



**Assessing Information Technology Educational Pathways That Promote Deployment and
Use of Rural Broadband**

4th Annual Report: NSF ATE (Award #1304382)

05/01/2017

Project Investigators

Marcia A. Mardis, PhD, marcia.mardis@cci.fsu.edu
Principal Investigator
Associate Professor, iSchool @ Florida State University

Charles R. McClure, PhD, Co-PI, cmclure@lis.fsu.edu
Director and Francis Eppes Professor
Information Institute

Kathryn M. Stewart, Co-PI
Program Chair, Computer Technology
Tallahassee Community College

David Bouvin, PhD, Co-PI
Dean, Business & Technology Programs
Chipola College

Ebrahim Randeree, Co-PI
Associate Dean, College of Communication & Information
Florida State University

Jonathan M. Hollister, PhD, Research Coordinator
Information Institute

Jisue Lee, PhD, Research Associate
Information Institute

Jung Hoon Baeg, PhD, Research Associate
Information Institute

Additional Research Contributors

Laura Spears, Research Consultant; Liz Liebman, Former Research Associate; Chandra Ambavarapu, Former Research Associate; and Nicole D. Alemanne, Former Post-Doctoral Research Associate

INTRODUCTION

This annual report describes the activities, findings and deliverables generated during Year 4 of a National Science Foundation Advanced Technological Education (NSF ATE) grant-funded study. The study collaborators include Tallahassee Community College (TCC) and Chipola College along with the Florida State University Information Institute, each located in the northwest Florida region.

MAJOR GOALS

The goals of this research project are to:

1. Understand the alignment of IT staffing with the needs of employers and employees working in IT positions;
2. Strengthen the employee pool of IT/broadband staffing (including general IT, broadband and network technicians);
3. Improve educational support related to broadband, telecommunications, and networks for future and current IT employees in non-metro Northwest Florida; and
4. Understand how to transfer this competency to other similar non-metro markets.

The research team composed of project principal investigators, researchers, faculty members, and administrators at universities and regional community colleges, are working toward the above goals.

RESEARCH QUESTIONS & SPECIFIC OBJECTIVES

The research questions addressed by this phase of the study include:

RQ1: How do the IT/broadband skills graduates gain through two-year community college programs compare to the needs expressed by employers in non-metro/metropolitan areas?

RQ2: How do the IT/broadband skills graduates gain through two-and four-year college programs compare to the skill sets new professionals identify they need after they are hired as IT employees in non-metro/metropolitan areas?

RQ3: What, if any, gaps exist between the skills non-metro/metropolitan employers report their IT/broadband employees need and the skill sets new professionals report they need to be successful as IT/broadband employees?

RQ4: What, if any, differences are there between the skills needed for IT/broadband employees in non-metro and metropolitan areas?

RQ5: How can two- and four-year college IT/broadband program curricula be modified to best meet the specific needs of employers and IT/broadband employees in non-metro/metropolitan areas?

The specific objectives for this project are to:

1. Understand private sector and Community Anchor Institutions' (CAI; e.g., public libraries, schools, community centers) IT/broadband staffing needs to facilitate recruitment and placement activities available through Chipola, and TCC;
2. Identify skill sets IT employees need on the job as reported by new professionals and identify any gaps between these skill sets and the staffing needs reported by employers;
3. Determine if there are differences in the needed IT/broadband employee skill sets between metropolitan and non-metro areas of Northwest Florida to understand what specific skill sets are needed for employees in non-metro areas;
4. Recommend changes to existing IT/broadband curricula at the Chipola and TCC IT/broadband programs to best meet the IT staffing needs of employers in non-metro Northwest Florida and as a guide for other non-metro areas; and
5. Build on existing industry-education relationships and create a process to provide ongoing feedback for future curriculum considerations.

By identifying the gaps and alignments between regional IT education and the needs of IT employers and new professionals, we hope to make recommendations to regional IT degree programs to improve their relevancy and the employability of their graduates which will, in turn, provide a stronger, more competitive workforce for IT employers and promote infrastructure and economic development in the Northwest Florida region.

MAJOR ACTIVITIES

During the fourth year of the project, major activities includes tasks spanning the third and fourth phases of the project. As mentioned, some of the activities are currently in progress and will be completed during the no-cost extension year.

Classroom Observations

The preliminary findings for the two classroom observations (one conducted at Chipola College and the other at Tallahassee Community College) reported in the 3rd annual report and can be found at our website listed below. Currently, the findings are under review by research team members and Co-PI's to help construct student-to-career pathways. These pathways help to provide recommendations for IT programs to better support their students in finding their first

job. In addition to the final report of this project, we hope to disseminate the final findings as part of upcoming publication submissions.

Student-to-Career Pathways Mapping and Alumni Tracking Updates

On May 5, 2016, the project PI and Co-PIs met in Chipola, FL to introduce and welcome Dr. David Bouvin to the project. The research team and the Co-PIs meeting focused on sharing updates on student and alumni tracking as well as discussed preliminary project findings from classroom observations and as they related to the student-to-career pathways.

On September 9th, 2016, the Information Institute hosting a meeting for NSF ATE team members at Florida State University. In attendance were David Bouvin, Jonathan Hollister, Faye Jones, Marcia Mardis, Vicki Mathis, and Ebe Randeree. Joining in via phone were Charles McClure, Flora McMartin, and Kate Stewart. This meeting also served as Faye Jones's introduction to the rest of the NSF ATE team. Co-PI's from Chipola (David Bouvin and Vicki Mathis) and TCC (Kate Stewart) shared planned updates IT curricula and pending administrative changes. Updates on student tracking were also discussed, but overall it remained a difficult process. Other topics included the importance of internships and experiential learning as identified in the preliminary analyses reported in the 3rd annual report and determining success metrics for IT programs in addition to updates on the ongoing analysis of data and the writing up publications.

Based on data from this NSF ATE project and a related FITC project, Faye Jones, a Senior Research Associate at the Information Institute, along with project PI Marcia Mardis and Co-PI Charles McClure co-authored a conference paper on alumni-tracking which was accepted for the 2017 Annual Conference of the American Institutes for Research. This paper discusses preliminary findings from the classroom observations, new professional interviews, as well as previously conducted focus groups with student, faculty, and administrators focus groups will be used to further identify and map student-to-career pathways during the no-cost extension year.

New Professional Interviews

As reported last year, interviews were conducted with early career/new professionals, who were also recent graduates from the IT programs of focus in this study. The preliminary report was shared with the research team, Co-PI's, and the project's external evaluator, Flora McMartin. Analysis of the interview data is ongoing in order to map student-to-career pathways. Final analysis and comparison and integration with the other findings will be completed during the no-cost extension year.

Employer Interviews

Expanding on the preliminary findings of the employer interviews that were reported last year, the research team finalized the analysis and wrote up the subsequent discussion of the findings and concluding remarks. The resulting article manuscript is currently accepted and undergoing final revision for the *Education + Training* journal. The main focus of our no-cost extension year is to deeply focus on data analysis and submit 5-8 papers to peer reviewed journals. The paper plans, scheduled, and destinations have been decided already.

Comprehensive Comparative Analysis of the Project Findings

As previously reported, portions of the data collected for this project were coded using a combined codebook derived from the *Competencies Model for IT Program Management* (OPM, 2011) and *Career and Technical Education IT Frameworks* (FL DOE, 2013). The data coded using the combined framework will be compared across samples to identify areas of alignment or misalignment between the skills needed by new IT professionals, requested by employers, and those taught in regional IT degree programs. To build consensus and decide on a method of comparison across the diverse data types, Jonathan Hollister, developed a proposal of competing comprehensive comparative approaches (see Appendix D) and shared it with PI, Co-PIs, research team, and project evaluator for feedback prior to the aforementioned meeting on May 5th. Project Co-PI's provided feedback during and after the meeting to finalize and agree on a method of analysis to complete the final report and related publications.

Results of the preliminary comprehensive analysis were presented as a Works-in-Progress poster at the 2017 Annual Conference of the Association of Library and Information Science Education. Please see Appendix A for the poster itself. Relatedly, significant results from the preliminary comprehensive analysis are discussed in the Significant Results section below.

Fourth NSF ATE Annual Report

Preparation of the fourth annual report for this NSF ATE grant project has also been a priority in early 2017. The significant results from the research projects from the past year are summarized in the Significant Results section below.

Additional Activities

In addition to regular communication via phone and email, the PI, Co-PIs, research team members, and the project evaluator coordinated multiple staff meetings and conference calls to share and discuss preliminary findings and emergent themes., and project members coordinated multiple meetings and conference calls that included everyone.

On April 6, 2017, the Information Institute hosted an Advisory Committee meeting teleconference. Dr. Mardis announced that she is now PI and McClure is Co-PI. Mardis reported

preliminary findings, issues, and next steps. Dr. Mardis discussed how the study team might advise participating institutions how to address the gap between students' and employers' job perspectives, especially with regards to major study finding of the need for soft skills. The advisory committee members were interested in the alumni tracking plan which has provided great feedback on school curriculum. The committee members provided suggestions for developing the necessary non-technical skills, which many employers mentioned during the employer interviews (A meeting summary is available at: http://www.ii.fsu.edu/sites/g/files/upcbnu576/files/NSF%20ATE%20April2017_AC%20Meeting.pdf).

Perhaps one of the greatest accomplishments of this project to date has been building a strong relationship with Chipola College. While FSU and TCC are long time collaborators, until this project, FSU and Chipola had only occasional collaborations. Co-PI Froh and Co-PI Bouvin have enthusiastically contributed their ideas, data collection assistance, data analysis input, and employer contacts; as a result, the project has been greatly strengthened and entire the research team's understanding of the challenges of North Florida's IT community deepened. As a direct result, Chipola and FSU are in the process of signing a formal articulation agreement for the AS to BS in IT programs and Chipola and FSU have sought another ATE research project to support Chipola's advanced manufacturing educational opportunities. All PIs have benefited from the work to date not only intellectually, but also have seen its broad impact on the region's IT education opportunities. Co-PI Bouvin is also an experienced researcher who is setting aside time in his new role as Dean of Business and Technology to contribute to Y5's planned activities.

SIGNIFICANT RESULTS

Key findings from multiple datasets are listed under the research questions below. Please see Figures 1, 2, and 3, which are included in Appendix B, for a comparison of the general, technical, and emergent codes from the entry level IT job postings, employer interviews, and combined IT syllabi data. Preliminary findings of the classroom observations and new professional interviews are still undergoing review and are not included in the charts below.

Figure 1. Accumulated Frequency of General Competencies (% of Overall Coding)

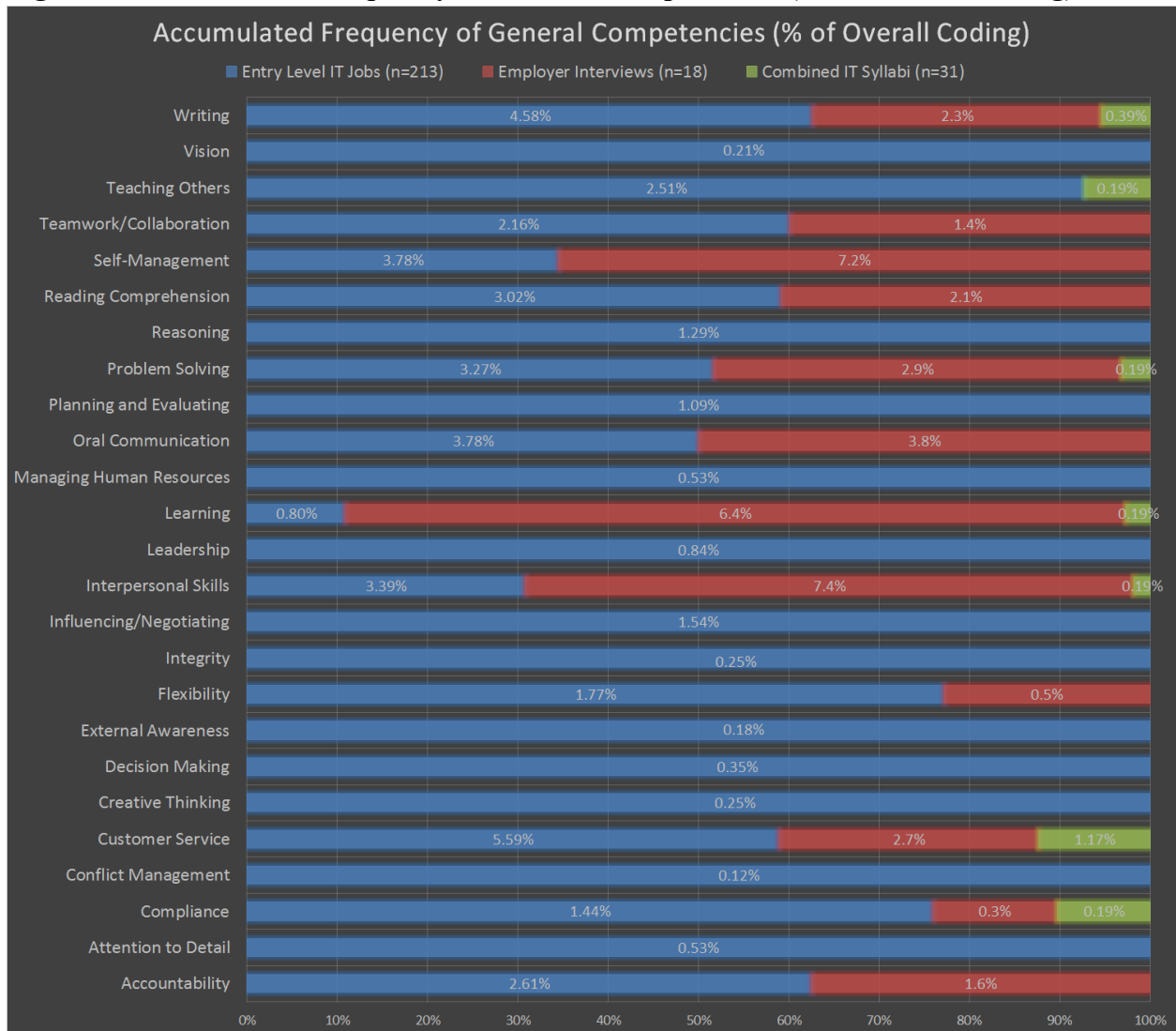


Figure 2. Accumulated Frequency of Technical Competencies (% of Overall Coding)

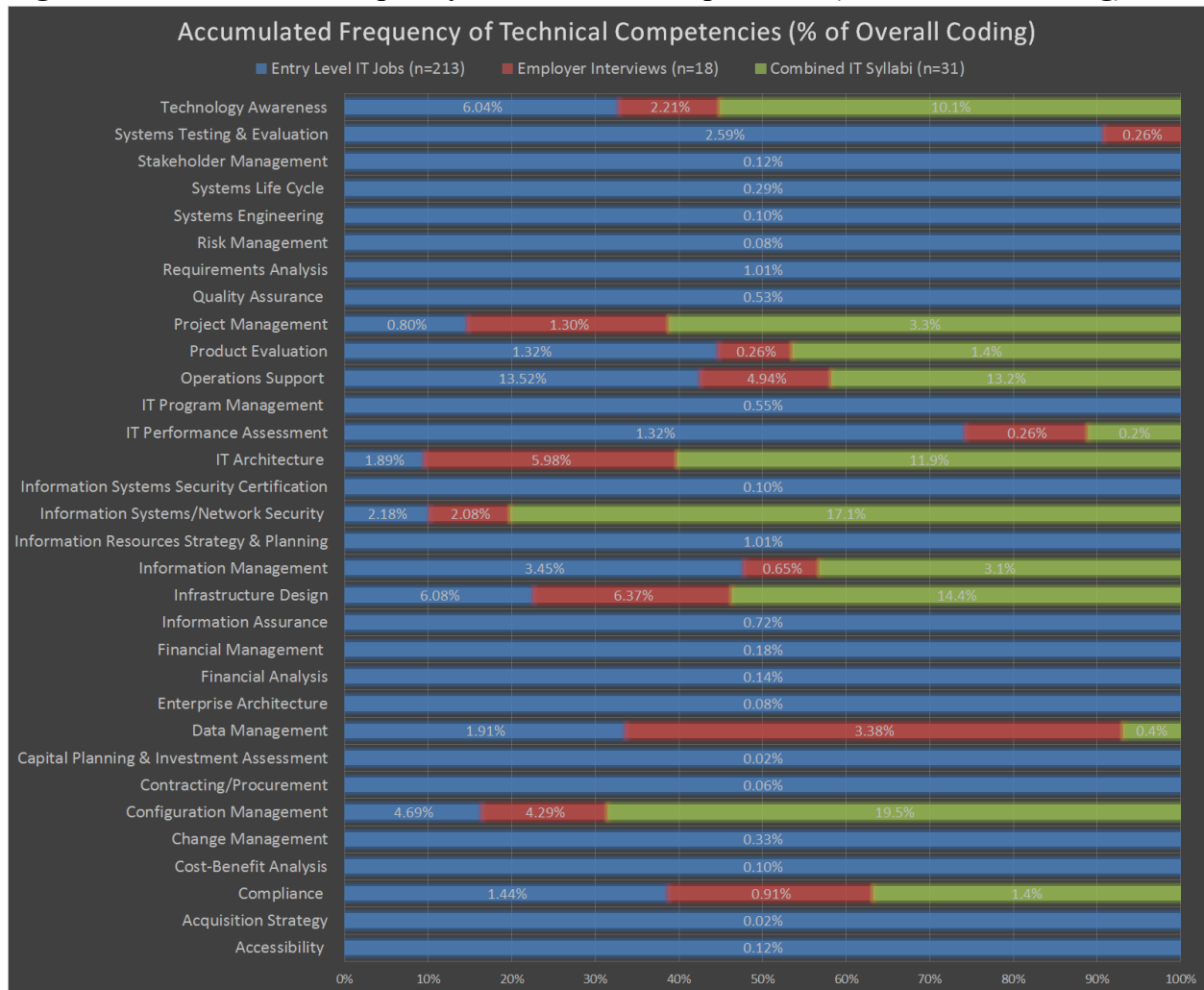
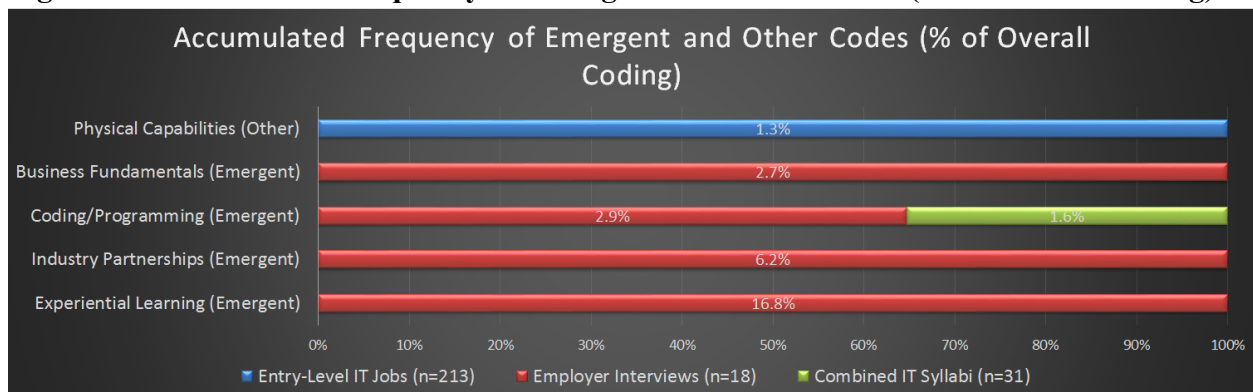


Figure 3. Accumulated Frequency of Emergent and Other Codes (% of Overall Coding).



RQ 1. How do the IT/broadband skills graduates gain through two-year community college programs compare to the needs expressed by employers in non-metro/metropolitan areas?

In Figure 1, the general competencies that all three datasets commonly covered include seven competencies: writing, teaching others, problem solving, learning, interpersonal skills, customer service, and compliance. Also, while entry level job postings and employers emphasize some general competencies such as teamwork/collaboration, self-management, oral communication, flexibility, and accountability, those competencies did not appear from the combined IT syllabi. This shows a gap between industry/employer perspective and education (curricula) perspective. While employers stressed the importance of soft skills, these skills were not directly linked with internship or experiential learning experiences. From interview data, employers primarily placed value on experiential learning such as internships and on the job training as shown in Figure 3, because they can provide hands-on experience and exposure to cutting edge technologies currently used in the industry. As such, recent graduates with internship experience may require less training after they are hired to get up to speed with the specialized systems and technologies, especially if they are hired by the company where they interned. These findings suggest that internships and other experiential learning opportunities are a crucial part of the student to career pathways for new IT professionals. Some employers mentioned that experiential learning opportunities may help students to develop and promote general or soft skills from interning at a workplace environment. Lastly, general competencies coming solely from entry level job postings, such as vision, reasoning, planning and evaluating, managing human resources, leadership, influencing/negotiating, integrity, external awareness, decision making, creative thinking, conflict management, and attention to detail, may show the potential foci to be included in the IT curriculum.

Regarding the technical competencies, industry/employer and education (curricula) perspectives have more alignments than they do as to general competencies. As Figure 2 demonstrates, twelve competencies are well covered by all of three datasets: technology awareness, project management, product evaluation, operations support, IT performance assessment, IT architecture, information system/network security, information management, infrastructure design, data management, configuration management, and compliance. In addition, technical competencies coming solely from entry level job postings include a variety of highly specialized ones: stakeholder management, systems life cycle, systems engineering, risk management, requirements analysis, quality assurance, IT program management, information resources strategy and planning, information assurance, financial management, financial analysis, enterprise architecture, capital planning and investment assessment, contracting/procurement, change management, cost-benefit analysis, acquisition strategy, and accessibility. These may lead to the conclusion that IT curriculum should include more specialization.

The results above show that even though industry/employer' needs come from both general and technical competencies, current IT education (curricula)'s focus is rather concentrated on the

technical competencies. It implies that IT curriculum should be modified to reflect increasing needs of various general and technical competencies by implementing more internships and hand-on learning experiences so that students can build both general and technical competencies as well as specialize their skill sets during their education.

RQ2. How do the IT/broadband skills graduates gain through two-and four-year college programs compare to the skill sets new professionals identify they need after they are hired as IT employees in non-metro/metropolitan areas?

As mentioned above, the new professional interviews data is currently being revisited and reviewed as part of ongoing analysis and will be discussed in greater detail in the final report and upcoming publications. Preliminary emergent themes from the new professional interviews reported last year included the need for more experiential learning experiences through internships as well as more hand-on training in the classroom. New professionals also stressed the importance of soft skills in the workplace and the lack of their coverage during their time in regional IT programs.

RQ3. What, if any, gaps exist between the skills non-metro/metropolitan employers report their IT/broadband employees need and the skill sets new professionals report they need to be successful as IT/broadband employees?

The new professional and employers agreed that both technical and soft skills and hands-on work experience gained through internships are highly valuable to new professionals and sought after by IT employers. Both groups, employers and new professionals, identified soft or general skills as the most important skills needed by IT employers. Of particular note, employers and new professionals both stressed the importance of Interpersonal Skills and Self-Management. These findings also align with the results from the final report of our *Florida IT Career (FITC) Alliance Pathways Assessment* grant project (available here: <http://ii.fsu.edu/Research/Projects/IMLS-LB21-2014-Project-Summary>). Employers interviewed in that report stated they expected IT graduates to be prepared and ready to be “plugged into” existing teams in their businesses and that new hires and graduates needed to have interpersonal and communication skills in order to do so.

Employers also emphasized the importance of learning, often in relation to both soft skills and current technology skills on the job, more so than new professionals. While the new professionals valued their education and especially relished the experience and skills gained through internships, these findings suggest that new professionals might not consider the importance of learning and/or continuing education as they enter the workforce and develop their careers. As employers expect new hires to spend a great deal of time learning the responsibilities and skills needed for their position and to fit into the workplace, seeking potential employees that also value learning is a sound hiring strategy.

In regards to technical competencies, employers sought more specific skill sets, such as Infrastructure Design and Information Technology Architecture. As seen above, employers often wished graduates had more specific skill sets coming into new positions. This may also explain why employers seek new hires with the ability to learn new skills. Both new professionals and employers emphasized the importance of basic computer knowledge, such as Operations Support and Configuration Management. Preliminary results indicate that new professionals identified problem solving and troubleshooting skills, the latter referring to more practical abilities to fix specific technical issues, more so than employers. However, given the nature of problem solving and troubleshooting, what new professionals referred to as problem solving and troubleshooting could, in part, be what employers are suggesting when they mentioned learning.

RQ 4. What, if any, differences are there between the skills needed for IT/broadband employees in non-metro and metropolitan areas?

As previously reported in a 2014 TPRC conference paper, 213 job postings were collected and coded using the aforementioned combined codebook. However, since only 13 of these postings were sourced from non-metro or rural areas, a meaningful comparison with the skills requested in job ads from metro or urban areas was not possible. However, this disparity highlights the lack of IT jobs in the North Florida region.

During interviews, nonmetropolitan employers did not report any difference in the types of skills necessary for their IT employees. These employers did mention additional struggles they face when hiring IT workers like being unable to offer competitive wages, lack of broadband, and lack of qualified applicants. Smaller, rural companies often do not have the funding or technological infrastructure to attract IT professionals to live and work in rural areas. While rural or non-metro IT employers did not seem to suggest that rural IT professionals required a different skill set than metro-area IT professionals, they did mention it was difficult to attract and retain IT professionals that were well-qualified. These themes are further discussed in the article under review at *Education + Training*.

RQ5. How can two-and four-year college IT/broadband program curricula be modified to best meet the specific needs of employers and IT/broadband employees in non-metro/metropolitan areas?

As the results of this 2015-2016 academic year curriculum analysis suggest, there is now no significant difference between the curricula offered by Chipola College's Computer Information Technology Program and TCC's Networking Services Technology programs. The results indicated that graduates from Chipola College and TCC are prepared mainly in the technical skill

areas of Configuration Management, Information Systems/Network Security, Infrastructure Design, Operations Support, IT Architecture, and Technology Awareness. However, the curricula from both schools lack emphasis in some technical skill areas, such as Compliance, Project Management, Coding/Programming, Product Evaluation, Systems Testing and Evaluation, Information Management, IT Performance Assessment, and Data Management.

Each institution's curriculum focus is heavily skewed towards the technical skills rather than general, soft, or employability skills. Given the U.S. Chamber of Commerce's (2012) findings, graduates from these and similar programs may be failing to meet the needs of employers because they did not complete coursework that emphasized general, soft, or employability skills.

As IT employers seek increasingly specialized new IT professionals and prefer applicants with soft skills and experiential learning experiences such as internship and work experience when making hiring decisions, IT curricula should be adjusted to incorporate more experiential learning opportunities into the requirements of their respective programs. In addition, community college IT/broadband programs should strengthen existing partnerships with local employers and continue to build new relationships with other employers in order to provide experiential learning opportunities, such as internships, service learning, volunteering, apprenticeships, etc. Additionally, the needs of incorporating more collaborative participatory activities into the curriculum, such as group discussion, demonstration, and presentation, which can develop soft skills are found from the classroom observation data. IT curricula should more directly address and provide opportunities to learn and apply soft skills, as reported in our *Second Curriculum Analysis Report* (Appendix C).

Given the need for highly skilled IT professionals in rural communities, building partnerships with rural employers could be especially beneficial for all stakeholders involved. Experiential learning opportunities in rural areas would allow students to gain needed skills and experience as well as provide opportunities for rural communities and employers to demonstrate and fulfill their IT and broadband needs as well as chance to extol the benefits of living and working in non-metro areas. New IT professionals that have internships in rural areas might be more likely to stay and work in the area, assuming some of the other challenges mentioned above are addressed.

KEY OUTCOMES

The research team completed analysis of the employer interviews data and has had a research paper based on them accepted for the peer-reviewed journal *Education + Training*. The employer interviews highlight the need for new employees and recent graduates to have more specialized technical skills, but not necessarily through certifications, as well as soft skills or general competencies such as communication, self-management, customer service, and interpersonal skills. Employers also stressed the importance of industrial partnerships to

facilitate experiential learning experiences. Employers in rural areas described several challenges in recruiting and retaining skilled IT workers, such as poor broadband infrastructure in non-metro areas and high salaries in metro areas. These insights suggest that industrial partnerships with rural IT companies may help students gain hands-on experience and provide rural companies and communities the skilled IT workers they need. Additionally, findings suggest that there is no substantial difference in the skills needed by IT professionals in metro areas vs. non-metro areas.

The research team, in collaboration with Co-PI's, planned a comprehensive, comparative analysis of the study's findings through triangulation of the various data points. The preliminary comparative results, discussed above, demonstrate major misalignments between the needs of employers and the curricula of regional IT degree programs, particularly the lack of soft skills or general competencies in the IT curriculum. These skills are highly sought after because new IT professionals and recent graduates need to be able to work with people as well as technology. Additionally, the findings emphasize the need for more hands-on learning in the classroom; partnerships between regional colleges and companies hiring IT professionals; and the importance of experiential learning, such as internships, service learning, etc. Given the amount and richness of the data and several staff changes, a no-cost extension has been requested to allow for additional time to analyze the data, disseminate the findings, and prepare the final report. The insights stated above identify key recommendations for improving the IT curricula in regional IT programs and developing a more competitive IT workforce as well as surfaced areas in need of further research, such as how to best integrate soft skills into the IT curricula, how to foster successful partnerships between educational institutions and industry, and how to determine and ensure effective and meaningful experiential learning activities and experiences.

As mentioned above and below, the research team disseminated preliminary findings of the study through a variety of means, including two conferences, an international trip (which was not paid for using NSF ATE funding), and other activities. An article based on the employer interviews data is currently under review at a well respected journal and additional manuscripts are planned following the completion of the comprehensive analysis discussed above.

OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT

The process of implementing the research design has allowed the personnel at the participating community colleges to become more familiar with research data collection and analysis procedures. This has expanded to roles as data collectors, as the Co-PIs recruited students, new IT professionals, and IT employers for the study. They have contributed to the refinement of the faculty and student focus group protocol, and were responsible for setting up each session at their locations. Dr. Froh (previous project Co-PI) and Dean Stewart trained with the research team on the classroom observation protocol in early December 2014, with modifications to the coding instrument made based on their feedback. They served as the lead classroom observers in the

classroom observations conducted in February 2015 and conducted post-observation interviews with faculty members. Dr. Hollister developed an online focus group methodology for the project (which we were unable to recruit enough participants for) and worked with the PI, Co-PI's to incorporate their feedback on the proposed comprehensive analysis approach for the final products and reports (see Appendix D).

The graduate students, both at the master's and doctoral levels, who have been working alongside the lead researchers have benefited from opportunities to increase their methodological knowledge as well as to present at respected conferences in the field. They have learned more about why data collection techniques are selected and implemented (including gaining experience in conducting focus groups and classroom observations), how data analysis procedures can be carried out (including learning how text mining techniques can be applied to the research problem of this project), and built familiarity with data analysis tools, such as SPSS and NVivo.

In the no-cost extension year, the research team still plans to develop and host a regional workshop to share our results with and gain feedback from regional employers, IT professionals, educators, and researchers for training and professional development purposes.

DISSEMINATION TO COMMUNITIES OF INTEREST

Postdoctoral Researcher visits South Korea to discuss NSF ATE Findings - June 2016

In June 2016, research team members, Jonathan Hollister and Jisue Lee, organized two meetings in South Korea to share and discuss the preliminary findings of the NSF ATE grant project. Several South Korean faculty members and academic librarians gathered and shared thoughts and feedback regarding trends and issues in Library and Information Science (LIS) and Information Technology (IT) education across South Korea and the United States. Unlike in the U.S., universities in South Korea offer LIS degrees from two-year and four-year colleges (granting a second level librarian certificate upon graduation) as well as Master's and/or PhD degree (granting a first level librarian certificate for management or leadership positions in libraries). In the first meeting (on June 10th), Dr. Sung Jae Park, an Assistant Professor at Hansung University and Dr. Ji Hei Kang, an Assistant Professor at Dongduk Women's University (both PhD Alumna from the FSU iSchool) mentioned that even though librarians positions are considered secure and stable public service positions despite economic fluctuations, librarians are rather stereotyped as simply managers of collections of books and little else. Many core tasks and functions in libraries such as cataloging or managing electronic resources and databases are easily outsourced due to limited budget, which results in deterioration of the quality of library services. They suggested that the LIS curriculum incorporate the broader information science perspectives, subject knowledges, and skills reflecting the regency of digital technologies and teach students more programming, coding, analytics, and business oriented skill

sets. In the second meeting on June 14th, a group of academic librarians and researchers added their comments emphasizing the necessity of helping librarians build more technical skills to streamline the traditional library services. In addition, they expect the LIS curriculum to be more interdisciplinary by adding perspectives from neighboring disciplines including Computer Science, Business Administration, and Human-Computer Interactions. Both meetings allowed a research team to present the preliminary findings of NSF ATE projects, obtain feedback, and validate the initial findings through international contexts. The complete write-up is available at: <http://ii.fsu.edu/article/postdoctoral-researcher-jonathan-hollister-discusses-nsf-ate-preliminary-findings-overseas>

Please note: Dr. Hollister's trip to South Korea was not funded using the NSF ATE award funds.

NSF ATE PI Meeting in Washington DC- October 2016

During the NSF ATE PI meeting in Washington D.C., in October, 2016, Dr. Mardis (PI) and Dr. Flora McMartin (Project Evaluator) participated in the information showcase displaying key findings of the Broadband Pathways project. The emphasis was put on the research collaborations between community colleges and universities. A more detailed write-up can be found on our website here: <http://ii.fsu.edu/article/broadband-pathways-co-pi-and-institute-associate-director-marcia-mardis-and-flora-mcmartin>

ALISE Annual Conference - January 2017

During the 2017 Association for Library Information Science Education (ALISE) Annual Conference at Atlanta, Georgia, research team members Jonathan Hollister and Jisue Lee presented a poster titled "The (mis)alignment of IT education and IT workforce needs: Challenges and opportunities in the North Florida region." This poster presenting preliminary findings of a comprehensive analysis comparing the skills identified in job ads, needed by employers, and those included in the IT degree program curricula of two regional colleges. The full citation is listed in the products section below. The abstract, poster, and references are available here at this URL <http://ii.fsu.edu/node/3636> and the poster in Appendix A.

Annual Conference of the American Institutes for Research (AIR) - May 2017

Faye Jones, Marcia Mardis, and Charles McClure will be presenting a conference paper based on data from this project as well as a related Florida Information Technology Career (FITC) Pathways Alliance funded project. In this paper, the team stresses the importance of IT programs' systematic documentation (tracking) of their alumni based on the findings from the FITC and NSF projects. A key finding is that several strategies can considerably improve alumni tracking without sacrificing student privacy. The full citation of this conference paper can be found in the products section below.

ACTIVITIES PLANNED IN NEXT REPORTING PERIOD THAT ACCOMPLISH GOALS

As we have requested a no-cost extension, our planned activities in the year 2017 will include:

1. A synthesis and comprehensive analysis of the collected data and preliminary findings from years 3 and 4. In order to fully address each research question and accomplish the overarching goals of this project, a macro-level and comprehensive approach to understanding the emergent themes is required.
2. Collaborate with project Co-PI's at partner institutions to analyze classroom observations, student focus group, new professional data, and student tracking data to identify and map student-to-career pathways.
3. Writing and submitting journal articles and/or conference papers that focus on: a) the multiple/mixed methodology of this project; b) the challenges faced by new professionals, employers, and colleges in rural, non-metro areas and communities; c) preliminary findings and final results from year 4 and beyond; and d) IT curricular recommendations and educational frameworks as informed by the student-to-career pathways we have identified.
4. Final results will also be disseminated to project stakeholders, educators, employers, and researchers in related fields and disciplines at a regional workshop to be broadcasted online for professional development purposes.
5. We will be exploring additional research and funding opportunities based on the emergent findings of this project.
6. Draft and submit the NSF ATE final report.

The research team meets weekly to discuss project progress, preliminary findings and emergent themes, as well as to explore opportunities for future research and new horizons for dissemination. We will continue to communicate regularly with the project evaluator, Flora McMartin, and request and use her feedback

PRODUCTS

Books - None

Book Chapters - None

Conference Papers and Presentations

Jones, F., Mardis, M.A., & McClure, C.R. (2017). Alumni Tracking: Promising Practices for Collecting, Analyzing, and reporting Employment Data. Paper to be Presented at *the Annual*

Conference of the American Institutes for Research, Washington DC, May 2017. Status = ACCEPTED; Acknowledgement of Federal Support = Yes.

Hollister, J. M., Spears, L. I., Mardis, M. A., McClure, C. R., & Lee, J. (2017). The (mis)alignment of IT education and IT workforce needs: Challenges and opportunities in the North Florida region. Poster presented at *the 2017 ALISE Annual Conference*, Atlanta, GA, January 17-20, 2017. Status = PRESENTED; Acknowledgement of Federal Support = Yes.

Inventions – None

Journals

Hollister, J. M., Spears, L. I., Mardis, M. A., Lee, J., McClure, C. R., & Liebman, E. (2017). Employers' perspectives on the employability of IT graduates in North Florida. *Education + Training*. Status = ACCEPTED; Acknowledgement of Federal Support = Yes; Peer Reviewed = Yes.

Jones, F.R., Mardis, M.A., McClure, C.R., & Randeree, E. (2017). Alumni Tracking: Promising Practices for Collecting, Analyzing, and Reporting Employment Data. *Journal of Higher Education Policy and Management*. Status = UNDER_REVIEW; Acknowledgement of Federal Support = Yes; Peer Reviewed = Yes

Licenses - None

Other Products – None

Other Publications

Patents – None

Technologies or Techniques

Graduate students who joined the NSF research team in early 2014 contributed stronger data management and analysis skills, resulting in the use of Natural Language Toolkit (NLTK) in which Python was deployed to conduct text mining on the syllabi and job posting documents. The NLTK was further refined in the second curriculum analysis by utilizing an updated codebook that was validated by external IT expert and research team members. Please see Appendix C for a full description of the revised text-mining and natural language processing approach.

Thesis/Dissertations – None

Websites

Assessing Information Technology Educational Pathways that Promote Deployment and Use of Rural Broadband (NSF)

<http://ii.fsu.edu/research/projects/assessing-information-technology-educational-pathways-promote-deployment-and-use-rural>

The project website has been established at <http://ii.fsu.edu/research/projects/assessing-information-technology-educational-pathways-promote-deployment-and-use-rural> with proper NSF notices and attribution. The project website provides an overview, descriptions of project team members, and links to related work. The project website will be updated to contain project products as they are developed.

PARTNERS AND COLLABORATORS

What other organizations have been involved as partners?

Nothing to report.

What other collaborators or contacts have been involved?

Nothing to report.

IMPACTS

What is the impact on the development of the principal discipline(s) of the project?

This project supports the goals of NSF ATE program through research into effective and sustainable preparation for IT/broadband technicians in Northwest Florida. Through its multiple methods pursuit of its research questions, this project is designed to address the dearth of collaborative research on the intersecting needs of IT educators, students, and employers concerning broadband.

Based on the preliminary findings generated thus far, impacts include:

Using the methodology identified in the NSF ATE study, the research team has collaborated with the Florida Information Technology Career (FITC) Alliance to assess a curriculum learning outcomes of a sample of high schools, two- and four-year colleges, and research universities (Florida A&M University and Florida State University) and to determine the extent to which these align with employer and workplace needs. This study is broader in scope with a greater

range of participants, and is building on the findings of the NSF study. Between the two studies, the use of text mining and natural language text tools has been tested and provided findings that informed Phases 3 and 4 of this project. Relatedly, having completed an assessment role on the Florida Information Technology Career (FITC) Pathways Alliance project, the research team acquired, with permission, access to research data from the FITC project to supplement and expand on the data collected for this NSF ATE project as well as triangulate preliminary findings across both studies. The combined results of both studies could potentially extend to other related projects and provide insights to broader undergraduate STEM education beyond just IT. The final assessment report for the FITC project can be found here:

http://ii.fsu.edu/content/download/296457/2025215/file/FITCInstituteFinalReport_AUG28_2015.pdf.

The preliminary findings in Year 4 continue to build on and expand the areas that require further research. In Year 2, these areas included the extension of the education-to-career pathway to begin with high school; the need to understand the role of guidance counselors, who may be underrepresented and lack the tools to provide guidance on such a dynamic and evolving field; the need to identify best practices for syllabi creation and use; and the need for dialogue on the standards being produced (or needing to be created) for the young IT discipline. Preliminary findings in Year 3 strongly supported the need for students to have opportunities for experiential learning, exposure to current technology used in the industry, as well as to develop and hone soft skills, such as communication, interpersonal, self-management, troubleshooting, and problem-solving skills. Preliminary findings, as discussed in the Significant Results and Key Outcomes sections above, of Year 4 suggest that IT programs need to incorporate instruction on soft skills or general competencies in addition to expanding to more specific technical skills, such as coding and programming, in order to meet the demands of employers and the industry at large.

The project has heightened awareness and attention to the FLDOE Career and Technical Education frameworks on the parts of TCC and Chipola, including the instructors at each institution. Contacts have been identified with the Florida College System from which a dialogue can be generated with a wider group of college administrators about their use of the IT program frameworks. Based on feedback from interviews and focus groups with new professionals and employers, as mentioned above, soft skills and experiential learning were also identified as crucial for students' success. As such, incorporating the Office of Personnel Management's (2011) Competencies Model for IT Program Management into the revised codebook and allowing for emergent themes has allowed us to identify explore more nuanced factors beyond technological skills that will, in turn, provide more useful and practical recommendations for IT curricula. However, further research on how to best incorporate soft skills into the IT curriculum and how to create industry partnerships with employers, particularly in rural areas, to facilitate experiential learning opportunities is needed.

As mentioned in the previous year's annual report, we plan to share preliminary and final research findings via a workshop with regional faculty and industry representatives and a final one-day seminar, broadcast online, to be held at FSU as part of the Eppes Professor Lecture Series. Additionally, research findings will continue to be disseminated through presentations at conferences and articles in journal, as well as made available on our project's website. All Co-PIs continue to present the findings to their stakeholders and communities.

In particular, the research team will attempt to submit proposals to present preliminary and final results at regional and national broadband and education conferences such as the National Career Development Association (NCDA), League for Innovation in the Community College (STEMtech, Innovations and Learning College Summit), and the American Association for Community Colleges' (AACC) Rural Community College Alliance (RCCA) conferences. Articles reporting project results will be submitted to journals such as *Community College Journal*, *Community College Review*, *Community College of Research and Practice*, *New Directions for Community Colleges*, *Educational Research Review*, and other community college and non-metro education journals. Policy conferences such as the Association for Public Policy Analysis (APPAM) and the Telecommunications Policy Research Conference (TPRC) will be targeted for presentations of findings. As stated in the Major Activities section, the research team presented at the Association of Library and Information Science Education (ALISE) Annual Conference in January 2017 and is accepted to present at the Annual Conference of American Institutes for Research in May 2017. As we are seeking a no-cost extension in order to better analyze the data collected, our final year will focus on the final comprehensive analysis and continuing our dissemination efforts to stakeholders, including community college educators and administrators, researchers, and employers in rural or non-metro as well as metro areas.

This project reflects a true collaboration among academic, employer, and community stakeholders and should yield benefits for many schools around the state. This study will further define a field that requires a flexible worker who can manage the constant stream of new knowledge, can leverage both technical and soft skills, and can support work functions that are increasingly broadband dependent. This study will also establish the use of the term non-metropolitan (non-metro) to describe the areas of the study more inclusively as communities that are adjacent to metro or urban areas and comprise a population of both urban and rural residents.

What is the impact on other disciplines?

Conduct of the project's research activities will have profound effect in the capacity of information science faculty and doctoral students to conduct collaborative research into workforce development. This combination of research and practice is aided by the use of rigorous techniques such as content analysis, text extraction, and machine learning. This collaborative effort has expanded into other studies that encompass multiple institutions,

including other universities, other two- and four-year colleges, and high schools and has extended into the disciplines of computer science and computer engineering.

At a more widespread level, project deliverables will be transferrable to other regions based on the comparative analyses that will be completed. In addition, the project team is positioned to annually attend, conduct research, or disseminate results on campus at the projected annual seminar and at regional industry expos, such as Tech Expo, which is produced by TalTech of Tallahassee, and Digitech, the school's digital technology expo which draws interest from the greater Northwest Florida industrial organizations. In addition, key advisory committee members are positioned to use results to influence curricula at their respective institutions. These prospective impact statements are unchanged in Year 4.

What is the impact on the development of human resources?

Post-secondary educational programs designed to prepare highly qualified entry-level IT/broadband workers in non-metropolitan communities must provide a broad array of skills for those who are supporting institutions with employees who may possess below average technical skills but have strong needs for technology access. The findings of this study will align the efforts of educators directly with the needs of employers and industry and are informing the creation of a network and infrastructure by which each domain can articulate goals, objectives, needs and challenges.

Each of the partner institutions is gaining perspectives on employer needs and increased opportunity to gather feedback that is structured and balanced by the articulation provided by the study. The identification of opportunities and methods to better position the employers in non-metro communities to provide experiential learning is a key way that human resources can be deployed to benefit both employers and schools and provides a more robust pathway for students progressing into technology careers. These prospective impact statements are unchanged in Year 4.

What is the impact on physical resources that form infrastructure?

Because a key aim of this project is to identify the value of and need for broadband IT technicians in rural areas and is engaging community stakeholders, this project is likely to impact the resources rural communities allocate to enhancing their broadband availability through serving great demand for high speed connectivity. This prospective impact statement is unchanged in Year 4.

What is the impact on institutional resources that form infrastructure?

Because a key aim of this project is to identify the value of and need for broadband IT technicians in rural areas, this project is likely to impact the resources two and four-year colleges allocate to their own broadband and network infrastructure in order to educate these individuals. This prospective impact statement is unchanged in Year 4.

What is the impact on information resources that form infrastructure?

A major activity of this project is to compare employers' needs to curriculum content. A likely impact of this project will be the revision and reinvigoration of IT curricula at rural community colleges in the region. This project has also impacted a state-level study that has broadened the scope to include high schools and universities along with other discipline domains, creating a network for increased dialogue across North Florida and among education institutions at all levels. This prospective impact statement is unchanged in Year 4.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

This study of non-metro communities that have deployed broadband or are preparing to do so will support the efforts of ATE to facilitate economic development and connect the communities to global society. We learned early on that a study of broadband technicians is really a study of IT professionals since the skill sets and educational opportunities are shared. This study has the potential to influence the ongoing examination and adoption of IT curriculum standards that are dynamic and responsive to the changing needs of industry. It also serves to extend the dialogue about the place of IT education beyond the scope of workplace training, in order to build a body of knowledge from which flow best practices. This research meets the challenge of the NSF ATE's goal of improving and supporting the dynamic education of technicians in the workplace who sustain these growing digital efforts and further defines IT/broadband skills needed in non-metropolitan labor markets in communities nationally. Our commitment to this prospective impact statement has only strengthened in Year 4.

CHANGES/PROBLEMS

Changes in approach and reason for change

As mentioned in Y2 annual report, we conducted a second job posting analysis because a preliminary review of the data collected projected that there would be no significant differences from the first analysis. Data analysis is underway. Also mentioned in the Y3 annual report, the planned online focus group with regional IT employers was canceled due to difficulties in recruiting participants, although future implementations are still under consideration in the

extension year as new Co-PI Bouvin has many contacts in the nearby Chipola community (Jackson County, FL).

Actual or Anticipated problems or delays and actions or plans to resolve them

Given the copious amount of data collected during this project, data analysis has taken much longer than originally expected and remains ongoing. Compounding this issue, there have been several changes and adjustments to the investigators and research team working on the project. First, a new Co-PI representing Chipola College, Dr. David Bouvin, was added to the project to replace the former Co-PI from Chipola College. Additionally, Dr. Mardis and Dr. McClure switched their principal investigator roles. Liz Liebman, a former Research Associate, accepted a new position as an information professional. Similarly, the Research Coordinator position at the Information Institute is being transitioned to a new team member due to doctoral students graduating and accepting full-time positions elsewhere. A new Research Coordinator is currently being trained along with two additional research associates, Faye R. Jones and Jisue Lee have been added to the project in late 2016 to assist with data analysis and dissemination efforts. Given the above issues, a no-cost extension for this grant project has been requested to allow for more time to comprehensively analyze the data and prepare additional publications.

Changes that have a significant impact on expenditures

Nothing to report.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals

Nothing to report.

Significant changes in use or care of biohazards

Nothing to report.

SPECIAL REQUIREMENTS

Nothing to report.

APPENDICES

(All appendices are available at: <http://www.ii.fsu.edu/sites/g/files/upcbnu576/files/2017-05/Award1304382AppendixA-D-PreliminaryReports.pdf>)

Appendix A: *The (mis)alignment of IT education and IT workforce needs: Challenges and opportunities in the north Florida region*

Appendix B: *Preliminary comprehensive comparison figures*

Appendix C: *Second Curriculum Analysis Report*

Appendix D: *Proposed Comprehensive Analysis Methodologies*

All preliminary reports are available on our website at:

<http://ii.fsu.edu/research/projects/assessing-information-technology-educational-pathways-promote-deployment-and-use-rural>