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# Program Evaluation: A Federal Agency's Air Traffic Control Train-the-Trainer Program

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Lisa Mercer

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2015

Abstract

Program Evaluation: A Federal Agency's Air Traffic Control Train-the-Trainer Program

by

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MAS, Embry-Riddle Aeronautical University (ERAU), 2011

BSA, ERAU, 2005

Instructional System Development Graduate Certification, ERAU, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

December 2015

## Abstract

In 2014, the Federal Aviation Administration (FAA) highlighted to the U.S. Senate the need to focus on air traffic control (ATC) training to meet job qualification and attrition rates within the career field. One U.S. Department of Defense military service assists the FAA in providing worldwide ATC services. This service is referred to as the *agency* throughout this paper to ensure confidentiality. The agency's ATC career field manager echoed the FAA's call for action in his 2014 Strategic/Action Plan. In August 2013, the agency's ATC trainer program was published. As of December 2015, the program had not been evaluated. The purpose of this study was to ascertain if the program facilitated the learning of critical ATC on-the-job training skills. An ad hoc expertise-oriented evaluation was conducted using the lenses of andragogy, experiential learning, and instructional system design (ISD). Purposeful sampling procedures were used to select 20 participants across the subgroups of supervisors, trainers, managers, and training developers from 7 focus sites. The semi-structured interviews queried 4 topical areas derived from Kirkpatrick's 4 levels of evaluation model. Data collected via documents and interviews were analyzed using descriptive, emotion, eclectic, and pattern coding. Key findings indicated that the program was not developed compliant with ISD principles and did not promote adult learning as endorsed by andragogy and experiential learning theory. The implications for positive social change include providing stakeholders with data needed to make evidence-based decisions regarding the current and future state of the program. The evaluation report project can be shared with the FAA, an agency partner, and has the potential to create a platform for improved training practices focusing on optimum and successful adult learning transactions.

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## Dedication

I dedicate this work to all past, present, and future agency air traffic controllers. Agency controllers provide service to aircraft in the global air traffic system during both times of peace and times of war. Air traffic controllers are highly specialized and routinely make split-second decisions that ensure the continued safety of millions of dollars in assets and human life. Air traffic controllers are meticulous and assertive decision makers who possess excellent real-time risk analysis skills and remain calm under extreme pressure. Moreover, agency controllers are a cohesive team that embodies the teamwork ethos both on and off duty. Once an agency controller, you are a teammate for life. Thank you to all my teammates for what you selflessly do every day for each other and the skies above without regard to personal gain or glory. In particular, thank you to the 20 agency controllers who shared their perspectives, experiences, and recommendations for this study.

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To my parents, who never lost faith when I veered off course (more than once), thank you for having faith that I would find my way (eventually). Thank you for teaching me to value hard work and to never settle for mediocrity. To my grandparents, I will be forever grateful for all you shared about life, love, and God. To my sisters, you are amazing women who lift my spirits daily and inspire me to achieve great things by simply following your incredible example.

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## Section 1: The Problem

### **Introduction**

The U.S. Federal Aviation Administration (FAA) called for a technically and functionally skilled workforce within its *Destination 2025 Performance Report* (FAA, 2014a). The FAA identified a need to focus on on-the-job (OJT) training in order to meet job qualification requirements and future attrition rates (FAA, 2014b). One U.S. Department of Defense (DoD) military service assists the FAA with providing worldwide ATC services. This service is referred to as the *agency* throughout this paper to ensure confidentiality. The agency's ATC career field manager (CFM) echoed the FAA's call for action by highlighting the need for improved training programs designed to meet current and future career field challenges in his *2014 Strategic Action Plan*.

The agency's ATC career field uses a train-the-trainer program wherein the *ATC Trainer Qualification Training Package (QTP)* is the primary guide used to facilitate training. In August 2013, the QTP was published. As of December 2015, no research had been conducted to ascertain program effectiveness. The purpose of this study was to determine whether the existing program facilitated the learning of skills needed to conduct OJT. This study fills a knowledge gap by evaluating the program and presenting data, findings, and recommendations to stakeholders via a formal program evaluation. In this section, I define the training problem, explore evidence of the problem within existing literature, explain the significance of the problem, define key terms, define the research focus, and describe possible study implications.

### **Definition of the Problem**

Both the FAA and the agency acknowledge the integral part training plays in the current and future sustainment of the controller inventory (FAA, 2014). The agency provides a 1-day (8 hours) train-the-trainer course. This course is not ATC centric and only provides general guidance. The agency's ATC career field provides additional ATC-centric training using the QTP. The trainee is provided a maximum of 45 days to accomplish the QTP, under the tutelage of a controller who received his or her trainer qualifications via the same program.

Evaluations are conducted to determine program effectiveness and to identify ways to improve a program (Fitzpatrick, Sanders, & Worthem, 2011; Kirkpatrick & Kirkpatrick, 2006). Spaulding (2014) reiterated this concept and clarified that a program evaluation differs from action research in its unique purpose. Action research is conducted to inform knowledge and practice. Conversely, program evaluations are conducted for decision-making purposes (Fitzpatrick et al., 2011; Spaulding, 2014). Stakeholders can use evaluation data to make evidence-based decisions regarding the current and future state of the QTP (Kirkpatrick & Kirkpatrick, 2006; Newcomer, Hatry, & Wholey, 2010).

Program stakeholders include trainees, trainers, supervisors, facility managers, developers, and the CFM. These stakeholders require systematically gathered data to inform and improve practices (Newcomer et al., 2010). Each stakeholder has an interest in the QTP's success and brings a particular perspective to the table (Creswell, 2012). Trainees and trainers are interested in the successful execution of the QTP. Supervisors

and facility managers are interested in the QTP's ability to generate qualified trainers. Developers are interested in the success of the QTP as it validates funding and effort vested into its development and maintenance. The CFM is interested in the continued health of the controller inventory, as well as the career field's ability to meet current and future challenges. Stakeholders, collectively, must answer to oversight agency personnel who want to know the value of the program they are funding (Newcomer et al., 2010). Absent a program evaluation, stakeholders lack sufficient data to justify the existence of or the future state of the QTP (Kasworm, Rose, & Ross-Gordon, 2010; Phillips, 2010).

### **Rationale**

#### **Evidence of the Problem at the Local Level**

According to agency regulatory guidance, the QTP must be completed in order to become an ATC trainer. Ineffective training could have disastrous results. Ineffective training could contribute to a lack of qualified controllers needed to operate facilities, to increased withdrawal rates, or to errors in individual judgment after certification. Ultimately, an ineffective ATC training program could contribute to the loss of millions of dollars in assets or human life.

In his *2014 Strategic Action Plan*, the CFM identified 900 (or 26%) of the agency's controller inventory are *unqualified* trainees. *Unqualified* trainees are individuals who have completed the agency's vocational school but have not completed OJT within an operational facility. Conversely, *qualified* trainees have completed both vocational school and OJT within an operational facility.

Within the local setting (Europe), controllers are assigned to a facility for 2-4 years, and then they must transfer to a new facility. Each time a controller transfers, he or she must reenter training at the new location as a *qualified* trainee. Additionally, controllers normally work 180 days outside their primary facility during their 2-4 year assignment. A controller's primary facility ATC certifications are suspended upon departure and must be retrained upon return. The controller enters training upon arrival to the new location and reenters training upon return to the primary facility. Due to these agency practices, there is a continuous need for certified trainers at all agency facilities.

Training programs should produce tangible results (Kirkpatrick & Kirkpatrick, 2006). If the program does not produce tangible results, the program should be modified or discontinued (Kirkpatrick & Kirkpatrick, 2006). In this case, the purpose of the QTP is to facilitate the qualification of trainers capable of conducting OJT. The tangible return on investment (ROI) is measured by calculating the number of days needed to train and the number of days the trainee performs duties in a facility after certification. According to the 2013 and 2014 annual training time reports, agency controllers assigned to the European region required 58% more training days than controllers not assigned to the region. Additionally, the number of days the trainee performed duties after certification drastically differed from non-Europe-based facilities, with differences seen even among facilities within the same region.

At one Europe-based tower facility, unqualified trainees required an average of 446 training days. Factoring in a 2-year assignment and 180-day tasking, the ROI was 104 days. In a comparable non-Europe based facility, unqualified trainees required 167

training days. The ROI was 381 days. Comparing these data highlighted a 277-day ROI gap. Additionally, in 2014, a qualified trainee at one Europe-based facility required 273 training days. The ROI was 277 days. At another Europe-based facility, a qualified trainee required only 22 training days. The ROI was 528 days. Comparing these data highlighted a 251-day ROI gap.

Trainer qualification using the QTP is a mandatory practice within the agency's ATC career field. This practice yields nonstandard ROI results for both qualified and unqualified trainee training. Data needed to compare training quality with ROI were not available, but the existing data indicated focus on the program was justified as evaluation data could be used to improve the program and reduce the existing ROI gap.

### **Evidence of the Problem From the Professional Literature**

Kontogiannis and Malakis (2013) contended that continuous air traffic volume increases have imposed greater demands on air traffic controllers. Air traffic controllers work in dynamic environments filled with time pressures, multiple goals, interconnected tasks, and high consequences for errors (FAA, 2014b, 2014c; Kontogiannis & Malakis, 2013). More than 13,000 controllers work for the FAA and the agency. These controllers provide air navigation services within 24.6 million square miles of the U.S. national airspace system as well as within 50 countries throughout the world. Quality trainer training is needed to ensure the continued safety of the global air traffic system.

### **Definitions**

*Air traffic controllers:* Persons who coordinate aircraft movement (Bureau of Labor Statistics, 2014).

*Andragogy*: The “art or science of helping adults learn (Knowles, Holton, & Swanson, 2012, p.61).”

*Experiential learning*: Learning through action, by doing, through experience, and through discovery and exploration (Lorretto, 2011).

*Federal Aviation Administration*: An agency of the U.S. Department of Transportation that is designated the national aviation authority and regulates all aspects of U.S. aviation (FAA, 2014).

*Agency ATC Train-the-Trainer Program*: Refers to the program used to facilitate agency ATC trainer training. This program includes a career-field-specific QTP used to facilitate training via one-on-one interaction, hands-on practice, and individual self-study. The QTP includes objectives, references, and task specific qualification standards.

### **Significance**

This project study is unique because it addresses a gap in knowledge. Data gleaned from this evaluation provide insight into the effectiveness of the agency’s trainer program from an adult learning perspective. This study makes an original contribution to the agency’s European facilities, and to the greater ATC community, by providing data needed to make evidence-based decisions regarding the program. The study’s implications for positive social change include providing stakeholders with data needed to make evidence-based decisions regarding the current and future state of the program. Further, other researchers can use this study to platform improved training practices throughout both ATC and non-ATC communities wherein an adult is the focus of a learning transaction.

## **Research Focus**

Spaulding (2014) defined *program evaluation* as the process of gathering data to determine the effectiveness of a program. The purpose of this study was to ascertain how effectively the agency's QTP facilitated the learning of trainer skills required to conduct OJT. Stakeholders can use evaluation data to make evidence-based decisions regarding the current and future state of the QTP, which could improve training practices within the local setting and the greater ATC community.

My academic and professional experience enabled me to perform an ad hoc individual expertise-oriented program evaluation as a content and teaching strategies expert. Areas explored during this evaluation included the following:

1. QTP curriculum.
2. Techniques used to facilitate OJT training.
3. Participant satisfaction.
4. Participant perception of knowledge and skills gained from training.
5. Knowledge gained from training transferred to day-to-day duties.

## **Review of the Literature**

The literature review process was conducted using both printed and online resources along with multiple institutional public and military libraries, such as those of the FAA, Walden University, and Embry-Riddle Aeronautical University. Databases used to conduct research included ERIC, ProQuest Central, AULIMP, EBSCO Host, science.gov, Hunt Library/Eagle Search, Education Research Complete, SAGE Premier, ScienceDirect, and Google Scholar. Using keyword searches assisted with identifying

the theoretical and conceptual frameworks appropriate for the program evaluation. Keyword searches included the following terms: *air traffic control training, adult learning theory, instructional system design and development, ADDIE, simulation training, simulator fidelity and realism, curriculum development and design, objective writing, assessment tools in education, cognitive load theory, bridging the gap between cognition and application, air traffic control future workforce plan, aviation forecast, simulation systems, simulations systems in air traffic control, adult learning theory, andragogy, and experiential learning.*

### **Theoretical/Conceptual Frameworks**

Two adult learning theoretical frameworks were used to inform this program evaluation: andragogy and experiential learning theory. Additionally, the instructional system design (ISD) model was used to evaluate the program curriculum. These theories were appropriate for this program evaluation framework, as they had been proven to facilitate positive adult learning transactions across multiple disciplinary fields.

**Andragogy.** Knowles's model and theory of adult learning, *andragogy*, was used as a wide lens to evaluate the agency's QTP. Agency members were above the age of 18, and the average age of agency controllers was 29. Within the agency, 85-95% had completed some college, an associate's degree, a bachelor's degree, a master's degree, and/or a professional degree. These demographics support the idea that agency controllers are considered *adults* in the context of learning theory (Knowles & Associates, 1984; Merriam, Sharron, Caffarella, Rosemary, & Baumgartner, 2007). Agency ATC trainers must facilitate training for adults who have distinctive needs and

expectations (Harper, 2011; Kelly, 2013). Training should build upon the knowledge and experience of the learner (Knowles & Associates, 1984; Merriam et al., 2007). Currently, controllers participate in 72 days of vocational instruction before entering training at their first facility.

Upon the trainees' arrival to their first operational facility, training focuses on continued cognitive skill building and application of learned knowledge in both real and simulated environments. Each time a controller transfers from one facility to another, training builds upon existing knowledge and must be applied in the new operational environment. Training is documented and maintained for the duration of the controllers' career. This documented training is a living, breathing reflection of training and retraining, certification and recertification of skills.

Adults learn by doing and by actively making sense of their learning experiences (West, 2013). Navarre and Wozniak (2013) proposed using andragogy as an asset-based heuristic approach to facilitate adult learning. Multiple disciplinary studies of adult learners support this recommendation (Harper & Ross, 2011; Henry, 2011). Knowles's (1984) model of adult learning, andragogy, includes six assumptions:

1. Adults need to know the reason for learning.
2. Experience is the basis of adult learning.
3. Adults need to be responsible for their learning.
4. Adults learn best when learning has immediate relevance.
5. Adults learn better when a problem-centered approach is used.
6. Adults respond better to internal motivators versus external motivators.

Curriculum development and execution should involve the trainee and be problem centered to capitalize upon Knowles's assumptions (Knowles et al., 2012; Merrill, 2002). The QTP must capitalize on the learner's need to act in a self-directed manner (Knowles & Associates, 1984; Knowles et al., 2012). The learning transaction should include a relevant and realistically problem-centered approach (Salden, Paas, van Merriënboer, 2006). Lastly, learning should capitalize on the adult learner's internal motivation (Harper & Ross, 2011; West, 2013; Wiltshire, Neville, Lauth, & Rininen, 2013).

**Experiential learning theory.** The second learning theory lens used to inform the program evaluation was experiential learning theory. Experiential learning theory emphasizes experience in the learning process and highlights the role of applying acquired knowledge in a relevant setting (Haynes, 2007; Kolb, 1984; Wurdinger & Carlson, 2010). Experiential learning theory includes four components: concrete experience, reflection, observation conceptualization, and active experimentation (Kolb, 1984; Pollock et al., 2002).

Wlodkowski (2008) asserted that what many consider *talent* is the actually the result of deliberate practice. Wlodkowski described how skill and knowledge exist as neural circuits. As learning occurs, axons and dendrites, parts of the brain, join with other fibers and neurons to create complex knowledge and skill (Wlodkowski, 2008). Learning promotes the connection of axons and dendrites to create complex knowledge by thickening myelin, a nerve fiber membrane, in response to frequent circuit use (Wlodkowski, 2008).

For the controller, the act of teaching other adults is a new or underdeveloped

skill that requires deliberate practice to perfect. Erroneous knowledge and skill acquisition may have accumulated thickened circuitry, making learning correct knowledge and skill more challenging. New learning can seem difficult and confusing to an adult learner because of slow unmyelinated and undeveloped circuitry (Wlodkoski, 2008). With frequent practice, continual corrective feedback, and deliberate effort to improve a weakness, the signal travels more actively and accurately (Wlodkoski, 2008).

ATC trainers use simulated training environments to facilitate learning. The agency's QTP includes a simulator-training objective wherein the trainer is required to facilitate trainee learning. *Simulation* is a training method that refers to a computer system that is used to reproduce human-aircraft interaction for training purposes (Gheorghiu, 2013). Simulators used by the agency include the Tower Simulation System (TSS), ATCoach, and Signal.

Simulators eliminate operational risks present in live traffic and provide significant contributions to ATC training by their fidelity and realism. ATC simulators help the trainee better understand how to apply new knowledge by replicating air traffic at slow or normal speeds with various levels of complexity (Cokorilo, 2013). Using ATC simulators, trainers provide the trainee with an opportunity to learn through action, experience, discovery, and exploration (Loft, Finnerty, & Rimington, 2011). Koskela and Palukka (2011) conducted an ethnomethodology study to explore methods used in ATC training. Their study found that trainers used different instructional strategies throughout the training life cycle (Koskela & Palukka, 2011). Trainees are transitioned from a simulated environment to nonsimulated traffic using a scaffolding method with

decreasing assistance from the trainer (Merril, 2002). Upon completion of their study, Koskela and Palukka recommended that greater attention be given to reconciling vocational and simulator training.

**Instructional system design (ISD).** Paas and van Gog (2009) maintained that training people to complete complex cognitive tasks requires simple-to-complex sequencing of tasks. The curriculum should be developed using cognitive load theory to facilitate simple to complex scaffolding (Vogel-Walcutt & Walcutt, 2013). Agency regulatory guidance directs the use of ISD to develop curriculums. ISD has been used to develop curriculum within the agency since 1965. ISD has remained a premier guide for instructional design in many educational environments, as it has been proven to improve human performance (Darabi & Kalyuga, 2012; Dick et al., 2009; Klein, 2014; Martina, 2011).

ISD is a flexible, systematic process that ensures effective, cost-efficient curriculum development (Richey & Klein, 2013). ISD directs developers to develop instruction based on performance requirements and eliminate irrelevant instruction (Morrison, Ross, Kemp, & Kalman, 2011). The agency's governing guidance requires instructional designers to use the ISD analysis, design, development, implementation, and evaluation (ADDIE) model (Davis, 2013). Skillfully executing the ADDIE model within the instructional design can assist learners in achieving learning outcomes (Chevalier, 2011; Mayfield, 2011; Pearson, 2011; Shibley et al., 2011). ADDIE is useful in providing a systems-based training method that encourages feedback at every level of instruction and provides structure to curriculum development (Mayfield, 2011).

## **Implications**

The U.S. Government Accountability Office (GAO, 2013) reported to Congress that “most federal managers lack evaluations of their programs (p. 1).” The Modernization Act of 2010 directed agencies to “use systematically collected data to inform decision-makers (GAO, 2013, p. 1).” This act also holds agencies accountable for achieving results and improving government performance (GAO, 2013). Only 37% of surveyed managers reported that their programs had been evaluated (GAO, 2013). The GAO stated that the “lack of evaluations might be the greatest barrier to informing managers and policy makers (p. 1).” It takes many studies to influence program or policy changes, and results should be shared with program partners (GAO, 2013).

By performing a program evaluation, the agency complies with the Modernization Act of 2010, and barriers to informing managers and policy makers of critical existing data were mitigated. The evaluation details findings and recommendations for program refinement. The CFM and program developers may use these data to inform and improve practice within the agency’s ATC career field. Appendix A, the *Program Evaluation Report*, could be shared with the FAA, an agency partner (GAO, 2013; Lodico, Spaulding, & Voegtle, 2010).

## **Summary**

The FAA and the agency’s CFM publicly highlighted the need to focus on controller training to meet job qualifications and future attrition rates. In August 2013, the QTP was published. As of December 2015, no evaluation had been accomplished to examine program effectiveness. An evaluation was needed to fill this gap in knowledge.

In this section, I have defined the problem, provided evidence of the problem, explained the significance of the problem, defined key terms, detailed researcher qualifications, outlined the research focus, examined existing literature, described study implications, and explained how findings and recommendations have been reported in Appendix A, the *Program Evaluation Report*. In subsequent sections of this study, I further explore the methodology used to conduct the program evaluation.

## Section 2: The Methodology

### **Introduction**

The research design was a program evaluation using Kirkpatrick's four levels of evaluation model. Qualitative data were gathered using documents and 20 one-on-one interviews. Interviews were transcribed using HyperTRANSCRIBE, and data analysis was accomplished using NVivo and manual coding. Through in-depth data collection and analysis, five themes emerged and were used to inform the *Program Evaluation Report* (Appendix A). Reliability and validity of findings were assured using data triangulation and member checking. Some limitations existed but did not detract from the quality of the overall study. In this section, I describe the research design and approach, study participants, data collection, analysis techniques, and study limitations.

### **Research Design and Approach**

Quantitative research approaches include descriptive survey research, experimental research, causal-comparative research, correlation research, or meta-analysis (Creswell, 2009, 2012; Lodico et al., 2010). Descriptive survey research is used to gather perceptions, opinions, and attitudes to describe behavior. Experimental research is used to test a hypothesis and establish cause-and-effect relationships. Causal-comparative research is used to explain or examine differences between group experiences. Correlation research is conducted in an effort to explain the relationship between two or more variables. Meta-analysis research statistically summarizes the results of other studies (Blume, 2009; Creswell, 2009, 2012; Lodico et al., 2010). These

quantitative research approaches were not appropriate for this study, as they did not align with the study intent.

Many qualitative research approaches were also not appropriate for this study. Qualitative research approaches summarize data via case or ethnographic studies, grounded theory, and phenomenological studies (Creswell, 2009, 2012; Lodico et al., 2010; Merriam, 2009). Case studies focus on a small group or individual to document that group or individual's experience. Ethnographic studies investigate interactions in a cultural group. Grounded theory research builds a theory based on narrative data. Phenomenological studies focus on the essence of the human experience. These qualitative research approaches were not appropriate for this study as the intent was not to examine a group or individual's experience, investigate a cultural group, build theory, or focus on the human experience.

Other research designs, such as applied research, could have been used to gather data generalizable back to a wider audience or literature (Spaulding, 2014). The intent of this study was not to generalize to a population, but rather to develop an in-depth understanding within a local setting. After researching the possible research methods available, it was determined this study was best served by using qualitative research methodology to inform the program evaluation.

For this study, the purpose of the research specifically called for examining a *program*. The program has a defined objective of producing qualified air traffic control trainers. The QTP includes set of specific activities with quantifiable goals and

objectives. The best design to examine the program was via a qualitatively informed program evaluation using an ad hoc expertise-oriented approach.

Creswell (2012) described how qualitative researchers analyze words or phrases to develop a deeper understanding of a phenomenon. In this study, the phenomenon was ATC OJT training. Wholey, Hatry, and Newcomer (2010) defined qualitative data as potentially being transcripts, questionnaires, photographs, videos, emails, meeting minutes, interviews, or other program documentation. The focus of this evaluation was ascertaining whether the QTP effectively facilitated the preparation of ATC trainers to conduct OJT. Transcripts, photographs, videos, emails, meeting minutes, and questionnaires would not have provided data useful to this program evaluation objective.

Because I wanted to evaluate the program through the eyes of the interviewees and the expert view of the evaluator, the most suitable qualitative data collection methodology involved document review and one-on-one interviews. Qualitative data were collected by first reviewing the QTP. Interviewee data were used to determine how participants reacted to the program, the extent to which OJT skills improved, and what behavioral changes occurred because of program participation (Kirkpatrick & Kirkpatrick, 2006).

### **Participants**

Creswell (2012) defined a *population* as a group of individuals with the same characteristics. According to the agency's CFM, 3,415 individuals made up the population of the agency's ATC inventory. Within this population, a purposeful sampling technique was used to identify 20 participants. Of these 20 participants, seven

were supervisors, seven were trainers, two were facility training managers, two were facility managers, one was a regional training manager, and one was from the agency's training program development office.

### **Selection Process**

Creswell (2012) described how sample size is specific to each qualitative study and can range from 1 to 40 individuals. For this study, 20 participants were interviewed, as a single interviewee perspective would not have adequately provided an in-depth perspective, and a larger number of interviewees may have produced an unwieldy amount of data or provided only a superficial perspective of the controller experience (Creswell, 2012). By sampling from each subcategory, the study was given depth and a well-rounded perspective of the wider population.

I used a purposeful sampling technique to identify study participants. Creswell (2012) described qualitative research as exploration of a central phenomenon; thus, the researcher conducting a qualitative study uses purposeful sampling to identify participants. Creswell further described purposeful sampling as intentionally identifying individuals and locations to participate in a qualitative study. For this study, I selected participants by comparing annual traffic count data, staffing reports, and identifying agency offices with equity in the program. For example, there were two regional training office candidates and five development office candidates. One individual from each office was selected to participate in this study. These two offices have equity in the development and implementation of this program.

There was a larger pool of possible participants within the other identified subgroups. There are 10 agency towers and six radar facilities at 10 different Europe-based locations. Of the 10 agency towers, the four with the most controllers and highest calendar year traffic count were selected as focus sites. Of the six radar facilities, the three with the most controllers and highest calendar year traffic count were selected as focus sites. These seven focus sites are at four locations in Europe. Because the focus sites were outside the United States, legal advice was sought to determine the applicability of international law. An international law attorney thoroughly reviewed the context of the study and determined that only U.S. laws applied at these focus sites.

Identification of candidates from the focus sites was accomplished using monthly employee lists. At these four locations and within these facilities, individuals were randomly identified from four subgroups: trainers, supervisors, training managers, and facility managers. Participants from the program facility manager, training manager, and supervisor subcategories were not difficult to recruit. Several individuals who were not specifically contacted requested to be part of the study but were turned away because the categories in which they fit were full. Additionally, individuals from other locations within these categories requested to be included but were turned away because they were from locations other than the focus sites.

Finding individuals interested in participating in the study specifically from the trainer category proved more challenging. Although they were identified and contacted using the same methodology used for the other categories, five individuals opted not to participate for unknown reasons. When an individual opted not to participate, another

participant was recruited from the same subcategory, from the same location and facility. Although filling the trainer category was more challenging, no category was overly difficult to fill, as many controllers were interested in sharing their experiences, opinions, and recommendations for the program evaluation.

### **Protection of Human Subjects**

Researchers protect participants while simultaneously promoting the integrity of research (Creswell, 2012; Yarbrough, Shulha, Hopson, & Caruthers, 2011). Program evaluators ensure that their actions do not cause harm to participants, stakeholders, or the greater community (Spaulding, 2014). To protect the integrity of my research and all participants, I received training in research methods required to protect human participants (Human Research Protection, 2014, para. 4).

This study did not pose any serious risk to participant safety or wellbeing. No personally identifiable information (PII) or Health Insurance Portability and Accountability Act (HIPPA) data were collected, and participants did not receive compensation. All interviewees are identified by participant numbers (e.g., Participant 1 [P1], Participant 2 [P2], Participant 3 [P3]) to protect their identity. Study data were secured and will be destroyed after 5 years. No personal data were released or shared to protect participants from harm (Yarbrough et al., 2011).

The Walden University Institutional Review Board (IRB) and the agency's Research Oversight and Compliance Division Office (RO&CDO) approved the study before data collection began. My Walden IRB approval number was 04-09-15-0395639. Additionally, the agency's ATC CFM and the participants' commanding officers

supported the use of human subjects for this study. The following statement is included in Appendix A: “DISCLAIMER: The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the U.S. government or the Department of Defense (DoD).”

Participants, treated as autonomous agents, were provided fully informed consent and were given the option to withdraw from the study at any time (NIH, 2014, Section 4). The consent form contained all required elements of 45 CFE 46.116(s), 32 CFR 219, DoDI 3616.02, and the agency’s supplemental guidance to DoDI 3616.02. Appendix A includes the following statement: “The voluntary, fully informed consent of the subjects used in this research was obtained as required by 32 CFR 219 and [agency supplemental guidance to DoDI 3616.02].” The consent form contained contact details for Walden University’s IRB office, should the participants wanted to discuss the study or had questions regarding their rights. Walden University’s IRB and the RO&CDO approved the consent form, and an attorney found the consent form to be legally sufficient (NIH, 2014, Section 4). Each participant signed the consent form in the presence of a witness who attested to the participant’s consent by signing in the place provided on the form.

### **Ethical Considerations**

Researchers must anticipate and address ethical dilemmas (Creswell, 2012). Although there were some issues that raised ethical considerations, none of them hindered or negatively affected participants beyond minor discomforts encountered in daily life, such as fatigue. The consent form screened for groups typically considered vulnerable, such as minors (17 or younger), elderly persons (65+), pregnant women, my

own subordinates or students, prisoners, persons who are mentally or emotionally disabled, persons who are economically challenged, and persons in crisis. There was no indication that members of any of these vulnerable groups disregarded screening and participated in the study.

### **Data Collection**

Data collection is used to learn from participants (Creswell, 2012). Data were collected using the document and interview protocols. Data were logged using digital recordings, transcriptions, and evaluator notes.

#### **Documents**

Creswell (2012) identified documents as valuable sources of information. Frost (2011) described how the factual and verifiable nature of documents is especially useful for program evaluations. The program includes regulatory guidance governing the development and execution of the program and the QTP. For this program evaluation, the QTP was the primary source document. I retrieved the QTP from the agency's ATC career field website, and I examined it using the leading questions outlined in Appendix B. I also used my professional and academic expertise to evaluate the QTP using the lens of ISD, andragogy, and experiential learning theory. Copious notes were taken, summarized, and transcribed to an Excel spreadsheet to assist with data analysis.

#### **Interviews**

Twenty air traffic controllers were selected using the described sampling technique. No voices were deliberately silenced using this selection process. An email was used to contact participants. Participants had 3 days to review, sign, and return the

informed consent form. Once the participant returned the completed form, a date and time were set to conduct the interview. The interviews lasted approximately 1 hour and were audio recorded. No adverse events occurred during the interview process. Once complete, the interviews were transcribed and emailed to the interviewees. Each interviewee had the opportunity to validate the accuracy of the transcript and ensure that his or her perspective(s), experience(s), and recommendation(s) were accurately captured.

The qualitative one-on-one structured interviews were conducted using seven open-ended questions without response options as outlined in the interview protocol (Creswell, 2012; Phillips, 2010). Each interviewee was asked the same questions using the standardized protocol (Creswell, 2012; Kirkpatrick & Kirkpatrick, 2006). Creswell (2012) suggested developing a protocol with six to eight broad questions and probes to address information within the larger context of the interview process. The questions, which focused on obtaining data consistent with Kirkpatrick's four levels of evaluation, are detailed in Appendix C.

### **Researcher Role**

The program evaluation was done using an ad hoc individual expertise-oriented approach. An ad hoc individual expertise-oriented approach is one of the most frequently used program evaluation methods performed wherein the evaluator is an expert. As a content and teaching strategies expert, the evaluator judges the value and quality of the program and makes recommendations (Fitzpatrick, 2011; Spaulding, 2014). My professional and academic experience was drawn upon to perform the evaluation as the content and teaching strategies expert.

I operated as an internal evaluator throughout this research project. There are both advantages and disadvantages to using an internal evaluator during program evaluations (Creswell, 2012; Kirkpatrick & Kirkpatrick, 2006). One advantage of acting as an internal evaluator is that my experiences and expertise informed the evaluation. I was familiar with the nuances of the program, understood the program context within the organization, and possessed ATC knowledge that might have been partially or entirely unknown to an external evaluator. I had a stake in the current and future state of the QTP and possessed a willingness to be thorough throughout the evaluation process to facilitate organizational improvement(s).

Disadvantages of using an internal evaluator include the possible perception of nonobjectivity. The evaluator may be too close to the subject, which could cause readers to dismiss the credibility of the study (Creswell, 2012; Kirkpatrick & Kirkpatrick, 2006). Additionally, an external evaluator may have more knowledge of issues, methods, or practices that would be useful to incorporate into the program evaluation (Creswell, 2012; Kirkpatrick & Kirkpatrick, 2006). I was comfortable with adult education and organizational learning concepts and used transparently developed protocols and evaluation lenses throughout this project. By transparently evaluating the program, I sought to increase confidence in my personal objectivity as well as my ability to act reflectively and employ my sound analytical skills.

My academic qualifications included the following achievements:

1. Graduate Certification: Instructional System Development (ISD) from Embry-Riddle Aeronautical University.

2. Master of Aeronautical Science with a specialization in Aviation and Aerospace Education and Technology from Embry-Riddle Aeronautical University.
3. Bachelor of Science, Professional Aeronautics with a minor in Aviation Safety from Embry-Riddle Aeronautical University.
4. Associate of Science, Airway Science from Embry-Riddle Aeronautical University.
5. Associate of Science, Airway Science from Community College of the U.S. Air Force.

My professional experience included 18 years of ATC experience within the agency. At the time of this study, I functioned as the regional ATC Operations and Procedures Manager wherein the scope of my duties encompassed managing ATC operations at 12 airfields located in Europe and Africa. I also routinely performed duties as the agency's ATC Training Manager for these same locations.

My previous agency experience included operating as a trainer, supervisor, facility manager, simulator program manager, and training manager in several facilities. In the performance of these duties, I developed, administered, and managed ATC training programs within 12 different facilities located in the United States, Europe, Middle East, and Asia. Within these facilities, I developed, facilitated, and managed ATC OJT, classroom instruction, course syllabus, written and performance examinations, and simulation training programs. My simulation system experience encompassed the Tower Simulation System (TSS), ATCoach, and Signal.

### **Potential Bias**

There was a risk of bias in this study because I had worked in the agency for 18 years. Additionally, controllers viewed the role of my duty position as an *inspector*. I advised participants that the study was conducted separate from my professional role in an effort to mitigate these biases. Participants were encouraged to provide candid feedback and advised how doing so was vital to the study's success. I did not interact with the participants on a regular basis, which alleviated the potential for bias due to friendship or loyalty.

There was some risk that interviewees felt obligated to not share negative information. Interviewees may have believed there was a possibility that I, or another agency member with equity in the study results, could become a key decision-maker in the participant's career at a future time. This risk was particularly possible for interviewees from the trainer category. These individuals were from the lowest level of authority within the agency and may not have fully understood the checks and balances in place within the agency to prevent misuse of positional power. In an effort to mitigate this risk, I advised interviewees that although complete confidentiality could not be assured, every effort would be made to protect their identity.

Participant responses may have been biased due to personal agendas. I did not hold any authority to influence the participants' performance reviews, promotions, bonuses, and/or salaries. I reiterated to all participants that this study was for academic purposes, and participation would not influence their professional standing. I had not discussed the study, beyond communications required to obtain permission to conduct the

study, before data collection began. Therefore, it is unlikely participants heard about the study before agreeing to participate, which reduced the potential for cognitive priming bias.

I was prepared to stop the interviews if any indication arose that the previously mentioned risks or biases existed; however, no adverse events occurred during the duration of the study. Interviewees were provided the opportunity to ask questions and they were advised they could withdraw at any point throughout the study. Although some individuals opted not to participate during in the selection process, no participant opted to withdraw after having provided their consent to participate in the study.

### **Data Analysis and Findings**

Data logged using digital recordings, transcripts, and evaluator notes were analyzed to detect emerging and meaningful themes. Five meaningful themes emerged that indicated the QTP was developed noncompliant with ISD principles, and did not facilitate adult learning as endorsed by andragogy and experiential learning theories. The data from the interviews and document review were used to inform the *Evaluation Report* (Appendix A).

### **Documents**

I used my professional and academic expertise to evaluate the QTP using the lens of ISD, andragogy, and experiential learning theory. I recorded copious notes to an Excel spreadsheet. I then examined the notes to identify trends or issues that impact reaction, learning, behavior, and results as outlined in Kirkpatrick's four levels of evaluation.

**Training objectives.** Within the ISD model, designers develop learning objectives after conducting a needs assessment. Training objectives contain a behavior, a condition, and a standard. I identified cognitive, affective, and psychomotor behaviors applied to training objectives in this program. I examined the objectives to determine if the expected results are observable and measurable and outlined in a logically and hierarchical manner. Lastly, I compared the expected level of learning to the needs and goals of the agency.

Section 3 of the QTP was titled *Planning and Conducting OJT*. This section included seven learning tasks associated with planning and conducting OJT. The training tasks included *Upgrade, Qualification, Proficiency, Review, Recurring, Supplemental, and On-the-job training* (in this order). Task 1 (*Upgrade Training*) had three objectives, which included the following items:

1. With reference, define upgrade training, with minimal error.
2. With reference, describe how upgrade training applies to ATC training, with minimal error.
3. With reference, state the upgrade training requirements for the award of the 5-skill level (Journeyman), without error.

These objectives had clearly defined behaviors, conditions, and standards. These objectives used action verbs to articulate the expected cognitive behavioral outcome. These verbs target the *remembering* categories within the cognitive domain as the trainee is expected to “define,” “describe,” or “state.” the learned material (Anderson et al., 2001; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Clark & Chopeta, 2004). The

objectives had observable, and measurable expected outcomes and the objectives were ordered in a logical hierarchical manner.

These objectives identified the condition the trainee was expected to perform. For all three objectives, the trainee was expected to perform “with reference.” The trainee was authorized to use reference material to assist in meeting the learning objective. Additionally, objectives 1 and 2 have a defined standard of “with minimal error.” The trainee was allowed to make minimal errors that do not alter the state of the objectives. The standard for objective 3 was “without error.” To demonstrate mastery of objective 3, the trainee cannot commit any errors. These behaviors, conditions, and standards are appropriate if the objective is to simply recall material versus perform an action.

The *On-the-job Training* task included the following objectives:

1. With reference, define OJT, with minimal error.
2. With reference, describe how OJT applies to ATC training, with minimal error.
3. With reference, describe how to plan training scenarios, with minimal error.
4. With reference, describe how to prepare a trainee for a training scenario, with minimal error.
5. With reference, describe how to prepare the training environment, with minimal error.

These objectives used action verbs intended to articulate the expected behavioral outcome equivalent to the *remembering category* within the cognitive domain of learning. The trainee was expected to “define,” or “describe” the learned material

(Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). The objectives had an observable and measurable outcome ordered in a logical hierarchical manner. These objectives identified the condition as “with reference.” The standard for all objectives was “with minimal error.” These behaviors, conditions, and standards were appropriate if the expected learning outcome was for the trainee to simply recall learned material. In the case of ATC training, the organizational goal is for the trainee to perform this objective through action(s). Therefore, the behaviors, conditions, and standards were not appropriate for this training task, as they did not meet the organizational training goal.

Training tasks focused on rote learning only. The tasks meant to facilitate OJT focused on the lowest level of Bloom’s taxonomy of learning domains and did not require demonstration of learned knowledge (Bloom et al., 1956). Training did not promote cognitive knowledge application, or teach how to analyze learned knowledge, how to analyze the material, or how to put together the knowledge in a new way to meet evolving situations. Additionally, the affective learning domain is particularly important for ATC trainers, as they are expected to operate independently, and to demonstrate valuing the learning process. However, the QTP had no objective geared towards ensuring behavior from the affective domain was realized or valued.

Within the QTP, there were no training tasks to facilitate the learning of *principles of instruction, adult learning theory, learning strategies, or OJT training techniques*. These areas of learning are critical skills needed to facilitate OJT for other adults. Additionally, the simulation task was located in another section entirely and did not connect to the knowledge provided in Section 3. This overall ordering and hierarchy

of tasks was not logical nor did it facilitate ready recall of learning or the connection of learning tasks.

**Training objective review summary.** All QTP training tasks included a learning domain, a condition, and a standard. Although each task and associated objectives were consistent with ISD principles in their construction, they did not meet the needs and goals of the organization. No task, within the QTP, directed learning *principles of instruction*, *adult learning theory*, *learning strategies*, or *OJT training techniques*. Trainees were not afforded the opportunity to learn or practice these critical skills. The training tasks and associated learning objectives throughout the QTP primarily focus on rote learning. Training did not facilitate functional level cognitive, psychomotor, or affective domain learning.

Trainees were not provided the opportunity to learn how to apply knowledge, how to analyze learned knowledge, or how to put together the knowledge in new, meaningful ways to meet evolving situations routinely encountered within ATC. The organization needs quality trainers who are capable of producing air traffic controllers using OJT techniques. The goal of the QTP is to facilitate the training of these quality trainers. Bridging the gap between the needs of the organization and the QTP is needed to have trainers capable of facilitating ATC training within the agency.

**Learning standard.** Dick, Carey, and Carey (2009) defined *assessment* as all activities effective for demonstrating learner's mastery of new skills. Assessment instruments were reviewed to ascertain if the program has a defined standard, and if the standard tests expected performance, corresponded with desired outcomes, and were

valid, reliable, and objective. At this time, no formalized or standardized assessment tool was used within the QTP. Further, the current assessment practice was noncompliant agency guidance.

Rothwell and Kazanas (2008) identified that performance measurements are developed to monitor learner achievement. Performance measurements provide learner accountability to ensure progression towards predetermined performance goals before and after instruction (Rothwell & Kazanas, 2008). Performance measurements should correspond to the objective and meet requirements for reliability and validity (Rothwell & Kazanas, 2008). Paper and pencil tests are the most common assessment instrument form (Rothwell & Kazanas, 2008). Entry skills tests can be used to ascertain if the learner is ready for instruction (Dick et al., 2009). Pre-tests can be used to ascertain which skills the learners have already mastered or must learn (Dick et al., 2009). Practice tests can be used to ascertain if the learner has achieved intended knowledge and skills (Dick et al., 2009). Post-tests can be used to ascertain if the learner had mastered learning objectives (Dick et al., 2009).

For ATC, the mastery of learned skills must be applied without error. A skill must be performed frequently enough, without error, to demonstrate it is nearly impossible for correct performance to be the result of chance alone (Dick et al., 2009). An ATC trainer is required to perform ATC duties in addition to facilitating the learning of a trainee, making the performance of normal duties more critical and tasking. In measuring the performance of motor skills, performance is typically evaluated using a standardized rubric of evaluation checklist (Dick et al., 2009). A rubric or checklist can

be also used to evaluate attitude learning (Dick et al., 2009). Thus, for ATC observation by a third-party certifier should occur to ensure mastery of learned skills in a live or simulated training environment. The third-party certifier should use an evaluation checklist or rubric.

The agency requires someone other than the trainer to act as a third-party certifier. The ATC career field has an exemption to this agency policy. The CFM has designated each facility's training and standardization manager to act as the third-party certifier during certifications to ensure an unbiased evaluation. Contrary to the CFM's direction, the QTP directed the trainer to act as the certifier and the facility CCTLR to act as the third-party certifier. This guidance and practice are contrary to all other certification procedures within the agency's ATC career field.

**Learning standard review summary/recommendations.** The QTP did not include an assessment instrument or define an agency approve standardized assessment process. The current practice is nonstandard, subjective, and ineffective. This subjective process failed to ensure the minimum level of knowledge, skill, or attitude (KSA) is learned, as it cannot be checked for reliability or validity. To facilitate the learning objectives to a standardized level throughout the career field, I recommend that a criterion-reference test be developed and administered by a third-party certifier to evaluate cognitive learning domain objectives. Further, that the same third-party certifier observe the trainee using a reliable and valid rubric or checklist to evaluate achievement of affective and psychomotor domains of learning. Compliance with these recommendations would ensure the QTP included assessment instruments geared towards

ensuring all learners demonstrated mastery of new skills to the same level of learning, using a reliable and valid technique.

**Training references and instructional strategies.** References were reviewed to ascertain if they were complete, were accurate, were current, were motivational, suitable for adult learners, and used available media tools. Instructional materials contain the written, mediated, or facilitated content the learner will use to achieve the objectives (Dick et al., 2009; Rothwell & Kazanas, 2008). Materials include information used to guide the learner, enhance memory, and facilitate learning transfer (Dick et al., 2009; Rothwell & Kazanas, 2008).

There is no required format for instructional materials (Rothwell & Kazanas, 2008). Instructional material format is based upon the purpose of instruction, the performance objective, who and how the material will be taught and applied, and the medium available to deliver the material (Rothwell & Kazanas, 2008). Agency regulatory guidance described the nature of instructional material as, “affecting the stimuli with which the learner interacts with during the learning process.” Reference material can include textbooks, technical orders, handbooks, manuals, interactive courseware such as computer-based training (CBT), and videos and audio files (Dick et al., 2009; Rothwell & Kazanas, 2008).

The references provided throughout the QTP were insufficient to meet learner needs. The current training references cited in the QTP were complete, accurate, and current, but they did not assist in meeting learning objectives, did not use available

media, and were not motivational. Thus, current training references did not facilitate learning for adults.

Two tasks already discussed included: *On-the-job Training (OJT)* and *Simulator Training*. These tasks included references as instructional material. These references included two text-based regulations and equipment manuals. These same references (in their entirety) were identified in all the QTP tasks. These references exceeded over 250 pages (each). No specific chapter, section, or paragraphs were identified; rather, the entire document was cited as the instructional material. The objectives could not be “answered” or learned using these text-based references, as the material was not relevant to the learning objective.

The references did not cover the material needed to address the objectives, and a text-based instructional method did not provide enough learning support to complete the learning process. To gain meaning from text, the learner must decode words. The lack of physical cues negatively affects the learning transaction. Additionally, the learner cannot ask questions when there is message ambiguity. Text is more formal than video or verbal communications. To understand the text, often the learner must look at the object or see the action describe. No other material or media was used in the QTP to bridge the gap between knowledge and application.

Media formats and delivery systems can be expensive (Dick et al., 2009; Rothwell, & Kazanas, 2008). Dick, Cary, and Carey (2009) indicated that less expensive media formats and delivery systems will not affect student learning, but will affect attention and perception of relevancy and authority. They further advised the best

strategy is to develop media formats and delivery systems simple and well rather than elaborate and poorly (Dick et al., 2009). Dick, Cary, and Cary used an example of a well-put together PowerPoint presentation versus a poorly put together video.

Videos can elicit learner responses but only provides rhetorical feedback. Videos are incapable of correcting learning misunderstandings or judging learning. This media type has a linear format and is edited to save time. This practice paces the delivery system and removes cues that may be available from the equipment or activity.

Interactive courseware or CBTs provide multiple stimuli for trainees, can be used to recall learning, and provide feedback to the learner.

**Training references and instructional strategies review summary.** The references were complete, accurate, and current but did not assist in meeting learning objectives, did not use available media, were not motivational, and, therefore would not facilitate learning for adults. The most effective delivery system would be instructor-led hands-on training. If learning is to include physical objects, the learner, by handling the objects, will build schemas of experience that are important to future learning.

Instructors demonstrate the use of knowledge or the use of materials and make the learner an observer. This technique involves the transmission of declarative knowledge, which the learner encodes and stores by handling an object. The instructor is the motivator, the presenter, the leader of activities, and the evaluator (Dick et al., 2009). Dick, Carey, and Carey (2009) recommend that instructional material be first self-instructional so the learner can learn the information or skills without instructor intervention. From there, the material should be designed to be instructor-led (Dick et al.,

2009). Learning component such as motivation, content, practice, and feedback should be built into the instructional materials (Dick et al., 2009).

### **Document Review Summary**

I used my professional and academic expertise to evaluate the QTP using the lens of ISD, andragogy, and experiential learning theory. I identified several areas that could affect reaction, learning, behavior, and training results as outlined in Kirkpatrick's four levels of evaluation. Training objectives did not meet the needs and goals of the organization. *Principles of instruction, adult learning theory, learning strategies, and OJT training techniques* were not included in the QTP. Additionally, the QTP focused on rote learning and failed to facilitate learning at a more functional level.

The QTP did not include an assessment instrument or define an agency approved assessment process. The current assessment process was subjective, did not ensure the minimum levels of KSAs were obtained because of training, was unreliable, and unverifiable. Training material and instructional methodology did not facilitate the learning of KSAs needed to function as an ATC trainer. Training references were vast, obscure, and could not be linked to the actual task. Training material did not use available media. Training references and instructional strategies were not motivational. Overall, trainer references and instructional strategies were poor and did not facilitate learning for adults. Bridging the gap between the needs of the organization to have trainers capable of facilitating ATC training for adult learners was not reflected in the QTP and the gap may contribute to trainer unpreparedness once certified.

## Interviews

Data collected via interviews were transcribed using HyperTRANSCRIBE, a transcription program that plays back small chunks of audio recording while data were typed into a transcription window. Once the data were transcribed, and member checked, I coded the data manually and via NVivo, a qualitative data analysis software program.

I used descriptive coding during the first cycle of coding. Descriptive coding is a straightforward method considered useful in qualitative studies used to summarize the primary topic of the excerpt (Saldana, 2013). Table 1 is an example of how descriptive coding was applied to the interview data. The one-word descriptive code (right column) summarized the primary topic of the excerpt.

Table 1

### *Descriptive Coding Example*

Excerpt	Code
The QTP does not teach, or go in-depth about how to conduct training. How to teach their technique, how to teach the trainees the intangibles.	ADULT LEARNING

Interview transcripts were also coded using In Vivo coding. In Vivo coding refers to literal coding using the actual language found in the qualitative data and is appropriate for studies that “prioritize and honor the participant (Saldana, 2013, p. 27).” This coding method calls for attuning oneself to words or phrases that seem to call for bolding, underlining, italicizing, highlighting, or vocal emphasis if spoken aloud (Saldana, 2013). Table 2 includes an example of how In Vivo coding was applied to the interview data. The code taken from the participant has been placed in quotation marks (right column).

Table 2

*In Vivo Coding Example*

Excerpt	Code
The trainer QTP provides trainers and supervisors with a good outline.	“OUTLINE”

When reviewing the interview transcripts for descriptive and In Vivo coding completeness and accuracy, I identified valuable emotional data were being overlooked. Emotions are a universal experience and acknowledging them in research provides insight into participant experiences (Saldana, 2013). Emotion coding was used to label emotions recalled or inferred by the researcher (Saldana, 2013). Table 3 includes an example of how emotion coding was applied to the interview data. The one-word emotion code used has been capitalized in the right column.

Table 3

*Emotion Coding Example*

Excerpt	Code
I felt like I was part of the team, but I also felt like I was helping others come along to be a part of the same team.	“PRIDE”

During the first cycle of coding, numerous descriptive, In Vivo, and emotion codes emerged. All interview transcripts were exhaustively reviewed and codes refined using eclectic coding. Eclectic coding employs compatible first cycle coding methods and is appropriate for qualitative researchers who use a wide variety of data forms such as interviews and documents (Saldana, 2011). Some codes were subsumed by other codes, relabeled, or dropped altogether. The results of the coding process were (in no

particular order): *valuable, not valuable, useful, not useful, impact, result, training quality, satisfied, dissatisfied, adult learning, teaching, learning theory, ISD, andragogy, experiential learning, feelings of abandonment, workload, time, trainer experience, controller experience, inherent ability, team support, readiness to learn, past training experience, involvement, caring, applicable, not applicable, missing critical items, condition feedback, standard feedback, overwhelmed, scared, outline, guide, source reference, preparedness, evaluation writing, insight into the administrative process, nonstandard qualification process, knowledge-based only, hands-on training, third-party certifier, personal preference, pencil whipping, and ISD.*

Once first cycle coding was complete, emerging and meaningful patterns identified as categories during the second cycle of coding. Categories are used to organize and group similarly coded data because they share similar characteristics (Saldana, 2013). In this case, pattern coding was used to develop categories. Pattern coding pulls together a lot of material into a more meaningful unit of analysis (Saldana, 2013). Once titled, I created rules to refine data placed into each category. Table 4 defines the categories and the rules I established for category inclusion. If the code complied with the rule, it was included in the category. Codes were reorganized into categories using these rules. Some coded data complied with multiple rules and was added to both categories. Table 5 details codes that were included in each category.

Table 4

*Category Inclusion Rules*

Category	Rule
Participant reaction	Participants shared matters relating to experience.
Influencing factors	Participants shared matters related to factors that influenced program success.
Quality of training material	Participants shared matters related to training material.
KSAs learned/not learned	Participants shared matters related to KSAs.
Certification procedures	Participants shared matters related to certification procedures.

Table 5

*Categorized Codes*

Categories	Codes
Participant reaction	Valuable, not valuable, not useful, useful, impact, results, training quality, satisfied, dissatisfied, adult learning, teaching, learning theory, ISD, andragogy, experiential learning, feelings of abandonment.
Influencing factors	Training quality, workload, time, trainer experience, controller experience, inherent ability, team support, and readiness to learn, past training experience, involvement, caring.
Quality of training material	Useful / not useful, applicable/not applicable, missing critical items, condition/standard feedback, overwhelmed, scared, outline, guide, source reference, unprepared, adult learning, teaching, learning theory, teaching, andragogy, ISD, experiential learning, pride, feeling of accomplishment, team member,
KSAs learned / not learned	improved controller skillset, evaluation writing, no change, insight into the administrative process.
Certification procedures	Nonstandard qualification process; knowledge-based only, hands-on training, third-party certifier, personal preference, pencil whipping, ISD

Once categories were identified and refined, I moved from an inductive to deductive mode to identify themes. Themes are discoverable through the manifestation of expression in data (Saldana, 2013). Therefore, I sifted through the data in search of repetition of expression, similarities, and differences, missing data, and sorted the data into a quote-by-quote matrix. Creswell (2012) suggested five to seven themes should be identified during the analysis phase and discussed in the research study. From the category data, I was able to identify five themes (Table 6).

Table 6

*Categories and Themes*

Categories	Themes
Participant reaction	The QTP is needed to supplement the agency's 1-day train-the-trainer course, but improvements are needed to facilitate program effectiveness.
Influencing factors	The effectiveness of trainer training is influenced by many factors.
Quality of training material	Training material and practices do not sufficiently meet training need.
KSAs learned/not learned	Knowledge, skills, and attitudes changed because of training.
Certification procedures	Certification procedures need to be reviewed.

**Theme 1: The QTP is needed to supplement the agency 1-day train-the-trainer course, but improvements are needed to facilitate program effectiveness.**

Interviewees highlighted both positive and negative aspects of the program when asked question #1 from the interview protocol. Question #1 was, "In your opinion, in

what way was the trainer QTP successful, or effective in teaching you (or trainers) to conduct OJT?”

Interviewees readily acknowledged the importance of training in the ATC career field. P4 stated, “Training that person to become a trainer is one of the biggest things I feel we do.” Additionally, the need for ATC specific trainer training was emphasized throughout the interviews. P17 stated, “A lot of people come into the [agency] and are not necessarily set up to be a trainer in a specific career field.” P13 recalled what training was like when controllers only completed the 1-day agency course and did not have the QTP, “Back in the day, when we went through, there was not a lot of emphasis on the trainer program, and whatever your trainer wanted to teach you is what you got.” Even with the career field specific supplemental training, interviewees questioned the relevancy of the 1-day agency course. P20 stated, “Everyone comes back with having been told ‘this doesn’t apply to you’.” P6 summarized his when he stated, “All I remember from the class was the teacher kept saying ‘if you’re an air traffic controller this does not pertain to you’. It kind of got redundant, so I just didn’t pay attention to any of it.”

When the QTP was developed, it standardized training for the career field. Standardization was positively highlighted throughout the interviews. P4, a facility manager, stated, “As a CCTLR, I know that all my trainers have the same baseline of knowledge, and I do not have to second guess what they were trained on.” Interviewees also highlighted the value of the QTP as the foundation of the training transaction.

P13 stated, “It gives them a good document to reference.”

P7 stated, "I think the QTP has been really good as far as giving controllers a template to follow."

P2 stated, "The trainer QTP provides trainers and supervisors with a good outline."

P7 stated, "It's a good foundation."

P20 stated, "It's a good baseline to start training."

When asked question #2 and #3, interviewees articulated negative reactions to the program highlighting that the program did not facilitate the learning of skills needed to conduct OJT. Question #2 was, "In your opinion, in what ways was the Trainer QTP weak or ineffective in teaching you (or trainers) how to conduct OJT?" Question #3 was, "Please identify what you (or you have observed trainers) learned (knowledge, skill, or attitude) because of your participation in the Trainer QTP as it pertains to facilitating OJT?" P4 recalled the impact poor training had on preparedness, "That first time, I clearly remember getting in there with a trainee. It was scary." P8 stated,

We seem to focus 80% of our effort toward the front end of the problem which is making sure we are getting the right candidate and identifying factors that make you a good air traffic controller, but the other half of the problem is having people properly trained to train them. We rely sometimes too much on that [REDACTED], and that experience, and assuming that I am going to be able to share my experience with every trainer, to make [him or her] good. \*Note: Word redacted to maintain confidentiality. Word used identifies an individual within the agency

who is charged to lead others, have integrity, and a higher sense of responsibility than the average person.

P10 summarized the negative impact deficiencies had on the career field,

We end up pretty much throwing people to the wolves, and that has a domino effect. They are passing their skillset, or lack thereof, to trainees, and it is not helping.

Interviewee expounded upon their dissatisfaction in response to question #4. Question #4 was, “Please identify (if possible) something you would have liked to learn as part of our OJT training?” or “Please identify (if possible) something you would like to see incorporated into the Trainer QTP in regards to OJT training.” For example, P2 stated,

I do not feel it adequately teaches a new trainer how to effectively transfer learning to another individual. I think that the QTP gives a good guideline for what is required in the training program. However, that huge piece that is missing. We do not learn how to train an individual effectively. Instead, we learn a process and what is required within that process, which is very detailed and extremely bogged down with the process, the process, the process. We focus on that instead of how a person can train another person to do something within a reasonable amount of time.

This sentiment was repeated throughout the vast majority of interviews in slightly different ways depending on the subcategory the interviewee represented. P14, a facility training manager, stated,

If you break down the QTP itself, it does not teach, or go in-depth about how to conduct training. How to teach...how to teach trainees the intangibles. It does not go into the psychology of training a trainee. It focuses a lot on [agency regulations] that are specific to a training program but *how* [emphasis added] to conduct OJT is really left up to the trainer.

P1, a supervisor, highlighted the same issue:

The QTP gives you an outline of the big picture of the entire training program and how each little part works. It really does not address how to train someone.... I see it [repeatedly], 'here is your objectives – go into a hole and learn them. Oh, you do not know it? Go learn it some more.' How are you going to learn something if no one teaches you? A lot of information is lost because no one teaches it to the trainee. People do not understand 'why'....why something works, how it works, what a pilot is seeing. The things people know, people have experience with, is lost. They were trained that way, so they train that way. The QTP facilitates a vicious cycle. It is not because a person cannot do it, it is that they are not trained...to train.

P11, a program manager, articulated how the QTP is a useful guide, but that it did not address the training objective,

The QTP does not directly affect a member's ability to conduct training. The QTP provides tools for success based on the efforts of the trainer and trainee. The QTP does little to impact or influence the ability of the trainer. It simply provides a guide for what needs to be learned or known to conduct training. So, in

short...it does not teach anybody how to train. Now, I have no idea how you fix that.

P17, a trainer, highlighted the deficiency and articulated what happened after QTP completion when trainers do not possess the skills to facilitate OJT: “people get frustrated.” P2, a facility manager, emphasized how poor training impacted ATC upgrade and qualification training:

Trainees are left on their own and to their own devices. Trainers give them a list of objectives and tell them ‘go learn this, then come back, and tell me what you learned.’ Then they come back, and they do not necessarily know the details of everything, [and] then they are ridiculed. So, the trainee is then told to go back, and learn some more. They are expected to come back and regurgitate it. Not only are they supposed to just know the knowledge perspective, but also they are supposed to be able to apply it. Most of these individuals are straight out of high school. They do not have any idea about air traffic control at all. We are expecting them to just read a book and know how to control multi-thousand-pound pieces of equipment through the sky, sometimes 15, 16, 20 at a time.... We take the wrong approach, and it is a very negative experience for the trainee. We do not teach anything because we are not taught how to teach.

P8, a regional program manager, expounded upon the training deficiency by articulating the impact it had on the continued sustainment of the controller inventory:

I think the QTP tells people what the expectations are in regards to administration and evaluation and why it is important. It always references the [agency

regulations], but what it does not do is actually teach people how to train. We assume everyone can train and is going to be good at it. That is just not true, and I think our program would benefit if we actually were better educated on how to teach people to train. It would have a direct impact on our ability to qualify people to be controllers. We seem to keep changing our standards to be a controller, i.e. [agency entry test] scores and other tests. We spend a lot of money on studies similar to what the FAA does, but we have not gone to the next step, which is to get better at training our trainers. I think we, as an [agency], and specifically ATC in the [agency], have not done a very good job at actually preparing people to be trainers. I do not believe our current QTP does that either. I think we need to refocus our efforts in regards to the training program. The biggest problem I have with the QTP: it does not properly train people how to train. This leads us to continued problems with completing upgrade training and reducing attrition rates. Regardless of what we seem to do, it still hangs out in that 50% range. I think we have been ineffective at reducing that and maximizing our resources because we have not actually addressed the real problem with training.

**Theme 2: The effectiveness of trainer training is influenced by many factors.**

Interview responses to question #5 and #6 indicated that the effectiveness of trainer training was influenced by many factors such as quality of training, workload, time, controller experience, inherent ability, team involvement, past experience, readiness to learn, and pencil whipping. Question #5 was, “Please describe how participating in the

Trainer QTP (as it pertains to OJT) changed your on-the-job performance. Please give an example, if possible.” or “Please describe how participation in the Trainer QTP changed on-the-job performance. Please give an example, if possible.” Question #6 was, “Where there any factors that influenced your ability to transfer your learning to the workplace? If possible, give an example” or “Will you please identify factors that may have influenced newly qualified trainers ability to transfer learning to the workplace? If possible, give an example.” Most interviewees intertwined these influencing factors and did not cite them as exclusive from one another. Time was repeatedly identified as an influencing factor. Time was emphasized in different ways: the time *before* training and the time *in* training.

Interviewees routinely intertwined time before training and controller experience. P5 emphasized how controller experience positively influenced training effectiveness, “...the more experience you have, the easier it is to adapt and be flexible. Inexperience is the biggest challenge for new trainers trying to transfer that learning application to the workplace.” P5 highlighted readiness to learn when explaining why this was a challenge for new trainers, “As a new trainer you go from just in training, to working position by yourself, and then you go to ‘here are three trainees’.” P3 recalled how the time before training and lack of controller experience influenced the ATC environment:

I honestly feel like, especially in a radar facility, I feel like they should go through their entire training and get their [full facility qualification], and then actually learn how to be a trainer, because knowing just the one position, they learn a little heavier on the trainees that are just behind them, that probably came to the base

with them. I feel like when you are brand new, I know how I felt, because I got mine within the first year, and I was already watching people that I had just gotten there with. They were ready to go, but I was a little quick on the trigger in position a lot of the time, and maybe a little bit harder on them in the simulators. It made for a slightly hostile work environment.

Time in training was emphasized as an influencing factor intertwined with workload, quality of training, and team support. P11 adequately summarized the issue by stating,

There is a disconnect between the amount of time and effort we put into training. Apprentice controllers, from the time they start to the time they are done, is typically 10-18 months. Yet, 60-days after someone is a [qualified] controller we can make [him or her] a trainer. We spend a year to a year and a half making them a controller, yet we spend as little as two months to train that person to now train air traffic control.

P9 recounted how time and workload also affected the quality of training received,

In 45-days, I do not get to just focus on just practical training. In most bases, you have at least one more, if not multiple positions to still get. Sometimes you get lucky, I got a little bit of a break between my [UGT] and kept going. [However], most people are not; they are like 'we need manning'. Every [facility] needs [staffing], it is never not the case. So every [newly qualified controller] we are immediately pushing. By the way, in your free time you have to do this training, and oh, by the way, the guy who is going to be training you, he has three other

trainees that he is forced to focus on, so he cannot help you on what is suddenly a much shorter period of time, with just as much knowledge.

P9 recollected how time and workload affected the quality of training given to others, So when I had a brand new trainer that I tried to go through this with just last year. I ran out of time because in addition to him doing his normal job, just him doing his normal job and me doing my normal job, we had to stay after work just to go through this whole thing. It is like ‘whelp, you have all the time in the world after work’. Do you really have all time after work? Because I have things to do and he has things to do.

The QTP provided insufficient time to adequately train some trainees. P14 stated, “If I were given the option to give someone way more time I think I would. I know I would. They would have so much more proficiency, and a lot more focused training on being a teacher [and] trainer.” P4 criticized the allowable training limit by stating, “If you have to spend more time training someone to become one of the best trainers out there, that is what it is. If someone needs extra time in the program, then we should spend it with them.” Despite the consensus, additional training time might be needed, only a couple of the interviewees indicated they had seen additional training time provided. Over the course of 20 interviews, two people indicated they had seen additional training time provided, indicating it may rarely occur in the career field.

Another influencing factor repeatedly discussed was inherent ability. A common thought expressed throughout the interviews was that not everyone should be a trainer. P8 highlighted how poor trainers’ impact inventory attrition rates, “Not everyone should

be a trainer. I think part of our attrition rate stems from that. People spend a lot of time trying to learn from people who are not good teachers.” P8 summed up the impact this had on facility managers,

[It is assumed] that I have the ability as a facility manager to say, ‘you are not a good trainer, so you do not get to train’. That is not a luxury that any facility would admit to having right now because of workload and the amount of trainees that facilities are dealing with, and I do not think that is going to change anytime soon especially with the flood gates open and people leaving. When you have the workload, you are almost forced to make everybody a trainer and assume they are going to figure it out or get the support they need. That is almost impossible.

There is not enough time in the day, and not enough good leaders out there, to sit everyone down, and ensure they have the tools they need. It is a challenge.

Past training experiences, trainer quality, and team involvement were identified as both a positive and negative influencing factor to program effectiveness. P3 recollected, It definitely involves the other controllers on crew, especially the ones who have been rated for a while. Trainers really influence the way the new trainers train a lot. If the trainer had a trainer that would go through the book work until they got it right, or sit down with them in a simulator, and show them ‘this is what you are doing’, or ‘this is how you can do it better’, or do it correctly, the trainer is more likely to do that kind of thing. If they had a trainer that was always hard on them, that is kind of how they will treat their trainee.

P9 also highlighted a similar sentiment,

If you have a lazy teacher as a trainer, not teaching them how to do the stuff is going to influence how well they are going to be as trainers. I think it's overall just the dedication provided to them will affect their ability to take that information and use it.

P19 shared how these factors influenced personal trainer development,

There were a couple of times where because of the stress level, level of traffic, in the beginning I would come across a little too blunt. Some people did not like that and I remember that specifically. That was one of those situations where people who were backing me through this whole thing and my whole career, they gave me that criticism and that really changed my aspect on it. I thought maybe I need to evaluate how I come across and how I teach certain people different pieces of information. So, it was really based off my team because if it was not for the people around me sort of guiding me, like they say 'training never stops' and you grow from the people you work with.

*Pencil whipping* was also routinely highlighted as an influencing factor to the quality of training received, KSAs gained from training, and the ability to transfer learning to the workplace. *Pencil whipping* refers to the process of pushing trainees through the program without ensuring they actually meet established standards. P9 indicated "absurd amounts" of pencil whipping occurs in regards to trainer training. This sentiment appears to be shared by the vast majority of interviewees. Some comments on pencil whipping included:

P1 stated, "People just tend to hurry through the process."

P2 stated, “I got tossed the QTP and told ‘have at it’.”

P4 stated, “Hey you have 45-days to complete this, read all this stuff, and sign off all of these items. Unfortunately, I feel like that probably happens a lot. The tendency we have seen in ATC is ‘oh yeah, you are good on this’ and not really sending them through the whole process.”

P20 stated, “I do not think they actually comprehend the learning experience they should have gotten out of it.”

P6 stated, “I saw people at my first facility that had trainers that really didn’t care, and really didn’t give them guidance, and it was kind of like ‘here, learn these items, we’ll sign you off, and put you up. Sink or swim. I cannot tell you how many times I have heard that.”

P8 articulated how pencil whipping has a long-term negative effect,

At that point, they realize, ‘man I should have asked more questions’. At that point, the damage is done, and now it has negatively affected the trainee, the crew as a whole, and the facility depending on how many trainers and trainees you are dealing with here.

### **Theme 3: Training material and practices do not sufficiently meet training need.**

Interviewees had many thoughts on the training material included in the QTP and routinely brought it up in response to question #7 as a contributing factor to change (or lack of change) to OJT skills of newly qualified trainers. Question #7 was, “Did your participation in the Trainer QTP (in regards to OJT training) influence your on-the-job performance? If so, please describe how. If possible, give an example” or “Can you

describe how participation in the Trainer QTP influenced trainer's ability to conduct OJT on-the-job? If possible, please give an example." Some interviewees expressed there was the right amount of information made available in the QTP; while others insisted it contained too little. The right balance, according to interviewees, is only including information relevant to trainees. P9 summed this up by stating, "How about we just focus on actual training!"

Many interviewees stated training objectives in the QTP were not relevant to newly qualified trainers. Other than a broad stroke of exposure, many interviewees highlighted that time is being wasted on nonessential training tasks not related to training another person. P9 stated,

I don't think a new trainer needs to learn all the details about supplemental training right way. Why? Because they are not in charge of it yet. Do that training when you go through [standardization manager] or [training manager] training. Also, I am not taught how to train but I know about TRBs. *Really* [emphasis added]? Why?

P1 stated, "At what point did trainers all of sudden have to do something differently for supplemental training? No, you're either studying it or helping someone else study it, that's it."

P6 stated, "If it is not necessary right now, why are we doing it?"

Interviewees identified the lack of hands-on training as a detriment to their development. Additionally, interviewees identified the lack of relevant training of items geared towards skill improvement such as adult learning, principles of instruction,

teaching, and learning theory. As noted in Theme 1, the overwhelming majority of interviewees believe that the QTP does not train how to teach. P13 stated, “I don’t think the QTP is very detailed on how you are actually supposed to facilitate training. All of those things that are not spelled out, like adult learning.” P15 highlighted this same issue and emphasized its connection to the trainer skillset, “If you look through the QTP, it is not really job performance, it is just ‘do you know this about being a trainer’. It is not really improving my skill as a trainer.” P2 stated, “Trainers are not taught to teach. They are taught to outline what references are available and they put the onus of actual training on the trainee.” P6 highlighted lack of hands-on training and the impact it has on trainer quality,

I have always been a believer that you can put down on paper and try to teach something on paper and try to explain how it is going to be, but until you are actually put in that position, or you are actually being a trainer, you do not know how that knowledge or that paper, or information is going to translate. I think, in general, the QTP did not really teach me how to be an effective trainer.

Interviewees related knowledge based training on the overall administrative training process is sufficient. However, the hands-on experience needed to use this information is not facilitated. Writing evaluations was not facilitated sufficient to prepare the trainee for experiences he or she may encounter once trainer qualified. P12 stated, “It prepared you for writing regular [evaluations], but did not prepare you for writing [experiencing difficult in training] [evaluations]. I had to later ask for help.” Several interviewees indicated they sought additional training after qualification because they

were unprepared. P3 described receiving additional training after qualification, “It didn’t actually happen until I had been a trainer for a while. I received additional training from the [training manager].”

Several interviewees mentioned a supplemental class developed at their facility was required to obtain the practical, hands-on, learning they needed to be a quality trainer. Interviewees who had experienced a facility developed supplemental training course relayed positive experiences, but noted that not all facilities did it, and not all facilities have the same quality of supplemental training in their classes. P13 stated, “It taught me how to train on paper. But practical wise, I don’t know if it made me a better trainer when it comes to the techniques and things like that.” P17 said,

I would like to see an approach on different methods for training, different methods for training who are in different positions as far if they are in [experiencing difficulty in training] or standard training. Along those lines, maybe conflict resolution for dealing with particular people. You may have one trainee where a training method works on them then you have another trainee to where a different method works on them. If you only go through a black and white, cut, and dry training process and we don't give them the tools to how different methods then we don't necessarily get the best product out of our trainers on the front line. They'll get that information as they grow into that training position, so if we touched on it just a little bit they'd have those to develop, and they may develop those a little bit quicker than you see in the majority of your trainers.

Interviewees identified the objectives and standards outlined in the QTP were not reasonable, rationale, or attainable. P9 summarized the experience by stating,

Without error and without reference you have to talk about this. Well, really, does it have to be without error? Why is there no leeway? What I think is most ridiculous is that at least half of these tasks say ‘with reference and minimal error’. That does not make sense. If you have the reference that should be the one time, you have zero error. There is no excuse for it at that point; you literally can see it in front of you. There is no consistency, rhyme, or reason to it. There are a billion tasks, and they all have some absurd standard that makes zero sense. Plus, the nature of the objectives and standards are cited as being knowledge based only. The way the QTP approaches things is either with reference or without reference, but it definitely wants you to quote the reference. That is not really how things work, we are training to pass a test, reality is, in live, to ensure they do not kill people.

Interviewees also negatively highlighted training references. References in the QTP were not specific or were too vague. References were cited as entire regulations or manuals that normally exceed 250 pages in length. P9 summed up controller dissatisfaction by stating,

That is wonderful! I have always been appreciative of that. That is completely unacceptable in a QTP. If someone gave you a [local training document] and all it had in it was the [FAA regulation] or [agency regulation], you would be like ‘this is ridiculous’. Inspection teams would come down and call it ‘ridiculous’,

but here it is perfectly acceptable. It is not local stuff; you cannot put a reference for the [local training regulation], got it. But you sure know what page it is addressed in the [agency regulation]. On a big level, on a [agency] level, there is no reason at all to not have it be more specific.

#### **Theme 4: Knowledge, skills, and attitudes changed because of training**

This theme encompassed many items that were previously discussed in themes 1, 2, and 3 such as knowledge gained about the administrative process associated to controller training, the lack of knowledge gained regarding learning and teaching, the lack of skills obtained needed to effectively train another adult, and the overtraining of knowledge-based objectives not essential to training. However, some additional information did not fit within the previously identified themes. Rather than restating the areas already highlighted, I will only add to the knowledge gained during the interview process.

Trainees strived to emulate trainers they had previously observed to be exceptional. P18 relayed a story about an experience she had during upgrade training wherein the trainer's ability impressed her,

A couple of years ago, I remember when I was in training, I was working a shift with another person, and she noticed the voice quality of the pilot in their first call up. She was immediately like, 'let me get this'. She told me later that she thought he was going to declare an emergency because he voice was shaky. Those little things that she knew to look for, I had no idea in his first call up that a couple of minutes later he was going to declare an emergency.

There was an attitude of pride, accomplishment, and a sense of responsibility that interviewees attributed to completing the training program. P2 summarized this feeling by stating,

It makes people view their environment in a different light, going from a narrow view just controlling airplanes to a broader view. I think it opens people's minds to the many facets that go into effectively conducting operations on a daily basis. Your role changes when you become a trainer. Now your responsibility is to train the workforce, not only for the facility but for the [agency]. You have a responsibility now to other individuals.

P9 articulated a similar sentiment,

They take away a sense of accomplishment. They are certified on something, and that is the very first real certification that a controller gets after they are a qualified controller and it's a notch in their belt, and they are proud of that. I think they take away that desire to apply those new procedures and have a positive influence on their facility's training program and being part of that overall solution. A training solution, making their [staffing] better, their base better, and the [agency] better.

P17 also emphasized the importance of trainer confidence,

We have people from all walks of life who may or may not have ever had somebody depend on them. It is very unique in our career field that we put a trainer in with a trainee; we put them in live position, and now that trainer is dependent upon that trainee to ensure they keep their own ratings. That has the

capability of building their confidence, so they know when to step in when the trainee is lost. Starting out as a trainer I would over key a trainee rather rapidly. As I put 3 months, 6 months into my own training as a trainer, it got to the point I could go much further.

### **Theme 5: Certification procedures need to be reviewed**

The current QTP third-party certifier is the facility manager, also known as the chief controller (CCTLR). Interviewees from the facility manager subcategory relayed that the certification process is sufficient and is achieving the desired results. However, interviewees from other categories adamantly identified standardized certification procedures are needed. Not a single nonfacility manager supported the CCTLR as the third-party certifier. These findings contradict each other with the viewpoint of facility managers being the minority perspective, hence the rationale behind its identification as a theme in this study.

Interviewees repeatedly noted that being able to actually train is not being certified by CCTLRs. Interviewee articulated that qualified trainers do not always meet the standard despite the CCTLR certification process. One training objective requires trainers to use the simulator to conduct training. P14 relayed that very few people can accomplish this objective,

I can tell you using [facility x] and [facility y] as examples, three out of 35 people do that, and at [facility z] it was far less. We had a high civilian population who would not run simulators. So, out of 103 controllers, 30 of which are trainees, so 70 controllers, I would say four or five. That is a low number.

P6 summed up his experience with, “You go into the CCTLR’s office who pretty much questions you to make sure your knowledge base was there but as far as actually sitting down and conducting a simulator with a trainee and being monitored, no.”

The knowledge certification process is subjective and inconsistent, unpredictable, and does not ensure trainer effectiveness or efficiency. P9 stated, “We just have to pour knowledge on you and just hope you grasp it. Oh by the way, what you did not get, the actual OJT stuff, all the practical stuff that matters, we did not touch that, but thank God you know that on page 38 of the [agency regulation] it addresses what the [manager of standardization] does.”

Lack of accountability was also emphasized by P13 as being an issue with the current certification process,

It does not matter if you have a great trainer and a great trainee and he just loves teaching and does a great job. If you do not have people above them watching, following them, making sure you have a good program in place, tracking like you need to, documenting like you need to, the program will fail, eventually. So, you are not always going to have good people under you to make the program spin if you are not providing the insight and oversight and that goes all the way up the chain. CCTLRs need to hold trainers accountable. [CCTLR’s boss] need to hold [training managers] and CCTLRs accountable. Involvement and holding people accountable is important.

No interviewee disputed the validity of accountability but most questioned whether it is actually occurring. P9 summarized this concern by stating, “98% of what I

have ever seen with people addressing the QTP for the first time is ‘what do you think the CCTLR is going to ask about?’ If they think the CCTLR is going to ask about everything, they will hit as many points in the QTP as they can within their 45-days. If you think the CCTLR is going to skim over it, they will skim over it. Or if he is lazy, they are not going to teach him anything.” Several interviewees articulated the need for some manner of standardized testing to ensure the knowledge base of all trainers is actually the same and is being retained. In addition to standardizing the knowledge portion of trainer training, interviewees emphasized the importance of ensuring mastery of practical application. P14 articulated this concern by saying,

When it comes to ATC training, in general, there is a knowledge portion, and there is a performance portion and I think anybody can get past the knowledge portion. I think the performance portion of it is where you separate people and when you come down to figuring out if they are going to be able to do this or not going to be able to do it. I think the same is true regarding all teachers. They know all the theories about how to teach someone, but someone needs to be able to sign off on that.

P3 expounded by offering a fix-action, “We could probably incorporate the NSE or someone in there just kind of like sitting at an empty scope and observing a trainer watching a trainer watching a trainee in position to kind of say, ‘yeah, they get the point.’”

Many emphasized that there is no certification standard so various CCTLR opinions have become the standard. P3 said,

It is just the CCTLRs blessing. Obviously, your crew boss or WS might throw in an opinion or two, but what it all comes down to is the Chiefs opinion. Which, from my personal experience, Chiefs are not in the training room or the [ATC environment]. They are not there listening to the trainers doing any kind of work with the trainees.

The document review findings indicated the QTP has not been developed compliant with ISD principles, and it does not promote adult learning as endorsed by andragogy and experiential learning theory. The interview data supports the document review findings increasing the validity and accuracy of the data. Both document and interview findings were used to inform Appendix A, the *Evaluation Report*.

### **Evidence of Quality**

I used two methods to validate findings: triangulation and member checking (Creswell, 2012). Triangulation describes a data analysis technique used to increase stakeholder confidence that findings are accurate (Creswell, 2012). Triangulation of data occurred by utilizing more than one source: interviews and documents.

Creswell (2012) defined member checking as verifying accuracy by asking one or more of the participants to review findings. For this study, each participant was provided a transcript draft within 2-3 days of the interview to validate the accuracy and ensure his or her perspective(s), experience(s), and recommendation(s) were captured accurately. Two interviewees indicated additional thoughts came to them after the interview, and they were allowed to add these thoughts to their transcript. All other interviewees indicated their transcripts accurately represented their thoughts and experiences. Data

analysis was accomplished using both a software program (NVivo) and manual coding. This process helped maintain a chain of evidence and helped improve reliability by crosschecking findings with manually coded data.

By using data triangulation and member checking, I created a detailed description of the data and drew conclusions on the original research focus areas:

1. QTP curriculum.
2. Techniques used to facilitate OJT training.
3. Participant satisfaction.
4. Participant perception of knowledge and skills gained from training.
5. Knowledge gained from training transferred to day-to-day duties.

I then reviewed the data again to ensure nothing was overlooked or left out; no discrepant data emerged. The use of multiple sources and analysis techniques ensured the accuracy and credibility of study findings. These techniques also ensured I was able to provide a detailed description of the how the data were interpreted and used to inform the *Program Evaluation Report* (Appendix A).

### **Project Deliverable**

The document review and interview data were used to inform the *Program Evaluation Report* (Appendix A). The five themes identified during the analysis phase were:

1. The QTP is needed to supplement the Agency 1-day train-the-trainer course, but improvements are needed to facilitate program effectiveness.
2. The effectiveness of trainer training is influenced by many factors.

3. Training materials and practices do not sufficiently meet training need.
4. Knowledge, skills, and attitudes changed because of training.
5. Certification procedures need to be reviewed.

The evaluation report contains data that can be used by stakeholders to make evidence-based decisions regarding the current and future state of the program. Other interested parties, such as the FAA, who are looking to examine professional OJT products wherein an adult is the focus of the learning transaction, can also use the report findings and recommendations to develop or improve FAA trainer training programs.

### **Limitations**

It is important that researchers identify a research problem that will benefit the individuals being studied, and study limitations, weaknesses, or problems with the study (Creswell, 2012). This study will benefit participants, but some limitations existed such as controller attrition rates, population turnover rates, and target sampling frame. The program is of interest to the individuals being studied, but the agency population changes regularly. According to the CFM, as of January 2014, 900 new unqualified trainees entered the career field. Of these 900, nearly 50% will not become qualified. This attrition rate drives a need for the continuous cycle of replacement trainees.

Air traffic controllers within the agency are not lifelong employees. Each year, new controllers enter the career field. As of January 2015, over 50% of the inventory consisted of controllers within their 6-year service window. Over time, the career field population drastically shrinks. Of the 3,415 controllers in the agency inventory, only approximately 700 have 11-30 years of experience. As the population changes over a

relatively short period of time, it is possible the findings of a program evaluation would not apply to the inventory in just a matter of 6-10 years.

The agency has 288 controllers assigned to facilities located in Europe. This population represents only 8.4% of the greater agency controller population. It is possible the data obtained in Europe-based facilities did not apply to those located elsewhere. Further, Europe-assigned controller experiences may not represent the experience of the greater controller community, as their experiences are different from those found elsewhere. By limiting the focus of the program evaluation to ISD and adult learning, these limitations are mitigated as these adult learning principles hold their value over the long term.

### **Conclusion**

This section described the research design and approach, study participants, data collection, data analysis, findings, and potential study limitations. The research design was a program evaluation utilizing an expertise-oriented approach. Qualitative data from documents and one-on-one interviews were gathered and analyzed using computer-assisted and manual coding techniques. Data from both the document and interviews were analyzed to identify areas needing improvement and five themes. The five themes include:

1. The QTP is needed to supplement the Agency 1-day train-the-trainer course, but improvements are needed to facilitate program effectiveness.
2. The effectiveness of trainer training is influenced by many factors.
3. Training material and practices do not sufficiently meet training need.

4. Knowledge, skills, and attitudes changed because of training.
5. Certification procedures need to be reviewed.

These themes were used to inform the *Program Evaluation Report* (Appendix A).

Stakeholders can use the evaluation report to make decisions regarding the current and future state of the QTP. Some study limitations existed such as controller attrition rates, population turnover rates, and target sampling frame but did not detract from the overall quality of the study.

## Section 3: The Project

### **Introduction**

The purpose of this study was to evaluate the agency's ATC train-the-trainer program wherein the QTP is the primary instructional document. Throughout my agency tenure, I witnessed unqualified and qualified controllers fail to achieve qualifications and subsequently cite poor training practices as a contributing factor to their failure(s). Agency leadership supports the idea that trainer duties rank among the most important. With a formal evaluation of this program, stakeholders are provided vital insight into program effectiveness. In this section, I describe the project study, provide the rationale for the study, explore relevant literature, and describe the implications of the study.

### **Description and Goals**

A program evaluation using Kirkpatrick's four levels of evaluation model was conducted to ascertain whether the agency's ATC QTP facilitates the acquisition of OJT skills among trainers. Throughout the evaluation, I examined the following areas, with findings detailed in Appendix A, the *Program Evaluation Report*:

1. QTP curriculum.
2. Techniques used to facilitate OJT training.
3. Participant satisfaction.
4. Participant perception of knowledge and skills gained from training.
5. Knowledge gained from training transferred to day-to-day duties.

## **Rationale**

Instructional system design supports the evaluation function of continuous process improvement. Three types of evaluation are formally recognized by the agency: formative, summative, and operational. However, by agency definition, these types of evaluation are conducted during the development and implementation phases. There is no existing guidance to evaluate a program once it has been implemented into practice. This project addressed an educational problem within the local setting by filling this knowledge gap via a program evaluation.

Spaulding (2014) argued that a program evaluation is conducted for “decision-making purposes, to examine a program’s worth, and to make recommendations for refinement (p. 53).” Guerra-Lopez (2008) described how evaluation practices date back to 2000 B.C., when Chinese officials evaluated an individual’s ability to hold government office. Over time, evaluation evolved. In the last 100 years, evaluation has rapidly evolved to account for billions of dollars in U.S. spending (Guerra-Lopez, 2008). There are several evaluation models: objectives-based evaluation; consumer-oriented evaluation; the discrepancy model of evaluation; goal-free evaluation; responsive/client-centered evaluation; Phillip’s return-on-investment method; Brinkerhoff’s success case method; the context, input, process, product (CIPP) model; and Kirkpatrick’s four levels of evaluation.

In the 1930s, Tyler called on educational and social programs to measure goal attainment using standardized criteria (Guerra-Lopez, 2008). Guerra-Lopez (2008) described this objective-based evaluation model as a method to determine whether

students met program objectives. One weakness of this approach is that the evaluator may overlook unexpected outcomes or benefits (Guerra-Lopez, 2008).

In 1967, consumer-oriented evaluation was developed (Guerra-Lopez, 2008). This approach focused on consumer needs and societal ideals more than developer objectives and was developed to evaluate products for potential adoption into a school system (Guerra-Lopez, 2008). This approach also made a distinction between formative and summative evaluation (Guerra-Lopez, 2008).

In 1971, the discrepancy model of evaluation was developed (Guerra-Lopez, 2008). The discrepancy model has four phases: establish objectives, standard compliance, identify the gap between objectives and result, and identify a corrective action (Guerra-Lopez, 2008). This model does not account for participant reaction and does not identify whether behavior changed because of training. It also does not identify whether there is a tangible return on investment because of training participation.

In 1972, Scriven developed goal-free evaluation (Guerra-Lopez, 2008). With the goal-free evaluation method, the evaluator remains uninformed about the program's goals and looks for effects regardless of program objectives (Guerra-Lopez, 2008). As the evaluation in this case, I was already familiar with the program goals and objectives.

Responsive/client-centered evaluation, developed in 1975, calls for continued communication with stakeholders, as it involves an assumption that program objectives will change over time (Guerra-Lopez, 2008). I conducted this evaluation at a specific point in time. Additionally, communication with program developers and stakeholders did not continue, making use of this model inappropriate.

The utilization-focused evaluation method, developed in 1997, calls for designing evaluation solely for the sake of decision-making (Guerra-Lopez, 2008). This method cannot be used to inform and improve practice. Use of this model would have limited the scope of potential evaluation findings and results.

Phillip's return-on-investment (ROI) model, published in 1997, capitalizes on Kirkpatrick's four levels of evaluation (Guerra-Lopez, 2008). ROI requires isolating training effects and attributing a direct cost and benefit to the program (Guerra-Lopez, 2008). For this study, isolating training effects would have been enormously time consuming and impractical. Further, the cost associated with the benefits of the program was far beyond my reach as the evaluator.

Brinkerhoff's case success method is used to evaluate extreme cases of success or failure (Guerra-Lopez, 2008). In air traffic control, controllers who fail to obtain required qualifications are eliminated, and such individuals would no longer be available for interviewing. Extreme cases of success would be difficult to measure, and the data necessary to determine a quality trainer are not available within the agency. Use of this method was not possible.

Stufflebeam penned the CIPP model of evaluation in 1971 (Guerra-Lopez, 2008). The CIPP model has four foci: content, inputs, process, and product (Guerra-Lopez, 2008). Guerra-Lopez (2008) described this model as blurring the lines between evaluation and needs assessment. Additionally, it is not widely known or used (Guerra-Lopez, 2008). This method can be used to evaluate a myriad of programs (Guerra-Lopez, 2008). Use of this model would have been possible and practical, but it was not chosen.

Although there is no best model, Kirkpatrick's four levels of evaluation was chosen for this study. Kirkpatrick's model was created in 1959, by Donald Kirkpatrick, and has been a popular approach to evaluation for almost 60 years (Guerra-Lopez, 2008). Kirkpatrick's four levels of evaluation was created for training intervention and appealed to me due to its simplicity (Guerra-Lopez, 2008). For a novice evaluator, this model was easy to conceptualize and served as a roadmap for research. Guerra-Lopez (2008) described how this framework is widely used and accepted in the industrial and organizational psychology fields. Kirkpatrick's four levels (reaction, learning, behavior, and results), as a model for collecting data, could prove useful to the stakeholders.

The reaction level was used to measure how participants reacted to the program (Kirkpatrick & Kirkpatrick, 2006). The learning level was used to determine the extent to which participants changed attitudes, improved knowledge, and increased skills because of attending the program (Kirkpatrick & Kirkpatrick, 2006). The behavior level assisted with identifying which change in behavior occurred because of program attendance (Kirkpatrick & Kirkpatrick, 2006). The results level helped to identify what occurred because a participant took part in the program (Kirkpatrick & Kirkpatrick, 2006). Stakeholders can use these data to make evidence-based decisions regarding the current and future state of the program.

### **Review of the Literature**

The literature review process was conducted using both printed and online resources along with multiple institutional public and military libraries, such as those of the FAA, Walden University, and Embry-Riddle Aeronautical University. Databases

used to conduct research included ERIC, ProQuest Central, AULIMP, EBSCO Host, science.gov, Hunt Library/Eagle Search, Education Research Complete, SAGE Premier, ScienceDirect, and Google Scholar. Use of keyword searches assisted with identifying the theoretical and conceptual frameworks appropriate for the program evaluation.

Keyword searches included: *program evaluation, Kirkpatrick's four levels of evaluation, instructional system design and development, simulation training, curriculum development, objective writing, assessment tools in education, bridging the gap between cognition and application, adult learning theory, andragogy, and experiential learning.*

ATC trainers facilitate training for adults who have distinctive needs and expectations (Harper, 2011; Kelly, 2013). Air traffic controllers complete 72 days of vocational instruction before entering on-the-job training at their first duty location. Upon arrival to their first duty location, training focuses on continued cognitive skill building and application of learned knowledge in both real and simulated environments. Each time a controller transfers from one facility to another facility, training builds upon existing knowledge and must be applied in the new environment.

Two adult learning theoretical frameworks were used to inform this program evaluation: andragogy and experiential learning theory. Additionally, the instructional system design (ISD) model was used to evaluate program curriculum. These frameworks were appropriate for this program evaluation, as they have proven to facilitate positive adult learning transactions across multiple disciplinary fields.

### **Andragogy**

Navarre and Wozniak (2013) proposed using andragogy as an asset-based

heuristic approach to facilitate adult learning. Multiple disciplinary studies support Navarre and Wozniak's recommendation (Harper & Ross, 2011; Henry, 2011).

Knowles's (1984) model of adult learning, andragogy, includes six assumptions concerning adult learners:

1. Adults need to know the reason for learning.
2. Experience is the basis of adult learning.
3. Adults need to be responsible for their own learning.
4. Adults learn best when learning has immediate relevance.
5. Adults learn better when a problem-centered approach is utilized.
6. Adults respond better to internal motivators versus external motivators.

Adults learn by doing and by actively making sense of their learning experiences (West, 2013). Curriculum development and execution should involve the learner and be problem-centered to capitalize upon Knowles's assumptions of adult learning (Knowles et al., 2012; Merrill, 2002; McGrath 2009). Training should capitalize on the learner's need to act in a self-directed manner (Knowles & Associates, 1984; Knowles et al., 2012; McGrath, 2009). The learning transaction should include a relevant and realistic problem-centered approach (Salden, Paas, & van Merriënboer, 2006). Lastly, learning must capitalize upon and foster the adult learner's internal motivation (Harper & Ross, 2011; West, 2013).

### **Experiential Learning Theory**

The second learning theory lens used in this program evaluation was experiential learning theory. Experiential learning theory emphasizes the role of experience in the

learning process. This theory also highlights the role of applying acquired knowledge in a relevant setting (Haynes, 2007; Kolb, 1984; Wurdinger & Carlson, 2010). Experiential learning theory includes four components: concrete experience, reflection, observation conceptualization, and active experimentation (Kolb, 1984; Pollock, Chandler, & Sweller, 2002).

Wlodkowski (2008) asserted that what many consider *talent* is actually the result of deliberate practice. Wlodkowski described how knowledge and skill exist as a neural circuit and how as learning occurs, axons and dendrites join with other fibers and neurons to create complex knowledge and skill. The connections of these axons and dendrites, parts of the brain, promote learning by thickening myelin, a nerve fiber membrane, in response to frequent circuit use (Wlodkowski, 2008). For the controller, the act of teaching other adults is a new or underdeveloped skill that requires deliberate practice to perfect. New learning can seem difficult and confusing to an adult learner because of slow and undeveloped circuitry (Wlodkoski, 2008). Erroneous knowledge and skill can accumulate thickened circuitry, making learning correct knowledge and skill more difficult. With frequent practice, continual corrective feedback, and deliberate effort to improve a weakness, the signal can travel more quickly and accurately (Wlodkoski, 2008).

The agency's QTP includes a simulator-training objective wherein the trainer is required to use simulation to facilitate trainee learning (HQ AFFSA, 2013). Koskela and Palukka (2011) conducted an ethnomethodology study to explore methods used in ATC training. They found that trainers used five different instructional strategies throughout

the training life cycle (Koskela & Palukka, 2011). Trainees are transitioned from a simulated environment to live traffic using a scaffolding method with decreasing assistance from the trainer (Merril, 2002). Upon completion of their study, Koskela and Palukka recommended that greater attention be given to reconciling vocational and simulator training.

Simulation is a training method that refers to the technology used to reproduce human-aircraft interaction for training (Gheorghiu, 2013). Simulation technology used by the agency includes the Tower Simulation System (TSS), Signal, and ATCoach. Simulators eliminate operational risk present in live traffic and provide significant contributions to air traffic control training through their fidelity and realism. ATC simulator scenarios at slow or normal speeds help trainees learn how to replicate various complexities commonly encountered in live traffic (Cokorilo, 2013). Using simulators, agency trainers provide the trainee an opportunity to learn through action, experience, discovery, and exploration (Loft et al., 2011).

### **Instructional System Design (ISD)**

Paas and van Gog (2009) maintained that training people to perform complex cognitive tasks requires simple-to-complex sequencing of training tasks. Curriculum should be developed using cognitive load theory to facilitate simple-to-complex scaffolding (Vogel-Walcutt & Walcutt, 2013). Agency regulatory guidance directs the use of the ISD principles to develop curriculum. Since 1965, ISD has been used to improve human performance (Darabi & Kalyuga, 2012; Dick, Carey, & Carey, 2009; Klein, 2014).

ISD is a systematic process used by designers to develop effective, cost-effective curriculum (Richey & Klein, 2013). The goal of ISD is to develop instruction based on job performance requirements, eliminate irrelevant skills and knowledge instruction, and ensure that trainees acquire necessary skills, knowledge, and attitudes to do the job (Morrison, Ross, Kemp, & Kalman, 2011). The agency's governing guidance requires instructional designers to use the ISD ADDIE model (analyze, design, develop, implement, and evaluate; Davis, 2013).

Skillfully using ADDIE in instructional design can assist learners in achieving learning outcomes (Chevalier, 2011; Mayfield, 2011; Pearson, 2011; Shibley et al., 2011). ADDIE is useful in providing a systems-based training method that encourages feedback at every level of instruction and provides structure to curriculum development (Mayfield, 2011). Literature across multiple disciplinary fields supports the integration of ISD and the use of ADDIE (Chevalier, 2011; Mayfield, 2011; Pearson, 2011; Shibley et al., 2011).

### **Implementation**

Shapiro (2005) argued that research has only one objective; to effect change based on improved knowledge. The gap between research findings and action taken to affect practice exists across many disciplinary fields (Boaz, 2011; Schillinger, 2010; Shapiro, 2005). Schillinger (2010) recommended anticipating and addressing likely barriers to enhance integration of research into practice. For this study, implementation barriers included knowledge transfer, knowledge exchange, and knowledge uptake.

Knowledge transfer refers to the imparting of research from producers to users (Schillinger, 2010). Boaz (2011) indicated passive dissemination of research is ineffective, and some strategy is needed to encourage implementation of research-based recommendations and to ensure a change in practice occurs. Knowledge exchange refers to the meaningful exchange of information between researcher and producers that is relevant and in a user-friendly format (Schillinger, 2010). Knowledge uptake refers to the acquisition of knowledge and its utilization, including incorporation into decision-making (Schillinger, 2010).

The widest dissemination of research is needed to address the knowledge transfer barrier. This research is beneficial to a specific group of people and will be sent to the agency's program development office and the CFM. The evaluation report was developed for a specific audience to ensure the information is relevant and formatted in a user-friendly way. The CFM has articulated his commitment to improving training practices and can directly influence the knowledge uptake barrier by incorporating the evaluation data into decisions made regarding the current and future state of the QTP. The CFM can direct program developers to make program refinements that can be implemented into immediate practice.

### **Project Evaluation**

Bridging the gap between research and practice is needed before project evaluation can re-occur, as evaluation is a reiterative process. Agency guidance describes the evaluation phase of ADDIE focuses on continuous improvement. There are three types of evaluation recognized by the agency: formative, summative, and operational.

Formative evaluations are conducted during program development to check the design of each component of the program for integration. Summative evaluations are operational tryouts using real trainees. Operational evaluations are used to ensure the program continues to produce trainers who meet established standards. An operational evaluation should occur after a reasonable amount of time has passed once changes have been incorporated into the existing program.

### **Implications Including Social Change**

#### **Local Community**

The size and complexity of research and poor access to evidence can be barriers to improving organizational practices (Boaz, 2011; Schillinger, 2010; Shapiro, 2005). This research project removed the research size barrier by focusing solely on the current trainer training practices. By providing insight into program effectiveness using the lens of andragogy, experiential learning, and ISD, the research is focused rather than complex, and findings are useful to stakeholders. By removing these barriers, the mantra “We’ve always done it this way,” loses its value at every organizational level. Trainers, supervisors, facility managers, training program managers, and regional managers are reminded that they play a vital part in realizing agency training program goals.

Program developers and the CFM have evidence that although the existence of the training program is both justified and valued, there is room for vast improvement. Program developers and the CFM must take action to bridge the gap between this research and practice. Appendix A can be used to make evidence-based decisions

regarding the current and future state of the program at the right time, and in the right way, to meet organizational goals.

### **Far-Reaching**

In 1929, the St. Louis Airport in Missouri hired the nation's first air traffic controller who stood at a location on the airfield and used colored flags to communicate to pilots (Nolan, 2011). Today, less than 100 years later, more than 13,000 controllers work for the FAA and the agency. Air traffic volumes are forecasted to impose increasingly greater demands on controllers who work in environments filled with time pressures, multiple goals, interconnected tasks, and high consequences for errors (FAA, 2014b, 2014c; Kontogiannis & Malakis, 2013). Current policy and procedures place great emphasis on the selection criteria of controllers but throughout this study, searches for research related to controller training produced little to no empirical data.

Many studies have been conducted and published in the pilot community and other unrelated fields; however, within the greater ATC community, training research is sparse or has not been published. This gap in knowledge facilitates ineffective, and inefficient training practices throughout the greater controller community. This study filled the gap in knowledge and promoted further research by encouraging the development of a benchmark practice within the agency. The FAA can use this benchmark to platform further research, and improve policy and training practices throughout the greater ATC community.

## **Conclusion**

This research project evaluated the agency's ATC train-the-trainer program wherein the QTP is the primary instructional document. This section described the study, provided the rationale for the study, explored relevant literature related to the study, and described implications of the study. Developing training utilizing ISD, andragogy, and experiential learning the transaction can maximize the effectiveness of the learning experience and increase program efficiency. By evaluating the QTP, a function not previously performed, program developers and the CFM have evidence that although the existence of the training program is both justified and valued, there is room for vast improvement. Action to bridge the gap between this research and practice can be made using the evaluation data. This study filled the gap in knowledge and promoted further research by encouraging the development of a benchmark practice within the agency. The FAA can use this benchmark to platform further research, and improve policy and training practices throughout the great ATC community.

## Section 4: Reflections and Conclusions

### **Introduction**

Program evaluation is a systematic method for collecting, analyzing, and using information to answer questions about a program (Creswell, 2012). In this section, I examine the program evaluation's strengths; present recommendations for the remediation of limitations; address issues of scholarship, project development and evaluation, leadership, and change; present an analysis of myself as a scholar, practitioner, and developer; and summarize the study's implications for social change. Stakeholders can use the data contained in Appendix A to make evidence-based decisions regarding the current and future state of the QTP.

### **Project Strengths**

Spaulding (2014) contended that research builds on existing understanding and knowledge of a topic. Conversely, program evaluations are conducted for decision-making purposes (Spaulding, 2014). Another difference between research and program evaluations is the speed at which they influence pragmatic program refinement (Lodico et al., 2010). Program evaluations produce data that can be used to make evidence-based decisions regarding the current and future state of a program (Kirkpatrick & Kirkpatrick, 2006). The integrity of findings relies on how well design and data collection methodology strengthen data validity and reliability (Newcomer et al., 2010). During this evaluation, the design and data collection methodology were executed in a transparent manner using practical qualitative research techniques. The CFM and

program developers can confidently use the evaluation data to justify making swift program refinements.

### **Limitations**

Two issues in program evaluation are ascertaining the effects of a program over time and determining the extent to which the program, rather than other factors, has contributed to those effects (Phillips, 2010; Wholey et al. 2010). Maturation can occur normally over time, with or without program intervention (Phillips, 2010). The 20 participants interviewed during this evaluation were trainers, supervisors, facility training managers, facility managers, the regional training manager, and course developers.

Controllers progress through these subgroups, in order, over the course of their agency careers. Therefore, each subsequent group increasingly includes older, more experienced controllers. Fourteen of the 20 participants were from the trainer and supervisor category; therefore, evaluation findings predominately reflect the experiences of individuals in these categories and may not accurately account for the natural maturation of controllers over time within the agency.

Isolating program effects is critical for program evaluations because factors other than the program can influence results (Phillips, 2010). Programs are implemented within complex systems of people, processes, and events (Phillips, 2010). Many factors can influence results, and giving credit to a single program without regard to other factors may be misleading (Phillips, 2010). For this evaluation, not all influencing factors were known. For example, some participants may have received additional training before, during, or after completing the trainer program. Some participants may

have had numerous opportunities to perfect their trainer skillset and may have provided feedback based on experiences covering several years or trainees. Other participants may not have had the opportunity to perform as trainers and may have provided feedback based on limited practical experience.

### **Recommendations for Alternative Approaches**

Alternative approaches could have been used to perform an evaluation of this program, such as control groups or trend line analysis. A control group could have been used to evaluate the program (Phillips, 2010). A control-group approach involves the use of an experimental group that participates and a control group that does not, followed by comparison of the results (Phillips, 2010). An advantage of using this approach is that it can isolate influencing factors and can ensure that all participants have similar experiences and the same level of maturation; further, outcome differences can be linked to program attendance (Phillips, 2010).

A trend line analysis can be done if a control group analysis is not feasible (Phillips, 2010). A trend line is forecasted using previous performance as a baseline extended into the future (Phillips, 2010). When the program is attended, actual performance is compared to the trend line, and improvements can be attributed to the program (Phillips, 2010). This approach could have been used if the evaluation had occurred early enough in the controllers' careers that a baseline could have been determined. An advantage of this approach would have been that evaluation data would have targeted and reflected findings from the trainer category, which represents the largest subpopulation within the agency.

## Scholarship

Learning occurs in the completion of a task or activity (Galbraith, 2004). Air traffic controllers must possess the ability to think and problem solve quickly. As a controller, I found it both a foreign and thrilling adventure to morph 18 years of experience and academia into a deliberate and meaningful research project. I have always had the desire to effect positive change within my sphere of influence as an agency controller and within the larger controller community. When I completed my Master of Science in Aeronautics from Embry-Riddle Aeronautical University, I had amassed valuable information pertinent to my field, but I still had one unanswered question. I did not know how to use knowledge to make a practical difference.

The second I read Walden's vision statement, wherein a commitment to promoting positive social change is expressed, I was interested. This vision appealed to my inner desire to bridge the gap between knowledge and application for the greater good of the ATC community. From my first semester at Walden, I applied knowledge in my work setting. I hope that those I worked with benefited from my enthusiasm about adult learning and research. In retrospect, I may have initially been swerving all over the road as I began my learning journey on shaky legs.

Throughout this journey, I learned to have confidence in myself as an expert in my field. I now walk with confidence, as I know how to use knowledge to effect change as a scholar, practitioner, and developer. I have learned how to view community through a broader lens and how to embrace multiple ways of knowing. I have learned how to

critically examine a problem, how to conduct exhaustive research, and how to develop a viable solution through deliberate planning, hard work, and communication.

I have learned how to help others promote positive social change. I have learned that when someone has a deeper understanding, beyond rote learning, that person is more apt to take action to correct injustice, improve practice, seek higher learning, and promote positive social change. Ultimately, I learned what one person could do; many can do better. As my doctoral journey ends, I am embarking on a journey as a lifelong learner. I am confident that I possess vision and the tools needed to pave the way for future and valued learning, authentic research, and project studies.

### **Project Development and Evaluation**

Developing this project study was a great learning experience. Many details went into project planning and execution. I invested numerous hours, and months, considering and exploring the problem, existing literature, population, stakeholders, and resources, as well as examining meaningful ways to execute the project. I spent significant time deliberating how to present findings in a way that would add value to existing literature, that would not be harmful to participants or the greater controller community, and that would have both local and far-reaching implications. This exhaustive research and deliberation led me to the conclusion that a program evaluation was appropriate for this project study.

### **Leadership and Change**

Without learning, there would be no leaders, and without leaders, there would be no change. The foundation of leadership is vision and the desire to promote positive

social change. Leaders are hardworking, are learned, and strive to better themselves, other individuals, and society. Leaders do not take the path of least resistance. Rather, leaders embrace challenge and difficulties as opportunities to experience deeper learning (Galbraith, 2004). Through this doctoral journey, I have improved and cemented effective leadership skills. I have facilitated personal learning by making mistakes and learning from them, by embracing difficulties as passionately as opportunities, and by setting and committing to goals. By doing these things, I have set a positive example for others to emulate.

### **Analysis of Self as Scholar**

I would not have described myself as a scholar before I began my doctoral journey. The term brought to mind old men sitting around a table stacked full of dusty books, smoking pipes before a toasty fire, discussing the meaning of life and the cosmos. However, as I have become better educated about what a scholar embodies, I now embrace the scholar title as a description of self. Scholars facilitate learning, work hard, and are leaders and role models who seek and brainstorm ideas that promote positive social change and who conduct research to synthesize information to educate and add to existing literature. Throughout this learning journey, I have embodied these actions and will go forth through the remainder of my life committed to lifelong learning and seeking ways to facilitate positive social change.

### **Analysis of Self as Practitioner**

I think I was born to be a practitioner. I have never been satisfied with just knowing; rather, I need to do something with what I know—hence my feelings of

dissatisfaction when I completed my Master of Science in Aeronautics. I felt lost with no outlet for my amassed knowledge and experience, as I embrace opportunities to apply knowledge to my everyday life. I do not recall at what point I realized this about myself, but it was early in my doctoral journey. Once I did realize it, I felt fully alive and in tune with my inner self, and the true learning experience began.

Throughout the process of conducting my research, executing my study, and developing the program evaluation report, I learned skills in thinking, strategizing, organizing, and bridging the gap between theory and application. My conflict resolution skills, communication skills, and change management skills have all vastly improved. I have learned to embrace feedback; in fact, I have learned to seek out feedback as a way and means to develop a thought or product.

Lastly, I learned that giving a voice to others is rewarding. When I began my journey, I would have described myself as a quantitative researcher, but based on the identification of this local problem, a qualitative method fit better than quantitative research methodologies. At first, I was uneasy and tried to find any way possible to force the problem to fit into a quantitative research method. When it just did not work, I accepted that I would be conducting a qualitatively based research project, and I found that I enjoyed it. If I had known how satisfying it would be to convey data through the voices of others, I would have saved myself a lot of time and angst and embraced it from the onset of my study. Perhaps I have learned that I am both a quantitative and qualitative researcher instead of simply one or the other.

### **Analysis of Self as Project Developer**

It is a great accomplishment to have completed a program evaluation through a self-developed project. I learned a lot through the process. I learned that the first draft of anything requires significant revision. I also learned that I enjoy the continuous improvement process associated with project development. Project development is tedious, time-consuming, hard work that requires numerous reviews and drafts before culminating into a usable, meaningful product. Second, I learned how to conduct research into a problem, how to develop project goals, and how to identify the best way to address the problem and achieve project goals, which is critical to project development success. Developing a project without addressing these steps first will result in project failure. Lastly, I learned that program evaluations are difficult when one is evaluating a program within an organization to which one belongs. There was so much information shared by participants unrelated to program goals that I found myself deviating and conducting unrelated research. I was thankful that the goals had been pre-identified, as they kept me from losing myself in the research data and wasting time.

### **The Project's Potential Impact on Social Change**

Hobbes (1668) penned the Latin phrase “*ipsa scientia potestas est*,” or “knowledge itself is power.” In this project, I brought together knowledge from many difference resources into one location via a program evaluation report. This report provides agency stakeholders with data needed to make evidence-based decisions regarding the current and future state of the QTP. Once read, it cannot be unread, and once known, it cannot be unknown by the reader. That alone makes the effort that went

into project development a worthwhile endeavor. I worked on this project knowing that the gap in existing knowledge was so vast that this project would either be well read or completely overlooked.

### **Implications, Applications, and Directions for Future Research**

It is hoped that the study was useful to agency stakeholders and other researchers who are sifting through data looking for current, relevant material wherein an adult is the center of the learning transaction. Implications for future research include follow-up evaluations within the agency on improvements made to the existing training program. Researchers who are looking for data on adult learning in the field of air traffic control could use this study to inform current or future research.

During this study, one thing that repeatedly came up outside the boundaries of the project was ATC simulation training. Limited empirical data existed regarding how, and how effectively, simulators or simulation systems are used in the controller community to facilitate training and proficiency. Simulation systems may become one of my future research studies, as simulation systems are an integral part of air traffic control training.

### **Conclusion**

This section has addressed the project's strengths, recommendations for remediation of limitations, scholarship, project development and evaluation, leadership, and change. I have further analyzed myself as a scholar, practitioner, and developer and have summarized the project's implications for social change. This project has been an extremely rewarding experience that has positively influenced me as a scholar, practitioner, and developer. I go forward as a lifelong learner committed to using

research to effect positive social change and striving to foster this same commitment in others. In the future, I am considering examining ATC simulation training to effect continued positive social change within my field of expertise.

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**A Program Evaluation:**

***A Federal Agency's Air Traffic Control  
Train-the-Trainer Program***

Evaluator: Lisa M. Mercer

December 2015

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the U.S. government or the Department of Defense (DoD).

The voluntary, fully informed consent of the subjects used in this research was obtained as required by 32 CFR 219 and [agency supplemental guidance to DoDI 3616.02].

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## ACRONYMS

ATC	Air traffic control
CCTLR	Chief controller, a.k.a. facility manager
CFM	Career field manager
FAA	Federal Aviation Administration
GAO	U.S. Government Accountability Office
ISD	Instructional System Design (or development)
KSAs	Knowledge, skills, or attitudes
NATCT	Agency ATC training manager
NSE	Agency ATC standardization and evaluation manager
OJT	On-the-job training
PE	Program evaluation
QTP	Trainer Qualification Training Package
ROI	Return on investment

# EXECUTIVE SUMMARY

I conducted this program evaluation in partial fulfillment of Walden University's doctoral study requirements. Throughout this program evaluation, I examined the agency's ATC trainer program wherein training is facilitated using the Trainer QTP.

## EVALUATION PURPOSE, FOCUS, & THEORETICAL FRAMEWORKS

The purpose of this PE was to ascertain the effectiveness of the QTP in facilitating the development of trainers capable of conducting OJT. I explored the following during the evaluation: the curriculum, training techniques used, participant satisfaction, and participant perception of KSAs gained from training and transferred to day-to-day duties. The program was evaluated using Kirkpatrick's four levels of evaluation model as a roadmap, and using the lenses of andragogy, experiential learning theory, and ISD. Curriculum documents and 20 one-on-one interviews were used to collect qualitative research data. Data were analyzed using NVivo and manual coding. Stakeholders can use the evaluation findings and recommendations to make evidence-based decisions regarding the current and future state of the program. *Intended Audience: Agency ATC trainers, supervisors, facility managers, regional managers, program developers, and the career field manager (CFM).*

## FINDINGS AND CONCLUSIONS

The existence of the trainer program was justified and benefited the agency's ATC career field. The QTP was a standardized document used by trainers and trainees as a guide and source reference. Kirkpatrick (2006) asserted that no change in behavior could be attributed to a program unless a change in KSAs occurred because of program attendance. Interviewees reported that the program failed to facilitate the learning of critical KSAs vital to their ability to conduct OJT once trainer qualified; therefore, a link between learning and program attendance could not be established. QTP development was not compliant with ISD principles outlined in agency governing directives. Curriculum and instructional strategies failed to promote adult learning, as endorsed by andragogy and experiential learning theory. Certification procedures were not compliant with agency governing guidance and were applied incongruously at the facility level. ROI data indicated program results were not consistent within the local setting (Europe), and the inconsistency may extend agency-wide. Although the QTP was a practical and useful product, it did not meet organizational needs or goals.

# EVALUATION PURPOSE, EVIDENCE OF PROBLEM, & THEORETICAL FRAMEWORKS

## EVALUATION PURPOSE

In 2014, the FAA highlighted to the U.S. Senate the need to focus on ATC OJT to meet job qualifications and future attrition rates within the ATC community (FAA, 2014). The CFM echoed the FAA's call for action in his *2015 Strategic/Action Plan* wherein he highlighted the need for improved training programs designed to meet current and future career field challenges. According to agency regulatory guidance, the QTP must be completed in order to become an ATC trainer. Ineffective training could have disastrous results. Ineffective training could contribute to a lack of qualified controllers needed to operate facilities, to increased withdrawal rates, or to errors in individual judgment after certification. Ultimately, an ineffective ATC training program could contribute to the loss of millions of dollars in assets or human life.

The GAO (2013) reported to Congress “most federal managers lack evaluations of their programs (p.1).” The *Modernization Act of 2010* directed agencies to “use systematically collected data to inform decision makers (GAO, 2013, p.1).” This act also holds agencies accountable for achieving results and improving government performance (GAO, 2013). Only 37% of managers reported their programs had been evaluated, and the “lack of evaluations might be the greatest barrier to informing managers and policy makers (GAO, 2013, p.3).” Additionally, the GAO (2013) contented that it takes many studies to influence program or policy changes, and results should be shared with program partners.

As of December 2015, no PE had been conducted to examine the trainer program. The purpose of this PE was to evaluate the QTP and ascertain its effectiveness in preparing controllers to facilitate OJT. For this program, stakeholders include trainees, trainers, supervisors, facility managers, developers, and the CFM. Each stakeholder has an interest in the QTP's success and brings a particular perspective to the table (Creswell, 2012). These stakeholders require systematically gathered data to inform and improve practices (Newcomer et al., 2010). Improvements made to the QTP directly influence the agency's ATC career field. Additionally, improved practices provide an exemplar for the FAA, an agency partner. Performing this PE ensured the agency complied with the *Modernization Act of 2010*, and demonstrated the agency's commitment to making evidence based decisions as directed by the GAO.

## EVIDENCE OF THE PROBLEM

There is a continuous need for trainers within the agency who can conduct OJT in an effective and efficient manner. In his *2014 Strategic/Action Plan*, the CFM identified 900 (or 26%) of the controller inventory consisted of *unqualified* trainees. *Unqualified*

trainees are individuals who have completed the agency's ATC vocational school, but have not completed OJT within an operational facility. *Qualified* trainees have completed both vocational school and OJT within an operational facility, but require additional training upon assignment to a new facility.

Training programs should produce tangible results (Kirkpatrick & Kirkpatrick, 2006). If the program does not produce tangible results, the program should be modified or discontinued (Kirkpatrick & Kirkpatrick, 2006). In this case, the purpose of the QTP was to facilitate the qualification of trainers capable of conducting OJT. The tangible ROI was measured by calculating the number of days needed to train and the number of days the trainee performed duties in a facility after certification. According to the 2013 and 2014 annual training time reports, agency controllers assigned to the European region required 58% more training days than controllers not assigned to the region. Additionally, the number of days the trainee performed duties after certification drastically differed from non-Europe-based facilities, with differences seen even among facilities within the same region.

At one Europe-based tower facility, unqualified trainees required an average of 446 training days. Factoring in a 2-year assignment and 180-day tasking, the ROI was 104 days. In a comparable non-Europe based facility, unqualified trainees required 167 training days. The ROI was 381 days. Comparing these data highlighted a 277-day ROI gap. Additionally, in 2014, a qualified trainee at one Europe-based facility required 273 training days. The ROI was 277 days. At another Europe-based facility, a qualified trainee required only 22 training days. The ROI was 528 days. Comparing these data highlighted a 251-day ROI gap.

Trainer qualification using the QTP is a mandatory practice within the agency's ATC career field. This practice yielded nonstandard ROI results for both qualified and unqualified trainee training within the local setting during 2013 and 2014. Data needed to compare training quality with ROI was not available, but the existing data indicated focus on the program was justified as evaluation data could be used to improve the program and reduce the existing ROI gap.

## **THEORETICAL FRAMEWORKS**

### **KIRKPATRICK'S FOUR LEVELS OF EVALUATION**

Kirkpatrick's four levels of evaluation model provided a roadmap for this PE. This model was specifically created for training intervention because it is easy to conceptualize, and is widely used and accepted across multiple industry sectors (Guerra-Lopez, 2008). Kirkpatrick's four levels include reaction (level 1), learning (level 2), behavior (level 3), and results (level 4). Each step must be addressed, in order, as it is an evaluator roadmap and each step is linked. For example, behavioral change cannot be attributed to program attendance if KSAs are not learned because of training.

Two adult learning theoretical frameworks were used to inform this PE: andragogy and experiential learning theory. Additionally, ISD was used to evaluate the program curriculum. These frameworks were appropriate for this PE, as their use have proven to facilitate positive adult learning transactions across multiple disciplinary fields.

## **ANDRAGOGY**

Knowles's model and theory of adult learning, *andragogy*, was used as a wide lens to evaluate the QTP. Agency members were above the age of 18, and the average age of agency controllers was 29. Within the agency, 85-95% had completed some college, an associate's degree, a bachelor's degree, a master's degree, and/or a professional degree. These demographics supported the idea that agency controllers were considered *adults* in the context of learning theory (Knowles & Associates, 1984; Merriam, Sharron, Caffarella, Rosemary, & Baumgartner, 2007). Adults learn by doing and by actively making sense of their learning experiences (West, 2013). Navarre & Wozniak (2013) proposed using andragogy as an asset-based heuristic approach to facilitate adult learning. Multiple disciplinary fields supported this recommendation (Harper & Ross, 2011; Henry, 2011). Knowles's (1984) model of adult learning, andragogy, includes include the following six assumptions:

1. Adults need to know the reason for learning.
2. Experience is the basis of adult learning.
3. Adults need to be responsible for their own learning.
4. Adults learn best when learning has immediate relevance.
5. Adults learn better when a problem-centered approach is utilized.
6. Adults respond better to internal motivators versus external motivators.

Agency ATC trainers must facilitate training for adults who have distinctive needs and expectations (Harper, 2011; Kelly, 2013). Andragogy should be considered during program development and execution (Harper & Ross, 2011; West, 2013; Wiltshire, Neville, Lauth, & Rinkinen, 2013). Currently, controllers participate in 72 days of vocational instruction before entering training at their first operational facility. Upon the trainees' arrival to their first operational facility, training focuses on continued cognitive skill building and application of learned knowledge in both real and simulated environments. Each time a controller transfers from one facility to another, training builds upon existing knowledge and must be applied in the new operational environment. Training is documented and maintained for the duration of the controllers' career. This documented training is a living, breathing reflection of training and retraining, certification and recertification of skills.

## **EXPERIENTIAL LEARNING THEORY**

The second learning theory lens that was used to evaluate the program was experiential learning theory. Experiential learning theory emphasizes experience in the

learning process and highlights the role of applying acquired knowledge in a relevant setting (Haynes, 2007; Kolb, 1984; Wurdinger & Carlson, 2010). Experiential learning theory includes four components: concrete experience, reflection, observation conceptualization, and active experimentation (Kolb, 1984; Pollock et al., 2002).

Wlodkowski (2008) asserted that what many consider *talent* is actually the result of deliberate practice. Wlodkowski described how knowledge and skill exist as a neural circuit and how as learning occurs axons and dendrites join with other fibers and neurons to create complex knowledge and skill. The connections of these axons and dendrites, parts of the brain, promote learning by thickening myelin, a nerve fiber membrane, in response to frequent circuit use (Wlodkowski, 2008). For the controller, the act of teaching other adults is a new or underdeveloped skill that requires deliberate practice to perfect. New learning can seem difficult and confusing to an adult learner because of slow and undeveloped circuitry (Wlodkoski, 2008). Erroneous knowledge and skill can accumulate thickened circuitry, making learning correct knowledge and skill more difficult. With frequent practice, continual corrective feedback, and deliberate effort to improve a weakness, the signal can travel more quickly and accurately (Wlodkoski, 2008).

ATC trainers use simulated training environments to facilitate learning. The agency's QTP included a simulator objective. Simulation is a training method that refers to the technology used to reproduce human-aircraft interaction for training purposes (Gheorghiu, 2013). Simulators eliminate operational risk present in live traffic and provide significant contributions to ATC training by their fidelity and realism (Gheorghiu, 2013). Simulators help the trainee understand how to apply new knowledge by replicating air traffic at slow or normal speeds with various levels of complexity (Cokorilo, 2013). Using simulators, trainers provide the trainee with an opportunity to learn through action, experience, discovery, and exploration (Loft et al., 2011).

### **INSTRUCTIONAL SYSTEM DESIGN (ISD)**

Paas and van Gog (2009) maintained training complex cognitive tasks require a simple to complex sequencing of training tasks. The curriculum should be developed using cognitive load theory to facilitate simple to complex scaffolding (Vogel-Walcutt & Walcutt, 2013). ISD also supports the use of simple to complex task sequencing and scaffolding. ISD has been used to develop agency curriculum since 1965 and is a premiere guide for designers because it has proven to improve human performance (Darabi & Kalyuga, 2012; Dick et al., 2009; Klein, 2014, Martina, 2011). ISD is a systematic, flexible process that ensures instructional curriculum is developed in an effective, cost-efficient way (Richey & Klein, 2013). The goal of ISD is to develop instruction-based, on-the-job performance requirements; eliminate irrelevant skills and knowledge instruction; and ensure trainees acquire necessary KSAs needed to do the job (Morrison et al., 2011).

The agency requires instructional designers use the ISD model to analyze, design, develop, implement, and evaluate (ADDIE). Skillfully executing ADDIE within the instructional design can assist learners in achieving learning outcomes (Chevalier, 2011; Pearson, 2011; Mayfield, 2011; Shibley et al., 2011). ADDIE is useful in providing a systems-based training method that encourages feedback at every level of instruction and provides structure to curriculum development (Mayfield, 2011). Literature found in multiple fields' supports the use of ADDIE (Chevalier, 2011; Pearson, 2011; Mayfield, 2011; Shibley et al., 2011).

## **DATA COLLECTION**

Data were collected via interviews and a document review. I used an ad hoc individual expertise-oriented approach during this PE. An ad hoc individual expertise-oriented approach is one of the most frequently used PE methods (Fitzpatrick, 2011; Spaulding, 2014). As a content and teaching strategies expert, the evaluator judges the value and quality of the program and makes recommendations (Fitzpatrick, 2011; Spaulding, 2014). My professional and academic experiences were drawn upon to perform the evaluation as a content and teaching strategies expert.

### **INTERVIEWS**

Twenty controllers were identified using a purposeful sampling technique. Two participants were from the agency's development and the regional office, and 18 others were identified from seven air traffic facilities located at four European locations. A U.S. international law attorney reviewed the context of the study and determined only U.S. laws applied to the research sites. From the seven facilities, participants were solicited from the following categories: trainers, supervisors, facility training managers, and facility managers. An email was used to contact participants. Participants had three days to review, sign, and return the informed consent document. Once the informed consent document was received, a date and time was set up to conduct the interview.

Qualitative one-on-one structured interviews were conducted using open-ended questions without response options as outlined in the interview protocol (Creswell, 2012; Phillips, 2010). Seven questions were developed obtain data consistent with Kirkpatrick's four levels of evaluation (Appendix C). The interviews lasted approximately 1 hour each and were audio recorded. No adverse events occurred during the interview process. The interviews were transcribed and emailed to the interviewee for review.

### **DOCUMENTS**

Creswell (2012) identified documents as valuable sources of information. Frost (2011) described how the factual and verifiable nature of documents is especially useful

for PEs. The program included regulatory guidance governing the development and execution of the program and the QTP. For this program evaluation, the QTP was the primary source document. I retrieved the QTP from the agency's ATC career field website, and I examined it using the leading questions outlined in Appendix B. I also used my professional and academic expertise to evaluate the QTP using the lens of ISD, andragogy, and experiential learning theory. Copious notes were taken, summarized, and transcribed to an Excel spreadsheet to assist with data analysis.

## **EVIDENCE OF QUALITY**

I used two methods to validate findings: triangulation and member checking (Creswell, 2012). Triangulation describes a data analysis technique used to increase stakeholder confidence that findings were accurate (Creswell, 2012). Triangulation of data occurred by utilizing more than one source: interviews and documents.

Creswell (2012) defined member checking as verifying accuracy by asking one or more of the participants to review findings. For this study, each participant was provided a transcript draft within 2-3 days of the interview to ensure his or her perspective(s), experience(s), and recommendation(s) were captured accurately. Two interviewees indicated additional thoughts came to them after the interview, and they were allowed to add these thoughts to their transcript. All other interviewees indicated their transcripts accurately represented their thoughts and experiences. Data analysis was accomplished using both a software program and manual coding. I created a detailed description of the data and drew conclusions based on the original research focus areas:

1. QTP curriculum.
2. Techniques used to facilitate OJT training.
3. Participant satisfaction.
4. Participant perception of knowledge and skills gained from training.
5. Knowledge gained from training transferred to day-to-day duties.

I then reviewed the data again to ensure nothing was overlooked or left out and no discrepant data emerged. The use of multiple sources and analysis techniques ensured the accuracy and credibility of study findings and ensured I was able to provide a detailed description of the how the data were interpreted and used to inform this PE.

## **DATA ANALYSIS**

### **INTERVIEWS**

Data collected via interviews were transcribed using HyperTRANSCRIBE then coded. Data were coded using descriptive coding. Descriptive coding is a straightforward method considered useful in qualitative studies and is used to summarize the primary topic of the excerpt (Saldana, 2013). Interview transcripts were also coded using In Vivo coding. In Vivo coding refers to literal coding using the actual language

found in the qualitative data and is appropriate for studies that prioritize and honor the participant's voice (Saldana, 2013). In Vivo coding calls for attuning oneself to words or phrases that seem to call for bolding, underlining, italicizing, highlighting, or vocal emphasis if spoken aloud (Saldana, 2013). When reviewing the interview transcripts for descriptive and In Vivo coding completeness and accuracy, I identified valuable emotional data were being overlooked. Emotions are a universal experience and acknowledging them in research provides insight into participant experiences (Saldana, 2013). Emotion coding was used to label emotions recalled or inferred by the researcher (Saldana, 2013). During the first cycle of coding, numerous descriptive, In Vivo, and emotion codes emerged. Codes were refined using eclectic coding. Eclectic coding employs compatible first cycle coding methods and is appropriate for qualitative researchers who use a wide variety of data forms such as interviews and documents (Saldana, 2011). Some codes were subsumed by other codes, relabeled, or dropped altogether.

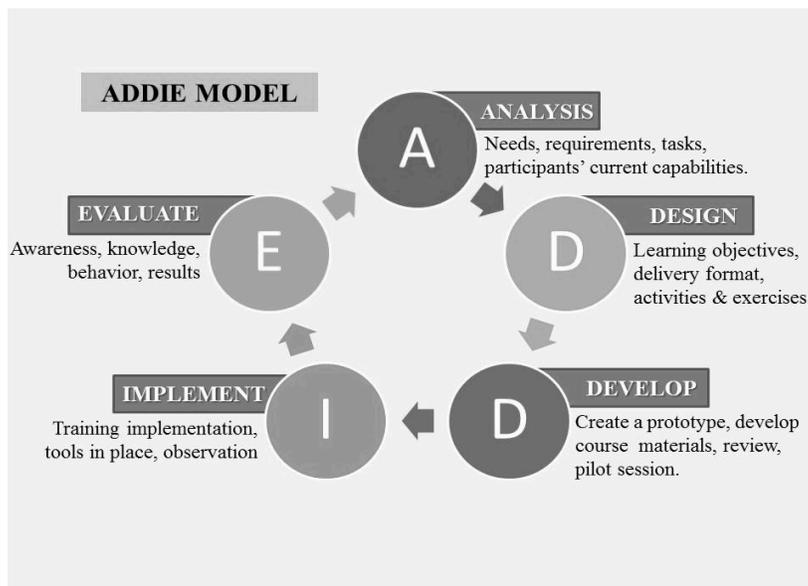
Once coding was complete, I identified emerging and meaningful patterns, which were categorized during the second cycle of coding. Categories are used to organize and group similarly coded data because they share similar characteristics (Saldana, 2013). In this case, pattern coding was used to develop categories. Pattern coding pulls together a lot of material into a more meaningful unit of analysis (Saldana, 2013). Rules were created to refine the data placed into each category. If the code complied with the rule, it was included in the category. Codes were reorganized into categories using these rules. Some coded data complied with multiple rules and was added to both categories.

Once categories were identified and refined, I moved from an inductive to deductive mode to identify themes. Themes are discoverable through the manifestation of expression in data (Saldana, 2013). Therefore, I sifted through the data in search of repetition of expression, similarities, differences, and missing data. I then sorted the data into a quote-by-quote matrix. From the categorized data, I identified five themes:

1. The QTP is needed to supplement the agency 1-day train-the-trainer course, but improvements are needed to facilitate program effectiveness.
2. The effectiveness of trainer training is influenced by many factors.
3. Training material and practices do not sufficiently meet training need.
4. Knowledge, skills, and attitudes changed because of training.
5. Certification procedures need to be reviewed.

## **DOCUMENTS**

I used my professional and academic expertise to evaluate the QTP using the lenses of ISD, andragogy, and experiential learning theory to identify trends or issues that could affect reaction, learning, behavior, and results as outlined in Kirkpatrick's four levels of evaluation. ISD uses ADDIE to design instruction (Dick et al., 2009; Rothwell & Kazana, 2010). Each step in the model feeds into the subsequent step (Dick et al., 2009; Rothwell & Kazana, 2010). Figure A1 visually depicts each ADDIE step.



*Figure A1.* The ADDIE Model. The ADDIE model includes five phases: analysis, design, development, implementation, and evaluation.

**FOR READABILITY, ITALICIZED HEADERS ARE USED THROUGHOUT THE REMAINDER OF THIS SECTION TO INDICATE THE ADDIE PHASES.**

### **ANALYSIS**

The analysis phase of ADDIE includes clarifying the instructional problem, identifying instructional goals and objectives, identifying the target audience, available resources, and delivery options. Conducting a needs assessment is the first step in ISD (Dick et al., 2009; Rothwell & Kazana, 2010). There are three components of a needs assessment: the desired goal, the actual status, and the need. The *desired goal* describes what is happening. The *actual status* describes what should be happening. The *need* is the gap between the desired and actual status state. If a gap exists, steps can be taken to ascertain how wide the performance gap is, how important addressing the gap is, and help identify what cost effective solutions are available (Rothwell & Kazana, 2010). Training programs can be created if a gap that can be addressed via instruction (Rothwell & Kazana, 2010). This step also includes identifying the target audience, what resources are available, and the focus of training. The needs assessment is critical to developing instructional goal(s). Without a needs assessment, instruction may not achieve the desired end state (Dick et al., 2009; Rothwell & Kazana, 2010)

### **ANALYSIS FINDINGS**

The agency has a non-ATC specific train-the-trainer course. This course is 1-day long and has been in place for an unknown number of years. In 2007, survey responses

from 25,858 personnel, and 112 interviews were used to evaluate the effectiveness of the 1-day course (Amos, 2007; Embry, 2008; Cole, 2014). This research determined the course was being administered differently between organizational units. In response, the QTP, an ATC specific program, was developed (Amos, 2007; Embry, 2008; Cole, 2014). I was unable to find data beyond the *decision to create* step. Data could not be obtained reflecting the process or information used to ascertain the mission, task, resources, and target audience for the QTP. The lack of data between the *decision to create* and *execution* of the QTP, suggested the step might not have accomplished before developing and implementing the QTP.

## **ANALYSIS RECOMMENDATIONS**

The consequence of this finding was echoed amongst interviewees who repeatedly stated their learning needs were not being met. Failure to adequately accomplish a needs assessment may have contributed to the misalignment of goals and the current product. This misalignment may have also directly contributed to the loss of valuable resources. I recommend that a *needs assessment* be formally conducted.

## **DESIGN & DEVELOPMENT**

The design phase of ADDIE involves designing objectives, assessment instruments, media selection, lesson planning, and subject matter expert analysis (Dick et al., 2009; Rothwell & Kazana, 2010). The development phase is where developers create instructional content to include objectives, assessment instruments, materials, and instructional strategies in the form of storyboards (Dick et al., 2009; Rothwell & Kazana, 2010).

## **OBJECTIVES**

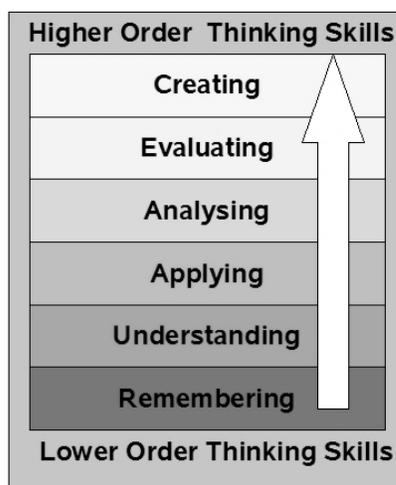
Designers develop learning objectives after conducting a needs assessment. An objective is a specific statement detailing what the trainee is expected to demonstrate upon completion of the training transaction. An objective has three parts: capability (behavior), condition, and a standard. The *capability* states what the trainee is required to demonstrate. The *condition* describes the actual condition under which the trainee must perform. The *standard* defines the acceptable level of performance the student must demonstrate (Dick et al., 2009). The capability, condition, and standard must be observable, measurable, verifiable, and reliable (Dick et al., 2009). The capability should be articulated using a verb to describe the desired learning outcome. Bloom's taxonomy of learning domains was created in 1956 to promote higher-order thinking. Bloom's taxonomy includes three domains of learning include cognitive (knowledge), affective (attitude or self), and psychomotor (manual or physical skills) (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). Table A1 includes sample words for stating learning objectives compliant with Bloom's Taxonomy of Learning Domains. The table reflects verbs appropriate for air traffic control.

Table A1  
*Sample Words for Learning Objectives (Dick & Resiser, 1989).*

	<b>Knowledge/Comprehension</b>		<b>Application</b>		<b>Problem Solving</b>	
<b>COGNITIVE</b>	Arrange	Order	Apply	Modify	Analyze	Explain
	Cite	Outline	Calculate	Operate	Appraise	Formulate
	Classify	Paraphrase	Change	Practice	Arrange	Generate
	Convert	Quote	Choose	Predict	Assess	Illustrate
	Copy	Recall	Defend	Prepare	Categorize	Infer
	Define	Recite	Demonstrate	Prepare	Choose	Inspect
	Describe	Recognize	Discover	Produce	Combine	Interpret
	Discuss	Record	Draft	Relate	Conclude	Justify
	Distinguish	Relate	Dramatize	Schedule	Construct	Manage
	Duplicate	Report	Draw	Select	Convert	Manipulate
	Explain	Restate	Employ	Show	Create	Organize
	Give example	Review	Explain	Sketch	Criticize	Plan
	Identify	Rewrite	Extend	Use	Debate	Predict
	Indicate	Specify	Illustrate		Defend	Prepare
	Label	Summarize	Infer		Design	Propose
	List	Tell	Interpret		Diagram	Relate
	Locate	Translate	Manipulate		Differentiate	Reorganize
Match	Underline			Discriminate	Score	
				Distinguish	Select	
				Estimate	Solve	
				Evaluate	Support	
				Examine	Test	
<b>AFFECTIVE</b>	Accept	Locate	Adhere	Initiate	Act	Integrate
	Accumulate	Name	Affirm	Invite	Adapt	Mediate
	Ask	Point to	Approve	Join	Change	Organize
	Describe	Respond to	Assist	Justify	Defend	Revise
	Follow	Select	Choose	Perform	Display	Solve
	Give	Use	Command	Practice	Influence	Verify
	Identify		Complete	Propose		
			Comply	Select		
			Conform	Share		
			Describe	Work		
		Discuss				
<b>PSYCHOMOTOR</b>	Complete	Press	Activate	Load	Adapt	Fix
	Demonstrate	Pull	Adjust	Locate	Combine	Generate
	Distinguish	Push	Assemble	Loosen	Compose	Illustrate
	Hear	See	Build	Manipulate	Construct	Modify
	Identify	Select	Calibrate	Measure	Convert	Organize
	Locate	Setup	Close	Open	Create	Plan
	Manipulate	Show	Construct	Operate	Design	Repair
	Move	Sort	Copy	Perform	Devise	Service
	Pickup	Specify	Demonstrate	Remove	Diagram	
	Point to	Touch	Draw	Replace		
	Practice	Transport	Duplicate	Rotate		
			Execute	Select		
				Set		
			Slid			

## COGNITIVE DOMAIN

The cognitive domain includes the recall or recognition of facts, procedures, and concepts (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). This domain has six categories: remembering (recall), comprehension (understanding), and application, analysis, evaluating, and creating (synthesis). *Remembering* includes recalling the material. *Comprehension* includes understanding, translating, or stating in one's own words. *Applying* includes using the concept in a new situation. *Analyzing* includes separating components so that its structure can be understood. *Evaluating* includes making a judgment about the value of an idea or material. *Creating* puts parts together to create new meaning (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). Figure A2 depicts the six cognitive domain categories.



*Figure A2.* Categories of cognitive domain. This domain has six categories are depicted from bottom to top. Each must be mastered for the next to be possible.

Controllers must be taught to remember and use a plethora of rules and procedures (Nolan, 2010). Controllers must be able to comprehend these rules and procedures and actively apply them in evolving situations (Nolan, 2010). To facilitate the learning of cognitive skills, trainers must understand the role the cognitive domain plays in learning. To facilitate advanced cognitive skills trainers must be taught to the appropriate cognitive level of learning. For example, training must go beyond reciting facts or rules associated with the act of learning or teaching. Trainers must comprehend the nuances of learning to facilitate learning by others. Controllers must communicate with pilots utilizing set phraseology, or a series of predetermined words and phrases (Nolan, 2010). This skill requires more than simply reciting the words associated with a set of specific directions. Rather, the controller must combine a series of instructions dependent on the needs of a pilot at the time the instruction is given. To teach this skill, a trainer must extend training beyond conditional learning, or reciting of the words. Training must include the comprehension of why and when these communications would

be appropriate and facilitate the trainee towards a higher order thinking cognitive level. The *create* level facilitates the trainee's ability to mix-and-match preset communication to suit changing circumstances, or create new meaning contingent on the pilot's needs. To ensure trainers are prepared to reach this level of cognitive ability, trainer training must facilitate learning at this level of Bloom's taxonomy of learning domains.

### **AFFECTIVE DOMAIN**

The *affective* domain includes emotions such as feelings, values, appreciation, motivation, and attitudes (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). The learner must learn prerequisite intellectual skills in order to acquire particular attitudes. For example, to have a positive attitude about safety in ATC, the learner should

1. Learn concepts and procedures associated with ATC safety, and
2. Be able to verbalize the advantages of safety procedures and the consequences of not adhering to them.

Attitudes are learned by observing the consequences of behavior. Experience and motivation also play a major role in attitude. Keller (1987) developed the ARCS model that included four conditions that motivate a learner: attention, relevance, confidence, and satisfaction. References should grab the learner's attention at the beginning and maintain their interest throughout the learning transaction. References should be relevant and add value to the learner mastery an objective. References should platform the trainee towards successful learning. References should facilitate satisfaction. Satisfaction comes from achieving performance goals. In the absence of an instructor, material should be incorporated to demonstrate the learning objectives (Keller, 2010).

The affective domain includes five categories: receiving phenomena, responding to phenomena, valuing, organization, and internalize values (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). *Receiving* phenomena includes awareness and willingness to hear. *Responding* to phenomena includes active participation, compliance in responding, or motivation. *Valuing* includes attaching worth to an object, phenomenon, or behavior (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). *Organization* includes prioritizing contrasting values and resolving conflicts between them. *Internalizing values* includes demonstrating self-reliance when working independently and cooperating in group activities (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004).

The agency considers the trainer as being the single most important piece of the training chain. Trainers plan, conduct, and evaluate training both independently and within a group setting. The trainer must share their experience and expertise, and provide a quality training program to the trainee. To act in this capacity, the trainer must value and appreciate the act of training. The trainer must be motivated and have a positive attitude towards training. Therefore, training should include behavioral objectives aimed at facilitating an affective level of learning.

## **PSYCHOMOTOR DOMAIN**

The psychomotor domain focuses on motor skills (Anderson et al., 2001; Bloom et al., 1956; Clark & Chopeta, 2004). Psychomotor skills are actions that involve the use of muscles. Psychomotor skills require practice and kinesthetic (natural) feedback. An observer can provide verbal feedback to help the learner make performance corrections. This verbal cueing is stopped once the learner no longer requires the prompt to perform the skills in a smooth and continuous manner.

The psychomotor domain is about doing through imitation, practicing, and habituating new skills by way of imitation, manipulation, precision, articulation, and naturalization (Dave, 1970; Mager, 1997; McLellan, 2003). *Imitation* includes mimicking behavior. *Manipulation* includes following direction (Dave, 1970; Mager, 1997; McLellan, 2003). *Precision* includes performing independently and refining the skill (Dave, 1970; Mager, 1997; McLellan, 2003). *Articulation* includes integrating refined action (Dave, 1970; Mager, 1997; McLellan, 2003). *Naturalization* includes performing a skill without thinking about the execution of the action (Dave, 1970; Mager, 1997; McLellan, 2003). The act of controlling aircraft is a psychomotor skill wherein the controller simultaneously must operate equipment, write or type information, provide verbal instructions, and communicate with team members (Nolan, 2010). Controllers must skillfully hone the ability to perform these duties (Nolan, 2010; Wlodkowski, 2008).

Trainers must perform ATC duties while simultaneously facilitating learning for a trainee to the naturalization level of the psychomotor domain. For the controller, the act of teaching other adults is a new or underdeveloped skill that requires deliberate practice to perfect. Failure to operate at this level could result in the loss of life or assets. Therefore, training must aim learning to this level to ensure the safety of aircraft and aircrew. Additionally, as controllers are expected to operate at this level once qualified, trainers must be taught to facilitate learning at this level.

### **OBJECTIVE FINDINGS**

Section 3 of the QTP was titled *Planning and Conducting OJT*. This section included seven learning tasks associated with planning and conducting OJT. The training tasks included: *Upgrade, Qualification, Proficiency, Review, Recurring, Supplemental, and On-the-job training* (in this order). Task 1 (*Upgrade Training*) had three objectives:

1. With reference, define upgrade training, with minimal error.
2. With reference, describe how upgrade training applies to ATC training, with minimal error.
3. With reference, state the upgrade training requirements for the award of the 5-skill level (Journeyman), without error.

These objectives had clearly defined behaviors, conditions, and standards. These objectives used action verbs to articulate the expected cognitive behavioral outcome. These verbs target the *remembering* category within the cognitive domain as the trainee

was expected to “define,” “describe,” or “state” the learned material. The objectives had observable, and measurable expected outcomes. The objectives were ordered in a logical hierarchical manner. These objectives identified the condition the trainee was expected to perform. For all three objectives, the trainee was expected to perform “with reference.” The trainee was authorized to use reference material to assist in meeting the learning objective. Additionally, objectives 1 and 2 have a defined standard of “with minimal error.” The trainee was allowed to make minimal errors that do not alter the state of the objectives. The standard for objective 3 was “without error.” To demonstrate mastery of the objective, the trainee could not commit any errors. These behaviors, conditions, and standards are appropriate if the expected learning outcome was to simply recall material. However, the organizational goal was for the trainee to perform an action. Therefore, the objectives for this task were not appropriate.

The *On-the-job Training* task included the following objectives:

1. With reference, define OJT, with minimal error.
2. With reference, describe how OJT applies to ATC training, with minimal error.
3. With reference, describe how to plan training scenarios, with minimal error.
4. With reference, describe how to prepare a trainee for a training scenario, with minimal error.
5. With reference, describe how to prepare the training environment, with minimal error.

These objectives used action verbs intended to articulate the expected behavioral outcome equivalent to the *remembering* category within the cognitive domain of learning. The trainee was expected to “define,” or “describe” the learned material. The objectives had an observable and measurable outcome ordered in a logical hierarchical manner. These objectives identified the condition as “with reference.” The standard for all objectives was “with minimal error.” These behaviors, conditions, and standards were appropriate if the expected learning outcome was for the trainee to simply recall learned material. In the case of ATC training, the organizational goal is for the trainee to perform these objectives through action(s). Therefore, the objectives for this task were not appropriate.

Although not contained in Section 3, the QTP contained a task titled *Simulator Training*. Simulator training plays a significant part in conducting OJT. The task included three objectives:

1. With reference, define simulation scenario, without error.
2. With reference, identify how to utilize the applicable simulation platform(s) available in your facility to include operating the device(s) for different upgrade and qualification scenarios, with minimal error.
3. With reference, demonstrate the ability to plan and conduct training using a simulator for a trainee, with minimal error.

Objectives 1 and 2 use action verbs intended to articulate the remembering category within the cognitive domain of learning. The trainee was expected to “define” and

“identify” learned material. Objective 3 used an action verb, “demonstrate,” intended to articulate the *applying* category within the cognitive domain of learning. The objectives had an observable and measurable outcome ordered in a logical hierarchical manner. These objectives identified the condition the trainee was expected to perform as “with reference.” Additionally, the standard for these objectives were “with minimal error” or “without error.” This task is an integral part of conducting OJT, and should be in Section 3 of the QTP.

The vast majority of training tasks within the QTP focused on rote learning only. The tasks meant to facilitate OJT predominantly focused on the lowest level of Bloom’s taxonomy of learning domains and did not require demonstration of learned knowledge. Training did not promote cognitive knowledge application, or teach how to analyze learned knowledge, how to analyze the material, or how to put together the knowledge in a new way to meet evolving situations. Additionally, the affective learning domain is particularly important for ATC trainers, as trainers are expected to operate independently, and to demonstrate valuing the learning process. However, the QTP had no objective that ensured behavior from the affective domain was realized. Within the QTP, there were no training tasks to facilitate the learning of *principles of instruction, adult learning theory, learning strategies, or OJT training techniques*. These areas of learning are critical skills needed to facilitate OJT for other adults. Additionally, the simulation task was located in another section entirely and did not connect to the knowledge provided in Section 3. This overall ordering and hierarchy of tasks were not logical, nor did it facilitate ready recall of learning or the connection of learning tasks.

## **OBJECTIVE RECOMMENDATIONS**

All QTP training tasks included a learning domain, condition, and standard. Although, each task and associated objectives were consistent with ISD principles in their construction, interviewees relayed that the training objectives do not meet the needs and goals of the organization. The organization needs quality trainers who are capable of producing air traffic controllers using OJT techniques. The goal of the QTP is to facilitate the training of these quality trainers. The gap between organizational needs and what is in the QTP has contributed to trainer unpreparedness.

Learning of principles of instruction, adult learning theory, learning strategies, or OJT training techniques was not included in the QTP. The training tasks and associated learning objectives throughout the QTP primarily focus on rote learning; the trainee must recite or repeat facts or rules. Learning did not occur at a higher order thinking level. Within Section 3 of the QTP, the seven tasks specifically meant to facilitate OJT focused on the lowest level of Bloom’s taxonomy of learning domains and did not call for consistent demonstration or application of learned knowledge. The simulation task was located in another section entirely and did not connect to the knowledge pieces provided in Section 3. The overall ordering and hierarchy of tasks within the QTP were not logical and did not facilitate ready recall of learning. I recommend that a reordering of

tasks occur QTP-wide. Additionally, the QTP does not sufficiently include objectives meant to facilitate psychomotor or affective learning. I recommend that the objectives be rewritten to facilitate higher order cognitive, psychomotor, and affective learning.

## **ASSESSMENT INSTRUMENTS**

Dick, Carey, and Carey (2009) defined *assessment* as all activities effective for demonstrating learner's mastery of new skills. Assessment instruments were reviewed to ascertain if the program has a defined standard, and if the standard tests expected performance, corresponded with desired outcomes, and were valid, reliable, and objective. At this time, no formalized or standardized assessment tool was used within the QTP. Further, the current assessment practice was noncompliant agency guidance. Rothwell and Kazanas (2008) identified that performance measurements are developed to monitor learner achievement. Performance measurements provide learner accountability to ensure progression towards predetermined performance goals before and after instruction (Rothwell & Kazanas, 2008). Performance measurements should correspond to the objective and meet requirements for reliability and validity (Rothwell & Kazanas, 2008). Paper and pencil tests and are the most common assessment instrument form (Rothwell & Kazanas, 2008). Entry skills tests can be used to ascertain if the learner is ready for instruction (Dick et al., 2009). Pre-tests can be used to ascertain which skills the learners have already mastered or must learn (Dick et al., 2009). Practice tests can be used to ascertain if the learner has achieved intended knowledge and skills (Dick et al., 2009). Post-tests can be used to ascertain if the learner had mastered learning objectives (Dick et al., 2009).

For ATC, the mastery of learned skills must be applied without error. A skill must be performed frequently enough, without error, to demonstrate it is impossible for correct performance to be the result of chance alone (Dick et al., 2009). A trainer is required to perform ATC duties in addition to facilitating training learning, making the performance of normal duties more critical and tasking. In measuring the performance of motor skills, performance is typically evaluated using a standardized rubric of evaluation checklist (Dick et al., 2009). A rubric or checklist can be also used to evaluate attitude learning (Dick et al., 2009). Thus, observation by a third-party certifier should occur to ensure mastery of learned skills in a live or simulated training environment. The third-party certifier should use an evaluation checklist or rubric.

The agency required someone other than the trainer to act as a third-party certifier. The ATC career field had an exemption to this agency policy. The CFM designated each facility's training and standardization manager to act as the third-party certifier during certifications to ensure an unbiased evaluation. Contrary to the CFM's direction, the QTP directed the trainer to act as the certifier and the facility CCTLR to act as the third-party certifier. This guidance and practice are contrary to all other certification procedures within the agency's ATC career field. This inconsistency

contributed to interviewees reporting assessment practices as “nonstandard,” “inconsistent,” and “opinion-based.”

## **ASSESSMENT INSTRUMENT RECOMMENDATIONS**

I recommend that a criterion-reference test be developed and administered by a third-party certifier. Further, I recommend that the same third-party certifier observe the trainee using a reliable and valid rubric or checklist to evaluate achievement of affective and psychomotor learning domains. Compliance with these recommendations would ensure the QTP included an assessment practice that would ensure all learners demonstrated mastery of skills to the same level of learning, using a reliable and valid assessment technique. Additionally, interviewees desired standardized assessment procedures and implementing one would enhance trainer quality agency-wide.

## **MATERIAL**

References were reviewed to ascertain if they were complete, were accurate, were current, were motivational, were suitable for adult learners, and used available media tools. Instructional materials contain the written, mediated, or facilitated content the learner will use to achieve the objectives (Dick et al., 2009; Rothwell & Kazanas, 2008). Materials include information used to guide the learner, enhance memory, and facilitate learning transfer (Dick et al., 2009; Rothwell & Kazanas, 2008).

There is no required format for instructional materials (Rothwell & Kazanas, 2008). Instructional material format is based upon the purpose of instruction, the performance objective, who and how the material will be taught and applied, and the medium available to deliver the material (Rothwell & Kazanas, 2008). Agency regulatory guidance described the nature of instructional material as, “affecting the stimuli with which the learner interacts with during the learning process.” Reference material can include textbooks, technical orders, handbooks, manuals, interactive courseware such as computer-based training (CBT), and videos and audio files (Dick et al., 2009; Rothwell & Kazanas, 2008).

The references provided throughout the QTP were insufficient to meet learner needs. The current training references cited in the QTP were complete, accurate, and current, but they did not assist in meeting learning objectives, did not use available media, and were not motivational. Thus, current training references did not facilitate learning for adults. Two tasks already discussed included: *On-the-job Training (OJT)* and *Simulator Training*. These tasks included references as instructional material. These references included two text-based regulations and equipment manuals. These same references (in their entirety) were identified in all the QTP tasks. These references exceeded over 250 pages (each). No specific chapter, section, or paragraphs were identified; rather, the entire document was cited as the instructional material. The

objectives could not be “answered” or learned using these text-based references, as the material was not relevant to the learning objective.

The references did not cover the material needed to address the objectives, and a text-based instructional method did not provide enough learning support to complete the learning process. To gain meaning from text, the learner must decode words. The lack of physical cues negatively affects the learning transaction. Additionally, the learner cannot ask questions when there is message ambiguity. Text is more formal than video or verbal communications. To understand the text, often the learner must look at the object or see the action describe. No other material or media was used in the QTP to bridge the gap between knowledge and application.

Media formats and delivery systems can be expensive (Dick et al., 2009; Rothwell, & Kazanas, 2008). Dick, Cary, and Carey (2009) indicated that less expensive media formats and delivery systems will not affect student learning, but will affect attention and perception of relevancy and authority. They further advised the best strategy is to develop media formats and delivery systems simple and well rather than elaborate and poorly (Dick et al., 2009). Dick et al. used an example of a well-put together PowerPoint presentation versus a poorly put together video. Videos can elicit learner responses but only provides rhetorical feedback. Videos are incapable of correcting learning misunderstandings or judging learning. This media type has a linear format and is edited to save time. This practice paces the delivery system and removes cues that may be available from the equipment or activity. Interactive courseware or CBTs provide multiple stimuli for trainees, can be used to recall learning, and provide feedback to the learner.

## **MATERIAL RECOMMENDATIONS**

The references were complete, accurate, and current but did not assist in meeting learning objectives, did not use available media, were not motivational, and would not facilitate learning for adults. The most effective delivery system would be instructor-led hands-on training. If learning is to include physical objects, the learner, by handling the objects, will build schemas of experience that are important to future learning. Instructors demonstrate the use of knowledge or the use of materials and make the learner an observer. This technique involves the transmission of declarative knowledge, which the learner encodes and stores by handling an object. The instructor is the motivator, the presenter, the leader of activities, and the evaluator (Dick et al., 2009). Dick, Carey, and Carey (2009) recommend that instructional material be first self-instructional so the learner can learn the information or skills without instructor intervention. From there, the material should be designed to be instructor-led (Dick et al., 2009). Learning component such as motivation, content, practice, and feedback should be built into the instructional materials (Dick et al., 2009).

## INSTRUCTIONAL STRATEGIES

QTP instructional strategies were evaluated using the document protocol. The QTP did not include instructional strategies. Instructional strategies outline how activities relate to objective achievement. Instructional strategies enable instructional activities to be designed, must be consistent with learning analysis and objective hierarchy decisions, and support instructional goals. The purpose of instruction is to facilitate the acquisition of new KSAs. Different learning outcomes drive the use of different instructional strategies. Learning strategies are typically based on Bloom's taxonomy of learning domains as reflected in the below matrix. Table A2 is not all-inclusive, but most learning strategies apply in the ATC career field. For example, *self-study* could fall under reading. The right three columns display Bloom's taxonomy of learning. The matrix rows progress from passive learning (top rows) to more active participation method (bottom rows). Lower performance levels can be taught using passive learning methods; higher performance levels require some action by the learner.

Table A2  
*Instructional Strategies.*

<b>Instructional Strategy</b>	<b>Cognitive Domain</b>	<b>Affective Domain</b>	<b>Psychomotor Domain</b>
Lecture, reading, audio/visual, demonstration, or guided observations, question and answer period	1. Knowledge	1. Receiving	1. Perception 2. Set
Discussions, multimedia CBT, Socratic didactic method, reflection. Activities such as surveys, role playing, case studies, fishbowls, etc.	2. Comprehension 3. Application	2. Responding to phenomena	3. Guided response 4. Mechanism
On-the-Job-Training (OJT), practice by doing (some direction or coaching is required), simulated job settings (to include CBT simulations)	4. Analysis	3. Valuing	5. Complex response
Use in real situations. Also may be trained by using several high level activities coupled with OJT.	5. Synthesis	4. Organize values into priorities	6. Adaptation
Normally developed on own (informal learning) through self-study or learning through mistakes, but mentoring and coaching can speed the process.	6. Evaluation	5. Internalizing values	7. Origination

Instructional strategies are derived from learning objectives and are normally included in the lesson plan. Lesson plans are used to gain attention, inform the learner of the objective, stimulate recall of prerequisite learning, present new material, provide learning guidance, elicit performance, provide performance feedback, and enhance retention and learning transfer. When determining instructional strategies, adult learning

theory should be studied. Agency guidance describes how adults learn by “doing, thinking, and feeling.” Therefore, to ensure learning takes place, the instructional strategy should be learner-centered and promote active learning participation. For example, to learn a skill the instructor should demonstrate the task to be performed then have the learner perform each step in the task. For knowledge-based learning, questions relating to the objective should be asked throughout the lesson. A human model can be used to shape the learner’s attitude. Additionally, giving or withholding rewards for expected attitudes can be used as a learning technique.

Feedback actively informs the learner on how well they are performing and serves as motivation for learning. Instructional strategies should be frequently provided during the early stages of learning to build confidence. Timing, responsiveness, and being constructive are critical to effective feedback. Instructional strategies should determine what activities are required to ensure feedback opportunities are present throughout the learning transaction. Planned pacing is another key strategy employed during instructional activities. Pacing can be group-paced, group lock step, or self paced. The QTP is required to be completed within 45 days. Although it is inferred to be self-paced which is intended to include certain parameters, the QTP does not include milestones to facilitate feedback or mark progress. Further, many interviewees reported the maximum day allocation did not meet user needs or forced “pencil-whipping” in direct correlation to facility mission requirements, availability of qualified trainers, and workload.

Intellectual skills are integrated into knowledge to be recalled via stored schemas. A schema is a structured memory element representing a larger set of meaningful information. Agency regulation defines *schemas* as, “Schemas contain information on well-understood features of an object or event, and these features are called slots.” The learner fills in slots when new information relating to the schema is encountered. Schemas are acquired through experience. For learning not to become rote knowledge, it must be practiced within a broader context. Agency regulation further mandate that instruction must “identify the target goal along with component skills, knowledge, and attitudes and then design instruction that enables the learner to acquire the capability to achieving this integrated outcome of experience.”

The context of learning determines what is learned and how it can be used in the future. For example, learning a list of information by associating the list to a previously learned list is often effective. Learning context enables new learning to be connected to previous learning. In the QTP, the role and relationship characteristics of concepts are not clearly described or illustrated. For example, the section including OJT-related tasks does not include the training task related to simulation or the use of technology to facilitate training. In the QTP, there are no links in the instruction between prerequisite skills stored in memory and new skills. Training tasks did not progress from simple to complex, familiar to unfamiliar, and concrete to abstract. Rather, there was a lumping of semi-similar tasks haphazardly lumped into sections of the QTP.

The agency defines meta-skills as “adapting, monitoring, and correcting the use of individual skills in complex performance that integrate cognitive, perceptual, and motor processes.” The agency further defined the process of acquiring meta-skills as “gaining organic knowledge of the effects of actions on overall goals, organizing knowledge hierarchically to include cause-effect rules.” Good activities are built for the attainment of goals that can be demonstrated using technology. The QTP did facilitate the learning of how to operate simulation equipment, but it did not facilitate the learning of the meta-skill required to integrate the use of equipment and the act of facilitating adult learning using technology. Trainees were not provided the opportunity to learn how to use technology using practice-oriented repetition. The learner was not evaluated on their ability to use technology in the learning transaction, only the ability to operate the equipment. The QTP did not direct repetitive demonstration, activities were not learner-centered, methods were not appropriate for the target audience, did not facilitate achievement of performance objectives, and methods did not give the learner feedback.

Adult learning theory was not discussed within the QTP; therefore, the program, although intended to produce trainers qualified to train adults, did not facilitate the understanding of adult learning theory. Rehearsal activities did not reflect the application of skills; rather merely require the recall of information about the performance of a skill. The QTP did not direct repetitive practice required to enable learners to perfect performance. Interviewees highlighted this as an issue that directly contributed to their inability to act as trainers once certified. Several interviewees reported feelings of fear because of limited or no practice opportunities encountered during training. The lack of instructional strategies did not promote a change in critical trainer KSAs. The program did not provide tools the trainee could use to help adults learn. Trainees were not provided an opportunity to practice adult learning techniques. Trainees were not provided opportunities to practice learned skills.

## **INSTRUCTIONAL STRATEGY RECOMMENDATION**

I recommend that instructional strategies be incorporated into the QTP via detailed lesson plans. The lesson plans should be learner-centered, be appropriate for the target audience, and use methods proven to promote change in KSAs. Lesson plans should include instructional methods that gain attention, inform the learning of the learning objective, stimulate recall of prerequisite learning, present new material, provide learning guidance, elicit performance, provide feedback and enhance retention and learning transfer. Instructional methods should facilitate the learner’s achievement of performance objectives, prompt performance, give feedback to the learner, and assist the learner in applying and retaining learned knowledge. Instructional strategies should facilitate the understanding of adult learning theory and facilitate the application of adult learning theory with available technology. Instructional strategies should provide the learner the opportunity to practice, demonstrate, and be evaluated on learning objectives. Instructional strategies should be clearly linked and organized in a simple to complex

manner. Lastly, follow-up training opportunities should be built in to enhance or refresh training.

## **IMPLEMENTATION**

During the implementation phase, training procedures are developed (Dick et al., 2009; Rothwell & Kazana, 2010). The instructors are provided training on how to facilitate the training program. In this case, the QTP has already been implemented. Once the instruction is implemented, the agency provides that it requires “continuous support, maintenance, and evaluation to ensure it operates effectively and efficiently and produces trainers who meet performance requirements.” The systems functions of management, support, administration, and delivery are needed to ensure instruction is operating effectively and efficiently.

## **MANAGEMENT FUNCTION**

“Management is the practice of directing, controlling, and supporting the instruction” according to agency regulatory guidance. In the case of the QTP, the management team consists of the trainer, facility manager, and the instructional developers. According to the agency, the trainer provides the teaching-learning activities; the facility manager manages the scheduling of training; and the instructional developers plan for “the design, development, implementation, support, and maintenance of the program.” For this program, the management function was established and was operating within the agency.

## **SUPPORT FUNCTION**

The support function is required to implement, operate, and maintain the program. The agency defines the support functions to include tasks required to implement the program and include “supplying equipment, producing instructional materials, constructing instructional aids, and providing funding.” Beyond the development of the QTP, there are no support functions provided. For example, the QTP did not include instructional aids nor was funding provided to obtain aids at the facility level.

## **ADMINISTRATIVE FUNCTION**

The administrative function includes day-to-day program operation. The training manager at each facility provides the administration function of the QTP. The training manager maintains documentation and maintains training records for the learner. However, the training manager did not provide documents such as “instructional standards, plans of instruction, or student workbooks.”

## **DELIVERY FUNCTION**

Agency management is charged with ensuring the delivery function is ready to be supported in the operational environment. For example, ensuring there are adequate instructors to support instruction. For the agency's ATC career field, instructors are developed using the QTP and charged with facilitating the learning of other potential trainers. At the unit level, these trainers are identified and appointed, in writing from their unit level leadership. Because no standard for training and no standard existed for selection as an appointed trainer, it is possible each unit identified trainers with a wide range of technical expertise (or no expertise), with little or no experience, and little or no motivation to actually act as a trainer.

## **OPERATIONAL EVALUATION**

Operational evaluations are conducted to assess how well graduates meet performance requirements. There are two operational evaluation activities: internal and external evaluations. Internal evaluations gather and analyze internal feedback and management data to assess effectiveness and quality of the instruction. External evaluations are normally gathered to assess graduate performance in an operational environment.

## **INTERNAL EVALUATION**

Internal evaluations continue throughout the life cycle of the instruction. The purpose of internal evaluations, according to the agency, is to "improve the instruction effectiveness and quality." The QTP had a built in internal evaluation method of soliciting feedback from the users. However, feedback was not required. The users were asked to provide student reaction feedback via an email to the developers. However, this feedback was not required and may not have been given. There was no transparency in feedback given and action taken by developers in amending the program in response to feedback provided.

Users need a way to provide feedback to program developers. Currently, users of the QTP were directed to provide feedback by forwarding an email to an email address. This process was optional. Without candid feedback from users, the developers are not able to identify weaknesses in the program or implement changes to improve the program. To facilitate honest and candid feedback, I recommend that developers include a mandatory feedback form to the end of the QTP. If this form were to include both closed and open-ended questions, the users would be required to provide data that could prove useful to the developers. I further recommended that submitting this feedback form to the developers be integrated into the qualification process as a required step.

Stakeholder buy in would be critical to implementing these recommendations (Kirkpatrick & Kirkpatrick, 2006). Stakeholders include the user, trainers, facility

managers, developers, and the career field manager. Each of these stakeholders plays a unique but crucial role to the successful implementation of all recommendations. User buy-in would be critical to ensuring the data were received via the feedback form. Trainer buy-in would be critical to ensuring the feedback form was completed and submitted upon completion of the training transaction. Facility manager buy-in would be critical to ensuring the feedback form was routed to the appropriate management agency. Facility manager would also play a crucial role by ensuring the participation was encouraged at all levels. Developer buy-in is critical to ensuring the feedback received from the users via the feedback form is addressed in a timely fashion. The career field manager's buy-in would be critical to ensuring the success of the feedback form by emphasizing his support for this process.

There are structures, cultures, and operations that would be affected by implementing these recommendations. The form would need to be created and added to the program. A culture of continuous process improvement regarding the life cycle of this program would need to be fostered at every level within the organization. A change that mandated its submission would require an extra stop gate to be recognized and enforced at all levels within the organization. Several steps would need to be taken to implement the feedback form. The first step would be to create the document and incorporate it into the existing program. The second step would be to change the existing policy to enforce the completion of this form as being mandatory for program completion. The third step would be to ensure that the developers who receive the completed form have a process in place to examine each recommendation for validity and realistic incorporation into the program. The last step would be to publish the updated program. Implementing these steps would ensure a culture of continuous improvement would become cemented into the program both short and long term.

## **EXTERNAL EVALUATION**

There was no method developers could formally receive feedback on the effectiveness of the QTP. I recommend the program developers create a feedback form to be submitted by the unit facility managers proving feedback on the graduate's ability to perform as a qualified trainer. This form could be attached to the QTP in the same manner as recommend for the internal evaluation feedback form mentioned in the previous section of this paper. Because this process would mimic an existing procedure within the program, it is more likely to be used and valued by program stakeholders.

## **EVALUATION**

The evaluation phase of ADDIE focuses on continuous improved of the instructional program. There were three types of evaluation recognized by the agency: formative, summative, and operational evaluation. Formative evaluations are conducted during the development stage of the program development process in the form of small group tryouts. The purpose of formative evaluations is to check the design of each

component of the program for integration. Summative evaluations are operational tryouts using real trainees. Summative evaluations check full program integration. Operational evaluations monitor the program throughout its lifecycle and are used to check the day-to-day integration of the program. Operational evaluations, according to the agency, are “gather and analyze internal and external feedback data to ensure the program continues to produce graduates who meet established requirements.”

## **EVALUATION FINDINGS**

It is unknown if formative or summative evaluations were conducted during the development and implementation stages of QTP development. Operational evaluations include both internal and external evaluation methods. Internal evaluation methods include continuously evaluating feedback data to improve the program. As previously identified, the program did not contain a mechanism to provide program developers with this data. It was been previously recommended the feedback processes be implemented as part of the QTP. External evaluation at this stage focuses on externally evaluating the program. This evaluation evaluates field data from an inspection or evaluation report to ensure graduates meet performance requirements. At this time, the QTP had no formal external evaluation process in place to provide critical feedback data to course developers.

## **EVALUATION RECOMMENDATIONS**

The agency employs an official organizational inspection assessment system. The ATC career field uses self-assessment checklists to monitor areas identified by agency leadership as integral to the continued safety, effectiveness, and efficiency of the ATC system. As training is a critical part of this bigger picture, I recommend that the train-the-trainer training be included in this self-assessment checklist. These self-assessment checklists are available to all levels of leadership via a web-based reporting system. Leaders at all levels can monitor the status of this program continuously across the inventory. Additionally, I recommend that a formal program evaluation schedule be developed to review the effectiveness of this program. Program evaluations are time-consuming and are potentially costly to facilitate but are integral to ensuring program compliance with governing directives. I recommend the program be formally evaluated via a program evaluation at least bi-annually.

## **LIMITATIONS**

It is important that researchers identify a research problem that will benefit the individuals being studied (Creswell, 2012). This study will benefit participants, but some limitations existed such as controller attrition rates, population turnover rates, and target sampling frame. The program was of interest to the individuals being studied, but the agency population changed regularly. According to the CFM, as of January 2014, 900 new unqualified trainees entered the career field. Of these 900, nearly 50% will not

become qualified. This attrition rate drives a need for the continuous cycle of replacement trainees.

Air traffic controllers within the agency are not lifelong employees. Each year, new controllers enter the career field. As of January 2014, over 50% of the inventory consisted of controllers within their 6-year service window. Over time, the career field population drastically shrinks. Of the 3,415 controllers in the agency inventory, only approximately 700 have 11-30 years of experience. As the population changes over a relatively short period, it is possible the findings of a program evaluation would not apply to the inventory in just a matter of 6-10 years.

The agency had 288 controllers assigned to facilities located in Europe. This population represented only 8.4% of the greater agency controller population. It is possible the data obtained in Europe-based facilities did not apply to those located elsewhere. Further, Europe-assigned controller experiences may not have represented the experience of the greater controller community, as their experiences may have differed from those found elsewhere. By limiting the focus of the program evaluation to ISD and adult learning, these limitations were mitigated as these adult learning principles hold their value over the long term.

## **SUMMARY (FOUR LEVELS OF EVALUATION)**

### **LEVEL 1 (L1) – PARTICIPANT REACTIONS**

The reaction level was used to report how participants reacted to the program (Kirkpatrick & Kirkpatrick, 2006). Interviewees reacted both favorably and unfavorably to the QTP. Favorable reactions were voiced about the QTP being used as a standardized guide and source reference. Unfavorable reactions included identifying the program as not sufficiently meeting learner needs, the use of poor training practices to facilitate learning, poor curriculum development, and inadequate certification procedures. The document review supported these findings as the development of the QTP was not compliant with ISD guidance and did not support adult learning as endorsed by andragogy and experiential learning theory.

### **LEVEL 2 (L2) – PARTICIPANT LEARNING**

The learning level described the extent KSAs changed because of program attendance (Kirkpatrick & Kirkpatrick, 2006). KSAs were learned because of training; however, not in relation to trainers being able to facilitate OJT, a critical ATC trainer skill. Interviewees reported administrative process and procedures were learned. Additionally, trainees gained an understanding of the importance of training in the larger context of the ATC career field. Conversely, interviewees reacted unfavorably to the program, citing that it failed to facilitate the learning of KSAs integral to the development

of the trainer skillset needed to perform and conduct OJT. Interviewees indicated the program was a paper-based training program that failed to provide critical learning opportunities such as hands-on, interactive, or practical training that ultimately lead to frustration and trainer unpreparedness after certification. The document review supported these findings, as KSAs critical to conducting OJT were not contained within the QTP.

### **LEVEL 3 (L3) – PARTICIPANT BEHAVIOR**

Identifying which change in behavior occurred because of program attendance was accomplished during L3 (Kirkpatrick & Kirkpatrick, 2006). Kirkpatrick (2006) asserted no change in behavior could be attributed to training unless a change in KSA occurred because of program attendance. No link between learning and program attendance could be established. Interviewees consistently and adamantly reported that the skills needed to conduct OJT were not learned because of program attendance. The absence of andragogy and experiential learning principles, and the noncompliance with the ISD model supported the reported interviewees' experiences, thoughts, and recommendations. Therefore, no behavioral changes could be attributed to the program (Kirkpatrick, 2006).

### **LEVEL 4 (L4) – RESULTS**

The results level was used to report what occurred because the participant participated in the program (Kirkpatrick & Kirkpatrick, 2006). The research conducted to justify the pursuit of this study suggested that program results were nonstandard. ROI data indicated there were inconsistent results among facilities at the same location, between facilities within the same region, and between facilities across the agency. Inconsistent ROI data indicated program results did not consistently meet agency goals. Research data and interviewee perspectives supported Kirkpatrick's assertion that if KSAs were not learned and were not transferred to the job through observable behavioral changes, the training program could not have had an impact (Kirkpatrick, 2006). Inconsistent program results may be attributed to poor curriculum development. Program development was not compliant with ISD principles. Additionally, program facilitation did not promote adult learning, as endorsed by andragogy and experiential learning theory.

## Appendix B: Document Review Instrument

Task	Subtasks
QTP Curriculum	<p>Examine OJT training objective(s). Does the objective:</p> <ul style="list-style-type: none"> <li>Detail the expected behavior, condition, and standard?</li> <li>Require a cognitive, affective, or psychomotor learning outcome?</li> <li>Facilitate adult learning theory?</li> <li>Describe observable and measurable behaviors?</li> <li>Are the objectives organized in a hierarchical manner?</li> <li>Are the needs and goals of the organization congruent with the instruction?</li> </ul> <p>Examine OJT learning standard(s):</p> <ul style="list-style-type: none"> <li>Does the program have defined standards?</li> <li>Does the standard test expected performance?</li> <li>Is the standard valid, reliable, and objective?</li> <li>Is the test valid, reliable, and objective?</li> <li>Are there areas that could be improved?</li> </ul> <p>Examine OJT training references:</p> <ul style="list-style-type: none"> <li>Are the materials complete, accurate, and current?</li> <li>Do the references support the objective/standard?</li> <li>Are references motivational and suitable to facilitate adult learning?</li> <li>Do the training references utilize all media tools available?</li> <li>Are the principles of learning instruction, and motivation evident</li> <li>Are there areas that can be improved?</li> </ul>
OJT Training Techniques	<p>Examine OJT Instructional Methodology:</p> <ul style="list-style-type: none"> <li>Are methods appropriate for the target audience?</li> <li>Are activities learner-centered?</li> <li>Are methods used to promote a change in knowledge, attitude, or skill of the learner?</li> <li>Do methods prompt performance, give feedback to the learner, and work toward assisting the learner retain and apply learned knowledge?</li> <li>Are lesson plans set up to: gain attention, inform learner of learning objective, stimulate recall of prerequisite learning, present new material, provide learning guidance, elicit performance, provide feedback on performance, enhance retention and learning transfer?</li> <li>Does the program facilitate adult learning theory?</li> <li>Are the trainees trained how to facilitate adult learning using technology?</li> <li>Are trainees provided the opportunity to practice facilitating learning using technology?</li> <li>Are trainees provided the opportunity to demonstrate their successful ability to use technology in the learning transaction?</li> <li>Are trainees evaluated on their ability to use technology in the learning transaction?</li> <li>Does the program provide tools to help adults learn?</li> <li>Are trainees provided opportunities to practice adult learning techniques?</li> <li>Are trainees provided opportunities to practice learned skills?</li> <li>Are the trainees evaluated on their ability to demonstrate adult learning techniques?</li> <li>Does training progress from simple to complex, familiar to unfamiliar, and/or concrete to abstract?</li> <li>Do rehearsal activities reflect application of the intellectual skill or merely recall information about the performance of the skill?</li> <li>Is repetitive practice provided to enable learners to perfect performance?</li> </ul>

## Appendix C: Interview Protocol

**Note:** \* indicates question has been reworded for supervisors and managers.

(Level 1 – Reaction). In your opinion, in what ways was the Trainer QTP, successful or effective in teaching you how to conduct OJT?

\*1. In your opinion, in what ways has the Trainer QTP successfully or effectively taught trainers to conduct OJT?

(Level 1 – Reaction). In your opinion, in what ways was the Trainer QTP weak or ineffective in teaching you how to conduct OJT?

\*2. In your opinion, in what ways has the Trainer QTP ineffectively taught trainers to conduct OJT?

(Level 2 – Learning). Please identify what you learned (knowledge, skill, or attitude) because of your participation in the Trainer QTP as it pertains to facilitating OJT?

\*3. Please identify OJT knowledge, skills, or attitudes you have observed trainers change because of participation in the Trainer QTP training?

(Level 2 – Learning). Please identify (if possible) something you would have liked to learn as part of our OJT training.

\*4. Please identify (if possible) something you would like to see incorporated into the Trainer QTP in regards to OJT training.

(Level 3 – Behavior). Please describe how participating in the Trainer QTP (as it pertains to OJT) changed your on-the-job performance. Please give an example, if possible.

\*5. Please describe how participation in the Trainer QTP changed on-the-job performance. Please give an example, if possible.

(Level 3 – Behavior). Where there any factors that influenced your ability to transfer your learning to the workplace? If possible, give an example.

\*6. Will you please identify factors that may have influenced newly qualified trainers ability to transfer learning to the workplace? If possible, give an example.

(Level 4 – Results). Did your participation in the Trainer QTP (in regards to OJT training) influence your on-the-job performance? If so, please describe how. If possible, give an example.

\*7. Can you describe how participation in the Trainer QTP influenced trainer's ability to conduct OJT on-the-job? If possible, please give an example.