

**THE PERCEPTIONS OF FLIGHT INSTRUCTORS REGARDING THE
APPLICATION OF MULTIPLE INTELLIGENCES THEORY IN FLIGHT
TRAINING**

by
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ABSTRACT

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Title: The Perceptions of Flight Instructors Regarding the Application of Multiple Intelligences Theory in Flight Training.

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For several decades, educators have used Howard Gardner's (1983) Multiple Intelligences Theory in a variety of ways to make teaching and learning more effective. However, within flight instruction, little or no attention has been focused on the concept of Multiple Intelligences and its impact on student learning and retention. Consequently, the purpose of this study was to determine whether Certified Flight Instructors (CFIs) who have been provided with information about Multiple Intelligences perceived a positive relationship between their new knowledge about Multiple Intelligences and their instructional effectiveness. The study used participant journals, focus groups, and individual interviews to determine if CFIs perceived Multiple Intelligences to be valuable when applied to flight instruction. The results indicated that participants believed Multiple Intelligences Theory added value to their flight instruction. Implications for practice and directions for future research are provided.

CHAPTER 1: INTRODUCTION

Nature of the Problem

Aviation is a trillion-dollar industry with an unfortunate shortage of commercial pilots (Garcia, 2018; Statista, 2018). The aviation industry provides a safe means of transportation for millions of people each year (Chance, 2006). One of the many factors contributing to this safety record is high-quality pilot training. It is critical that the industry supports the development of highly qualified pilots, particularly as they go through training, where many potential pilots may be lost from the career pipeline due to attrition. From primary to advanced flight training, students must be provided with effective instruction to acquire the required skills, attitudes, and knowledge related to (a) aviation rules and regulations and (b) the proper operation of an aircraft. These rules, regulations, and standards for proper operation are determined by the U.S. governing body for aviation, the Federal Aviation Administration (FAA). As an extension of the FAA's standard teaching procedures, every flight instructor should understand how an individual student learns most effectively, to maximize students' mastery and retention of aviation-related competencies (Henley, 2003).

Efficient mastery and retention of competencies increase the likelihood that students will complete their pilot certificates or ratings. It is the responsibility of flight instructors to teach students how to integrate their newly acquired competencies into effective and efficient behaviors as pilots (FAA, 2008). Aviation-related behaviors need to be properly demonstrated, in compliance with FAA standards and regulations to advance safety. The aviation industry would benefit from a reflection on its practices and asking whether the principles and philosophical models that guide flight training are appropriate for the needs of current professionals and

students attempting to become professionals within the industry. In addition to the major theoretical and practical issues that concern any education endeavor, efficient flight instruction cannot be separated from basic adult learning principles (Henley, 2003).

Meaningful learning occurs when understanding, demonstration of skills, and useful interactions between instructor and students are achieved. The instructor must guide learners so that they become critical thinkers and problem solvers with a well-structured knowledge base. They must also encourage appropriate motivation, and facilitate meaningful interactions with others, while simultaneously being involved in substantial learning activities. Interactions between instructor and student are a critical component of adult learning, in which quality learning is more than mere acquisition of knowledge, but also the ability to demonstrate knowledge (Telfer & Moore, 1997).

The topic of learning has been the subject of research for decades. However, there is still insufficient agreement on how effective learning occurs for individual students. There is a variety of explanations describing what happens cognitively and physically when learning occurs. These explanations are called learning theories, each with their own set of assumptions about the role of the teacher and the learner, as well as student motivation and the techniques required to facilitate optimal learning (Merriam & Caffarella, 1999). Gardner's Multiple Intelligences Theory describes the challenges for instructors in designing worthwhile learning activities that acknowledge individual differences and satisfy the learning needs of all students, while also raising students' awareness regarding their own learning strengths and challenges. Furthermore, Multiple Intelligences Theory aligns well with Bloom's Taxonomy.

Gardner (1983; 1993; 2006; 2011) developed and refined Multiple Intelligences Theory to explain capabilities not historically captured by traditional intelligence tests. Although

Gardner's research appears to be largely ignored by psychologists, it has continued to interest professional educators. This audience includes, but is not limited to, teachers, administrators, supervisors, school board members, legislators, college professors, parents, educated laypersons, and other education stakeholders.

The Multiple Intelligences Theory is comprised of eight categories: (a) bodily-kinesthetic, (b) interpersonal, (c) intrapersonal, (d) linguistic, (e) logical-mathematical, (f) musical, (g) naturalistic, and (h) spatial. In describing his theory, Gardner (1993) stated the following:

There is nothing magical about the word "intelligence." I have purposely chosen it to join issue with those psychologists who consider logical reasoning or linguistic competence to be on a different plane than musical problem-solving or bodily-kinesthetic aptitude. Placing logic and language on a pedestal reflects the values of our Western culture and the great premium placed on the familiar tests of intelligence. A more Olympian view sees all eight as equally valid. To call some "talent" and some "intelligence" displays this bias. Call them all "talents" if you wish; or call them all "intelligences" (pp. 35-36)

In flight training, cognitive and physical skills must be taught by instructors and utilized by students. However, students may learn best through an integration of strategies for one or more of the intelligence categories. Accordingly, Multiple Intelligences Theory may have useful applications in flight training.

Statement of the Problem

Improving students' comprehension of aviation knowledge and the ability to apply that knowledge is a requirement for safety. Multiple Intelligences-related recommendations could

provide professional flight programs and flight instructors with additional information to enhance their flight lessons and students' understanding. Therefore, this study determined whether teaching Multiple Intelligences Theory to flight instructors provides them with a positive perception of their ability to enhance students' learning and retention, presumably through a greater understanding of individual students' learning methods. This study attempted to determine whether flight instructors believed that Multiple Intelligences Theory had added value as an educational approach and whether knowledge of Multiple Intelligences concepts is related to instructors' perceived teaching effectiveness. One of the issues in flight training programs is the retention of qualified applicants: that is, how can the profession retain more flight students? One approach to improve the retention of flight students is to improve students' comprehension of aviation knowledge and the ability to apply that knowledge via flight instructors' integration of Multiple Intelligences Theory.

The value of Multiple Intelligences Theory in flight instruction can be assessed in several ways. However, the focus of this study was on instructors' perceptions of the value of Multiple Intelligences concepts as they delivered training to student pilots. If increasing instructors' awareness of each student's learning traits and the improvement of students' comprehension is a primary program goal, then a broader knowledge of Multiple Intelligences Theory might be utilized by future instructors to improve student comprehension and skills. The study sought to determine if instructor awareness of Multiple Intelligences Theory and Multiple Intelligences recommendations was associated with perceptions regarding flight students' acquisition of FAA-required aviation knowledge and skills.

Purpose and Objectives of the Study

The *Aviation Instructor's Handbook* (FAA, 2008) provides an introduction to teaching procedures. Multiple Intelligences Theory indicates that when instructors recognize differences in students' learning styles and associated challenges, instructors can adapt their methods to provide more effective instruction (FAA, 2008). However, the *Aviation Instructor's Handbook* (FAA, 2008) only provides one page of information concerning learning styles, and no information on Multiple Intelligences Theory. Therefore, an exploratory study that could examine the potential application of Multiple Intelligences Theory was needed. Thus, the objectives of this study included the following:

1. Determine whether flight instructors perceive Multiple Intelligences Theory as having value as an educational strategy, and
2. Determine how knowledge of Multiple Intelligences concepts was related to instructors' perceptions of their flight instruction effectiveness.

The literature review examined Multiple Intelligences concepts and instructional accommodations based on an individual's Multiple Intelligences, particularly as related to flight instruction. Although little research has been reported regarding Multiple Intelligences Theory in aviation, there is a substantial body of knowledge regarding general areas of education and training that contributed meaningfully to this study. The literature indicated that it was important for instructors to understand that students may benefit from the use of Multiple Intelligences Theory and practices. This belief is likely true even if instructors do not recognize that Multiple Intelligences techniques may realistically be used during instruction (Gardner, 2006). For this study, it was important that instructors recognized the potential uses of Multiple Intelligences-related techniques and value of those techniques.

The FAA has focused heavily on instruction related to flight techniques, but has provided little guidance regarding flight instructors' use of efficient training methods for their students' understanding of critical flight skills (Fry, Ketteridge, & Marshall, 2009). Without this information, flight instructors are likely to continue using less-effective methods of instruction, therefore, reducing the quality of instruction and the number of pilots completing training programs (Estrada et al., 2007; FAA, 2018a). An examination of Multiple Intelligences techniques for flight student comprehension could add to the knowledge base and potentially improve flight instruction methods.

The study was intended to determine if flight instructors' perceptions of the quality of instruction were related to the use of Multiple Intelligences-related teaching techniques. Therefore, this study's findings are likely to be of interest to (a) instructors who desire to increase their training success with flight students, (b) flight schools that seek to improve flight training curricula, and (c) the aviation community as a whole, which works to support a substantial increase in well-trained pilots completing flight training.

Research Questions

This study sought to determine if information about Multiple Intelligences Theory, when provided to flight instructors, could inform their teaching methods related to flight training. This study also sought to determine if flight instructors perceived Multiple Intelligences Theory as a valuable educational strategy and if knowledge of Multiple Intelligences concepts was related to instructors' perceived teaching effectiveness. Accordingly, the study posited the following research questions:

1. What are the perceptions of flight instructors regarding the use of Multiple Intelligences Theory in designing individual flight lessons?

2. How does using a variety of Multiple Intelligences-related instructional strategies assist in improving flight students' performance?
3. Do flight instructors perceive the use of Multiple Intelligences Theory and practice as an effective strategy to reduce instructional barriers to students' performance?

Significance of the Study

Within the United States, the FAA is responsible for all aviation-related procedures and outcomes, including the authorization of educational materials, the development and enforcement of regulations and standards, and the certification of flight and ground instructors. The process of becoming a flight instructor is specified in federal regulations U.S. FAR 61 Subpart H and I (FAA, 2018a). An applicant may become a flight instructor after passing two written tests, developed and administered by the FAA's written test centers, with a score of 70% or higher (FAA, 2018). Additionally, instructor applicants must hold a commercial pilot certificate or higher, and must have received appropriate flight training from a currently licensed CFI. Finally, instructor applicants must pass a practical flight test administered by an FAA examiner or a Designated Pilot examiner. The FAA publishes an instructor's handbook designed for use by ground instructors, flight instructors, and aviation maintenance instructors (FAA, 2018). The publications were developed by the Flight Standards Service (AFS-600) and Airman Testing Standards Branch (AFS-630) (FAA, 2008).

Aviation is a rapidly changing and increasingly more complex industry, yet aviation education and training processes have changed very little over time (Karp, 1998). The FAA updated the *Aviation Instructor's Handbook* in 2008. The handbook was updated and replaced the original and previous *Aviation Instructor's Handbooks* printed in 1977, and again in 1999.

Furthermore, although the 2008 version of the *Aviation Instructor's Handbook* provides valuable information, it is limited in its scope regarding the presentation of educational methods.

The *Aviation Instructor's Handbook* (2008) provides a foundation for beginning instructors to understand and apply the fundamentals of instruction. The handbook is comprised of five chapters that concentrate on the following areas: characteristics of human behavior, communication, learning theory, and teaching processes. Although the information is useful, it does not provide many of the practical strategies required to become an effective instructor. The information and skills that flight instructor applicants are required to master focus primarily on flight maneuver techniques. The *Aviation Instructor's Handbook* places limited emphasis on methods regarding the teaching of flight curriculum, how individual students may differ from one to the next, and how students may best learn best through the integration of multiple learning methods. However, each of the knowledge areas to be mastered are clearly specified in federal regulations U.S. FAR 61 Subpart H and I (FAA, 2018a).

Maneuver-based flight training is the foundation many flight schools use to teach novice pilots in piloting exams and within other accreditation practices in the industry. Typically, maneuver-based training involves lectures or written lessons regarding how to perform specific maneuvers in isolation. These lessons can be accompanied by visuals, such as pictures or videos, but do not enhance decision-making skills or judgment. The focus on rote learning and repetition of maneuvers improves performance in the short-term; however, it places too much emphasis on content-based learning instead of outcome-based learning, and can encourage instructors to “teach to the test” (Fanjoy, Young, & Dillman, 2005). This focus on rote learning and repetition of maneuvers ultimately places students at a disadvantage in real world situations.

Recently, scenario-based training has emerged with the expectation of improving the overall education and skill sets of pilots. Unlike maneuver-based training, scenario training uses methods that test decision-making skills. Scenario-based training is more relevant to our emerging technology and teaches pilots through practical experiences using real world situations. In combination with written examinations, students are also judged on a performance basis, where there are multiple correct answers for any given situation. This type of method is also called scenario-based training (Craig, Bertrand, Dornan, Gossett, & Thorsby, 2005). Scenario-based training is advantageous since it refrains from conforming to single-response written examinations like maneuver-based training; rather, it serves to “teach to the real world” (Craig et al., 2005). In a study involving scenario-based training, researchers found that participants performed equal to, or better than, their peers who learned maneuver-based training (Craig et al., 2005).

While scenario-based training has shown promise, the basis of pilot certification still relies heavily on written examinations constructed solely around traditional maneuver-based training methods. Although scenario-based training is gaining greater acceptance within the industry, outdated pilot assessment methods make the transition from maneuver-based to scenario-based training a difficult, time-consuming process. Craig et al. (2005) has suggested that the transition from one strategy to the next is “a spectrum rather than a single step” (p. 21). Therefore, as the gradual shift from one method to the next occurs, both training methods will be utilized in the foreseeable future. Ultimately, the needs of the industry should be the main consideration regarding the steps to be taken next. However, even scenario-based training does not address procedures regarding the tailoring of scenarios to utilize flight students’ strongest learning traits.

Flight instruction does have unique attributes. Flight instruction usually consists of one-to-one learning experiences between student and instructor. The student is usually a young adult or an adult learner (16 years or older), and is typically eager and willing to learn (FAA, 2018a). Flight students are similar to other students in that each has a unique way of learning, and their learning styles have often been influenced by past experiences (i.e., learning style; FAA, 2008). If flight instructors were to acquire additional knowledge and skills related to accommodating learning styles effectively, CFIs could potentially develop instructional strategies that are more effective for an intended student's learning progression.

One method to improve flight instruction might be to apply Gardner's Multiple Intelligences Theory to flight training. Multiple Intelligences Theory is consistent with John Dewey's (1938) ideas on improved educational methods rather than a focus on past flight training methods. The concept of individual learning styles has been studied and expanded for several decades (Armstrong, 2018). Multiple Intelligences Theory provides a method for understanding learning differences in practical terms for educators and trainers. Multiple Intelligences concepts offer flight instructors a variety of methods that can be incorporated into flight instruction. The potential of using Multiple Intelligences concepts to improve students' learning and retention is a necessary and desirable outcome for the aviation industry.

Assumptions of the Study

Several assumptions guided this study. First, it was assumed that methods used to teach cognitive skills in fields other than aviation would also be effective for flight instruction. Therefore, teaching instructors how to assess the Multiple Intelligences of students should improve their teaching methods and increase the comprehension of their flight students. Henley (2003) stated, "The Multiple Intelligences model proposed by Gardner provides a valuable

framework for aviation educators since most of the eight intelligences or abilities identified by Gardner have applications within the aviation context” (pp. 92-93).

Second, it was assumed that the research participants would be in similar learning contexts and have had similar flight and instructor experiences during the study because they were sampled from the same flight program. Third, it was assumed that participants would utilize a highly structured flight simulator training program during the study that would limit the potential of external influences.

Definition of Terms

Adult learners: Individuals who have real-life experiences and a greater variety of roles; they have developed beyond the adolescent phases of development (Brookfield, 1986).

Flight evaluations: A determination of the level of skill demonstrated by a flight student through required flight maneuvers as determined by the FAA (FAA, 2018a).

Flight maneuvers: One or a combination of the four fundamentals of flight (i.e., climbs, descents, straight-and-level flight, and turns). Flight maneuvers also include stalls, approaches, and ground reference maneuvers (FAA, 2018a).

General aviation (GA): This is an area of aviation operation that does not include military or airlines; GA includes flight schools, sport flying, flying clubs, agricultural aviation, business flying, and the manufacturers of aircraft and maintenance facilities that service these types of aircraft (Crane, 2012).

CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this chapter is to provide a review of the literature regarding flight instruction and Multiple Intelligences Theory. The literature indicated that many instructors are challenged with finding a way to respond to individual learning styles. Gardner's Multiple Intelligences Theory embraces certain characteristics that contribute to particular skills. Gardner's approach allows educators to vary their instructional methods to fit the needs of each student (Nolen, 2003). The theory claims that humans are born with one or more intelligences, and specific intelligences are dominant in some people and recessive in others. Additionally, it is possible to develop all types of intelligence (Brockman, 1997). Gardner (2006) stated that instructors must have knowledge of all eight intelligences so they can develop methods to respond to the needs of learners. If instructors can develop lessons tailored to an individual student's learning style, the student will increase engagement with the curriculum and instruction. Gardner indicated that instructors whose methods of teaching include concepts of multiple intelligence realize the benefits of an eager learner who has a greater chance of learning and applying what has been learned to other situations.

Flight instruction is one-on-one training specific to the ability to fly and navigate an aircraft in safe conditions. Flight instruction is composed of two primary areas, ground and flight. Students obtain ground instruction to gain basic knowledge about what is required to act as pilot in command of an aircraft, plan flights, preflight aircraft, and fly the aircraft following FAA standards. The ground instruction may be in a classroom setting or one-on-one between a flight instructor and a student. Flight instruction occurs when both parties are in the airplane, performing skills directly associated with the flying-related content of ground lessons. The goal of flight instruction is for students to increase their understanding of flight by applying flight

maneuvering knowledge in the aircraft. Flight students must be able to demonstrate satisfactory knowledge during the ground and flight portions of training and satisfactory skills during the flight portion of training to obtain a flight certificate.

Multiple Intelligences Theory

Gardner (1983; 1993; 2006; 2011) constructed a theory that describes the existence of several intelligences inherent in individuals, but could also be developed further with guidance. This theory was constructed and further developed during his work with, and studies of, child prodigies, gifted individuals, patients with traumatic brain injuries, and typically developing children and adults. Gardner's work has provided information for teachers to assist in determining methods that satisfy the individual student's learning needs. Gardner believed that teachers could improve learning if they addressed the differences in multiple forms of intelligence. Gardner stated, "Only if we expand and reformulate our view of what counts as human intellect will we be able to devise more appropriate ways of assessing it and more effective ways of educating it" (Gardner, 1993, p. 4).

Gardner described intelligence as the "capacity to solve problems or to fashion products that are valued in one or more cultural settings" (Gardner & Hatch, 1989, p. 4). Without the introduction of knowledge regarding Multiple Intelligences Theory and associated learning styles, flight instructors may be challenged to identify ways to respond to individual learning needs and styles. Multiple Intelligences Theory can enhance teaching methods by educating teachers on the need to acknowledge differences in learning styles and the need to accommodate a variety of learning styles. Each intelligence possesses characteristics that lend themselves to particular skills; educators need to modify their instructional methods to satisfy the needs of

different intelligences (Nolen, 2003). In terms of flight instruction, flight instructors would have to modify their approach to instruction to satisfy each student's intelligences in a similar fashion.

According to Multiple Intelligences Theory, everyone is born possessing certain types of intelligence; some intelligences are dominant while others are recessive, and it is possible to improve the potential of all types of intelligence (Brockman, 1997). Gardner (1983) described eight intelligences in his original framework: (a) bodily-kinesthetic, (b) interpersonal, (c) intrapersonal, (d) linguistic, (e) logical-mathematical, (f) musical, (g) naturalistic, and (h) spatial. The following definitions describe the different intelligences.

According to Gardner (1983; 1993; 2006; 2011), individuals with bodily/kinesthetic intelligence discover the world through the body. They usually have well-developed fine and gross motor skills. They understand the world and express their feelings through touch and motion. People with this intelligence are often described as dancers, athletes, carpenters, surgeons, plumbers, and mechanics, among other occupations. Bodily/kinesthetic intelligence enables people to express emotion with body language. Bodily/kinesthetic intelligence is the ability to act gracefully, be animated in actions, and learn best by doing and touching. Instruction for bodily/kinesthetic learners can be optimized by using manipulatives and physical activity.

According to Gardner (1983; 1993; 2006; 2011), interpersonal intelligence provides the ability to perceive and discriminate between peoples' feelings and motives. Interpersonal intelligence offers the ability to look outside oneself and understand other people, including the ability to analyze emotions and understand reactions to various situations. Interpersonal intelligence enables the ability to understand others and communicate with people from varied backgrounds and cultures. This intelligence is often found in teachers, clergy, sales personnel, and psychologists.

According to Gardner (1983; 1993; 2006; 2011), intrapersonal intelligence is used for self-reflection and understanding how other people feel about their normal selves. People with intrapersonal intelligence are commonly creative and have a high degree of self-respect. Students with intrapersonal intelligence possess the need for praise to increase learning. This intelligence can be developed by using exercises that require imagination and working with others on class projects. Intrapersonal learners often learn best through observation and experience.

According to Gardner (1983; 1993; 2006; 2011), people with linguistic intelligence have a mastery of language, enjoy reading, and tend to think in words. They have excellent skills in grammar and vocabulary and usually memorize by using words. Individuals with linguistic intelligence tend to have the ability to explain information through words because they have a capacity for analyzing language and creating a better understanding of what is said or written. This intelligence of language leads many to careers in teaching, journalism, writing, law, and studies in a foreign language. They are usually better at memorizing information and are often excellent at telling stories. Furthermore, individuals with strong linguistic intelligence have the ability to learn best by reading, writing, and delivering oral reports. Linguistic intelligence is one of the most highly regarded intelligences and is a major component of the traditional education system.

According to Gardner (1983; 1993; 2006; 2011), students with logical-mathematical intelligence can detect patterns, reason deductively, and think logically. As children, they may first display this intelligence by setting items in order or matching them with other objects. Later, they can do math without the use of pencil, paper, or other manipulatives. As those with logical-mathematical intelligence mature, the ability to use abstract thought is greater than in other intelligences. Students can follow long lines of reasoning and usually do well in a traditional

classroom because they can conform to the role of the model student. This intelligence is also highly regarded as a key component of the traditional education system.

According to Gardner (1983; 1993; 2006; 2011), traditional education tends to limit the importance of music and music education. However, music often acts as a way to identify and express emotions. In general, students with musical intelligence have a strong understanding of pitch, rhythm, and loudness. Musical intelligence appears in early childhood and often relates to other intelligences because it contains patterns of rhythm and beat that are found in logical-mathematical intelligence.

According to Gardner (1983; 1993; 2006; 2011), naturalistic intelligence is somewhat like intrapersonal intelligence in that those with it also benefit from observation and life experiences. Naturalistic intelligence enhances an individual's appreciation of nature and the environment. People with this intelligence become knowledgeable about classifying and using elements of the environment and tend to develop a concern for the state of the planet. Educators who have students with this intelligence can develop activities for labeling and preserving specimens and encourage observations of nature and the environment by taking exploratory field trips. In general, students with naturalistic intelligence are better at classifying animals, insects, plants, and other categories.

According to Gardner (1983; 1993; 2006; 2011), people with spatial intelligence tend to relate best to the real world and are in direct contact to the logical-mathematical thinker. Students with spatial intelligence tend to enjoy painting, sculpting, and participating in activities that require advanced thinking and strategy, like the game of chess. Those with spatial intelligence tend to visualize multiple aspects of the world; even individuals with sight challenges can develop this intelligence. Spatial intelligence provides a sense of direction and accuracy and is

found in professions such as guides, architects, designers, pilots/navigators, hunters, and travelers. Individuals with spatial intelligence are generally able to visualize and manipulate how something will appear before it is finished.

Criticisms of Multiple Intelligences Theory

Some note that Gardner's theory appears to be derived more from his own intuition and reasoning than from empirical research (Armstrong, 2018). As such, Multiple Intelligences Theory is not without criticism from researchers and scholars. There are three central criticisms: (a) a lack of research pertaining to the definitive answer as to whether or not Multiple Intelligences exist, (b) a lack of research pertaining to the efficacy of using Multiple Intelligences concepts in academic settings, and (c) the belief that Multiple Intelligences Theory is a strategy for "dumbing down" the curriculum because students will be categorized into specific groups of ability to learn or not learn regarding specific subject areas (Armstrong, 2018).

Concerning the first criticism, traditional researchers and scholars argue for the existence of a general intelligence factor that can be measured by intelligence tests, which has not been accomplished concerning Multiple Intelligences Theory (Armstrong, 2002). However, there is much debate on what constitutes intelligence beyond the Western concept of intelligence that centers solely on linguistic and mathematic abilities. As such, researchers have recognized that determining a standard measure has been a difficult task. White (1998) noted "questions around the individual criteria; for example, do all intelligences involve symbol systems; how the criteria are to be applied; and why these particular criteria are important" (p. 9).

Regarding the second criticism, although scholars may criticize Gardner's work, educational researchers have given him high praise for his help in increasing educators' understanding that Multiple Intelligences are multifaceted, and intelligence surely must extend

beyond linguistics and mathematics (Armstrong, 2018). Multiple Intelligences Theory has helped educators understand and value the various talents of learners (Collins, 1998). However, empirical evidence is needed for Multiple Intelligences Theory to gain respect and acceptance among educators. Gardner insisted that an educational approach, taking different intelligences into account, is more effective than an approach denying the existence of intelligences beyond linguistic and mathematical intelligences (Nolen, 2003). Multiple Intelligences Theory shows an overall trend in neurology and cognitive psychology that supports Gardner's view of many abilities comprising intelligences (Collins, 1998).

As for the third criticism, Multiple Intelligences Theory attempted to guide educators in the adaptation of their subject matter to the students' type of intelligences so they would be able to comprehend a variety of subject matters outside their primary intelligence. For example, a student with a high bodily-kinesthetic ability might be frustrated with content strictly taught in the logical-mathematical environment. Instead of assuming that the student cannot complete mathematical functions, a teacher may modify mathematics scenarios to incorporate the student's bodily-kinesthetic abilities into the curriculum.

Multiple Intelligences Theory and Bloom's Taxonomy

How one instructs is as important as what one teaches. The understanding and use of Multiple Intelligences concepts theoretically enable students of all intelligence types to grasp course content more easily and develop higher-level critical thinking skills. Although developed long before Multiple Intelligences Theory, Bloom's taxonomy complements Gardner's work. Bloom and colleagues (1956) published a classification system, commonly known as Bloom's taxonomy, to describe the different domains of learning: affective, cognitive, and psychomotor. Originally, the most popular domain, the cognitive domain, was divided into six levels of

increasingly higher order critical thinking skills: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). The revised version of Bloom's taxonomy uses modified terminology, but the same basic tenets: remember, understand, apply, analyze, evaluate, and create (Armstrong, 2018).

According to Bloom and colleagues (1956), knowledge or remember, the lowest level of the taxonomy, is defined as the remembering of previously learned material and involves the recall of facts. Comprehension is the ability to understand material by adapting it in different forms. Application is the ability to use learned material in new situations, including correct usage of a method or procedure. Analysis allows one to break down information into parts by identifying and analyzing relationships and unstated assumptions. Synthesis, the highest domain in the new taxonomy, is the ability to put parts together to form a new whole; the combination of ideas forms new patterns or structures. Evaluation is the ability to judge the value of materials and present opinions by forming judgments about the information, based on a set of criteria (Armstrong, 2018; Bloom et al., 1956).

Bloom's taxonomy is a widely accepted educational design and evaluation tool that can develop and encourage higher order thinking skills. The taxonomy demonstrates how Multiple Intelligences could be integrated into virtually every subject and in a manner that encourages higher order critical thinking skills; Multiple Intelligences Theory is often combined with Bloom's taxonomy. Armstrong (2018) suggested that Multiple Intelligences concepts can be combined in all six levels of Bloom's taxonomy concerning cognitive critical thinking skills. Armstrong (2018) suggested that combining Bloom's taxonomy with Multiple Intelligences Theory could have the educator enter into a conversation with the student in an attempt to guide them into discovering a higher level of understanding.

Bloom's taxonomy heavily regards critical evaluation as the top priority of quality learning. Critical evaluation skills are an important element for the successful use of technology in an advanced society (Castle, 2003). Students must learn to access, process, and judge the value of information that is fundamental to understanding written and visual materials, and how conclusions are supported with data. This process helps students when making professional and personal decisions, and is critical for the professional and GA pilot.

Success in traditional education settings involves a considerable reliance on linguistic and mathematical intelligence (Gray & Waggoner, 2002). Bloom's taxonomy, combined with Multiple Intelligences Theory, has the potential to engage all learning styles by teaching students to think in ways that are meaningful to them. Tomlinson (1999) stated, "In a differentiated classroom, the teacher fashions instruction around the essential concepts, principles, and skills of the subject" (p. 9). There are various ways to present course concepts to students that allow them to learn more effectively and at improved rates. Gardner (2011) suggested students may learn more quickly and demonstrate their knowledge of the material through means that ensure learning, if learning becomes personal and an enjoyable journey.

Multiple Intelligences Theory links brain research to learning and suggests that diversified instruction carries the potential to reach an increasing number of learners (Armstrong, 2018). Armstrong (2018) suggested that Multiple Intelligences Theory and the cognitive critical thinking skills found in Bloom's taxonomy can be integrated across various levels (see Figure 1).

Level	Linguistic	Logical-Mathematical	Musical	Spatial
Remembering	name, define, state/ label, select	label, find, list/ name, find identify	state, recite/ memorize, know, recall	select, write/ recognize, quote
Understanding	explain, infer, describe/ express, locate	simplify, account for, express/ group, classify, recognize	recognize, show/ interview, review	code, group, locate/ paraphrase, report
Applying	communicate, discuss, derive/ demonstrate, construct, dramatize	solve, prove, compute, convert/ record, investigate, keep records	perform, produce/ interpret, model, plan	illustrate, apply, chart/ translate, interview, discuss
Analyzing	criticize, relate, question/ separate, diagram, sort, take apart	analyze, infer, deduce/ sort, discover, examine, categorize	differentiate, distinguish, classify/ determine, simplify	compare, contrast, diagram/ debate, draw, conclusions
Evaluating	recommend, verify/select, measure, rate	assess, measure, test, rank, value/ measure, select, test	critique, judge, rate/ evaluate, validate	critique, appraise/ define, argue, support
Creating	propose, synthesize, compose/invent, make up, construct, assemble	build, combine, translate, formulate/ organize, reconstruct	Create, produce, compose/ imagine, integrate	create, design, invent, organize/ present, summarize

Figure 1. Integration of multiple intelligences within the Revised Bloom's Taxonomy

Summary

The literature review suggested that while there may be issues with Multiple Intelligences Theory, it has strong support from many educators because it extends beyond established, yet not always effective, educational methods. Gardner's work does more than categorize students. Multiple Intelligences Theory creates conditions that allow for the enhancement of the way students are taught (Brockman, 1997). Gardner explained Multiple Intelligences as flexible and

providing opportunities that can shape and enhance teaching methods for educators and students (Gardner, 2011).

Nolen (2003) stated that the Multiple Intelligences Theory provides an understanding of all intelligences and unique learning for students' needs. Nolen further explained that instructors should learn how to present course material that engage the learning styles of most, if not all, intelligences. Instructors whose teaching methods use Multiple Intelligences concepts understand the benefits, most notably, active, engaged learners.

Multiple Intelligences Theory provides guidance for designing curriculum and instruction centered on students' needs while offering a variety of methods of learning (Hoerr, 1996). Gardner (2011) contended that the Multiple Intelligences approach develops a student's full potential for mastering information. Jordan (1996) supported Gardner's contention regarding the power of Multiple Intelligences as an educational strategy because it emphasizes students' abilities rather than their disabilities. Today's educational system is confronted with a more diverse group of learners who possess a broad spectrum of interests and abilities. Multiple Intelligences is an important element in meeting that niche by providing critical insight for improving design, instruction, and assessment methodology (Latham, 1997; Visser, 1996).

Information regarding Multiple Intelligences Theory has the potential to impact how a flight instructor approaches the learning environment. Evidence of Multiple Intelligences and how this approach can impact learning are found in primary, secondary, and corporate educational systems; educational software; media programming; and instructional design and professional development programs (Pennar, 1996). Flight instructors with an understanding of Multiple Intelligences Theory and its applications to instruction can employ these strategies for a better design and style of instructional delivery for effective learning. Multiple Intelligences

concepts provide a method for greater understanding of learning, regarding how learning styles and teaching styles can merge to shape learning potential.

Armstrong (2018) suggested that in all forms of intelligence, teachers do not have to teach and students do not have to learn facts. Rather, they only need to investigate the possibilities and then choose the particular pathways that most likely will be effective for individual students. Multiple Intelligences Theory is intriguing because it expands the instructor's set of available teaching and learning tools beyond the conventional linguistic and logical methods. An instructor could place a topic related to flight training on the center of a piece of paper, and then draw eight spokes radiating out from this topic. The instructor could then label each line with a different intelligence. Next, the instructor could brainstorm ideas for teaching or learning and write ideas next to each intelligence. This example is a spatial-linguistic approach to brainstorming. The instructor could develop other methods, such as tape-recording ideas and techniques or having a group brainstorming session.

CHAPTER 3: METHODOLOGY

The review of the literature with respect to flight training and the integration of Multiple Intelligences Theory into training indicated a need for an examination of CFIs' perceptions of student learning. This study addressed the need by analyzing CFI perceptions of Multiple Intelligences Theory in flight instruction. Chapter 3 describes the methodology used to answer the following research questions:

1. What are the perceptions of flight instructors regarding the use of Multiple Intelligences Theory in designing individual flight lessons?
2. How does using a variety of Multiple Intelligences-related instructional strategies assist in improving flight students' performance?
3. Do flight instructors perceive the use of Multiple Intelligences Theory and practice as an effective strategy to reduce instructional barriers to students' performance?

Research Design

Case studies are used to investigate complex and multifaceted research. They can be used to discover behavior patterns that may emerge from the research, while events and trends are explained using "how" and "why" questions in natural settings without researcher obstruction (Denzin & Lincoln, 2005; Fichtman & Yendol-Hoppey, 2009). In case studies, participants are studied in more detail to gain further understanding of a given concept, problem, issue, or behavior (Janesick, 2004). While many forms of case study design and evidence exist, the researcher chose to use the works of Yin (2009) and his case study research methodology as a guide, because he provides extensive discussions regarding triangulation and additional information regarding logic models and alternative analytic options.

This case study provides data on flight instructors' perceptions of the benefits of using Multiple Intelligences concepts and related accommodations as instructional aids. Case studies focus on a single phenomenon in a real-life context; this design was chosen because it is particularly well suited for investigating real-life contexts in which multiple pieces of evidence are utilized to collect data (Gall, Borg, & Gall, 1996; Yin, 2009). A case study is also appropriate if the research does not have the benefit of prior theoretical propositions, as was the situation in the current study (Stake, 1995; Yin, 1999; Yin, 2009). Furthermore, in case study research, the instrumentation, observation methods, and modes of analysis to address validity and reliability demand strict adherence to guidelines established by experts (Lee, Mitchell, & Sablynski, 1999; Yin, 2009). The three tenets of qualitative research methodology were satisfied with the case study design: (a) describing, (b) understanding, and (c) explaining (Tellis, 1997).

The first, and most important, condition for differentiation among various research methods is to classify the type of research questions being asked. In general, "what" questions could either be exploratory or about prevalence, in which surveys or analysis of archival records would be favored. "How" and "why" questions are likely to favor the use of case studies, experiments, or histories (Yin, 2009). Yin (2009) stated the five components of research design: (1) research questions, (2) research propositions, if any, (3) research units of analysis, (4) logic linking the data to the propositions, and (5) criteria for interpreting the findings.

Regarding the study questions, this study sought to answer "how" and "why" questions and, therefore, a case study methodology was most appropriate for the research questions. The second component, propositions, directs attention to an area that should be studied within the scope of the study's questions. Propositions will move the research into the correct direction, reflect an important theoretical issue, and begin to point to relevant evidence that defines the case

study (Yin, 2009). In this study, the unit of analysis was flight instructors. The researcher's attempt was to link data to the next component by finding patterns, explanations, logic models, and cross-case syntheses. This component helped to determine whether there was too much or too little information in the research area, and if the proper analytic technique was used for data collection. The criteria for interpreting a study's findings are considerably different from those for analyzing quantitative statistical data. It is of critical importance for case studies to identify and address different explanations for the findings (Yin, 2009).

This researcher developed analytic statements based on participant journals, observations, and interviews (field work). The researchers sought to analyze flight instructors' opinions regarding whether or not the knowledge of Multiple Intelligences Theory improved the ability to be an effective flight instructor. The research was triangulated using open, semi-structured interviews as well as student and instructor observations (with field notes) in natural class settings and from the instructors' notes on lessons and training methods (Creswell, 2003; Janesick, 2004; Leech & Onwuegbuzie, 2007). Triangulation of data includes multiple viewpoints and perspectives, allowing for greater accuracy and reliability of data interpretation (Creswell, 2003; Stage & Russell, 1992; Yin, 2009). The researcher remained neutral during the study by only reporting students' and instructor's behaviors, including their interactions with one another, and their engagement levels. The researcher's personal beliefs and preconceived notions were kept to a minimum by recording only what was observed.

The use of alternative designs (quantitative surveys, pre-tests, post-tests, and quasi-experimental designs) was explored for use in this study. However, it was concluded that these alternative methods were limited concerning the needed insights that a case study design can provide. Case study design allows for the identification of participant perspectives and points of

view; both are uncovered as the relationship between the researcher and the participants evolves. Quantitative tests are often designed with researchers' theories and hypotheses that are established a priori. Hatch (2002) believed quantitative studies should be used when the number of participants is high and samples represent a larger population; a large sample was not the case in the current study. Moreover, quantitative studies tend to lack the spontaneity and interpretive reflexivity that qualitative studies typically offer (Hatch, 2002).

According to Hatch, "qualitative researchers believe there is no relationship between the number of participants and the quality of the study" (2002, p. 48). The researcher contended that a qualitative case study with eight participants would clearly represent instructor engagement and motivation in the simulator setting. By documenting and analyzing student and instructor interactions, behaviors, and engagement levels in the natural training setting (i.e., a simulator), the researcher sought to improve instructors' understanding of instruction and how the learning environment directly impacted student performance.

Setting and Participants

The site for this study was a state-supported land grant university with more than 37,000 students. The researcher secured approval from the university's Institutional Review Board (IRB) for the use of the documents listed in the appendices. The research participants were eight part-time CFIs who taught 22 full-time students at the university. The students were in their second year of flight coursework, had their private pilot certificates, and were training for an instrument rating. The demographics of the CFIs included experience ranging from one year to more than five years, with an average age of 22 years (range: 20 to 26); flight instructors were composed of one female and seven males.

Stake (1995) asserted that researchers “must select participants based upon the availability of participants and the need of the researcher to equally represent the demographic area” (p. 37). The researcher determined that he could collect a more in-depth set of data by selecting a small sample of eight participants, representative of the demographic population. The use of multiple sources of data (instructors’ journals and notes, participant interviews, and direct observations) added greater depth and understanding of the instructors’ perspectives and beliefs about the students’ abilities as well as their ability to use their knowledge of Multiple Intelligences Theory in an instructional setting. The incorporation of a variety of resources enhanced the validity of the study by converging commonalities in the research findings and creating a distinct chain of evidence from the data collected (Yin, 2009).

The participants were chosen for this study by a purposeful sampling design. They were selected due to their assignment to teach students in a simulator course in a local flight program. All participants in this study were volunteers, and the confidentiality of their responses was assured because the researcher assigned pseudonyms to each participant. The eight instructors involved in the study were given information about Multiple Intelligences Theory, how to determine students’ intelligences, and instructional methods about how to present information tailored to individual students’ abilities.

The instructors participating in this study were given different strategies for developing lessons that were better tailored to individual students. They were provided a packet of information regarding Multiple Intelligences Theory, including definitions of the different types of intelligence and examples of student behavior linked to the different types of intelligence (see Appendix A). Multiple Intelligences Theory has strong implications for adult learning and development; therefore, the instructors were given a list of the intelligences and how they

provide different potential pathways to adult learning. The instructors were informed that Multiple Intelligences concepts have several significant implications for teaching, and the theory implies a number of shortcomings when education and training strategies are restricted to a single approach (Walters, 1992).

The instructors were also informed that typical classroom lectures focus heavily on verbal content, which favor students who excel in linguistic intelligence. However, this approach does not challenge students to pursue problems using their other intelligence strengths. One example provided to instructors was, “In history class, students read summaries of the work of historians: they don’t “do” history. In English class, they read interpretations of novels and analyses of plays: they do not typically write novels or perform plays” (Walters, 1992, p. 8). Because normal problem-solving strategies are uniquely structured and largely linguistic, students often fail to transfer the problem-solving skills they develop in their educational experiences to their day-to-day real-life problems. In flight training, students are expected to solve problems using any intelligence resources that yield useful solutions. Typical linguistic approaches do not offer students adequate opportunities to develop the necessary flexibility in their thinking-related efforts.

Role of the Researcher

The researcher was a CFI and FAA-licensed pilot examiner who possessed two degrees in education and had more than 30 years of experience as an instructor and educator. It was important that the researcher not allow his biases to influence the research findings. A researcher must remain an observer during interviews and group discussions and not influence the participants during this process. The researcher must also remain neutral while analyzing the data by not being judgmental of instructor-developed approaches.

Before beginning the study, the researcher held a meeting with the participants to discuss the case study and provide information about Multiple Intelligences Theory, concepts, and methods. During this period, the researcher also reviewed the confidentiality agreement with the participants. The researcher reiterated that pseudonyms would be used in the study to protect the identity of the instructors as participants.

Procedures

To enhance consistency, the researcher engaged a variety of strategies. The case study was conducted after the instructors were given an eight-hour introduction to Multiple Intelligences Theory, a Multiple Intelligences Survey (MIS), and several examples of lessons tailored to a student's classification of intelligence as determined by the survey, throughout one weekend. Researcher bias was disclosed at the onset of the study to add credibility to the research and gain the trust of the readers. The role of the researcher and focus of the study were clearly defined, the participants' functions in the study were discussed, and the data collection methods were explained to participants at the beginning of the study. The researcher maintained clear and accurate records in a consistent format to ensure similar findings and conclusions and to enable the study to be replicated by other researchers.

The decision to conduct this study emerged from selective discussions with new flight instructors about their students' difficulties in understanding and applying the knowledge and skills presented by their instructors. In these discussions, it was often discovered that the instructor did not know how a student might best learn. The participating instructors read a very short summary of learning theories in their flight instructor training; however, the instructors were neither provided examples of learning theories nor received training concerning the application of learning theories. Therefore, the researcher intended to determine whether

extended knowledge of Multiple Intelligences Theory would reflect greater comprehension by students and instructors.

A questionnaire developed by McClellan and Conti (2008; see Appendix B and C) was used to determine the optimal intelligence styles and corresponding strengths of their students to support instructors' positive perceptions of their students. McClellan and Conti (2008) conducted a factor analysis to confirm the construct validity of the MIS. Factor analysis was used to confirm the construct validity of the MIS. Accordingly, data reduction procedures resulted in the MIS being decreased from its 45-item, field-testing version to a 27-item preference indicator. Each of the Multiple Intelligences categories contained three items that formed a single abstract dimension or factor, as indicated by their factor loadings.

The reliability of the MIS was established by the test-retest process. The test-retest process was employed with 70 general education students at a community college. The Multiple Intelligences preference indicator was administered to these students and then re-administered two weeks later. For an acceptable estimate of reliability, a correlation of at least 0.7 should be obtained. Four of the Multiple Intelligences areas exceeded the 0.7 level, four were slightly below it, and one was 0.5: bodily-kinesthetic: 0.83; interpersonal: 0.72; intrapersonal: 0.66; linguistic: 0.75; logical-mathematical: 0.59; musical: 0.59; naturalistic: 0.64; and spatial: 0.50.

The MIS scoring key can be found in Appendix C. The use of questionnaires and focus groups produced data for triangulation. The mixed-method approach ensured a greater understanding of the data, concerning what students and instructors perceived as the effectiveness of Multiple Intelligences techniques (Creswell, 2003). Creswell stated that the mixed-methods approach is one in which the researcher tends to "base knowledge claims on pragmatic grounds" (Creswell, p. 18).

Having an outsider in the educational environment may lead to the Hawthorn effect, which tends to produce abnormal behavioral responses from participants who are being observed (Mayo, 1933). Observation during flight instruction may affect the types of interactions and behaviors demonstrated by instructors and students. The researcher attempted to desensitize the instructors to his presence within training settings by being continuously present before data collection began. This desensitizing period also helped the researcher to understand the common terminology used by the participants, and assisted in the development of appropriate questions to be used in the interview phase of the study. While the process of adapting the questions was completed before conducting the research sessions, this process enabled the researcher to revise questions when needed. In general, by knowing the researcher through flight classes and FAA flight tests, it was anticipated that the participants in the study would have had experienced less awkwardness and discomfort in the research setting.

Data Collection

Three types of data were collected during this study: direct observations, instructor journals with the initial Multiple Intelligences responses, and interviews. The researcher collected the direct observation and instructor journal data at the end of the data collection period. Observations and interview responses were coded after each data collection session. Appendix D contains a list of the interview questions used in this study. The researcher used a computer data analysis program, NVivo 10 (2015); the interview data were entered by a research assistant to minimize study bias.

Direct observations were used to document student and instructor interactions, attitudes, and behaviors during students' flight simulator lessons. The researcher recorded his observations during lessons to capture information as it occurred. The instructor journals provided a stable,

unobtrusive, and accurate form of data collection that contained information solely from the perspective of the participating instructors. Instructor journals were used to corroborate other forms of data and to obtain data in the words and language of the individual participants.

The direct observation data, instructor journals, and interview transcripts were entered into NVivo 10 to examine their commonalities. The interrelationships and patterns found in the data guided the data analyses (Stuckey, 2015). Selective computer coding was used to aggregate the data into appropriate categories for analysis. For example, participants' similar responses to interview questions were clustered into categories. Observations and interview responses were categorized by feelings, opinions, and perspectives as they occurred, allowing the researcher to examine issues as the study progressed.

Data matrices with identified categories were created and analyzed. To determine the developing patterns, the researcher read and reread the data matrices to form generalizations and uncover participant experiences from the emergent data. The researcher examined the coded responses of all eight participants to find commonalities and patterns among the responses. The data were then coded to organize them into manageable subgroups or themes to identify possible meanings of the various data perspectives.

Interviews

Interviews are often used to capture participants' perceptions. They are usually conducted in a face-to-face setting with an interviewer who has had experience with the subject under study (Hall & Rist, 1999). Participants provide the most reliable information when they trust and feel comfortable with the researcher in the interview situation. If participants feel threatened or unsure of the motives for the research, the information obtained will most likely be incomplete or produce dishonest responses (Anderson, 1987). The general strategy is to ask questions of

individuals who have knowledge of the research phenomenon, and then analyze their responses. Information provided by participants allows the researcher to gain an insider's understanding of the phenomena through the participants' narrative reports. These reports are then used to gain greater depth and detail through personal experience or research conducted to prepare for the study (Anderson, 1987; Stempel & Westley, 1981).

Interview data offer many advantages to researchers. One advantage is the amount of information that can be obtained and later expanded in detail. Interviews allow several research questions to be addressed in one session, while also providing the researcher the ability to ask a wide variety of questions once the session begins (Stempel & Westley, 1981). Interviews allow the researcher to manage the session to satisfy the needs of the participant and the research study. Other methods, such as surveys and questionnaires, do not readily provide the opportunity to adjust questions or modify a session to gather additional information from participants. The second advantage of interviews is that they allow the researcher to tailor a session to satisfy the needs and comfort level of a participant. The researcher can probe incomplete, vague, or ambiguous answers, or follow-up on new information provided by the participant (Hall & Rist, 1999). A third advantage of the interview method is avoiding the problem of group conformity. A participant may change their mind on a topic to agree with the group's viewpoint, or participants may not speak freely and instead withdraw from the discussion rather than voice a dissenting opinion (Hall & Rist, 1999). Therefore, the use of the interview method in the current study allowed participants to participate fully and speak freely.

Interviews also have several disadvantages. One disadvantage is that there are no means to test the accuracy or completeness of the participant's responses. Interviews provide the perceptions of a participant; however, perceptions can be skewed or mistaken. Participants may

have selective recall, self-delusion and perceptual distortions, and failure to remember details that can occur simultaneously during a session (Fielding & Thomas, 2008; McFee, 1992). A second disadvantage of interviews is that a participant may be more comfortable expressing opinions in a supportive group setting than in a one-to-one situation. Participants may also feel the pressure of providing an answer to a question they were not prepared to answer, or feel hurried to provide an answer that was not well thought out (Lofland & Lofland, 1995).

One-on-one interviews for this study required a range of approximately 30-60 minutes, with an average interview time of 40 minutes. The interviews began with a brief description of the session, stressing that the sessions were voluntary. Per IRB exemption, no written consent was required from those who agreed to participate in the study. The sessions were recorded to allow the researcher to gain information shared by the participants without excessive note-taking during the sessions. The interview questions developed by Berkemeier (2002) were used as a guide in the development of interview questions used in this study. The same list of questions used in the focus groups also served as the guide for the interviews (see Appendix D).

The interviews were conducted with participants during the third and fourth weeks of the flight course. The researcher reviewed the interview protocol with all participants before the beginning of the study to make the participants feel more comfortable and at ease. The participants were told that the interviews would occur in a quiet conference room to add familiarity and make the interview experience more comfortable.

As the participants provided their answers, the researcher probed more deeply into each response to clarify and gain more information regarding the participants' thoughts and insights. The participants' responses to the interview questions were digitally recorded and transcribed for later review. The researcher maintained the conversation (interview questions), as natural in tone

and inflection as possible, to reestablish the previously derived comfort levels. The interviews assisted the researcher to use important personal insights to investigate the instructors' perceptions in detail. The interview questions and answers followed each other in a logical order. It was the sole responsibility of the researcher to listen carefully, not only to what was being said clearly but also what was not being said. The description that emerged narrowed the focus of the study and assisted in building a constructivist interpretation of the data that were collected.

Direct Observations

Each flight instructor was observed providing flight training in a flight training device (i.e., a flight simulator). Observations were used to determine whether the flight instructor was using Multiple Intelligences methods while providing instruction. The observer recorded direct observation notes regarding only how Multiple Intelligences methods were used, and did not seek to determine flight instructors' perceptions of the effectiveness of Multiple Intelligences methods during the observations. Each instructor was observed at least twice during this study.

The researcher discussed the simulation observation process with the participating instructors. For the observation portion of the study, the researcher prearranged a location in the back of the simulator to be as small a distraction as possible. The learning environment, participant behaviors, and interactions were the focus of the researcher's observations. The time for each simulator observation was discussed with the cooperating instructor before the observation. Approximately two hours of direct observations occurred during each observed simulation session. Each instructor was observed for a minimum of four hours in the simulator setting to increase the continuity of the study's findings. No interactions with the instructors or their students occurred immediately before or during the observation sessions.

Journals

The instructors' journals served as written evidence, using the participants' own words and language. The journals added detail and depth to the data. The researcher used the instructors' journals to determine their beliefs regarding an individual student's Multiple Intelligences style without the direct contact of the researcher. Each participant was given a demonstration on how to complete entries properly and return them to the researcher. After every two weeks of instruction, and again at the end of the study, the instructors submitted their journals to the researcher. To maintain response privacy and security. The instructors were asked to return their journals, without the names of their students, in a large manila envelope provided by the researcher to maintain response privacy and security. After each submission, the journal entries were coded for future triangulation.

Data Analysis

The sample was comprised of students and flight instructors from a large Midwestern university. The researcher used an electronic recording device during the observations and the interviews that were later transcribed by the researcher. The recordings were erased upon the completion of transcriptions, and pseudonyms were used in place of participant names.

Several categories, guided by the research questions, were used to create the columns of the matrix within NVivo 10: (a) common learning styles from Multiple Intelligences Theory related to instructor technique, (b) teacher rapport, and (c) resiliency strategies and skills. The instructors' notes were constructed similarly to cluster information. Through a series of progressive revisions and cross-checks, the final categories and themes were created to analyze succinctly the large amount of data collected (Stuckey, 2015).

Creswell (2007) indicated that the process of data analysis in qualitative research is eclectic: that is, there is no correct way. In qualitative analysis, several simultaneous activities engage the attention of the researcher, including collecting information from the field, sorting the information into categories, formatting the information into a story or picture, and writing the qualitative analysis. Fielding and Thomas (2008) noted that four steps are required for dependable qualitative research, and they occur in the following order: field notes or transcripts, search for category patterns, mark up or categorize the data, and construct an outline.

Field notes and transcripts were created during the data collection and interpretation phases. It was necessary to transcribe the recordings completely and type the additional field notes acquired from the sessions to analyze the data fully and arrive at the level of detail required to address the research questions (Krueger, 1994). The researcher used two coding procedures. First, open coding contributed to the identification of topics within a larger volume of information. Second, the researcher categorized and subdivided the data. After the initial round of topic identification and labeling, similar topics were clustered together to determine themes and patterns. Coding facilitated the refinement of the list of topics and themes into categories that were useful in addressing the research questions (Maxwell, 2005). Krueger (1994) indicated that this process allows the researcher to analyze the data and reassemble it in new ways that aid in the development of theoretical concepts.

A spreadsheet was used to list coded categories and support the development of theoretical explanations between the research questions and the data. The process of analysis was considered complete when the researcher found that the core set of critical themes and categories were well-defined, the relationships between them were well established, and the key concepts investigated through the research questions were addressed (Marshall & Rossman, 1995).

Triangulation

Qualitative analysis software was used to classify, sort, manage, arrange, and clarify the case study participants' responses to interview questions. Triangulation of the data facilitated the identification of several themes. These themes provided a basis to determine the perceptions instructors' had regarding how Multiple Intelligences concepts and related instructional strategies helped their flight students learn.

Reliability and Validity

Reliability and validity are concepts often synonymous with quantitative research, but common definitions must be adapted before they can be applied to qualitative research (Golafshani, 2003; Stuckey, 2015). In quantitative research, reliability typically refers to the repeatability of a dataset or questionnaire over time and, while there are several different methods of providing evidence for validity, it generally refers to whether or not the test or questionnaire measures what it purports to measure (Creswell, 2007; Shadish, Cook, & Campbell, 2002). In qualitative research, however, research findings capture only a small period and do not expect to be repeatable long-term. Reliability, then, refers to the researcher's ability to maintain an accurate record of the participants' words, free of interpretation and subjectivity (Silverman, 2001). Careful documentation of the themes and relationships that emerge can contribute to the illustration of reliability (Bazeley & Richards, 2000). Coding should be conducted without prior hypotheses so that the patterns reported to readers exist in the data itself, instead of only in particular sections (Silverman, 2001).

Validity in qualitative research is not a method of comparing the results to an objective measure of truth; instead, it is concerned with ruling out specific alternative hypotheses after the results are known (Maxwell, 2005). Because the researcher's biases may have influenced

interpretation of the data, or their presence may have changed the behavior and perceptions of individuals they are studying, qualitative studies typically compare different types of information (triangulation) or allow participants an opportunity to verify the findings, known as respondent validation or member checking (Silverman, 2001). Other methods of ruling out alternative hypotheses include ensuring that the observations are long-term and intensive, gathering rich descriptive data, examining data carefully for negative cases or disconfirming evidence, and using comparisons (Maxwell, 2005).

CHAPTER 4: FINDINGS

The purpose of this qualitative exploratory case study was to explore flight instructors' perceptions of Multiple Intelligences Theory regarding effective instruction and learning in flight training. The purposive sampling of eight flight instructors was conducted within a major Midwestern university with a large flight program. The research questions that guided this study included the following:

1. What are the perceptions of flight instructors regarding the use of Multiple Intelligences Theory in designing individual flight lessons?
2. How does using a variety of multiple intelligence-related instructional strategies assist in improving flight students' performance?
3. Do flight instructors perceive the use of Multiple Intelligences Theory and practice as an effective strategy to reduce instructional barriers to students' performance?

This chapter presents the findings of the study with regard to the research questions. Rather than addressing each research question individually, a rational guide to understanding the results of this study is contained in the organization of the identified themes. The following themes emerged from the triangulation process: (a) Multiple Intelligences training was helpful to understand students' abilities, (b) flight instructors would use Multiple Intelligences methods in the future, (c) instructors perceived themselves as better at their jobs after Multiple Intelligences training, and (d) FAA CFI training lacks information regarding individual student differences and differentiation. The themes originating from the analyses are illustrated in Figure 2.

Theme	Participants
Multiple Intelligences training was helpful to understand students' abilities	100%
Flight instructors would use Multiple Intelligences methods in the future	100%
Instructors perceived themselves as better at their jobs after Multiple Intelligences training	100%
FAA Certified Flight Instructor training lacks information regarding individual student differences and differentiation	87.5%

Figure 2. Theme Significance Based on Participant Perceptions

Theme One

Multiple Intelligences training was helpful to understand students' abilities. The participants' perceptions about the information obtained regarding Multiple Intelligences Theory provided a structure to evaluate learning styles. The participants reported that Multiple Intelligences-related information helped them "hone in on the student's learning abilities, and helped them out in [knowing] where the student's strength was; in another sense, it helped determine their weakness." Participants also mentioned that the awareness of Multiple Intelligences traits made it "obvious; everyone learns differently." Another participant stated, "If you cater to their learning styles, per se, I think they will get more out of it." All eight participants indicated that Multiple Intelligences training helped them evaluate their students' learning strengths and potential accommodations to meet student learning needs.

Theme Two

Flight instructors would use Multiple Intelligences methods in the future. The participants indicated that information regarding how to determine a student's Multiple Intelligences traits and how to modify a lesson to utilize students' abilities would be useful in

future flight training activities. One participant, when asked if they would use Multiple Intelligences methods in future flight instruction said, “I sure would, because it’s important to help convey the ideas to students, because if they have a different method of learning, then, of course, it’s going to help them, or help you to teach them, if you know exactly what they favor.” Another participant stated, “I will use Multiple Intelligences methods because you’re going to get different sides and experiences that’ll collaborate into one. Um, you’re going to have different sides of the story, everyone’s going to have their angles, and you choose the best one that suits your needs.” All eight participants stated that they would use Multiple Intelligences methods in future training of flight students.

Theme Three

Instructors perceived themselves as better at their jobs after Multiple Intelligences training. All eight instructors indicated that the selection and implementation of appropriate instructional strategies are imperative when providing learning experiences that enhance students’ learning performance and outcomes. One participant stated, “I was always teaching my learning style because I knew it worked for me and it was easiest for me to understand. But I have tried to put it in words or in other methods that become easier for someone else to pick up on. I am more sensitive to it; I can pay more attention to it, especially with a new student.” Another participant noted, “I already used some of the ideas, but I did not realize it. I will continue to use these methods to help people out.” One participant also stated, “I have become more creative, I think overall it will help students, especially if you can cater to their learning style.” All eight participants indicated that Multiple Intelligences training made them better instructors.

Theme Four

FAA Certified Flight Instructor training lacks information regarding individual student differences and differentiation. All but one participant addressed the issue of FAA CFI training. The participants stated that the FAA training materials provided beneficial technical information regarding the skills required for flight training. They also reported that the FAA clearly describes the standards needed to complete the required training and to obtain a pilot certificate. However, participants felt that they had not been given strategies to present the FAA's required content. They also believed they had not been taught how skills could be taught through a variety of instructional methods. One participant commented, "Not every student is the same, so you're going to have to find different techniques to teach them. [That participant's instructor never provided additional information regarding how to vary methods of instruction.] They just state 'Do it' but they didn't tell you how." Another participant was a little more direct: "I'd say no, it probably didn't adequately prepare me for each person learning in different ways, nor did it even teach me how to identify that. One participant simply stated, "They pretty much showed me how to make a lesson plan and then said 'you will learn how to do it when you get some students'."

CHAPTER 5: CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Conclusions

The research questions were posited, in part, on the educational experiences of the researcher. He taught special needs learners and became aware of the individual learning differences of students. The success of each student was often determined by their teachers' ability to develop and implement instructional strategies that maximized individual students' learning styles and prior educational achievements successfully. Flight instruction is typically a one-on-one learning environment in which an instructor presents information in a manner that enable students to utilize their intelligence most effectively. Therefore, a flight instructor who is knowledgeable about Multiple Intelligences Theory may be able to use that knowledge to evaluate the nature of an individual student's area of intelligence and then use that insight to enhance the effectiveness of their instruction and their students' training. This study was designed to determine if instructors who were introduced to the nature of Multiple Intelligences categories subsequently; (a) perceived value in using multiple intelligence concepts, (b) perceived an improvement in student performance, and (c) perceived a reduction in barriers to effective instruction.

The purpose of this study was to examine flight instructors' perceptions of the influence that Multiple Intelligences teaching strategies may have on flight instruction and flight students' achievement. Purposeful sampling was used to select participants for one-on-one interviews and observations. Therefore, the participants did present a potential limiting dynamic in the data collection. However, the participants' demographics and willingness to provide candid responses

did not appear to be a limiting factor in the findings. The following research questions guided the study:

1. What are the perceptions of flight instructors regarding the use of Multiple Intelligences Theory in designing individual flight lessons?
2. How does using a variety of Multiple Intelligences-related instructional strategies assist in improving flight students' performance?
3. Do flight instructors perceive the use of Multiple Intelligences Theory and practice as an effective strategy to reduce instructional barriers to students' performance?

Qualitative data collection drawn from instructors' journals, interviews, and observations by the researcher facilitated an impartial investigation that revealed several common patterns and themes. Triangulation of the data was used to increase the reliability and validity of the results. The triangulation of the data identified the perceptions of flight instructors regarding the influential impact of Multiple Intelligences instructional strategies on flight students. Four themes emerged: (a) Multiple Intelligences training was helpful to understand students' abilities, (b) flight instructors would use Multiple Intelligences methods in the future, (c) instructors perceived themselves as better at their job after Multiple Intelligences training, and (d) FAA Certified Flight Instructor training lacks information regarding individual student differences and differentiation.

The need to ensure that flight students are achieving their highest potential regarding understanding, decision-making, and safety requires the use of effective instructional strategies that address diverse learning needs. Multiple Intelligences-related instructional strategies may assist in the improvement of flight instruction and flight students' performance. The foundation

for the following conclusions, limitations, and recommendations was derived from the findings and are outlined within each theme.

Theme One: Multiple Intelligences training was helpful to understand students' abilities. The participants noted the meaningful role Multiple Intelligences strategies held in their instruction. All participants expressed the importance of ensuring flight lessons were designed to match students' individual learning styles. The participants also noted that understanding the learning challenges of each student helped them to develop lessons that increased positive learning climates and experiences. The participants indicated that their enhanced understanding of Multiple Intelligences strategies made them aware of, and more sensitive to, each student's learning abilities and the realization that flight instructors were often teaching to their own personal learning style, not those of their students. Participants revealed that Multiple Intelligences strategies would make them better flight instructors. Furthermore, the participants stated that understanding Multiple Intelligences strategies made them more observant of students' strengths and challenges, therefore, enabling them to change their approaches to flight instruction for the individual needs of their students.

Theme Two: Flight instructors would use Multiple Intelligences methods in the future. All of the participants stated they would use Multiple Intelligences instructional methods in future flight instruction. Improving and sustaining each flight student's performance requires an ongoing effort to establish rapport with the student through various methods of communication, educational materials, and educational strategies. The participants believed Multiple Intelligences strategies allowed them to focus on students' strengths and, equally important, students' learning challenges. The Multiple Intelligences strategies helped the flight instructors to individualize their lessons to improve students' understanding and confidence

levels. The participants believed that Multiple Intelligences strategies helped them to teach concepts and skills more easily, and flight students' comprehension levels were higher. One participant stated that Multiple Intelligences strategies were very helpful in understanding cultural differences between Asian and American flight students. The participant also stated that Multiple Intelligences strategies helped to overcome language differences and allowed them to determine if the student had mastered important concepts. Another participant stated that Multiple Intelligences strategies helped determine if their student was comprehending and applying concepts or skills instead of just memorizing or copying the tasks.

Theme Three: Instructors perceived themselves as better at their job after Multiple Intelligences training. The results indicated that all participants agreed that the information provided to them enhanced their flight training. When participants were asked if the information provided to them about Multiple Intelligences Theory and methods would be useful to them during future flight instruction, they all stated that they would use Multiple Intelligences methods in future flight training. One participant said he would use Multiple Intelligences methods to help identify his students' strengths and challenges and to build their confidence levels. Another participant stated that Multiple Intelligences methods made him realize that everyone learns differently, and it caused him to become more sensitive to each of his students' abilities. An additional participant subsequently used Multiple Intelligences theories and methods to enhance their own methods of learning. The instructor and student developed a variety of learning aids, based on their learning styles, and used the strategies they believed would be most effective for the student to learn, retain, and apply skills. Other participants believed that Multiple Intelligences Theory and methods had helped them develop their ability to perceive a student's most effective learning methods by observing how they processed information provided by the

instructor. The participant stated that in the future, he would present information centered on his observations and refine his approach to providing information based on each student's performance.

Theme Four: FAA Certified Flight Instructor training lacks information regarding individual students' differences and differentiation. The results indicated that all but one participant felt that during their CFI training, they did not receive adequate training related to key differences in how students learn. Seven participants indicated that flight instructors were not taught how to modify lessons to accommodate student learning differences, particularly based on student strengths and challenges. Some participants indicated they were told that students learn at different levels and learning styles; however, they did not receive training on how to modify lessons to fit those learning styles. One participant stated that they were not adequately prepared to adapt teaching strategies for individual students' learning traits or how to identify students' learning differences. Another participant was simply taught to develop lesson plans and present them, which would be sufficient for their CFI training. A different participant was told to learn how to teach students on their own and develop better methods over time. The one participant who had divergent responses on this theme stated that the instructor who provided them with CFI training did include instruction on individual student learning differences and required them to teach techniques using a variety of strategies. The participant told their own students that they should provide multiple approaches to teaching in most of their lesson plans and instruction.

Implications

This study found evidence, through observations and one-on-one interviews, that the participants were able to design and implement lessons tailored to their flight students' learning styles. The participants also stated that they benefited from the understanding of Multiple

Intelligences Theory and would use Multiple Intelligences concepts and methods in future flight instruction. Accordingly, a major implication of this study is that the FAA needs to modify its standards to include improved awareness of learning differences for flight instructors. The FAA also needs to modify learning materials to reduce the knowledge gap around Multiple Intelligences Theory, concepts, and related methods. The participants' responses to the interview questions demonstrated that CFIs want and need improved instruction regarding individual student learning differences. FAA publications provide extensive detail regarding the mastery of rules, standards, and skills for flight students. However, the agency provides little to no guidance on how to teach these rules, standards, and skills, particularly for students with diverse learning needs.

Recommendations

Due to the methodology and the restriction to one geographic location, there are several limitations associated with this study. The results of this study are based on a small purposive sample. The sample used in this study consisted of only flight instructors in two instrument training courses in a major Midwestern university aviation program. The FAA allows individuals to obtain a private pilot airplane certificate at age 17 with no termination date on the certificate (FAA, 2018a), but those under age 18 were not permitted to participate in the study. Therefore, the sample used in this study likely did not represent all student pilot populations. Accordingly, the training and background of the GA pilot population are quite varied because there are no minimum educational requirements. Only a minimum number of mandated flight hours and training are required for certification.

Furthermore, the general pilot population exceeds 600,000 (FAA, 2018b). This study was based on a very small number of cognitively skilled participants who were self-selected for a

rigorous flight program. It is assumed that participants differed from the general pilot population in numerous unknown ways. Therefore, the findings of this study are not readily generalizable to the GA pilot population. Furthermore, although the FAA has published a detailed set of standards for conducting pilot performance tests, pilot performance testing is not completely objective. Some degree of subjectivity exists in practical testing and differences between evaluators.

Furthermore, the flight training device (Paradigm Level 5) used in this study was modified to duplicate the aircraft used by the students in their actual flights. The Paradigm Level 5 is a very effective training device; however, it cannot be assumed that the simulator accurately represented the actions of a real airplane. In addition to the flight training device, some instruction was delivered in an aircraft used by the flight school. Regardless, it is believed that the findings yield useful insight for the improvement of flight instruction. Although the findings of this study cannot be generalized to other flight instructors, they do provide useful information to guide future research.

Research conducted with a variety of students in multiple locations may provide results similar to, or substantially different from, the results obtained in the current study. The participants in this study were flight instructors from a rigorous university flight program. They all had completed or were close to completing a Bachelor of Science degree in Professional Flight. Therefore, research with a focus on non-university flight training, in geographically different locations, and with a wide range of ages among instructors and students is recommended. Future studies should be expanded to include flight students from non-aviation universities, commercial flight training companies, and local GA Fixed-Base Operations.

The findings and implications of this study lead to multiple recommendations, particularly regarding policy, practice, and research. First, CFI requirements should include a more in-depth focus on individual learning differences. This strategy could explore the understanding of Multiple Intelligences Theory as it relates to the use of one-on-one adult learning environments during flight instruction. Enhanced lessons focused on an individual student's learning strengths may improve those students' subsequent flight knowledge and skill level. Although Multiple Intelligences Theory is only one avenue to give flight instructors the necessary methods to understand their students' learning styles, the basic theory is relatively easy to understand and illustrate.

Secondly, instructors who are provided with multiple examples regarding how a lesson can be presented, will increase the possibility for improved comprehension for a greater number of students (i.e., universal design for learning). These multiple examples will allow instructors to develop a wider variety of approaches to take advantage of individual students' most effective learning styles. If a flight instructor adapts a lesson to the student's intelligence-type, it may improve the lesson's effectiveness for that student. Moreover, students who are encouraged to enhance self-awareness of personal learning styles have the potential to further develop and use them in the future. This self-awareness can lead to a long-term impact: the ability of students to advocate for effective, individualized learning experiences throughout their professional careers.

Theme One: Multiple Intelligences training was helpful to understand students' abilities. The results of this study imply that universities, colleges, and flight schools providing CFI training should address students' individual learning differences and how to accommodate them effectively. Multiple Intelligences strategies represent only one way to address learning differences. However, Multiple Intelligences Theory considers learning differences in terms that

can be addressed directly by non-education professionals. Therefore, Multiple Intelligences is a learning theory that can be taught to flight instructors who may have limited knowledge regarding learning theories.

This theme leads to several questions that should be addressed in future research and includes:

1. How important is Multiple Intelligences Theory for influencing flight instructors' perceptions about their students' abilities?
2. How can flight instructors determine their students' learning styles?
3. How do instructors use their insights when developing flight lessons tailored to their students' learning styles?
4. Are flight instructors' perceptions of the importance of Multiple Intelligences related to their effectiveness when accommodating students' Multiple Intelligences-related traits?
5. Is Multiple Intelligences Theory the best approach to understanding students' learning styles? What other educational theories can provide the greatest benefit to students?
6. What learning theories are feasible to integrate into flight instruction for instructors with limited education backgrounds and training?
7. What are the most effective strategies to teach flight instructors how to integrate Multiple Intelligences concepts into their flight instruction?
8. What is the relative impact of each Multiple Intelligences category (e.g., strengths and weaknesses for flight instructors and their students)?
9. What is the relationship between Multiple Intelligences-related accommodations and flight students' retention, attitudes, and success rates?

Theme Two: Flight instructors would use Multiple Intelligences methods in the future. Two actions may improve flight training for CFIs. First, a greater focus should be placed on the instructor's responsibility to determine individual flight students' learning styles. If instructors can determine the learning styles of their students, they can design lessons that utilize the students' strengths and improve comprehension of flight training concepts. Multiple Intelligences-related strategies can be integrated into tailored lessons that take advantage of students' strongest Multiple Intelligences categories. The concept of understanding individual differences in students should be introduced at the earliest stages of CFI training. There should also be an evaluation of each CFI candidate's understanding of student learning differences in both written and practical tests.

To align Multiple Intelligences-related concepts in flight training, the second action should focus on the development of training materials and examples that demonstrate the use of Multiple Intelligences strategies in a wide variety of flight training methods. The study participants indicated that Multiple Intelligences strategies informed their decisions regarding how to enhance their students' learning effectiveness. They also believed that Multiple Intelligences-related strategies improved their confidence by understanding how their students' learning and personality functioned. There are many government and private publications about flight instruction; most concentrate on the information that will be required for a student to pass written knowledge and practical flight tests. There is little to no significant focus on how to teach the required concepts and skills effectively.

This theme leads to additional questions for future research that includes:

1. Do flight students have positive, negative, or no reactions to having the nature of their Multiple Intelligences being utilized in instruction?

2. How effective are instructors at determining their students' Multiple Intelligences categories?
3. Which Multiple Intelligences strategies are the most effective for flight training programs?
4. How accurate are CFIs in using Multiple Intelligences determination procedures to assess students' Multiple Intelligences traits?
5. What are the most effective strategies for accommodating the various Multiple Intelligences traits of flight students?
6. What areas of flight knowledge are the most beneficial (or least beneficial) regarding the use of Multiple Intelligences accommodation strategies?
7. How do instructors determine the use of specific Multiple Intelligences accommodations in their flight instruction?

Theme Three: Instructors perceived themselves as better at their job after Multiple Intelligences training. Every two years, a flight instructor is required to complete a refresher course in person or online. In the future, this refresher course should be revised to include information regarding how to enhance instruction to use flight students' learning strengths effectively and recognize students' learning challenges. The current refresher course provides 16 hours of training; it is more than an adequate amount of time to include Multiple Intelligences-related methods for current flight instructors and to enhance participants' awareness of Multiple Intelligences-related learning differences. The third theme leads to the following future research questions:

1. Why do instructors believe Multiple Intelligences training improves their instructional ability?

2. What impact does Multiple Intelligences training have on flight students?
3. What methods do instructors use to implement Multiple Intelligences training with their flight students?
4. What impact does flight instructors' Multiple Intelligences training have on the development of their lesson plans for individual students?

Theme Four: FAA Certified Flight Instructor training lacks information regarding individual students' differences and differentiation. The FAA should include an explanation of individual learning differences in their *Fundamentals of Instruction* publication. The FAA's Certified Flight Instructor practical test should include an emphasis on instructional strategies that accommodate students' learning differences effectively. CFI training should include strategies for differentiating (i.e., modifying) lessons and require CFI students to create lessons that use differentiation to teach specified concepts and information.

This theme leads to several future research questions:

1. What instructional techniques are used most effectively during flight training?
2. Who provides CFIs with instructional materials?
3. How do CFIs present materials and information?
4. By what means or format are instructional materials accessed by flight students?
5. Is it beneficial for the FAA to provide more in-depth information about student learning differences?

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APPENDIX A: MULTIPLE INTELLIGENCES THEORY PARTICIPANT INFORMATION PACKET CONTENT

Reading Materials

The reading materials came from Armstrong (1994); specifically, the chapters listed below.

Armstrong, T. (1994). *Multiple intelligences in the classroom*. Alexandria, VA: Association for Supervision and Curriculum Development.

Overview: Teaching for Multiple Intelligences: A New Look at the Curriculum (pp. 18-41)

Chapter 5: Multiple Intelligences and Curriculum Development (pp. 48-64)

Chapter 6: Multiple Intelligences and Teaching Strategies (pp. 65-85)

Chapter 7: Multiple Intelligences and the Classroom Environment (pp. 86-95)

YouTube Video

A 45-minute video demonstration in an elementary school classroom. The demonstration provides examples of a teacher using Multiple Intelligences Theory to develop individual lessons for the students in the room.

Online Module

The online module was a self-assessment of the type of Multiple Intelligence demonstrated by the user.

APPENDIX B: MODIFIED MULTIPLE INTELLIGENCES SURVEY (MULTIPLE INTELLIGENCES)

Directions: People differ in their ways of learning and knowing. These differences are called Multiple Intelligences. Below is a list of 27 items in 3 sets that relate to each type of Multiple Intelligence. Some of these will apply to how you like to learn, and others will not.

Ranking: There are nine items in each group. For each of the three groups, rank the items according to how they apply to you. Put a 1 next to the item that is most like you. Put a 2 next to the item that is second most like you. Do this for each item until you have numbered every item with a number from 1 to 9. The item least like you should be 9. Do not use a number more than once in each group.

Rank each of the following 9 items from 1 to 9.

	I live an active lifestyle. (Item 1)
	Meditation exercises are rewarding. (Item 2)
	I am a "team player." (Item 3)
	Fairness is important to me. (Item 4)
	Structure helps me be successful. (Item 5)
	I enjoy many kinds of music. (Item 6)
	My home has a recycling system in place. (Item 7)
	I keep a journal. (Item 8)
	I enjoy doing three dimensional puzzles. (Item 9)

Rank each of the following 9 items from 1 to 9.

	I enjoy outdoor games. (Item 10)
	Questions about the meaning of life are important to me. (Item 11)
	I learn best interacting with others. (Item 12)
	Social justice issues concern me. (Item 13)
	I get easily frustrated with disorganized people. (Item 14)
	I have always been interested in playing a musical instrument. (Item 15)
	Animals are important in my life. (Item 16)
	I write for pleasure. (Item 17)
	I can recall things in mental pictures. (Item 18)

Rank each of the following 9 items from 1 to 9.

	I like working with tools. (Item 19)
	I enjoy discussing questions about life. (Item 20)
	Things such as clubs and extracurricular activities are fun. (Item 21)
	I learn best when I have an emotional attachment to the subject. (Item 22)
	Step-by-step directions are a big help. (Item 23)
	Remembering song lyrics is easy for me. (Item 24)
	Hiking is an enjoyable activity. (Item 25)
	Foreign languages interest me. (Item 26)
	I can imagine ideas in my mind. (Item 27)

APPENDIX C: MULTIPLE INTELLIGENCES SURVEY (MULTIPLE INTELLIGENCES) SCORING

Scoring the Multiple Intelligences: Add your ranking for the 27 items on the Multiple Intelligences according to the following table. Your lowest score is your preferred Multiple Intelligences (Multiple Intelligences) area.

Bodily/Kinesthetic		Existential (removed for current study)		Interpersonal	
Item 1		Item 2		Item 3	
Item 10		Item 11		Item 12	
Item 19		Item 20		Item 21	
Total		Total		Total	
Intrapersonal		Logical-Mathematical		Musical	
Item 4		Item 5		Item 6	
Item 13		Item 14		Item 15	
Item 22		Item 23		Item 24	
Total		Total		Total	
Naturalistic		Linguistic		Spatial	
Item 7		Item 8		Item 9	
Item 16		Item 17		Item 18	
Item 25		Item 26		Item 27	
Total		Total		Total	

My Multiple Intelligences Area Preferences

1. My most preferred Multiple Intelligences area (My lowest score)	
2. My second most preferred Multiple Intelligences area (My next lowest score)	

APPENDIX D: INTERVIEW DISCUSSION

All participation in this interview is voluntary and anonymous. Thank you for your participation.

1. Provide examples on how an instructor could use words, verbally or in writing to convey concepts about flying.
2. Provide examples on how an instructor could use logic in conveying flight concepts; i.e., creating problems, patterns, processes about flying skills.
3. Provide examples on how an instructor could use imagery in conveying flying skills in the form of mental or actual drawings or video screens.
4. Provide examples on how an instructor could use rhythm or melody, as in music or cadence, in conveying flying concepts.
5. Provide examples on how an instructor could use body language to convey flight skills.
6. Provide examples to illustrate how an instructor could use collaborative activities with students in conveying flight concepts, e.g., discussions brainstorming, shared experiences, drawing conclusions, analogies, or generating alternative views on similar subjects.
7. Provide examples on how an instructor could provide opportunities for reflection and introspection in conveying flight concepts.
8. Provide examples on how an instructor could identify and categorize uniquenesses and differences or refer to natural elements as in seasonal changes in conveying flying concepts.
9. Do you believe the information provided about Multiple Intelligences will help you be a better flight instructor in the future?
10. Do you believe your initial CFI training provided adequate information about how to present flying concepts to individual students?