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Obstacles Non-Native English Speakers Experience
in Aviation Training

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Honors Project

Submitted to the Honors College at Bowling Green State University in partial fulfillment of the
requirements for graduation with University Honors

April 30, 2018

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Acknowledgement

I would first like to thank my project advisors- Catherine Smith and Rebecca Warner for their valuable guidance, dedication, and encouragement throughout this entire process.

To the faculty and staff in the Honors College at Bowling Green State University- thank you for giving me the opportunity to enhance my college experience through my honors classes and the Honors Project.

To my mother – thank you for the utmost optimism, love, and support throughout these past four years, and more importantly throughout this project.

To my father – thank you for helping me overcome anything that comes my way. All of my achievements and accomplishments are for you.

Abstract

The purpose of this study was to determine if there are challenges associated with the comprehension of aviation content in the English language for international students in flight training. The researcher conducted a study by interviewing four international students enrolled in flight training at the Bowling Green State University Aviation Studies program utilizing a qualitative and quantitative survey questionnaire. Results revealed that there is a correlation between an international student's Interagency Language Roundtable (ILR) score and the challenges encountered with effective communication. The discussion and subsequent findings revealed connections between ILR scores and perceived student challenges. Additional connections between the International Civil Aviation Organization (ICAO) Language Proficiency Requirements and the challenges identified by the international students were confirmed. Limitations included the researcher's emphasis on qualitative rather than quantitative data affecting perceived objectivity and the small sample size which contributed to the limited responses and representation of demographics. Meaningful connections were revealed by examining the relationship between an international student's ILR score and the resulting challenges to facilitate effective communication skills.

Keywords: communication, flight training, international student, language

Introduction

The aviation industry is a fast-growing, advanced sector within our society that helps transport people and goods globally. From the primitive start of aviation in the late 18th century, many things have changed. Aircraft have become more sophisticated- they are faster, larger, and more automated. One thing that has not changed, however, is the need for effective communication. Communication is imperative for effective interactions in this world. Communication can be as simple as saying “hello” to someone sitting next to you on the bus, or as advanced as a professor teaching quantum physics. Communication comes in a multitude of mediums- to include but not limited to oral, written, nonverbal and artistic. Without effective communication, who knows how advanced (or primal) our society would be. As within most fields of study, in order to successfully operate in the aviation industry, people must be able to properly communicate- whether it be intrapersonal or interpersonal.

English is one of the most widely-spoken languages and is the “language of aviation”. Pilots must be able to speak English in order to operate successfully within our National Airspace System, and other airspaces around the world. The Federal Aviation Administration (FAA) further defines language requirements that pilots must meet to operate within the airspace system. The FAA annually publishes the “Federal Aviation Regulations” (FAR); a book of aviation rules and regulations. One of the many regulations listed within this book is the requirement and capability of pilots to demonstrate English language proficiency. The FAA states that, “an individual who holds an FAA certificate or an applicant for an FAA certificate or rating, per the eligibility requirement of the respective certificate, should continuously demonstrate the ability to read, write, speak, and understand the English language” (Federal

Aviation Administration, 2017). Furthermore, the FAA mandates that “the holder of an FAA certificate or applicant for an FAA certificate or rating must be able to communicate in English with air traffic control (ATC), pilots, and others involved in preparing an aircraft for flight and operating an aircraft in flight. This communication may or may not involve the use of the radio” (Federal Aviation Administration, 2017). The FAA requires the pilot applicant be able to read, speak, write, and understand the English language (Federal Aviation Administration, 2017).

There are nearly 600 languages spoken around the world, aviation only utilizes one; English. Learning any language takes months and years, through exposure, practice, trial and error, and formal instruction (Koprowski, 2016). Most fields of study have their own vocabulary and field-specific language- aviation is no different. Comprehension of aviation-specific English is imperative for safety and effective communication, even more so now that the demand for pilots has increased globally. What impact do these English requirements have on international flight students whose native language is not English? This is the basis of the research question.

Research Question

The research question is “to determine if there are challenges associated with the comprehension of aviation content in the English language for international students in flight training”.

Literature Review

Research shows that communication errors can lead to aviation incidents and accidents. In a study titled “Miscommunication in General Aviation: The Influence of External Factors on Communication Errors”, Molesworth and Estival (2015) explain how miscommunication in aviation remains a serious threat to safety (Molesworth & Estival, 2015). In aviation, there is a

common phrase regarding task management and what pilots should do in chronological order-aviate, navigate, communicate. Aviate- meaning pilots should have positive control of the aircraft at all times. Navigate- meaning, once positive control is maintained, they should now focus on navigating the aircraft. Communicate- the last part of this phrase, meaning once the pilot is flying the aircraft in the direction they wish or are told to go, they should focus on communicating their position and intentions to other pilots and aircraft in the worldwide airspace system. While this process ensures that a pilot always maintains aircraft control and situational awareness, could this lead them to underestimate the need to prioritize effective communication?

Molesworth and Estival state that having four or more items in one radio transmission degraded communication performance, especially for pilots under high workloads (Molesworth & Estival, 2015). Eliminating prosodic features, such as pauses in radio transmissions, also increased communication errors; most notably for pilots whose native language was not English. This research includes three main highlights (Molesworth & Estival, 2015):

- Miscommunication features prominently in many aviation accidents
- External factors can influence communication accuracy (such as fluency)
- Prosodic features of ATC transmission adversely affect non-native English speakers (ESL) pilot communication accuracy

Other studies, such as “Misunderstandings in ATC Communication: Language, Cognition, and Experimental Methodology” (2013) explain that there is a complex combination of factors between both air traffic controllers and pilots (e.g. speech rate, controller message length, English language proficiency, cognitive workload) believed to contribute to miscommunications

between such controllers and pilots (Barshi et al., 2013). The authors note that many miscommunications occur between ATC and native-English speakers, and even more so with non-native English speakers. Each of the three factors listed above influence how many miscommunications occur and the severity of each.

Of significant importance is *how* the FAA determines if an applicant meets all the requirements of being able to read, speak, write and understand the English language. The International Civil Aviation Organization (ICAO), a branch of the United Nations, regulates aviation internationally, including radio communication and phraseology (Alderson, 2009). ICAO established English as the language of aviation. They have developed a set of language proficiency requirements (LPRs) which is to be used both as the basis for test construction and for the rating of language proficiency for both pilots and air traffic controllers. On a 6-level scale, each applicant must reach a minimum of level 4 to be eligible for licensure. According to the article, descriptions of level 4 parameters are listed below (Alderson, 2009):

- Pronunciation - assumes a dialect and/or accent intelligible to the aeronautical community.
- Structure - relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.
- Vocabulary - range and accuracy are usually sufficient to communicate effectively on common, concrete and work-related topics.
- Fluency - produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication.

- Comprehension - responses are mostly accurate on common, concrete and work related-topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.
- Interactions - responses are usually immediate, appropriate and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming or clarifying.

These concrete parameters help ICAO determine if someone meets the language requirements for pilot certification.

Method

For this study, the researcher identified a population of eleven international students pursuing flight training in Bowling Green State University's Aviation Studies program. Based on study volunteers, the research sample included four subjects. The first subject ("subject A"), from a European country, is a student pilot. Subject B, from the Caribbean region, is a private pilot with an instrument rating. The third and fourth subjects ("subject C" and "subject D", respectively) are from a Middle Eastern country, and both have their Private Pilot licenses. This sample of students represents varying levels of experience and licensure, as well as students from varying regions of the world.

Each subject was invited to participate in this research. Once they agreed to participate, they each read and signed a consent form explaining the entirety of the research and how it could potentially benefit the aviation community. The questions that were asked are included

below (see Appendix A). This research was primarily qualitative based, however, question 4c was a quantitative assessment item- asking subjects to rate their English fluency using the ILR scale- scoring their reading, writing, speaking, and understanding from 0 to 5. The emphasis on a predominantly qualitative research methodology was deliberately utilized by the researcher to facilitate the subject's response in communicating challenges they personally faced and their corresponding resolution. Additionally, since the subjects were not only asked to rate their challenges quantitatively but also qualitatively, this data will further assist the aviation community in gaining an understanding of the possible challenges international students encounter in flight training.

While formulating a primarily quantitative survey might have provided for increased objectivity, the researcher determined that limiting qualitative information would have limited the overall understanding of study results. Conducting face-to-face interviews to solicit qualitative data allowed the researcher to gain valuable information and personal anecdotes. This methodology also allowed for the subjects to relay their emotions and feelings on the subject- further ensuing a "bigger picture".

Results

Based on the interview questionnaire, the researcher was able to survey the subjects on quantitative and qualitative standpoints. Graph A depicts subjects and their corresponding ILR fluency values for reading, writing, speaking, and understanding English. Survey data revealed a correlation between subjects' scores and effective communication. Where subjects' mean scores were high, effective communication was less of a challenge. However, where subjects' mean scores were low, effective communication was more of a challenge. Subject D with the lowest mean ($m=3.5$) personally experienced more effective communication challenges than

Subject B, who had the highest mean (m=5). This data supports that higher ILR scores resulted in fewer effective communication challenges.

Table A represents a summary of challenges and resolutions identified by single or multiple subjects in response to the interview questionnaire.

Graph A

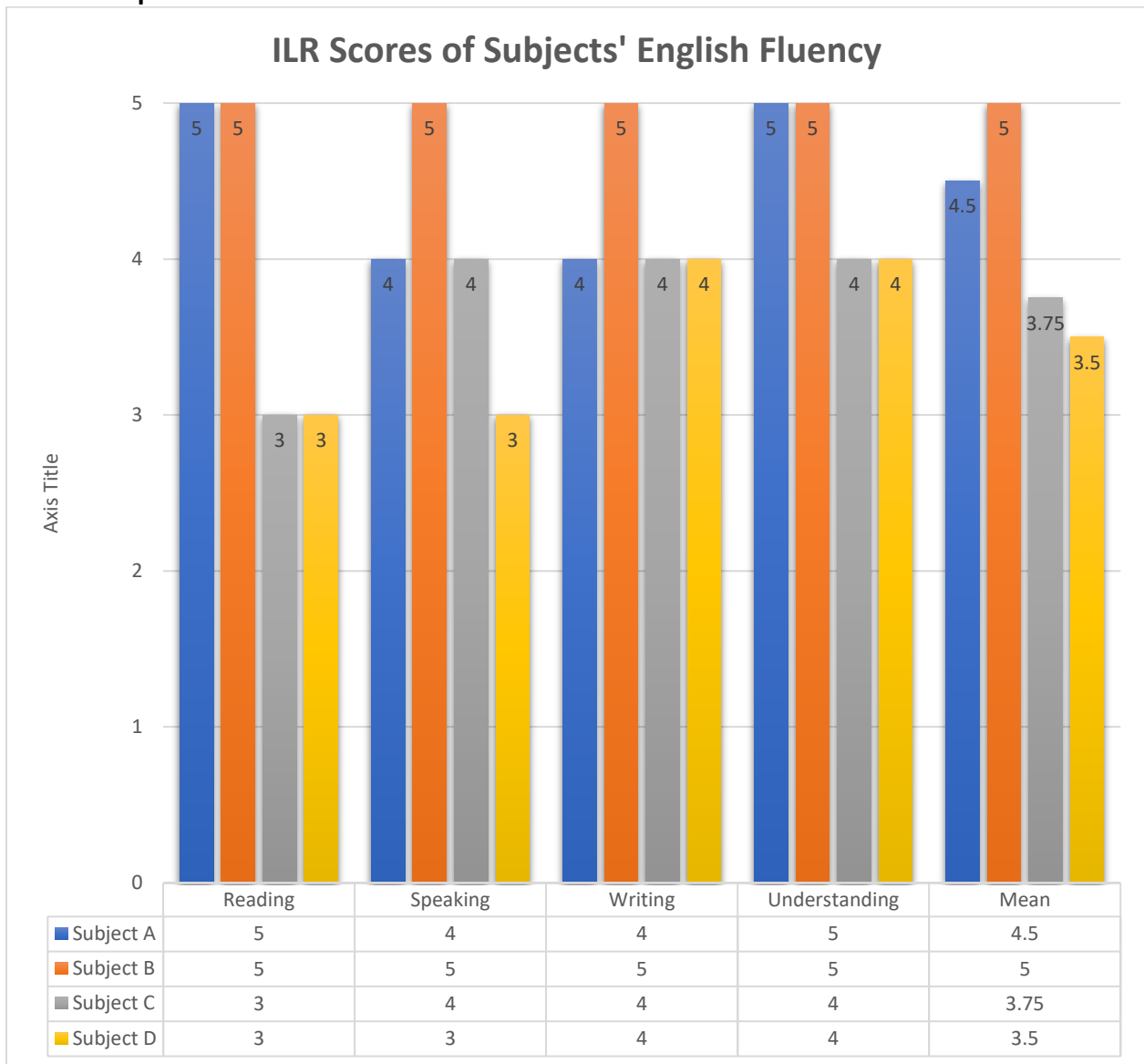


Table A

Subjects' Challenges and Their Respective Resolutions

Scenario	Challenge	Resolution
I	Difficulty learning and memorizing aviation acronym's and vocabulary	Needed to spend more time studying in addition to receiving extra help from flight instructors and professors
II	Thick accent made it more difficult for others to understand subject	<ul style="list-style-type: none"> - Focus more on word pronunciation - Living in the U.S. and being immersed in the culture slowly lessened the harshness of accent
III	Ensuring safety (people understanding them on radios)	<ul style="list-style-type: none"> - Focus more on word pronunciation - Living in the U.S. and being immersed in the culture slowly lessened the harshness of accent
IV	Ensuring there was a sense of belonging and being comfortable	Had to actively "tailor their accent" to become more understandable
V	People speaking too fast – both with radios, over the phone (e.g. weather briefer) and in-person interactions	Ask instructor for help

Discussion

Based on the results of the interview questionnaire, the hypothesis that a connection between ILR scores and challenges in effective communication was confirmed. Knowing a student's ILR scores could offer flight instructors more insight of a possible challenge to effective communication. Based on the researcher's experience of being a flight instructor, it is imperative to match an effective instructional style to the student's learning style. It is the instructors job to communicate effectively to ensure that the student fully comprehends the concepts, equations and principles that are being taught.

Scenario I examined the difficulty of learning and memorizing aviation acronyms. Similar to other fields of study, aviation requires the student to gain proficiency in technical content. A technique used to learn large amounts of information is chunking, which is defined as "segmenting a sequence of elements into blocks, or chunks, [where] information becomes easier to retain and recall in the correct order" (Fonollosa et al., 2015). Acronyms are a form of chunking, whereby the student replaces words that need to be memorized into a more cohesive unit (e.g. one word) to aid in remembering the information. Examples of aviation acronyms include DECIDE (**D**etect, **E**stimate, **C**hoose, **I**dentify, **D**o, **E**valuate), PAVE (**P**ilot, **A**ircraft, **e**n**V**ironment, **E**xternal pressures), AROW (**A**irworthiness, **R**egistration, **O**peration and limitations, **W**eight and balance), to name a few. This form of chunking helps students internalize many of the principles that are imperative for their flight training. Since this challenge was identified by half of the subjects, it would suggest additional solutions are necessary.

Scenario II reveals the challenge a thick accent has on a student in flight training. Listening to a person who has a different accent than your own can be difficult at times, depending on how thick it is. Subject B stated “it’s just something I had to learn, because I kept realizing that people always kept asking me to repeat myself, always. I was afraid that it would translate [to] somebody not being able to understand what I said on the radio, and you know, that could lead to a safety issue... or something bad” (Subject B, personal communication, April 22, 2018). When the researcher asked what the resolution to this challenge was, the subject stated they actively focus on their pronunciation. This reinforces one of the six parameters that ICAO has established for their Language Proficiency Requirements. The subjects reported their accent became more “watered down” the longer they were in the United States, similar to people who are immersed in a country other than their own. Subjects also stated they would feel uncomfortable at times because they would say something, and their instructor wouldn’t be able to fully understand what they said. “I could tell they were trying to make me comfortable with my accent, but at the same time there are certain ways that they wanted things to be said, just for the sake of people understanding me” (Subject B, personal communication, April 22, 2018). A subject mentioned that as much as their instructor tried to make them feel comfortable in the learning situation, it was still evident that some things need to be said in a prescribed manner to maintain the uniformity of aviation phraseology. In essence, the instructor places reinforcement on structure in aviation communications where necessary. What additional resolutions exist for this challenge? For example, BGSU’s Aviation Studies program utilizes a multi-faceted approach when teaching and improving radio phraseology and communication. One aspect of this approach is requiring flight students to

enroll in AERT 2240: *Air Traffic Control & The National Airspace System* which focuses on the National Airspace System and how pilots operate within it. Another aspect of this approach is using repetition in the flight lab instruction when rehearsing radio transmissions to gain proficiency and to foster effective communication skills. These approaches are helpful to both domestic and international students in flight training.

Where scenario II highlighted accent, pronunciation and structure aspects, scenario III speaks to ensuring safety and the concept of people understanding the international student over the radio. Subject B indicated that it was sometimes hard for people to understand them during radio communications and felt this could lead to potential safety issues. Fluency and comprehension play an integral role in the student being able to understand the aviation phraseology and the tempo of radio transmissions. There is a structure and content to each radio transmission in aviation. Air Traffic Control is responsible for ensuring traffic separation between aircraft through the use of radio communications. A traffic alert issued over the radio might sound like the following example "N544HY, traffic, 2 o'clock, 5-thousand feet, 4 miles, southbound". There are two things each pilot must perform- they must first comprehend that there is a traffic alert at their two o'clock, four miles ahead of them, at five thousand feet, and that the plane is traveling southbound. The second task is to then respond with the correct phraseology, letting ATC know that either they do have positive visual contact of the other aircraft, or they do not. International flight students must have the ability to comprehend every transmission ATC issues, and also reply in a clear and concise manner, to ensure traffic avoidance. Communications lacking comprehension, interaction, fluency, or structure could lead to safety issues.

Scenario IV highlights the students need to have a sense of belongingness and feeling comfortable in a learning environment. Maslow's hierarchy of needs plays a critical role in a student feeling comfortable in their flight training environment. These range from basic human needs of survival to the most advanced need of fulfillment. The order is as follows: physiological, safety, love and belonging, esteem, and self-actualization (Barnes, 2000). This scenario discusses the third level of Maslow's hierarchy- love and belonging. Love and belonging is desired "if both the physiological and the safety needs are fairly well gratified" and people will now search "for affectionate relations with people in general, namely, for a place in their group, and they will strive with great intensity to achieve this goal" (Barnes, 2000). A subject in this study feared that their accent was preventing them from feeling a sense of belongingness, and as a result, they actively tailored their accent in order to meet the needs of this level of the hierarchy. In response to this challenge, the subject was able to improve interactions, resulting in more effective communication.

Scenario V, the final challenge, results from students finding a difficulty with the tempo at which communications were taking place in their aviation training. The subjects struggled with understanding aviation vocabulary at a normal pace utilized by air traffic controllers, other pilots, and weather briefers, for example. When the subject was asked what their resolution was to this challenge, they said they would "ask the instructor what they said. The more he did it, the more I got used to [the speed]" (Subject D, personal communication, April 27, 2018). This subject also stated that once they were able to *anticipate* what other pilots and air traffic controllers were going to say, the challenge of fast-paced speech was diminished.

Limitations and Future Study

A limitation of this research study is the small population of international students currently enrolled in flight training in Bowling Green State University's Aviation Studies program, resulting in a smaller survey sample. Future studies could be performed using other flight training programs beyond the population of international students in BGSU's Aviation Studies program. As a result of the sample only including four volunteers, this survey should be repeated utilizing a larger population, seeking a broader demographic scope with subjects ensuring statistical validity of the results.

Additional survey instruments could be developed to increase the objectivity of results. Due to the qualitative nature of the survey questionnaire, objectivity is another perceived limitation of this research. Having more subjects would likely increase both quantitative (e.g. ILR scores) and qualitative (challenges reported by subjects) data, therefore bringing overall survey results objectivity and validity. Future study might also include survey and analysis of the extent to which pilot experience is a factor in communication effectiveness or miscommunication issues.

Conclusion

This study sought "to determine if there are challenges associated with the comprehension of aviation content in the English language for international students in flight training". Although participation was a limiting factor, the researcher was able to survey, analyze, and report meaningful results.

Referencing the ICAO standard for English language eligibility, each of the six parameters were relevant within all challenges identified by the subject's. Vocabulary was an issue, associated with the challenge of learning aviation acronym's in order to gain proficiency

in technical content. Subject's identifying difficulties arising from their accent, supported the resolution requiring additional structure and pronunciation. Fluency and comprehension were critical to the subject being able to understand the proper phraseology, tempo, and structure of radio transmissions in aviation. Interaction was critical in allowing the subject to appropriately navigate the communication necessary for flight training as well as fostering a sense of belongingness in the learning environment.

This research suggests aviation instructors should consider the relationship between an international student's ILR scores and the resulting challenges. Moreover, the theory and resolutions identified in the study's results can provide a greater awareness of the best instructional approach to ensure effective communication in flight training. Understanding the challenges associated with effective communication and the resulting adaptation of instructional styles will allow international students to become more effective communicators and better pilots.

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Appendix A. – Interview Questions

1. How old are you?
2. Which race do you identify with?
3. Which ethnicity do you identify with?
4. What is your first language?
 - a. Which and how many languages do you know?
 - b. How many years have you been studying English?
 - c. How fluent would you consider yourself with the English language?
 - Use the *Interagency Language Roundtable scale (see below)*
 - Ask student to determine their scores with reading, speaking, writing, and understanding, individually.

	ILR Level 0	ILR Level 1	ILR Level 2	ILR Level 3	ILR Level 4	ILR Level 5
Reading						
Speaking						
Writing						
Understanding						

5. Why did you enroll in flight training?
6. Upon entering your first semester at BGSU, what challenges have you personally encountered in your flight training and what was your resolution to those challenges, specifically with reading, speaking, writing, and understanding English.

Scenario	Challenge	Resolution
I		
II		
III		

Appendix B. – Interagency Language Roundtable Levels and Descriptions

ILR Level	Short Description	Extended Description
0	No Proficiency	Unable to function in the spoken language. Oral production is limited to occasional isolated words. Has essentially no communicative ability. Able to satisfy immediate needs using rehearsed utterances. Shows little real autonomy of expression, flexibility or spontaneity. Can ask questions or make statements with reasonable accuracy only with memorized utterances.
1	Elementary Proficiency	Able to satisfy minimum courtesy requirements and maintain very simple face-to-face conversations on familiar topics. A native speaker must often use slowed speech, repetition, paraphrase, or a combination of these to be understood by this individual. Similarly, the native speaker must strain and employ real-world knowledge to understand even simple statements/questions from this individual. This speaker has a functional, but limited proficiency.
2	Limited Working Proficiency	Able to satisfy routine social demands and limited work requirements. Can handle routine work-related interactions that are limited in scope. In more complex and sophisticated work-related tasks, language usage generally disturbs the native speaker. Can handle with confidence, but not with facility, most normal, high-frequency social conversational situations including extensive, but casual conversations about current events, as well as work, family, and autobiographical information.
3	General Professional Proficiency	Able to speak the language with sufficient structural accuracy and vocabulary to participate effectively in most formal and informal conversations in practical, social and professional topics. Nevertheless, the individual's limitations generally restrict the professional contexts of language use to matters of shared knowledge and/or international convention. Discourse is cohesive. The individual uses the language acceptably, but with some noticeable imperfections; yet, errors virtually never interfere with understanding and rarely disturb the native speaker.
4	Advanced Professional Proficiency	Able to use the language fluently and accurately on all levels normally pertinent to professional needs. The individual's language usage and ability to function are fully successful. Organizes discourse well, using appropriate rhetorical speech devices, native cultural references and understanding. Language ability only rarely hinders him/her in performing any task requiring language; yet, the individual would seldom be perceived as a native. Speaks effortlessly and smoothly and is able to use the language with a high degree of effectiveness, reliability and precision.
5	Functionally Native Proficiency	Speaking proficiency is functionally equivalent to that of a highly articulate well-educated native speaker and reflects the cultural standards of the country where the language is natively spoken. The individual uses the language with complete flexibility and intuition, so that speech on all levels is fully accepted by well-educated native speakers in all of its features, including breadth of vocabulary and idiom, colloquialisms and pertinent cultural references.

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