A Qualitative Study of Technology-based Training in Organizations That Hire Agriculture and Life Sciences Students

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Abstract

Technological advances have created unlimited opportunities in education. Training and technology have merged to create new methods referred to as technology-based training. The purpose of this study was to identify organizations that hire agriculture and life sciences students for positions involving technology-based training and identify competencies required for these positions from the perspective of the identified organizations. This study describes the technologies that the identified organizations were using to design and deliver technology-based training, the audience to whom the organizations were providing training, and the competencies that the identified organizations were seeking in potential employees. Findings from this study revealed a need for individuals with specialized skills related to technology-based training. Findings specifically suggest seven key competencies needed to work in technology-based training: (a) instructional design, (b) technology/computer skills, (c) the ability to conduct a needs assessment, (d) interpersonal skills, (e) writing skills, (f) planning and organizational skills, and (g) evaluation skills. Study findings lead one to conclude that students with expertise in these competency areas are more marketable in organizations that hire agriculture and life sciences students.

Introduction & Theoretical Framework

Distance education is often perceived as a modern trend, while in actuality it has an extensive history throughout government, corporate, and education environments. According to Burgess and Russell (2003), distance education has evolved through four stages over the years, with each evolution resulting in increased effectiveness and creating a wider range of applications. These stages include: correspondence courses, audio and video conferencing, the pairing of multi-media with personal interaction, and finally two-way communication using a variety of cutting edge technologies. Saba (2001) refers to the current form of this type of learning by stating that:

For the third time in fifty years distance education has been touted as the elixir that will cure all the ills in education and training. However, what is different is that never before has this much attention, money, publicity, and hope been invested in its practice in education and training. (p. 1)

Technology has become a dominant feature in everyday life, especially for the technologically-savvy generation in K-12 schools (Donlevy, 2005). A survey conducted by the Office of Educational Technology in the U.S. Department of Education indicated that approximately 36 percent of school districts had students enrolled in distance courses in the 2002-03 school years, and the majority of the students that were enrolled were in high school (Setzer & Lewis, 2005).
In addition, emerging technologies provide a way for higher education institutions to provide courses and programs using technology-based methods (Duhaney, 2005). According to Miller and Pilcher (1999), agricultural institutions are often leaders in distance education programs. This could be due to the goal of land-grant institutions, as well as agricultural institutions, which is to reach those geographically dispersed and to provide life-long learning (Irani, Telg, & Place, 2003; Martin & Cheek, 2004). Historically, agricultural colleges have frequently experienced budget cuts, which can be accommodated by implementing technology and distance education in order to cut long term costs and increase revenue (Connor, 2003). When looking specifically at agricultural education departments, Roberts and Dyer (2005) indicated that approximately two-thirds of departments are implementing some degree of distance education courses. These courses are most often provided through learning management systems, but other methods such as the internet, interactive video conferencing and videotapes or CDs are also applicable methods.

The expansion of distance education programs has also extended into workforce training. In a recent survey conducted by the Institute of Management and Administration, it was reported that “77.8% of survey participants…plan to expand…training efforts to meet expected company growth” (“How to Use Training to Accelerate Growth”, 2005, p. 3). According to ASTD’s 2004 State of the Industry Report, classroom learning has steadily decreased over the years, while an estimated 29 percent of training was conducted through technology-based methods in 2004 (ASTD, 2004). Ellis (2004) identified end-user or desktop training as a prominent type of training offered through technology-based methods.

Typical training has become unpopular in organizations because of its similarity to traditional school, which is viewed by some as a short-term memorization process, rather than a learning process (Huseman & Goodman, 1999). Technology has created a learning environment that exceeds that of traditional learning (Brazen & Clark, 2005) and has significantly altered the way that training and development efforts are conducted (Garrett & Vogt, 2003). Delivery methods such as CD-ROM, audio, computer projection, and video conferencing continue to be used and now new technologies such as interactive networks that provide web-based instruction (Rugelj, 2005) are becoming more predominate throughout organizations.

As organizations make the transformation into learning organizations, technology will facilitate in the sharing of knowledge (Duhaney, 2005). Research has revealed that agricultural professionals make up a significant number of the students enrolled in agricultural education distance courses (Miller & Miller, 2005; Moore & Wilson, 2005; Roberts & Dyer, 2005). In 2000, organizations spent over 30 billion dollars on training and as they begin to feel more pressure from the economy, they increasingly turn to technology (Lee, Bhattacharya, Nelson, & Kihn, 2002). Organizations will continue to turn to technology to reach people internationally (Garrett & Vogt, 2003), to prepare for organizational growth (“How to Use Training to Accelerate Growth”, 2005), and to accommodate to learners time, financial, and responsibility constraints (Duhaney, 2005).

Although organizations are converting to technology-based training methods, they are not replacing classroom training completely (Webb, 2003). According to ASTD’s State of the Industry Report (2004), approximately 60 percent of training remains in the classroom. Blended
approaches realize that technology-based training will not completely replace traditional training, while acknowledging that appropriate technologies will encourage success (Garrett & Vogt, 2003). The Sloan Consortium (2004) defines ways to offer courses using a variety of degrees of technology as traditional courses, web facilitated courses, blended learning, and online or technology-based courses. The most predominant method provided by organizations is a blended approach.

Although many organizations currently implement or plan to implement technology-based training, concerns do exist both on the employee and management level (Ellis, 2004). Employees are concerned about the time required to complete this type of training, as well as technical skills required and self-discipline (Ellis, 2004). Managers are concerned with the cost of implementing this type of training, the technology requirements, and the fear that the organization will not accept technology-based training (Ellis, 2004). Technological limitations include bandwidth limitations and availability, rate of technological changes, and loss of interaction (Murphrey & Dooley, 2000).

Goolnik (2002) expressed the importance of qualified and competent staff in order to create an effective program. With the increase of technology-based training there is a need for specialists that outweighs the supply of competent technology-based trainers (Foshay, 2001). Just as in academic settings where the importance of providing distance education training and support to faculty and staff has been documented (Murphrey & Dooley, 2000; Roberts & Dyer, 2005), organizations that plan to design and develop technology-based training should hire people with experience (Escoffery, Leppke, Robinson, Mettler, Miner, & Smith, 2005). The field of technology-based training is a multidisciplinary field that requires knowledge and experience in a variety of areas (Rugelj, 2005). With more people pursuing the field of technology-based training, it is critical to identify the competencies for the field (Murphrey & Dooley, 2006). Research has been conducted to identify the necessary competencies by Thach and Murphy (1995), Williams (2003), Egan and Akdere (2005), and Murphrey and Dooley (2006).

Thach and Murphy (1995) conducted research that studied the roles, outputs and competencies needed by distance education professionals within the United States and Canada. Williams (2003) conducted similar research, dealing with roles, outputs, and competencies necessary to implement and manage distance education in higher education. Both Thach and Murphy and Williams’s studies found general competencies that were required across all roles, which include: communication/interaction, management/administration, technology, and learning and instructor (Williams, 2003).

Egan and Akdere (2005) studied distance education competencies by gathering information from advanced distance education graduate students. The graduate students surveyed indicated that technology competencies were the most important (Egan & Akdere, 2005), which differed from Thach and Murphy (1995) and Williams (2003), who indicated communication competencies as the most important skill set. Murphrey and Dooley (2006) expanded on previous studies by focusing specifically on competencies in the field of e-Learning by conducting a focus group study of current and past graduate students currently working or planning to work in the field of e-learning. Like the study by Egan and Akdere (2005), the most important skill set indicated was technology skills (Murphrey & Dooley, 2006). While there were similarities and differences
across the studies, it is clear that three skill areas stand out: technology skills, organizational skills, and communication skills (Egan & Akdere, 2005; Murphrey & Dooley, 2006; Thach & Murphy, 1995; Williams, 2003).

With the spread of the technology-based training industry, new and diverse employment opportunities are surfacing, creating jobs and positions that require specific skills and competencies. As we consider this point, we need to ask the questions: To what extent are organizations that hire agriculture and life science students involved in technology-based training? Are there employment opportunities within these organizations for students with expertise in the development and delivery of technology-based training? And, are there specific skills or competencies needed for these positions?

**Purpose and Objectives**

The purpose of this study was to identify organizations that hire agriculture and life sciences students for positions involving technology-based training and identify competencies required for these positions from the perspective of the identified organizations. The following objectives were achieved in order to complete this study:

1. Identify organizations that hire agriculture and life sciences students that implement technology-based training.
2. Identify positions related to technology-based training available in the organizations identified as implementing technology-based training.
3. Describe the design and delivery methods being used to implement technology-based training in the organizations identified.
4. Identify competencies required for the identified positions associated with technology-based training.

**Methods and Procedures**

A qualitative study was conducted to provide quality, in-depth information (Berg, 2001; Patton, 2002). The research design was based on grounded theory (Glaser & Strauss, 1999), which is “the discovery of theory from data systematically obtained from social research” (p. 2). Grounded theory was used in order to construct new theory from emerging themes present in the data collected. This research was approved by the Texas A&M University Institutional Review Board.

Qualitative research maintains limitations in quality of data and objectivity. Although qualitative research provides a deep understanding of information, it is not necessarily generalizable. The information provided and the interpretation of the information is subjective due to the human element. According to Patton (2002), qualitative research does not constrain a researcher to any predetermined categories and it allows for the design to be emergent throughout the data collection. Qualitative research provides the researcher with the ability to collect data in a way that allows subjects to freely express their feelings and the researcher to capture their intended meaning. Therefore, this research design provides the ability to conduct research that provides a deep understanding of unquantifiable data.
Purposive sampling was used to select the population in order to collect information rich data (Erlandson, Harris, Skipper, & Allen, 1993; Patton, 2002). The purposive sample selected for this research included organizations identified by the College of Agriculture and Life Science Student Council at Texas A&M University as interested in hiring agriculture and life sciences students. The original list represented 163 organizations, closer examination of the list reduced the number to 132 due to insufficient information. The group was purposely selected due to their interest in hiring students from the College. Organizational recruiters served as the gatekeeper because they were in a position to encourage organizations’ participation (Berg, 2001). The gatekeeper, in most instances, provided access to the person most knowledgeable about technology-based training, though in some cases the gatekeeper was actually the person interviewed.

A systematic process was employed to identify the purposeful sample of organizations willing to contribute information to the study. A total of 132 organizations were contacted, with 59 interviews conducted. In some instances the researcher spoke with individuals within the organizations, but the individuals were unable to provide any information. If the researcher was unable to speak with an individual, a message was left when possible. Some individuals replied to the message, while others never responded. Table 1 provides a more descript summary of the organizations contacted.

Table 1
**Purposive Sampling Process: Interview Contacts Regarding Technology-based Training (N=132)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number in Original List</td>
<td>163</td>
<td></td>
</tr>
<tr>
<td>Deleted from List Due to Insufficient Information</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Total Number Available for Contact</td>
<td></td>
<td>132</td>
</tr>
<tr>
<td>Organizations Contacted Based on Use of Technology-based Training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicated Use of Technology-based Training</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Indicated No Use of Technology-based Training</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Organizations Contacted – Provided Information</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Organizations Contacted – No Information Provided</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Organizations Contacted – No Reply</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Total Number Contacted</td>
<td></td>
<td>132</td>
</tr>
</tbody>
</table>

*Note.* One individual indicated the use of technology-based training, but did not provide any additional information.

The instrument used to collect data was a semi-standardized interview guide that encouraged free digression depending on the responses provided (Berg, 2001). The guide consisted of five open-ended essential questions designed to address the objectives of the study. With each essential question, there were also probes included to encourage the enticement of more precise and in-depth information from the subjects (Berg, 2001). The instrument was untested, but was approved by professionals that have conducted extensive qualitative research, similar to that conducted in this study.
Data was collected through semi-structured telephone interviews and the analysis of documents provided by interviewees. Information was obtained primarily through the interview process. While face-to-face interviews are the preferred method, Berg (2001) states that telephone interviews are appropriate when a geographical barrier exists between the researcher and the subjects to be interviewed. After ten organizations had been interviewed, a peer debriefing was held to review emerging themes and to develop a plan for contacting the remaining organizations. The data collection phase ended after each organization had been contacted at least twice and a final peer debriefing was held to determine if theoretical saturation (Strauss & Corbin, 1998) had been reached.

In order to ensure trustworthiness of the research, multiple measures were taken. Credibility was established through triangulation and peer debriefings in order to increase the richness of the data and confidence in the findings (Berg, 2001; Erlandson, et al., 1993). A coding system was implemented to provide an audit trail so that one could “determine if the conclusions, interpretations, and recommendations can be traced to their sources” (Erlandson, et al., 1993, p. 35) as a means of dependability and confirmability. Organizations were coded C01 through C55, agencies were coded A01 through A05, and documents were coded D01 through D04. To ensure trustworthiness of the interpretation of themes that emerged, codes were included in the findings.

The data collected was analyzed using the constant comparative method of qualitative analysis (Glaser & Strauss, 1999). This method places relevant data, which contribute to a common idea, into categories that through integration and delimitation create theory. There are four stages of the constant comparative method: “1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the theory, and 4) writing the theory” (p. 105). Using this method, the researcher coded similar statements throughout the research using a color coding technique. Once this stage of the process was complete, the coded data was grouped into themes and the researcher compared each piece of data with data previously analyzed in all groups that had emerged to further develop sub-categories of each theme. Through constantly comparing the categories and information within each, themes emerged, findings were revealed, and theory was developed.

**Findings**

Of the 132 organizations contacted, 59 interviews were conducted. Of the 59 interviews conducted, 35 indicated no use of technology-based training, while 24 reported use of technology-based training. The majority of the individuals interviewed were associated with either the information technology department or the human resource department. The organizations contacted were geographically dispersed and varied in size and type of organization.

Many organizations were not conducting this form of training for multiple reasons, which are listed in Table 2. These reasons included: small size (approximately 40 employees) (C01), training employees how to use large machinery (C32), employees lacking access to computers (A02), organizational culture (i.e., employees preferring classroom training (C32) and case-by-case training (C43)), and lack of resources due to budget cuts (A05). Of the 35 organizations not conducting technology-based training, eight expressed interest in implementing a form of this
type of training in the future. Some thought it would provide an opportunity to network and connect with geographically dispersed employees (A02), as well as people within the industry (C10). Others expressed interest in finding appropriate training to provide through technology-based methods (C43, C45).

Table 2
Audit Trail: Reasons Indicated for Not Conducting Technology-based Training

<table>
<thead>
<tr>
<th>Reason</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>C01, C08, C33, C43, C50</td>
</tr>
<tr>
<td>Type of Training</td>
<td>A03, C05, C10, C32, C39, C42, C45, C48</td>
</tr>
<tr>
<td>Access</td>
<td>A02, C26, C53</td>
</tr>
<tr>
<td>Organizational Culture</td>
<td>A02, A05, C01, C11, C27, C32, C33, C43, C47, C51</td>
</tr>
<tr>
<td>Lack of Resources</td>
<td>A05, C27</td>
</tr>
</tbody>
</table>

As shared earlier, 24 organizations that were contacted and provided information reported conducting technology-based training. These organizations were primarily international organizations (C03, C06, C07, C09, C16, C19, C21, C25, C27, C29, C31, C32, C36, C41, C46, C44, C52, C55), with only a few national and state organizations (A01, A02, A04, A05, C18, C24). Of those reporting size, organizations ranged from approximately 500 employees (C29) to greater than 240,000 employees (C21). The organizations were broken down into seven types (i.e., plant services, products and science; government agencies; food and beverage; medicinal; structural supplies; animal feeds; and agricultural information service), with the majority of them being involved in plant services, products, and science, which included a variety of types of organizations ranging from tree experts (C06, C44) to plant breeding (C32). Meat processing (C41) and beverage distribution (C18) organizations were two examples placed into the food and beverage category. Biotechnological (C03) and pharmaceutical (C52) organizations were placed in the medicinal category. Table 3 provides a complete breakdown of the types of organizations.

Table 3
Audit Trail: Types of Organizations that Indicated the Use of Technology-based Training

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Services/Products/Science</td>
<td>C06, C09, C29, C32, C36, C46, C44</td>
</tr>
<tr>
<td>Government Agencies</td>
<td>A01, A02, A04, A05</td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>C18, C21, C27, C41</td>
</tr>
<tr>
<td>Medicinal</td>
<td>C03, C07, C25, C52</td>
</tr>
<tr>
<td>Structural Supplies</td>
<td>C16, C31</td>
</tr>
<tr>
<td>Animal Feeds</td>
<td>C55</td>
</tr>
<tr>
<td>Agricultural Information Service</td>
<td>C19</td>
</tr>
</tbody>
</table>

Organizations reported technology-based training as being created both internally and externally (see Table 4). One interviewee shared that their training was created externally, either being outsourced or purchased “off-the-shelf” (C52). Other interviewees indicated internally created training, with two specifically indicating a collaborative effort between departments (C16, C21). On the other hand, the majority of the organizations used a combination of internally and externally created training, with one interviewee stating that “technical training is developed in-house, but many of the software application training programs are ‘off-the-shelf’ training” (C09).
Externally developed training appeared to be for general or professional training, while training created internally involved organization specific training.

Table 4
Audit Trail: Creation or Acquisition of Technology-based Training by Organizations

<table>
<thead>
<tr>
<th>Description</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>C29, C36, C52, C54</td>
</tr>
<tr>
<td>Internal</td>
<td>A01, A05, C16, C21, C27</td>
</tr>
<tr>
<td>Both</td>
<td>A02, C07, C09, C24, C31, C55</td>
</tr>
</tbody>
</table>

Note. Only 15 of the 59 interviewees provided information pertaining to where training was created or acquired.

Training was described as being provided through a variety of methods throughout the organizations interviewed, with the majority of the training being provided through the internet (A01, A02, A03, C09, C16, C18, C24, C25, C27, C29, C31, C54). Another method that was widely used included training provided on CD-ROMs (A01, C06, C07, C09, C16, C29, C31, C36, C55, C53). Methods less common throughout the organizations included intranet (C09, C16, C52), webinars (C19, C46), and satellite (A03). One organization (C31) specifically discussed blended learning as a method that they utilized, while others indicated using the internet for informal training purposes (C08, C32, C39).

The types of training provided through technology-based methods reported by these organizations varied greatly. Training types were categorized into four groups: human resource training (e.g., safety (C06, C31); sexual harassment (C07, C46)), organization/industry specific training (e.g., policies and procedures (C19, C52); health plan training (C06)), professional development (e.g., interpersonal (D02); goal setting (C55)), and computer training (e.g., software applications (C29); internet security (A03)). Table 5 provides a listing of interviewee responses to types of training being offered through technology-based methods.

Table 5
Audit Trail: Types of Training Offered through Technology-based Methods

<table>
<thead>
<tr>
<th>Description</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Resource Training</td>
<td>A01, A03, C06, C07, C09, C21, C24, C27, C31, C36, C46</td>
</tr>
<tr>
<td>Organization/Industry Specific Training</td>
<td>A05, C06, C07, C09, C16, C18, C19, C24, C31, C36, C41, C52, C54, C55, D02</td>
</tr>
<tr>
<td>Professional Development Training</td>
<td>A03, C09, C21, C29, C31, C36, C55, D02</td>
</tr>
<tr>
<td>Computer Training</td>
<td>A01, A03, C19, C24, C25, C29, C31, C36, C44, C55, D02</td>
</tr>
</tbody>
</table>

Note. Interviewees could respond with multiple responses.

Learning management systems were used for multiple reasons by some of the organizations (A01, C09, C16, C24, C29, C31, C36, C55). Some used them for simply supplying their training through a secure online system (A01). Some not only used the system to provide the training to employees, but also purchased actual training content from the vendor (C29). Another
organization used the vendor’s platform for assistance in creating their technology-based training (C36).

Organizations that indicated that their training was created internally were further asked regarding who was actually responsible for the creation of the training. Some of the training was revealed as being created through the human resources department (A05, C25, C31). The majority of organizations identified a small training group that worked with the information technology department to create technology-based training (A02, C06, C09, C36, C52). Three interviewees provided titles for positions responsible for technology-based training as e-Learning Consultant (D01), State Recruiting and Training Manager (D03), and Instructional Designer (D04).

Finally, interviewees were asked about skills specific to technology-based training positions. Although most interviewees were unable to provide information, some provided not only their own words, but also job descriptions. Skills required ranged from general skills to more specific technology skills. Instructional design (C09, C16, C31, D04) and technology/computer skills (C18, C19, C31, D04) were the skills most emphasized by the interviewees. Additional skills that were frequently mentioned included: the ability to conduct a needs assessment (C09, C16, D03), interpersonal skills (C16, C18, C31), writing skills (C16, C31, D04), planning and organizational skills (C18, D01), and evaluation skills (C09, D01).

Conclusions, Implications, & Recommendations

Multiple conclusions were drawn from the findings of this study. The findings revealed that several organizations that hire agriculture and life sciences students were implementing technology-based training. Approximately 40 percent of the organizations interviewed indicated that they were implementing this type of training. While a higher percentage of organizations interviewed, 60 percent, are not currently conducting technology-based training, the findings provide evidence to conclude that a substantial number of agriculturally related organizations currently implement some form of technology-based training.

While many of the organizations that were interviewed were not currently conducting technology-based training, a substantial number expressed interest in implementing this type of training. In addition, factors including size, type of training, access, organizational culture, and lack of resources were revealed as barriers to the use of technology-based training. As technologies evolve, technology-based practices spread and support for technology-based instruction increases, organizations may be able to overcome the barriers to technology-based training through increased access, greater options regarding the types of training, and more available resources due to support. It was concluded, based on these findings, that the future may bring an increase in technology-based job opportunities.

Of the six types of organizations that emerged from the data, four types of organizations (i.e., plant services, products, and science; government agencies; food and beverage; and medicinal organizations) appear to utilize technology-based training more than other types of organizations. Particularly, organizations involved in the area of plant services, products, and science were revealed as having a greater use of technology-based training. Given this information, it was
concluded that an individual in agriculture and life sciences, interested in technology-based training, would be more likely to find a job in an organization involved in one of these areas.

As increasing numbers of organizations adopt the use of technology-based training, more organization specific training is desired. This requires the employment of individuals internally who possess the set of skills to oversee or create this training. Findings revealed in this study indicate that organizations not only have the need for technology-based training, but also need individuals experienced in creating and providing technology-based training, which suggests that there may be an increase in technology-based training positions within these organizations.

Information collected from interviews and documents revealed specific skills required of individuals working in the area of technology-based training. The documents collected from interviewees indicated three job titles for positions relevant to technology-based training, which include: e-Learning Consultant, State Recruiting and Training Manager, and Instructional Designer. Based on these documents, one can conclude that position titles for technology-based training positions vary greatly. Given the diversity of these titles, as well as the variety of departments the researcher was directed to visit with during the interview process (e.g., human resources, training, and information technology), individuals pursuing a career in technology-based training should explore an assortment of positions and departments. On the other hand, findings revealed that external sources are being recruited to create and implement technology-based training for some organizations. This suggests that technology-based training positions may be just as plentiful in organizations specific to technology-based training as in industry-specific organizations.

While organizations reported a variety of methods to deliver technology-based training, the internet and CD-ROM were found to be dominant delivery methods in the organizations interviewed. This finding may indicate a greater need for e-Learning specialists. The finding that webinars were used by a few organizations and that some organizations were encouraging the use of the internet for informal training indicates support of new technologies. This lends further support for a future for technology-based training in the organizations not currently conducting technology-based training.

Some interviewees expressed that although they were conducting technology-based training, it would never completely replace traditional training. One organization specifically identified blended learning and its importance, while others unknowingly identified this type of learning. These findings support that of previous research (Garrett & Vogt, 2003), that predict an increase in this type of delivery.

A wide variety of training was reported as being delivered through technology-based methods. Interviewees indicated that technology-based training was primarily being used for organization or industry specific training. In addition, computer training, human resource training, and professional development training were noted. Computer training was noted as a prominent type of off-the shelf training provided through technology-based methods, which supports Ellis’ (2004) findings. Based on these findings, it was concluded that organizations that hire agriculture and life sciences students have a need for diverse content.
The findings indicated that the key skills and competencies needed to work in technology-based training include: (a) instructional design, (b) technology/computer skills, (c) the ability to conduct a needs assessment, (d) interpersonal skills, (e) writing skills, (f) planning and organizational skills, and (g) evaluation skills. Based on these findings, technology-based training competencies closely coincide with e-Learning competencies, with only adult learning theory not appearing as a key competency, yet it was identified. As found in Murphrey and Dooley’s study (2006), the e-Learning field has unique competencies. This study may coincide so closely, due to the fact that most organizations interviewed use online methods of providing training to employees.

When comparing the current study to the previous competency studies (see Table 6), it is apparent that computer skills, interpersonal skills, writing skills, and planning and organizational skills are important to any aspect of technology-based fields. As in e-Learning competencies, instructional design was specifically mentioned in this study as an important competency. Other studies mentioned similar competencies that are parts of instructional design, but only Williams’ study (2003) indicated these aspects in the top ten competencies. Technology or computer skills, similar to the e-Learning competencies, cover a general area; whereas the other studies broke this area down into specific skills, which were all mentioned in their top ten competencies. It is important to note that in previous studies evaluation and assessment skills have been treated as a single skill, but in the current study individuals expressed needs assessment and evaluation skills as individually important factors. Based on these findings, it was concluded that students with expertise in the area of technology-based training are in fact more marketable. It is recommended that colleges of agriculture and life sciences encourage students to take courses and programs to obtain these skills and competencies. In fact, the e-Learning Development Certificate in Agriculture has been implemented as a means to improve technology-based skills and competencies of students in the College of Agriculture and Life Sciences at Texas A&M University.

Considering that this study focused on a set of organizations with a specific interest, the study should be replicated, not only with another population of organizations that hire agriculture and life sciences students, but also with organizations in other industries. Individuals should be interviewed in these studies to compare frequencies of those who are and who are not conducting technology-based training. Are organizations in other industries implementing technology-based training? What barriers exist? What competencies do these organizations perceive as necessary for someone working in technology-based training? What factors influence the adoption of newer methods?

Given the variety of job titles and departments related to technology-based training revealed in this study, further research is needed. Job descriptions relating to technology-based training should be collected and analyzed in order to more accurately identify job opportunities for graduates with expertise in technology-based training.

Technology-based training is a complex and growing industry in itself. As it becomes more prevalent across agriculture and life sciences industries, more detailed information should be collected regarding the extent to which technology-based training is being implemented and in regard to competencies required for positions within agricultural organizations. As technologies
continue to change at a rapid pace, technology-based training should be continuously studied in an effort to remain current.

Table 6
Comparison of Technology-based Training Skills to Existing Literature

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Instructional design</td>
<td>Instructional design</td>
<td>Not in top ten; #16</td>
<td>Skills in development of collaborative student-focused learning environment</td>
<td>No Mention</td>
</tr>
<tr>
<td>Technology/computer skills</td>
<td>Proficiency with computers and programs and interface design</td>
<td>Basic technology; Technology access knowledge; Knowledge of distance learning field; Multimedia knowledge; Software skills</td>
<td>Basic technology knowledge; Knowledge of distance learning field</td>
<td>Knowledge of distance learning field; Basic technology knowledge; Technology access knowledge</td>
</tr>
<tr>
<td>Needs assessment</td>
<td>Evaluation and assessment strategies</td>
<td>Not in top ten; #21</td>
<td>Not in top ten; #22</td>
<td>Not in top ten; #18</td>
</tr>
<tr>
<td>Interpersonal skills</td>
<td>Student/teacher relationship</td>
<td>Collaborative and teamwork skills</td>
<td>Collaboration and teamwork skills; Interpersonal communication skills</td>
<td>Interpersonal communication Collaboration and teamwork; Feedback</td>
</tr>
<tr>
<td>Writing skills</td>
<td>Written communication skills</td>
<td>Not in top ten; #13</td>
<td>Writing skills; English proficiency</td>
<td>Writing; English proficiency</td>
</tr>
<tr>
<td>Planning and organizational skills</td>
<td>Organizational skills</td>
<td>Organizational skills</td>
<td>Not in top ten; #12</td>
<td>Planning; Organization</td>
</tr>
<tr>
<td>Evaluation skills</td>
<td>Evaluation and assessment strategies (repeated)</td>
<td>Not in top ten; #21 (repeated)</td>
<td>Not in top ten; #22 (repeated)</td>
<td>Not in top ten; #18 (repeated)</td>
</tr>
</tbody>
</table>
References


