the predictors with N = 121.
Regression Analysis (Model Two)

A multiple regression analysis conducted to evaluate how well Predictors: S1, S2, S3, S4, S5, S6 and S7 predict Q indicate that the model as a whole was significant, F (7, 113) = 9.400, p< .001 (Table 21 and Table 22). An R^2 of .37 was obtained from the analysis indicating that approximately 37% of the variance of the student evaluation of Instructional Quality Scale can be accounted for by the linear combination of; S1, S2, S3, S4, S5, S6 and S7 scale. The adjusted R^2 for the regression model 2 was .329. The significant levels of the regression coefficients which are assessed through t statistics indicated that none of the Independent variables S1, S2, S3, S4, S5, S6 and S7 was individually significant with t of .919, .306, 1.419, .565, -.944, 1.707 and -.202 respectively. The regression equation for model 2 is:

\[
IQ = 40.558 + .492S1 + 184S2 + .684S3 + .415S4 + 484S5 + .981S6 - .133S7
\]

The prediction model is also illustrated by Scatter plot of the residual ZRESID versus the predicted values ZPRED Appendix J (Figure 8).
Table 21

**Multiple Regression Analysis (N = 120) - Model Two**

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td>.607</td>
<td>.368</td>
<td>.329</td>
<td>7</td>
</tr>
</tbody>
</table>

Predictors (constant): S1, S2, S3, S4, S5, S6 and S7.

Predictors: S1: Faculty encourages student and faculty interaction, S2: Faculty Promotes cooperation among students, S3: Faculty promotes active learning techniques, S4: Faculty Gives prompt feedback, S5: Faculty emphasizes time on task, S6: Faculty communicates high expectations, S7: Faculty respects diverse talents and ways of learning.

Dependent Variable: Instructional Quality
Table 22

*Multiple Regression Coefficients (N = 120) - Model Two*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>40.558</td>
<td>4.259</td>
<td>0</td>
<td>9.522</td>
</tr>
<tr>
<td>S1_Sum Student Faculty Interaction</td>
<td>.492</td>
<td>.535</td>
<td>.152</td>
<td>.919</td>
</tr>
<tr>
<td>S2_Sum cooperation among students</td>
<td>.184</td>
<td>.601</td>
<td>.053</td>
<td>.306</td>
</tr>
<tr>
<td>S3_Sum prompt feedback</td>
<td>.684</td>
<td>.482</td>
<td>.224</td>
<td>1.419</td>
</tr>
<tr>
<td>S4_Sum promote active learning techniques</td>
<td>.415</td>
<td>.735</td>
<td>.118</td>
<td>.565</td>
</tr>
<tr>
<td>S5_Sum emphasize time on task</td>
<td>-.484</td>
<td>.513</td>
<td>-.160</td>
<td>-.944</td>
</tr>
<tr>
<td>S6_Sum communicate high expectations</td>
<td>.981</td>
<td>.575</td>
<td>.303</td>
<td>1.707</td>
</tr>
<tr>
<td>S7_Sum respect diverse talents and ways of</td>
<td>-.133</td>
<td>.657</td>
<td>-.038</td>
<td>-.202</td>
</tr>
<tr>
<td>learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B - Unstandardized Coefficients

β - Standardized Coefficients
Summary

This chapter provided results of the main study. Data analysis was quantitative using multiple regression analysis. Data collected was presented, beginning with reliability using Cronbach’s Alpha (α) to measure the internal consistency of the survey instrument, factor analysis to support construct validity, demographic data, correlations, and regression results. To investigate to what extent student perceptions of different forms of technology use for instruction purposes can predict instructional quality this chapter presented results which set the stage for a detailed discussion in chapter 5.
Chapter 5: Discussion

Introduction

This chapter begins with a restating of the purpose and design of the study followed by the main research question and hypothesis underlying the study. A discussion of the sample is presented. The results of the null hypothesis and supplemental analyses are discussed and implications presented. Important insights garnered from the data are discussed. Limitations of the study and directions for future research are discussed.

Purpose and Design

The purpose of this study was to examine to what extent students perceptions of different forms of technology use for instruction purposes predict instructional quality. The study sought to explore whether different forms of technology: productivity tools, presentation tools, communication tools, and World Wide Web tools, reliably predict instructional quality. The study also aimed at examining which of the predictors, productivity tools, presentation tools, communication tools, and World Wide Web tools is more important in predicting instructional quality.

Data were collected with an online questionnaire. The instrument site was located at the SurveyMonkey website http://www.surveymonkey.com. This site linked the respondents to all the sections of the instrument hosted on the SurveyMonkey server. The questionnaire used to collect data in this study was specifically designed and refined by the researcher for the purposes of the study. The instrument consisted of three parts. Part
I of the instrument focused on demographic information. This information allowed the
author to better describe the study participants.

Part II, was designed to measure faculty instructional quality as perceived by
students. Part II of the instrument was adapted from the teacher education student
evaluation questionnaire titled ‘student evaluation of instruction’ by the department of
Teacher Education, College of Education in a large Midwestern University.

Part III of the instrument development was informed by literature on the seven
principles of good practice in undergraduate education and the use of technology. This
part of the instrument relates to the various forms of technology and the seven principles
of good practice in undergraduate education. The forms of technology include
productivity tools, presentation tools, communication tools, and World Wide Web tools.
The choice of these tools was informed by the literature in chapter two of this
dissertation.

The population of this study was all students of the Teacher Education Programs
within the United States. A large Midwestern University Teacher Education program in
the state of Ohio was the accessible population from which a convenient sample was
drawn. In the State of Ohio, all Colleges of Education undergraduate programs lead to
initial licensure which is accredited by NCATE. Since all teacher education training
programs in Ohio are to meet NCATE standards for accreditation, one can expect similar
characteristics in the teacher training institutions within the state of Ohio.
Research Question and Hypothesis

The following research question guided the study:

Q1. To what extent do student perceptions of different forms of technology use for instruction purposes predict instructional quality?

To answer the research question above the following hypothesis was tested:

\[ \text{Ho: } R^2 = 0 \]
\[ \text{HA: } R^2 \neq 0 \]

\text{Ho:} The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and World Wide Web tools are not significant predictors of the dependent variable, instructional quality.

\text{HA:} The independent variables, forms of technology use for instruction: productivity tools, presentation tools, communication tools, and world wide web tools are significant predictors of the dependent variable, instructional quality.

Discussion of the Findings

The multiple regression analysis rejected the null hypothesis that the independent variables, forms of technology use for instruction: Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools are not significant predictors of the dependent variable, instructional quality. The results indicate that productivity tools, presentation tools, communication tools, and World Wide Web tools are significant predictors of the dependent variable, instructional quality. Approximately 57\% of the variance of the student evaluation of Instructional Quality Scale (I.Q.) can be accounted for by its linear relationship with Productivity Tools Scale, Presentation Tools Scale,
Communication Tools Scale, and World Wide Web Tools Scale. Two of the predictor scales, Productivity Tools Scale and Presentation Tools Scale were statistically significant in predicting the Instructional Quality; Productivity Tools Scale ($N = 120, \beta = 0.369, p < 0.05$) and Presentation Tools Scale ($N = 120, \beta = 1.521, p < 0.01$). That is, an instructor who uses the Presentation and Productivity tools would on average be perceived by students as exhibiting a high Instructional Quality. All 4 tools -Productivity Tools, Presentation Tools, Communication Tools, and World Wide Web Tools individually correlated significantly with Instructional Quality Scale.

Findings support Solvie and Kloek (2007) claims that students learning needs can be addressed by technology tools. The results supports earlier research by Harley and Maher (2003) who reported that the deployment of quizzes online, conversion of chalkboard content to Powerpoint slides and the broadcast of video lectures over the Internet for on-demand replay resulted in positive time utilization, and promoted learning and understanding of course material.

The Seven Principles for Good Practice in Undergraduate Education was the guide for all the technology tools in Part III of the instrument. All the four predictors individually correlated with Instructional Quality, an indication there is a relationship. The overall significant results of the regression model and the subsequent significant results of the t-test for Presentation Tools and Productivity Tools is an indication that Presentation tool and Productivity can be used by faculty to facilitate student and faculty interaction, promote cooperation among students, promote active learning techniques, give prompt feedback, emphasize time on task, communicate high expectation and
respect diverse talents and ways of learning. Among the predictors, Presentation Tool emerged as the most important predictor of Instructional Quality.

The recognition of the benefits of Presentation Tool in instruction by students is well documented (Clarke, 2008). Evidence suggests students appreciate the benefits of Presentation Tools but are critical enough to discern the ability to use Presentation Tools in meeting teaching objectives versus using Presentation Tools as the main thrust of the lecture (Clarke, 2008). Using technology to promote good teaching involves using technology to deliver lectures, encouraging interaction among student and faculty, promoting cooperation among students and giving prompt feedback (Chickering & Gamson, 1991).

Students are diverse learners and learn through various means of instruction. The use of technology would better equip teachers with the means to diversify their instruction so that all students have a chance to learn in their own way. Consequently providing different potential pathways to learning through technology is important. Using a combination of all the various technologies – Presentation, Communication and the World Wide Web would help to facilitate good instruction and better learning. Where there are limited resources to cover all aspects of technology, committing resources towards Presentation and Productivity Tools appears to be a step in the right direction considering the current findings from this research. The researcher is in no way advocating for committing 100 % of funds to Presentation Tools and Productivity Tools but rather advocating for equity based on informed decision.
The results from regression model one and two support Chickering and Gamson (1991) that a good practice in undergraduate education involves the seven principles of good undergraduate education: that is, encourages student and faculty interaction, promotes cooperation among students, promotes active learning techniques, gives prompt feedback, emphasizes time on task, communicates high expectations and respects diverse talents and ways of learning. An effective instruction should include all these seven principles. The results support Kvavik and Caruso (2005) findings that instructors perceived by students as integrating technology in the curriculum report more interest in the subject, more engagement, better understanding of the complex issue and improve learning.

To make their teaching more effective, instructors should integrate technology in the curriculum. Instructors can use technology to encourage student and faculty interaction, promote cooperation among students, promote active learning techniques, give prompt feedback, emphasize time on task, communicate high expectations and respect diverse talents and ways of learning.

**Limitations of the Study**

The implications and conclusion of this study were restricted by the inherent limitations. These limitations were:

1. The use of questionnaire as an instrument for data collection. The limitation comes from deficiencies associated with questionnaire method for research specifically for data collection. These deficiencies include respondents’
honesty and their differences in the interpretation/understanding of the questions.

2. Problems with individual response. The responses represent perceptions of participants. This may have been influenced by other variables not included in the study.

3. The study focused on college students in a large Midwestern University College of Education on the Athens Campus. The study is thus limited to one college within a university making generalization of the results very difficult for the entire state or even country.

4. The reliability of the supplementary analysis scale was low. A low internal consistency may have contributed to the non significant result of the individual items on the scale the supplementary scale.

5. The researcher had worked with all the professors during the past year in his capacity as the LiveText specialist for the College of Education. The professors were thus very helpful in reminding students to voluntary participate in the survey. Such familiarity may have influenced other variables not included in the study.

Recommendations and Directions for Future Research

1. The reliability of the items on model one was very high. The reliability of the items for the model two was relatively low. The study should be repeated with an improved scale with higher reliability levels for the supplemental analysis.
This should provide reliable results for the individual items on model two and their ability to predict the dependent variable.

2. It may be useful to broaden the scope of future studies based upon the null hypothesis and supplemental analysis. Increasing the population will ensure that the results can be generalized to a much larger population. It is hoped that the study some of these technology tools if not all would manifest itself in the College of Education classrooms. This may lead to teaching practices that will promote greater interaction between instructor and student, cooperation among students and active learning techniques.

3. A qualitative analysis could be conducted to examine the differences in perceptions in the different scales such as Productivity Tools and Presentation Tools.

4. Further studies (qualitative) should be conducted to investigate in-depth to determine what students feel the role of technology should be in the classroom. Such a study can shed more light on perceptions of students on whether technology should replace lectures or should it be used to highlight salient points in a lecture.

Conclusion

The purpose of this study was to examine whether different forms of technology: productivity tools, presentation tools, communication tools, and World Wide Web tools, reliably predict instructional quality. The study also aimed at examining which of the predictors, productivity tools, presentation tools, communication tools, and World Wide
Web tools is more important in predicting instructional quality. The findings from the null hypothesis and supplementary analyses demonstrated a statistically significant relationship between the predictors and Instructional Quality. Productivity and Presentation Tools emerged as significant predictors of Instructional Quality. Presentation Tools was more important in predicting Instructional Quality from the perception of the students than Productivity Tools. The findings of this study provide additional literature supporting the role of technology in instruction. The research would provide administrators and instructors an insight into those technologies that students perceive as enhancing instructional quality.
References


Dodge, B., & Molebash, P. (2005). Mini-courses for teaching with technology: Thinking outside the 3-credit box. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2005* (pp. 3155-3156). Chesapeake, VA: AACE.


McCarthy, D. (2004). Practice makes possible. Preservice teachers use technology to learn before using it to teach. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference* (pp. 2481-2483). Chesapeake, VA: AACE.


Oblinger, D.G., & Hawking, B. L. (2005, September/October). The Myth about students: We understand our students. EDUCAUSE Review.


Student Evaluation of Instruction. (n.d.). Athens, OH: Teacher Education Department, College of Education, Ohio University.


Appendix A: Questionnaire

The Relationship of Technology Use to Perception of Instructional Quality

Part I: Academic and Demographic Information

1. Sex: (Mark the appropriate circle)
   o Female
   o Male

2. Age: (specify) ________________________________

3. Race/Ethnicity: (Mark the appropriate circle)
   o American Indian/Alaskan Native
   o African-American/Black
   o Asian/Pacific Islander
   o Caucasian
   o Hispanic/Latino
   o Other (specify)________________________________

4. Which of the following best describes your academic level in college?
   o Freshman (1st year student)
   o Sophomore (2nd year student)
   o Junior (3rd year student)
   o Senior (4th year student)
   o Other (specify)________________________________

5. What is your major? Mark the appropriate circle.
   o Early Childhood Education
   o Middle Childhood Education
   o Special Education (Intervention Specialist)
   o Integrated Language Arts Education - Adolescent-to-Young Adult
   o Integrated Mathematics Education - Adolescent-to-Young Adult
   o Integrated Science Education - Adolescent-to-Young Adult
   o Earth Science Education - Adolescent-to-Young Adult
   o Life Science Education (Chemistry and Physics) - Adolescent-to-Young Adult
   o Integrated Social Studies Education - Adolescent-to-Young Adult
   o Physical Science Education - Adolescent-to-Young Adult
   o Family and Consumer Science Education - Adolescent-to-Young Adult
   o Multi-Age (Music Education)
   o Multi-Age (Art Education)
   o Multi-Age (Physical Education)
   o Multi-Age (Modern Languages Education)
   o Other (specify)________________________________

6. Do you own a computer?
   o Yes
   o No
Part II. Student Evaluation of Instruction by College of Education Faculty  
(Instructional Quality)  
To what extent was each of the following given priority during this academic year  
by all College of Education faculty. Indicate whether you agree or disagree.  

<table>
<thead>
<tr>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Faculty uses of instructional materials/ technology were effective in promoting learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Faculty gave assignments that were purposeful and promoted learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Content of courses were current with knowledge and issues in field.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The courses increased your knowledge and competence in the subject area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Faculty teaching were effective.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Faculty were knowledgeable in their fields.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>If desired, faculty were available outside of class to give assistance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Faculty encouraged student participation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Faculty were enthusiastic about the subject.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Faculty used varied and creative instructional strategies.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Faculty demonstrated a genuine interest in educating students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>The faculty evaluation procedures and grading techniques were fair.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Faculty evaluation procedures and grading criteria were clearly communicated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Faculty evaluations were representative of course materials/objectives.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Faculty graded assignments were returned in a reasonable period of time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Faculty gave useful comments and feedback.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Overall the courses were of great value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Overall the courses achieved their stated objectives.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please use the following scale for your evaluation:  
SD = Strongly Disagree  
D = Disagree  
N = Neutral  
A = Agree  
SA = Strongly Agree
Part III: Student Evaluation of Technology Use by College of Education Faculty

Please use the following scale for your evaluation of Items A, B, C, and D:

- **SD** = Strongly Disagree
- **D** = Disagree
- **N** = Neutral
- **A** = Agree
- **SA** = Strongly Agree

### A. Productivity Tools (e.g. word processing, spreadsheet, and Blackboard tools).

Considering the productivity tools suggested above, to what extent do productivity tools encourage the following instructional principles by College of Education Faculty:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>College of Education faculty use productivity tools to encourage student and faculty interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>College of Education faculty use productivity tools to promote cooperation among students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>College of Education faculty use productivity tools to give prompt feedback.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>College of Education faculty use productivity tools to promote active learning techniques.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>College of Education faculty use productivity tools to emphasize time on task.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>College of Education faculty use productivity tools to communicate high expectations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>College of Education faculty use productivity tools to respect diverse talents and ways of learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**B. Presentation Tools** (e.g. video, presentation tools, films, slides).

Considering the presentation tools suggested above, to what extent do presentation tools encourage the following instructional principles by College of Education Faculty:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>College of Education faculty use presentation tools to encourage student and faculty interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>College of Education faculty use presentation tools to promote cooperation among students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>College of Education faculty use presentation tools to give prompt feedback.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>College of Education faculty use presentation tools to promote active learning techniques.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>College of Education faculty use presentation tools to emphasize time on task.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>College of Education faculty use presentation tools to communicate high expectations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>College of Education faculty use presentation tools to respect diverse talents and ways of learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. Communication Tools (e.g. email, chat, discussion board in Blackboard, video conferencing, instant messaging).

Considering the communication tools suggested above, to what extent do communication tools encourage the following instructional principles by College of Education Faculty:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>College of Education faculty use communication tools to encourage student and faculty interaction.</td>
</tr>
<tr>
<td>2</td>
<td>College of Education faculty use communication tools to promote cooperation among students.</td>
</tr>
<tr>
<td>3</td>
<td>College of Education faculty use communication tools to give prompt feedback.</td>
</tr>
<tr>
<td>4</td>
<td>College of Education faculty use communication tools to promote active learning techniques.</td>
</tr>
<tr>
<td>5</td>
<td>College of Education faculty use communication tools to emphasize time on task.</td>
</tr>
<tr>
<td>6</td>
<td>College of Education faculty use communication tools to communicate high expectations.</td>
</tr>
<tr>
<td>7</td>
<td>College of Education faculty use communication tools to respect diverse talents and ways of learning.</td>
</tr>
</tbody>
</table>
**D. World Wide Web Tools** (e.g. internet searches, wikis, blogs, creating webpages).

Considering the World Wide Web tools suggested above, to what extent do the World Wide Web encourage the following instructional principles by College of Education Faculty:

<table>
<thead>
<tr>
<th></th>
<th>College of Education faculty use World Wide Web tools to encourage student and faculty interaction.</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>College of Education faculty use World Wide Web tools to promote cooperation among students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>College of Education faculty use World Wide Web tools to give prompt feedback.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>College of Education faculty use World Wide Web tools to promote active learning techniques.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>College of Education faculty use World Wide Web tools to emphasize time on task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>College of Education faculty use World Wide Web tools to communicate high expectations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>College of Education faculty use World Wide Web tools to respect diverse talents and ways of learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Participant,

I am a Ph.D. Student in Instructional Technology at Ohio University in Athens, Ohio. The completion of a dissertation is part of the requirements for this degree. Accordingly, I am conducting a study that focuses on the relationship of technology use and perception of instructional quality at Ohio University College of Education. The participants for this study are students from the Ohio University College of Education.

Your participation is crucial in helping to successfully conduct this study. The significance, recommendations, and the conclusion of the study will be based on your response. Participants will be asked to respond to questions on demographic and academic information, teaching and learning strategies, and experiences with technology. Participation is voluntary. There are no known or anticipated risks to the participants involve in the study. You must be 18 years of age or older to participate in this study. To protect every participant’s confidentiality no results will be reported using real names or pseudonyms to protect the participant’s identities.

After you complete the survey, you will be entered into a lottery and you have the chance to win a Flash Memory drive (USB storage device of 512 Megabytes/1GB) with a value of $20 to $40.

Here is a link to the survey:
[SurveyLink]

Thanks for your participation,

Albert Akyeampong

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]
Appendix C: Consent on Survey

Dear Participant,
Thank you for participating in this research. I am a Ph.D. Student in Instructional Technology at Ohio University in Athens, Ohio. The completion of a dissertation is part of the requirements for this degree. Accordingly, I am conducting a study that focuses on the relationship of technology use and perception of instructional quality at Ohio University College of Education.

You must be 18 years of age or older to participate in this study. The whole survey will take approximately 15 minutes of your time. Please complete all of the items. It is usually best to respond with your first impression. Because no names are being collected with the survey your responses will be completely anonymous. There are no known or anticipated risks to the participants involve in the study. By answering the questions in the survey, you are providing consent and agreeing to participate in this Pilot Study.

Confidentiality of the data would be ensured fully by limiting the access of the data to the researcher, members of the dissertation committee, and those individuals or departments involved in the analysis of the data. To protect every participant’s confidentiality no results will be reported using real names or pseudonyms to protect the participant’s identities.

After you complete the survey, you will be entered into a lottery and you have the chance to win a Flash Memory drive (USB storage device of one Gigabyte capacity: A total of 8 Flash Memory drives will be available for the lottery) with a value of $30 each.

Your participation is crucial in helping to successfully conduct this study. The significance, recommendations, and the conclusion of the study will be based on your response. Participants will be expected to respond to questions on demographic and academic information, teaching and learning strategies, and experiences with technology.

When you have finished responding to all items, please click the Submit button at the bottom of the survey. Again, thank you for your Participation.

Click ‘Next’ to get started with the survey.
Appendix D: Follow up Letter for Survey

Help with survey and win a USB Flash Drive

Dear Participant,
You have most likely received an email (or two) regarding participating in my dissertation study. I am a doctoral student in Instructional Technology. The completion of a dissertation is part of the requirements for this degree. Accordingly, I am conducting a study that focuses on the relationship of technology use and perception of instructional quality at Ohio University, College of Education.

I still need more students, to fill out my survey which is investigating the relationship of technology use and perception of instructional quality at Ohio University, College of Education. If you have already filled it out, thank you so much for your help. However, if you have not I would really appreciate it if you could take 15 minutes of your time to fill out the online surveys.

Your participation would help me out greatly as I still need many more people to participate. The survey is confidential so you do not have to give your name. The whole process will take only 15 minutes. Once you start the survey it goes by quickly. I appreciate your taking the time to read this email.

After you complete the survey, you will be entered into a lottery and you have the chance to win a Flash Memory drive (USB storage device of 512 Megabytes /1GB) with a value of $20 to $40.
Here is a link to the survey:
[SurveyLink]

Thanks for your participation,

Albert Akyeampong
Instructional Technology
College of Education
McCracken Hall
Athens, OH 45701

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]
Appendix E: Letter to the Experts

Instructional Technology
Educational Studies
College of Education
McCracken Hall
Athens, OH 45701

Date……………

Dear Dr ……,

I am a Ph.D. Student in Instructional Technology at Ohio University in Athens, Ohio. The completion of a dissertation is part of the requirements for this degree. Accordingly, I am conducting a study that focuses on the relationship of technology use and perception of instructional quality at Ohio University College of Education. The participants for this study are students from the Ohio University College of Education.

To ensure content validity in this study I am sending the instrument to you as an expert in the field, to judge if the items are stated appropriately, the language used is appropriate and the items relate to each component. Your suggestions will be used to modify the instrument to ensure content validity. I do not want you to answer the individual questions but to judge if the items are appropriate and relate to the component.

Your input is crucial to the success of this study. Be assured that all your comments will be confidential. Your participation in this exercise is important and will be very much appreciated.

Sincerely,

Albert Akyeampong
Appendix F: Pilot Study Results

Table 23

Reliability Analysis of Instrument

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Reliability: Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Instructional Quality</td>
<td>.926</td>
</tr>
<tr>
<td>A: Productivity Tools</td>
<td>.777</td>
</tr>
<tr>
<td>B: Presentation Tools</td>
<td>.875</td>
</tr>
<tr>
<td>C: Communication Tools</td>
<td>.867</td>
</tr>
<tr>
<td>D: World Wide Web Tools</td>
<td>.923</td>
</tr>
</tbody>
</table>
Table 24

*Descriptive Statistics*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Instructional Quality</td>
<td>75.9688</td>
<td>32</td>
</tr>
<tr>
<td>A: Productivity Tools</td>
<td>27.3750</td>
<td>32</td>
</tr>
<tr>
<td>B: Presentation Tools</td>
<td>27.2188</td>
<td>32</td>
</tr>
<tr>
<td>C: Communication Tools</td>
<td>29.2500</td>
<td>32</td>
</tr>
</tbody>
</table>

C has the highest mean of 29.25 among the predictors with N = 32.
Table 25

*Model Summary (without gender as predictor)*

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td>.540(a)</td>
<td>.291</td>
<td>.186</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Predictors: A, B, C and D.

Dependent Variable: Quality

A = Productivity Tools, B = Presentation tools, C = Communication tools, D = World Wide Web tools.
Table 26

_Model Summary (Gender included as a Predictor)_

<table>
<thead>
<tr>
<th>Adjusted</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>R Square</td>
<td>R Square</td>
<td>Change Statistics</td>
</tr>
<tr>
<td>.591 (a)</td>
<td>.349</td>
<td>.224</td>
<td>5 26 .038</td>
</tr>
</tbody>
</table>

Predictors: (Constant), D, Gender, A, B, C

Dependent Variable: Quality
Table 27

**Correlations among Predictors and Criterion Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Quality</th>
<th>Gender</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.192</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>.389</td>
<td>-.116</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.391</td>
<td>.136</td>
<td>.615</td>
<td>__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.510</td>
<td>.004</td>
<td>.691</td>
<td>.748</td>
<td>__</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>.315</td>
<td>.130</td>
<td>.581</td>
<td>.698</td>
<td>.804</td>
<td>__</td>
</tr>
</tbody>
</table>

Predictors: A = Productivity Tools Scale, B = Presentation tools Scale, C = Communication tools Scale, D = World Wide Web tools Scale, Gender.

Dependent Variable: Quality = Instructional Quality
Figure 1. Scatterplot of ZPPRED and ZRESID.
Figure 2. Normal Q-Q Plots for items on the Productivity Tools Scale.
Figure 3. Normal Q-Q Plots for Items on the Presentation Tools Scale.
Figure 4. Normal Q-Q Plots for Items on the communication Tools Scale.
Figure 5. Normal Q-Q Plots for Items on the World Wide Web Tools Scale.
Case number 14 is an outlier on C and D. Case 1 is an outlier in instructional quality. In the main study, such cases will be excluded from the analysis to see if it would give a different result.

*Figure 6.* Box Plots for A, B, C, D, and Quality.
Appendix G: Student Evaluation Form (Side A)
Appendix H: Student Evaluation Form (Side B)

### THE INSTRUCTOR

- What did the instructor do that made this class valuable?

- What recommendations would you make to the instructor to strengthen his or her teaching and to help students learn? (Consider content, materials, activities, assignments that should be dropped or added, amount and kind of feedback, as well as changes in teaching strategies.)

<table>
<thead>
<tr>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. The instructor was knowledgeable in the field.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>9. If desired, the instructor was available outside of class time to give assistance.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>10. The instructor encouraged student participation.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>11. The instructor was enthusiastic about the subject.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>12. The instructor used varied and creative instructional strategies.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>13. The instructor demonstrated a genuine interest in educating students.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
</tbody>
</table>

### EVALUATION OF STUDENT PERFORMANCE

- What recommendations would you make to clarify grading methods or promote fairness so that the grades you receive reflect both the effort and quality you put into the course work?

<table>
<thead>
<tr>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Evaluation procedures and grading techniques were fair.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>15. Evaluation procedures and grading criteria were clearly communicated.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>16. Evaluation was representative of course material/objectives.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>17. Graded assignments were returned in a reasonable period of time.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>18. Useful comments and feedback were given.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
</tbody>
</table>

- What advice would you give to students who are thinking of taking this course?

- What additional comments or suggestions could you offer?

### ADDITIONAL INSTRUCTOR DESIGNED QUESTIONS

<table>
<thead>
<tr>
<th></th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td>20.</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>A</td>
</tr>
</tbody>
</table>
Appendix I: IRB Approval Document

The amendment, detailed below, and submitted for the following research study has been approved by the Institutional Review Board at Ohio University. Approval date of this amendment does not affect the expiration date of the original approval.

Amendment: Title Change

Project: The Relationship of Technology Use to Perception of Instructional Quality

Project Director: Albert Akyeampong

Advisor: Teresa Franklin
Department: Educational Studies

Rebecca Cale
Institutional Review Board
1/31/08
Date
Appendix J: Figures


*Figure 7.* Scatterplot of ZPPRED and ZRESID (for A, B, C and D scale).
Predictors: S1: Encourages student and faculty interaction, S2: Promotes cooperation among students, S3: Promotes active learning techniques, S4: Gives prompt feedback, S5: Emphasizes time on task, S6: Communicates high expectations, S7: Respects diverse talents and ways of learning.

*Figure 8.* Scatterplot of ZPPRED and ZRESID (for S1, S2, S3, S4, S5, S6, and S7 scale).
Figure 9. Normal Q-Q Plots for Items on the Quality Scale.
Figure 10. Normal Q-Q Plots for Items on the Productivity Tools Scale.
Figure 11. Normal Q-Q Plots for Items on the Presentation Tools Scale.
Figure 12. Normal Q-Q Plots for Items on the communication Tools Scale.
Figure 13. Normal Q-Q Plots for Items on the World Wide Web Tools Scale.
Normal Q-Q Plot of S1_Sum Student Faculty Interaction

Figure 14. Normal Q-Q Plots for Items on the S1 Scale.
Normal Q-Q Plot of S2_Sum cooperation among students

Figure 15. Normal Q-Q Plots for Items on S2 Scale.
Normal Q-Q Plot of S3_Sum prompt feedback

Figure 16. Normal Q-Q Plots for Items on the S3 Scale.
Normal Q-Q Plot of S4_Sum promote active learning techniques

Figure 17. Normal Q-Q Plots for Items on the S4 Scale.
Normal Q-Q Plot of S5_Sum emphasize time on task

Figure 18. Normal Q-Q Plots for Items on the S5 Scale.
Normal Q-Q Plot of S6_Sum communicate high expectations

*Figure 19*. Normal Q-Q Plots for Items on the S6 Scale.
Normal Q-Q Plot of S7_Sum respect diverse talents and ways of learning

Figure 20. Normal Q-Q Plots for Items on the S7 Scale
Figure 21. Box Plots for A, B, C, and D.
Figure 22. Box Plots for S1, S2, S3, S4, S5, S6, and S7.
This Box plot showing item 44 as an outlier on Productivity Scale and Communication Scale and an Extreme value on the Presentation scale.

*Figure 23. Box Plots for A, B, C, and D – Item 44 as Extreme Value.*
Figure 24. Histogram for Productivity Tools.
Figure 25. Histogram for Presentation Tools.
Figure 26. Histogram for Communication Tools.
Figure 27. Histogram for World Wide Web Tools.
Scatterplot

Dependent Variable: IQ_sum

Regression Standardized Predicted Value


*Figure 28.* Scatterplot of ZPPRED and ZRESID (with, A, B, C, D and Gender).
Appendix K: Tables

Table 28

**Collinearity Statistics**

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Productivity Tools</td>
<td>.477</td>
<td>2.096</td>
</tr>
<tr>
<td>B: Presentation Tools</td>
<td>.483</td>
<td>2.071</td>
</tr>
<tr>
<td>C: Communication Tools</td>
<td>.507</td>
<td>1.972</td>
</tr>
<tr>
<td>D: World Wide Web Tools</td>
<td>.679</td>
<td>1.473</td>
</tr>
</tbody>
</table>
Table 29

*Collinearity Statistics - Supplemental*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1_Sum Student Faculty Interaction</td>
<td>.204</td>
<td>4.900</td>
</tr>
<tr>
<td>S2_Sum cooperation among students</td>
<td>.183</td>
<td>5.456</td>
</tr>
<tr>
<td>S3_Sum prompt feedback</td>
<td>.224</td>
<td>4.465</td>
</tr>
<tr>
<td>S4_Sum promote active learning techniques</td>
<td>.129</td>
<td>7.780</td>
</tr>
<tr>
<td>S5_Sum emphasize time on task</td>
<td>.195</td>
<td>5.122</td>
</tr>
<tr>
<td>S6_Sum communicate high expectations</td>
<td>.178</td>
<td>5.632</td>
</tr>
<tr>
<td>S7_Sum respect diverse talents and ways of learning</td>
<td>.156</td>
<td>6.417</td>
</tr>
</tbody>
</table>
Table 30

*Multiple Regression Analysis - Case 44 Included*

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td>.776(a)</td>
<td>.602</td>
<td>.584</td>
</tr>
</tbody>
</table>

Predictors (constant): D, B, C, and A.


Dependent Variable: Instructional Quality

Summary of the Seven Principles and Productivity Tools
Table 31

*Multiple Regression Coefficients (N = 121) - Case 44 Included*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>26.018</td>
<td>3.608</td>
<td>0</td>
<td>7.211</td>
</tr>
<tr>
<td>A_Sum Productivity Tools</td>
<td>.345</td>
<td>.178</td>
<td>.177</td>
<td>1.941</td>
</tr>
<tr>
<td>B_Sum Presentation Tools</td>
<td>1.481</td>
<td>.196</td>
<td>.684</td>
<td>7.550</td>
</tr>
<tr>
<td>C_Sum Communication Tools</td>
<td>-.137</td>
<td>.146</td>
<td>-.082</td>
<td>-.941</td>
</tr>
<tr>
<td>D_Sum World Wide Web Tools</td>
<td>.018</td>
<td>.116</td>
<td>.011</td>
<td>.153</td>
</tr>
</tbody>
</table>
Table 32

*Multiple Regression Analysis - Gender Included*

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>.758(a)</td>
<td>.574</td>
<td>.556</td>
<td>5</td>
<td>114</td>
</tr>
</tbody>
</table>

Predictors (constant): Gender, D, B, C, and A.

A: Productivity Tools, B: Presentation tools, C: Communication tools,

D: World Wide Web tools.

Dependent Variable: Instructional Quality

Summary of the Seven Principles and Productivity Tools
Table 33

*Multiple Regression Coefficients (N = 121) - Gender Included*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>24.340</td>
<td>3.993</td>
<td>0</td>
<td>6.096</td>
</tr>
<tr>
<td>A_Sum Productivity Tools</td>
<td>.359</td>
<td>.178</td>
<td>.179</td>
<td>2.014</td>
</tr>
<tr>
<td>B_Sum Presentation Tools</td>
<td>1.520</td>
<td>.200</td>
<td>.668</td>
<td>7.592</td>
</tr>
<tr>
<td>C_Sum Communication Tools</td>
<td>-.138</td>
<td>.146</td>
<td>-.081</td>
<td>-.943</td>
</tr>
<tr>
<td>D_Sum World Wide Web Tools</td>
<td>.023</td>
<td>.116</td>
<td>.015</td>
<td>.195</td>
</tr>
<tr>
<td>Gender</td>
<td>.781</td>
<td>1.230</td>
<td>.039</td>
<td>.635</td>
</tr>
</tbody>
</table>
### Table 34

**Gender Difference Between Academic Levels**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Observed</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freshman</td>
<td>Sophomore</td>
</tr>
<tr>
<td>male</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>6.9</td>
<td>10.7</td>
</tr>
<tr>
<td>female</td>
<td>19</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>17.1</td>
<td>26.3</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>24.0</td>
<td>37.0</td>
</tr>
</tbody>
</table>

$\chi^2 (3, N = 121) = 16.591, \ p < .001$
Table 35A

*Factor Analysis: Rotated Component Matrix*

<table>
<thead>
<tr>
<th>Productivity Tools</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage student and faculty interaction</td>
<td>.148</td>
<td>.426</td>
<td>.627</td>
<td>.259</td>
</tr>
<tr>
<td>Promote cooperation among students</td>
<td>.136</td>
<td>.384</td>
<td>.697</td>
<td>.152</td>
</tr>
<tr>
<td>Give prompt feedback</td>
<td>.197</td>
<td>.334</td>
<td>.722</td>
<td>.122</td>
</tr>
<tr>
<td>Promote active learning techniques</td>
<td>.297</td>
<td>.227</td>
<td>.728</td>
<td>.243</td>
</tr>
<tr>
<td>Emphasize time on task</td>
<td>.331</td>
<td>.173</td>
<td>.679</td>
<td>.263</td>
</tr>
<tr>
<td>Communicate high expectations</td>
<td>.180</td>
<td>.184</td>
<td>.747</td>
<td>.289</td>
</tr>
<tr>
<td>Respect diverse talents and ways of learning</td>
<td>.149</td>
<td>.177</td>
<td>.750</td>
<td>.288</td>
</tr>
</tbody>
</table>
### Table 35B

*Factor Analysis: Rotated Component Matrix Continued*

<table>
<thead>
<tr>
<th></th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>presentation tools encourage student and faculty interaction</td>
<td>.176</td>
<td>.414</td>
<td>.053</td>
<td>.695</td>
</tr>
<tr>
<td>presentation tools promote cooperation among students</td>
<td>.107</td>
<td>.391</td>
<td>.223</td>
<td>.674</td>
</tr>
<tr>
<td>presentation tools give prompt feedback</td>
<td>.286</td>
<td>.237</td>
<td>.383</td>
<td>.425</td>
</tr>
<tr>
<td>presentation tools promote active learning techniques</td>
<td>.103</td>
<td>.153</td>
<td>.207</td>
<td>.776</td>
</tr>
<tr>
<td>presentation tools emphasize time on task</td>
<td>.304</td>
<td>.198</td>
<td>.403</td>
<td>.604</td>
</tr>
<tr>
<td>presentation tools communicate high expectations</td>
<td>.175</td>
<td>.091</td>
<td>.341</td>
<td>.669</td>
</tr>
<tr>
<td>presentation tools respect diverse talents and ways of learning</td>
<td>.235</td>
<td>.233</td>
<td>.327</td>
<td>.657</td>
</tr>
</tbody>
</table>
Table 35C

*Factor Analysis: Rotated Component Matrix Continued*

<table>
<thead>
<tr>
<th></th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>communication tools encourage student and faculty interaction</td>
<td>.254</td>
<td>.805</td>
<td>.190</td>
<td>.178</td>
</tr>
<tr>
<td>communication tools promote cooperation among students</td>
<td>.187</td>
<td>.781</td>
<td>.239</td>
<td>.157</td>
</tr>
<tr>
<td>communication tools give prompt feedback</td>
<td>.190</td>
<td>.768</td>
<td>.170</td>
<td>.302</td>
</tr>
<tr>
<td>communication tools promote active learning techniques</td>
<td>.197</td>
<td>.794</td>
<td>.238</td>
<td>.190</td>
</tr>
<tr>
<td>communication tools emphasize time on task</td>
<td>.308</td>
<td>.688</td>
<td>.278</td>
<td>.279</td>
</tr>
<tr>
<td>communication tools communicate high expectations</td>
<td>.175</td>
<td>.778</td>
<td>.325</td>
<td>.300</td>
</tr>
<tr>
<td>communication tools respect diverse talents and ways of learning</td>
<td>.224</td>
<td>.750</td>
<td>.319</td>
<td>.130</td>
</tr>
</tbody>
</table>
Table 35D

*Factor Analysis: Rotated Component Matrix Continued*

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>world wide web tools encourage student and faculty interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>world wide web tools promote cooperation among students</td>
<td>.786</td>
<td>.264</td>
<td>.124</td>
<td>.189</td>
</tr>
<tr>
<td>world wide web tools give prompt feedback</td>
<td>.816</td>
<td>.158</td>
<td>.103</td>
<td>.249</td>
</tr>
<tr>
<td>world wide web tools promote active learning techniques</td>
<td>.795</td>
<td>.142</td>
<td>.295</td>
<td>.112</td>
</tr>
<tr>
<td>world wide web tools emphasize time on task</td>
<td>.808</td>
<td>.304</td>
<td>.184</td>
<td>.102</td>
</tr>
<tr>
<td>world wide web tools communicate high expectations</td>
<td>.845</td>
<td>.164</td>
<td>.219</td>
<td>.209</td>
</tr>
<tr>
<td>world wide web tools respect diverse talents and ways of learning</td>
<td>.863</td>
<td>.100</td>
<td>.267</td>
<td>.166</td>
</tr>
<tr>
<td>world wide web tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Table 36A

*Factor Analysis: Total variance Explained*

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative</td>
</tr>
<tr>
<td>1</td>
<td>13.839</td>
<td>49.424</td>
<td>49.424</td>
</tr>
<tr>
<td>2</td>
<td>2.855</td>
<td>10.198</td>
<td>59.622</td>
</tr>
<tr>
<td>3</td>
<td>1.936</td>
<td>6.915</td>
<td>66.537</td>
</tr>
<tr>
<td>4</td>
<td>1.439</td>
<td>5.140</td>
<td>71.677</td>
</tr>
<tr>
<td>5</td>
<td>.967</td>
<td>3.452</td>
<td>75.129</td>
</tr>
<tr>
<td>6</td>
<td>.908</td>
<td>3.241</td>
<td>78.370</td>
</tr>
<tr>
<td>7</td>
<td>.677</td>
<td>2.418</td>
<td>80.788</td>
</tr>
<tr>
<td>8</td>
<td>.629</td>
<td>2.248</td>
<td>83.036</td>
</tr>
<tr>
<td>9</td>
<td>.615</td>
<td>2.197</td>
<td>85.232</td>
</tr>
<tr>
<td>10</td>
<td>.533</td>
<td>1.904</td>
<td>87.137</td>
</tr>
<tr>
<td>11</td>
<td>.448</td>
<td>1.601</td>
<td>88.738</td>
</tr>
<tr>
<td>12</td>
<td>.388</td>
<td>1.384</td>
<td>90.122</td>
</tr>
<tr>
<td>13</td>
<td>.357</td>
<td>1.273</td>
<td>91.396</td>
</tr>
<tr>
<td>14</td>
<td>.310</td>
<td>1.106</td>
<td>92.502</td>
</tr>
<tr>
<td>15</td>
<td>.281</td>
<td>1.003</td>
<td>93.505</td>
</tr>
<tr>
<td>16</td>
<td>.241</td>
<td>.860</td>
<td>94.365</td>
</tr>
<tr>
<td>17</td>
<td>.228</td>
<td>.813</td>
<td>95.178</td>
</tr>
<tr>
<td>18</td>
<td>.208</td>
<td>.742</td>
<td>95.921</td>
</tr>
<tr>
<td>19</td>
<td>.190</td>
<td>.680</td>
<td>96.600</td>
</tr>
<tr>
<td>20</td>
<td>.171</td>
<td>.609</td>
<td>97.209</td>
</tr>
<tr>
<td>21</td>
<td>.156</td>
<td>.557</td>
<td>97.767</td>
</tr>
<tr>
<td>22</td>
<td>.137</td>
<td>.488</td>
<td>98.255</td>
</tr>
<tr>
<td>23</td>
<td>.122</td>
<td>.437</td>
<td>98.691</td>
</tr>
</tbody>
</table>
Table 36B

*Factor Analysis: Total Variance Explained Continued.*

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Variance</td>
<td>% of Variance</td>
<td>Cumulative</td>
</tr>
<tr>
<td>24</td>
<td>.094</td>
<td>.336</td>
<td>99.028</td>
</tr>
<tr>
<td>25</td>
<td>.091</td>
<td>.325</td>
<td>99.353</td>
</tr>
<tr>
<td>26</td>
<td>.072</td>
<td>.257</td>
<td>99.610</td>
</tr>
<tr>
<td>27</td>
<td>.060</td>
<td>.216</td>
<td>99.826</td>
</tr>
<tr>
<td>28</td>
<td>.049</td>
<td>.174</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Appendix M: Descriptive Statistics for Questions

Table 37

*Descriptive Statistics for Student Evaluation of Instruction by College of Education Faculty - Instructional Quality*

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>faculty use of instructional material</td>
<td>3.99</td>
<td>.689</td>
<td>121</td>
</tr>
<tr>
<td>faculty gave purposeful assignment</td>
<td>3.96</td>
<td>.712</td>
<td>121</td>
</tr>
<tr>
<td>course content current with knowledge in field</td>
<td>4.07</td>
<td>.668</td>
<td>121</td>
</tr>
<tr>
<td>course increased competence in subject area</td>
<td>3.99</td>
<td>.769</td>
<td>121</td>
</tr>
<tr>
<td>faculty teaching were effective</td>
<td>3.98</td>
<td>.730</td>
<td>121</td>
</tr>
<tr>
<td>faculty knowledgeable in field</td>
<td>4.27</td>
<td>.619</td>
<td>121</td>
</tr>
<tr>
<td>faculty available outside of class for assistance</td>
<td>4.17</td>
<td>.703</td>
<td>121</td>
</tr>
<tr>
<td>faculty encouraged student participation</td>
<td>4.21</td>
<td>.694</td>
<td>121</td>
</tr>
<tr>
<td>faculty were enthusiastic about the subject</td>
<td>4.21</td>
<td>.706</td>
<td>121</td>
</tr>
<tr>
<td>faculty use varied and creative instructional strategies</td>
<td>3.87</td>
<td>.826</td>
<td>121</td>
</tr>
<tr>
<td>genuine interest to educate students</td>
<td>4.17</td>
<td>.691</td>
<td>121</td>
</tr>
<tr>
<td>fair evaluation and grading techniques</td>
<td>4.08</td>
<td>.737</td>
<td>121</td>
</tr>
<tr>
<td>evaluation and grading criteria were clearly communicated</td>
<td>3.82</td>
<td>.904</td>
<td>121</td>
</tr>
<tr>
<td>evaluation representative of course materials</td>
<td>3.98</td>
<td>.719</td>
<td>121</td>
</tr>
<tr>
<td>graded assignments returned on time</td>
<td>3.99</td>
<td>.801</td>
<td>121</td>
</tr>
<tr>
<td>faculty gave useful comments and feedback</td>
<td>3.93</td>
<td>.766</td>
<td>121</td>
</tr>
<tr>
<td>overall courses were of great value</td>
<td>3.86</td>
<td>.799</td>
<td>121</td>
</tr>
<tr>
<td>overall courses achieved their stated objective</td>
<td>4.06</td>
<td>.722</td>
<td>121</td>
</tr>
</tbody>
</table>
Table 38

*Descriptive Statistics for Productivity Tools*

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>productivity tools encourage student and faculty interaction</td>
<td>3.91</td>
<td>.742</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools promote cooperation among students</td>
<td>3.77</td>
<td>.804</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools give prompt feedback</td>
<td>3.77</td>
<td>.920</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools promote active learning techniques</td>
<td>3.89</td>
<td>.751</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools emphasize time on task</td>
<td>3.66</td>
<td>.802</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools communicate high expectations</td>
<td>3.74</td>
<td>.814</td>
<td>121</td>
</tr>
<tr>
<td>productivity tools respect diverse talents and ways of learning</td>
<td>3.86</td>
<td>.745</td>
<td>121</td>
</tr>
</tbody>
</table>
Table 39

Descriptive Statistics for Presentation Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>presentation tools encourage student and faculty interaction</td>
<td>3.96</td>
<td>.760</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools promote cooperation among students</td>
<td>3.93</td>
<td>.700</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools give prompt feedback</td>
<td>3.64</td>
<td>.915</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools promote active learning techniques</td>
<td>4.00</td>
<td>.635</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools emphasize time on task</td>
<td>3.70</td>
<td>.826</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools communicate high expectations</td>
<td>3.84</td>
<td>.799</td>
<td>120</td>
</tr>
<tr>
<td>presentation tools respect diverse talents and ways of learning</td>
<td>4.03</td>
<td>.716</td>
<td>120</td>
</tr>
</tbody>
</table>
Table 40

*Descriptive Statistics for Communication Tools*

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication tools encourage student and faculty interaction</td>
<td>3.73</td>
<td>.923</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools promote cooperation among students</td>
<td>3.73</td>
<td>.896</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools give prompt feedback</td>
<td>3.82</td>
<td>.944</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools promote active learning techniques</td>
<td>3.68</td>
<td>.890</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools emphasize time on task</td>
<td>3.68</td>
<td>.879</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools communicate high expectations</td>
<td>3.71</td>
<td>.844</td>
<td>120</td>
</tr>
<tr>
<td>Communication tools respect diverse talents and ways of learning</td>
<td>3.73</td>
<td>.840</td>
<td>120</td>
</tr>
</tbody>
</table>
Table 41

*Descriptive Statistics for World wide Tools*

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>world wide web tools encourage student and faculty interaction</td>
<td>3.68</td>
<td>.944</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools promote cooperation among students</td>
<td>3.69</td>
<td>.924</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools give prompt feedback</td>
<td>3.48</td>
<td>.961</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools promote active learning techniques</td>
<td>3.70</td>
<td>.949</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools emphasize time on task</td>
<td>3.47</td>
<td>.987</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools communicate high expectations</td>
<td>3.63</td>
<td>.953</td>
<td>120</td>
</tr>
<tr>
<td>world wide web tools respect diverse talents and ways of learning</td>
<td>3.76</td>
<td>.935</td>
<td>120</td>
</tr>
</tbody>
</table>