

University of Memphis

## University of Memphis Digital Commons

---

Electronic Theses and Dissertations

---

4-14-2017

### A Study of College Professors' Perceptions of International Students in STEM Classrooms at a Technical University

Barbara Feeney Abendschein

Follow this and additional works at: <https://digitalcommons.memphis.edu/etd>

---

#### Recommended Citation

Abendschein, Barbara Feeney, "A Study of College Professors' Perceptions of International Students in STEM Classrooms at a Technical University" (2017). *Electronic Theses and Dissertations*. 1608.  
<https://digitalcommons.memphis.edu/etd/1608>

This Dissertation is brought to you for free and open access by University of Memphis Digital Commons. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of University of Memphis Digital Commons. For more information, please contact [khggerty@memphis.edu](mailto:khggerty@memphis.edu).

A STUDY OF COLLEGE PROFESSORS' PERCEPTIONS OF  
INTERNATIONAL STUDENTS IN STEM CLASSROOMS  
AT A TECHNICAL UNIVERSITY

by

Barbara Feeney Abendschein

A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

Major: English

The University of Memphis

May 2017

Copyright© Barbara Feeney Abendschein

All rights reserved

## Dedication

*To three men named John R. Feeney*

*father, brother, and nephew*

for your unflagging encouragement and love

never doubting that I could manage

this twilight accomplishment:

*truly an Abendschein moment!*

## **Acknowledgements**

I welcome this opportunity to recognize the many colleagues at Embry Riddle Aeronautical University who made my doctoral work possible: Dr. Donna Barbie encouraged me to apply for university support and wiped the clouds of doubt from my sky whenever they loomed, Linda Larkin tamed the bureaucracy for me with cheerful efficiency, Drs. Libbie Searcy and Jennifer Wojton backed my efforts consistently, Dr. Lindsey Ives opened intellectual doors for me, served on my committee, and let me know I was “hard to replace” (I loved hearing that and look forward to making it unnecessary for a long time!), Professor Mike Perez took my ability to do this so much for granted that it amazed even me. Dr. William Grams kindly let me know a change in administration would not threaten my plans. M.B. McLatchey and Teri Gabriel coached me through the IRB process. My colleagues in the HU/COM Department were genuinely encouraging, even when I thought I had bitten off more than I could chew. The participants in my study (you know who you are) kindly gave me access to their time and thoughts, making this qualitative study possible. My students at ERAU, Daytona State College, and Northern Virginia Community College taught me more than they will ever know.

My friend and colleague Professor Ron Serra introduced me to the University of Memphis, and Dr. Charles Hall convinced me (erroneously as it turned out) that I could complete the program online. By the time I learned a full-time year of study was required, I had met Dr. Teresa Dalle who heads the Applied Linguistics Department with gentle efficiency, completed a course in ESL Reading with Dr. Emily Thrush (who became my committee chair), and realized that what I had written in my application letter was absolutely true: this program was a perfect match for my professional goals. Dr. Susan Nordstrom taught me how to do qualitative research

in the hardest most rewarding course I ever took. Dr. Jeffrey Scraba scaffolded prospectus instruction making a seemingly impossible task surprisingly doable. Dr. Angela Thevenot inspired a course I will teach in the future, and Dr. Rebecca Adams has interested me in collaborative research. My committee members (Dr. Emily Thrush, Dr. Teresa Dalle, Dr. William Duffy, and Dr. Lindsey Ives) gave me just enough direction and needed encouragement. The value of their work on my behalf would be hard to calculate. Sarah Ellis tamed the paper-chase monsters, dissipating my stress in her sea of cheerful calm.

I would never have gotten here without early recognition from Dr. Nancy Lind of Illinois State University who saw a spark of ambition in a senior student and fanned it with my first academic recognition award. The linguistics professors at George Mason University, including Drs. Steven Weinberger, Doug Wulf and the late Charlie Jones, fed my love of language. I still think of lights they turned on for me.

I am grateful for the good wishes of my friends, Marilyn Munson, Barbara Hammerbeck, Richard Seivert, Dennis and Julie Gagne, Jochem Riehm, and Sandra Methven, as well as long-time buddies Eileen Flaherty, Peggy Noone, Eileen and Jack Peters, Mary Moreland, Sheila Reilly, Judy Olenik, Margie Malone and Kathy Guckenberger. Many of my life supporters are no longer among us. My parents would have loved this. They would have told their friends on Sigsbee Road. My late husband Ken (or Andreas as they liked to call him in Austria) would not have been surprised. His psychic support is behind many of my little life victories.

And I did not fail to notice the patience with which José accepted delayed and shortened walks and a few months in a somewhat cold place without his own backyard. Wagging tail and wet kisses greeted my every return, and he found a place to curl up waiting for me to finish

transcription, composition, and revision during what must have seemed like a long time for a critter who lives in the perpetual present.

## Abstract

Abendschein, Barbara Feeny. Ph.D. The University of Memphis. May, 2017. A Study of College Professors' Perceptions on International Students in STEM Classes at a Technical University: A Case Study. Major Professor: Dr. Emily Thrush.

This study investigated the perceptions of STEM professors at a Southeastern technical college about the international students in their undergraduate classrooms, including impact on the learning environment, academic abilities and proficiency in meeting course goals, contribution to class activities and recommendations for improved preparation. Data were gathered from semi-structured interviews with nine full-time STEM teachers and review of documents provided by these professors, including copies of student writing with teacher feedback, typical writing prompts (or examination questions) and course syllabi. Using thematic analysis to tease meaning from data, I allowed meaning to emerge from interview testimony and counterbalanced that information with evidence from provided documents.

Major findings included the following:

1. International students are perceived as neither better nor worse academically:
  - a. a few of them excel, as reported by teachers who acknowledge some cultures value math and science more than others
  - b. bell curves of student grades are normal
2. The few non-native speakers who exhibit writing and speaking challenges are accommodated quite naturally by professors and almost always by teammates, with emphasis on the practical application of written and oral work
  - a. Differences are apparent between writing teacher perspectives provided in anecdotal evidence and those reported in ESL literature in this regard



3. Contributions of unique non-Western examples and home-country influenced motivation leading to innovative projects are appreciated and celebrated, but most contributions come from students who are mature, experienced, studious and outgoing no matter their nationality or first language, and
4. Writing deficits and lack of “transfer” are seen as universal, far from confined to students who did not grow up speaking English.

One professor’s comment seems to encapsulate the general attitude about international students at this campus: “They fit in.” Findings contradict predictions that L2 writers would underperform their American classmates but are in harmony with Writing across the Disciplines literature and practice. This case study might be reassuring to international students and supportive of an emerging WID program at the university as well as similar approaches in STEM higher education.

## Table of Contents

Chapter		Page
1	Introduction	1
	Theoretical Framework	3
	Statement of the Problem and Research Questions	4
2	Literature Review	7
3	Methodology	27
	Methodology	27
	Methodological Theory	28
	Case Study Methodology	29
	Epistemology, Philosophy and Social Constructionism	32
	Why Case Study Fits	34
	Methods	36
	Data Collection Methods	36
	Interviews	36
	Documents	37
	Trustworthiness and Ethics	38
	Trustworthiness	38
	Construct Validity	38
	External Validity	39
	Reliability	39
	Ethics	39
	Constraints	39
	Site Selection	40
	Participants	40
	Data Analysis	41
	Representation	43
4	Research Findings: The First Three Research Questions	44
	Learning Styles	45
	Response to Accents	49
	Grouping Philosophies	51
	Language and Academics	52
5	Research Findings: The Fourth Research Question	60

6	Discussion of Research Findings	65
	Normal Bell Curves	66
	Bad Writing and failure to Transfer across the Disciplines	71
	Limitations	72
	Conclusion	73
7	Conclusions and Recommendations	75
	Changes to Course Offerings	75
	Students Views on Cultural Needs	80
	Conclusion	80
	References	82
	Appendices	
	A. Research and Interview Questions	92
	B. Email Inviting Participants	96
	C. Participant Consent Form	97
	IRB Document	

## Chapter 1

### Introduction

International students, those born and raised in another country who come to the United States for a college education after which they plan to return home (Ferris, 2009, p. 4), are enrolling in American STEM universities in increasing numbers (Neuhauser, 2016). These students bring different world views and writing traditions to their major subject classrooms as well as varying levels of English acquisition. The mix of native and non-native English speakers and writers can be expected to complicate instruction in STEM courses. In 1993, Silva's evaluation of then contemporary research indicated that non-native speakers of English performed less well than native speakers in every category of oral and written academic production. Testimony from STEM professors puts this issue in a different light. Student voices, expressing their multiple issues (cultural, linguistic, and academic) have been increasingly reported in the literature (Zawacki et al., 2007; Zawacki & Habib, 2010, and others). This study investigates aspects of this complication from the viewpoint of STEM teachers at a private technical university in the Southeast where international students account for from 10 to 20% of enrolled undergraduates, accounting for 33% of new undergraduate enrollees in the Spring 2017 semester and 52% of graduate students (Enrollment Factsheet, 2017). Pursuing the research question *How does the presence/participation of international students affect the learning dynamics of STEM classrooms?*, it investigates teacher perspectives on the role international students play in classroom discussions, various kinds of teamwork, evidence of course-specific listening, speaking, reading and writing skills, uptake on feedback, among other issues.

My interest in this topic developed after hearing a senior writing teacher at our school express his impatience with some of my former international students' inaccurate comma use as well as inappropriate pragmatic classroom behavior. If a writing teacher had trouble with international students, I wondered, how much more difficulty would teachers of other courses experience? In this regard, the responses of my participants often surprised me. Our school is a nationally-recognized university with alumni who are pilots, astronauts, engineers, internet technicians, inventors, and homeland security professionals. Many of them have job offers the day they receive their diploma, with more than 95% employed within a year of graduation according to a recently published survey on the class of 2013-2014 (Alumni survey, 2016). Many of the international students who attend classes here began to learn English during their teenage years (see Johnson & Newport, 1987, for critical period discussion) or studied from an earlier age in EFL classrooms where, in some cases, reading and/or speaking were not emphasized (personal conversations with numerous foreign students). The international students I teach often speak and write with an accent that ESL teachers have come to accommodate in NNS Freshman composition courses. Silva (2010) tells us interlanguage speech of ESL students using first language phonology, word order and difficult to acquire morphology is accepted by most people but rejected, and considered "grammar error," in academic text even though meaning is rarely affected. Substantial literature (Thaiss & Zawacki, 2006; Zawacki et al., 2007; Zawacki & Habib, 2010, and others) has documented student perceptions of their difficulties in academic writing, including cultural as well as linguistic challenges. I wondered what STEM teachers were experiencing. Colleagues were attempting to found a Writing in the Disciplines (WID) program at our school, and I also wondered how much support STEM professors would offer for it. Case study methodology offered a promising way to let these professionals tell their stories. An

appreciative inquiry approach seemed an effective way to recognize their continuing success and investigate their challenges.

Why does the testimony of STEM teachers matter? Aside from the obvious argument to fairness, the solicitation of STEM teachers' opinions about their experience with international students has the potential to explain the relatively slow and incomplete acceptance of WAC/WID programming in post-secondary STEM schools and provide insights into contemporary teaching practices in these courses that may or may not benefit from revision, and open up a dialogue between teaching linguists and scientists that could benefit both. My role as a full-time non-tenure track instructor who has taught international students first year writing courses here for more than five years put me in an advantageous position to conduct this research

### **Theoretical Framework**

In this qualitative research project, I use an appreciative case study approach to recognize the history of success our school's STEM professors have accomplished, while investigating their perceptions about current classroom issues. Social constructionism (Burr, 2003) supports this study with its basic understanding that people create knowledge together as van Manen (2014) reiterates when he writes, "Practice, in its social constructionist version, is not only meant to mean something, practice is supposed to make it possible to explain, interpret or understand the nature of the phenomena within its scope" (p. 18).

Why social constructionism instead of constructivism? These approaches seem to be philosophical cousins; however, it is the socially constructed knowledge (rather than the individual sense-making of experience) that will provide access to what I want to know. One academic explains it this way:

Rather than focus attention on mental processes (construct systems, cognition),

constructionism urges us to explore the ways in which people engage together in their activities. To the constructionist, meaning making is a relational activity (McNamee, in press; McNamee, 2002; McNamee & Gergen, 1999). Knowledge and understanding are not in the person but in the performance. Thus, interest in constructs – a hypothetical, abstract notion – is replaced with an interest in communication, discourse, dialogue. It is not what is in the head but what people are doing together that concerns us. (MacNamee, 2004, pp. 3-4)

In dialogue (the performance), we create knowledge together.

### **Statement of the Problem and Research Questions**

In this qualitative appreciative inquiry case study supported by social constructionism, I interviewed nine college professors who teach at a Southeastern private technical university in order to learn about their perceptions of how international students affect the learning dynamics in their STEM classrooms. In addition, I reviewed documents these teachers provided, including class syllabuses, typical writing prompts and written work (some with teacher feedback) of both domestic and international students from FA16 classes. As will become obvious, the latter documents were less telling than expected because of the predominantly collaborative nature of STEM assignments.

The study sought to answer the following research questions:

1. How does the presence of international students affect the learning dynamics of the STEM classroom?
2. What are the perceptions of STEM teachers about the academic skills (reading, writing, pragmatics) international students bring to the STEM classroom and how effective are those skills in meeting the requirements of contemporary STEM pedagogy?

3. What are the perceptions of STEM teachers about the contributions international students make to the STEM classroom?

4. What (if any) changes would STEM teachers like to see in the preparation of international students for STEM courses they teach?

This study is important because it provides voice from an oft unheard cohort: STEM teachers of classes that mix international students with native speakers. It has the potential to challenge and/or extend published testimony from STEM international students. The importance of understanding the issues involved here from the sides of teachers and students are magnified by the fact increasing numbers of international students are enrolling in STEM courses in American colleges, including this one. Professors' testimony could lead to improvements across the board and inform contemporary approaches such as WAC/WID.

Chapter 2 of this work contains a discussion of the theory underpinning this study and a review of contemporary literature on L2 writing and culture as well as pragmatic concerns that affect student behavior and faculty understanding.

Chapter 3 explains the research design, focus and methods as well as the researcher role and biases, ethical considerations and necessary approvals (IRB, confidentiality statement), and summary.

Chapters 4 and 5 provide evidence gathered from interviews and document review in response to the four research questions.

Chapter 6 contains a discussion of what may lie behind participant testimony.

Chapter 7 focuses on recommendations arising from the study including how those recommendations might enhance collaborative plans in early stages of development at the



school, and offers suggestions for future research into the perspectives of international students regarding issues what were brought up by study participants.

## Chapter 2

### Literature Review

Since international students in STEM classes face linguistic and cultural challenges (in addition to the academic issues all college students face), it is logical to review the literature related to their diverse language and culture as well as aspects of STEM pedagogy to situate this study. It will be informative to note the responses of this study's participants in dealing with these challenges. Do they underplay the obvious, choosing not to see differences, or do they deal with individual abilities in terms of student goals, providing pedagogical workarounds that improve the learning environment for all students?

It would be difficult to begin an exploration of college academics without a focus on writing. Columbia linguist John McWhorter (2011) observes that writing is “a latecomer to the ball. [... It] began only 5,500 years ago, in Mesopotamia, and widespread, cross-class literacy was rare among any humans until just a few centuries ago” (pp. 145-6). He goes on to value the spontaneous nature of speech, a quality beginning writing rarely has. Writing is work. Novelist Sinclair Lewis is quoted as saying “Writing is just work--there's no secret. If you dictate or use a pen or type or write with your toes--it's still just work” (as cited in Nordquist, 2016). And writing in a language that is not one's own compounds the difficulty of that work.

Language acquisition theory (Chomsky, 1988; Pinker, 1994, and others) indicates that everybody *gets* a native language. Whether it is innate (Chomsky, 1988), as I choose to believe, is immaterial to this discussion. Speaking in one's first language is easy: toddlers can do it. In fact, not acquiring a first language is so rare that research papers on language-deprived individuals such as the abused feral child “Genie” (Curtis, 1977) have a “man bites dog” quality. They are poignantly unusual and thankfully rare. There are also cases in which deaf children of

hearing parents who were not introduced to sign language in early childhood experienced learning difficulties while deaf children who communicated from their earliest years in sign acquired that language naturally (Strozer, 1994, p. 5). In essence, children acquire the language(s) they are exposed to and intuit regular grammar rules in a situation that linguists describe as “a poverty of stimulus,” meaning children do not receive enough input to account for learning these rules (Chomsky, 1988).

Nobody *gets* writing. The art or craft of composing is a skill that has to be taught. That it is easier in one’s native language is intuitive:

- the writer already has the “grammar” of the language and can put words together into understandable sentences,
- the writer, in most cases, is situated in the culture where the writing will be done and has implicit knowledge about many genres (while competency degrees differ, most people know the difference between writing an email, text or composition for school),
- culturally-specific writing instruction begins in elementary school when learners are quite young, and
- the environment abounds in examples of written language from storybooks to birthday cards to street signs, advertisements, and all manner of printed texts.

While the development of writing skills is not easy --- even for native speakers of the language in which they write who are surrounded by understandable input, second language writers face multiple challenges connected to linguistic proficiency (Matsuda & Silva, 2001, and others), cultural background (Kaplan, 1966, 1987; Zawicki & Habib, 2010, and others) and academic expectations (Bahls, 2012; Bartholomae, 2005; Ferris, 2009, and others).

Several linguists and researchers have commented on the “brief history” or “early neglect” of L2 writing, (see Matsuda, 2003, for a definitive history of the discipline). “Despite its brief history as a discipline, L2 writing lacks a tidy corpus of conclusive theory and research upon which to base a straight forward introduction to processes of learning and teaching” (Ferris & Hedgecock, 2005, p. 3). Silva (2016) echoes this sentiment when he says,

L2W has not at this point developed a particular conceptual or theoretical framework or methodological approach; it has embraced a largely eclectic orientation towards inquiry, primarily adopting and adapting frameworks and approaches from other areas and creating new ones to meet changing needs, blending work from disparate areas, e.g., cognitive psychology, anthropology, and literary studies.

Silva goes on to state that the multi-disciplinary approach keeps the research options open for the L2W field and that other important fields, such as medicine and human factors, are also not limited to single theories or methodologies. The lack of unitary theory has in no way impeded an impressive publication trail, and that literature tell a story of trial and error, proposals and counterproposals, and what many can interpret as progress.

As early as 1962, Pincas recognized that “the belief that grammar and guided reading are sufficient preparation for ‘free composition’ is widespread and quite wrong” (p. 1). Even while decrying the “emphasis on ‘controlled habit formation’ [...] so that errors arising from native to target language transfer can be avoided,” she goes on to propose a strategy of “multiple substitution” that encourages L2 writers to heavily paraphrase in order to become familiar with “fixed patterns” of composition before attempting to write from their own experience. It is discouraging to see this emphasis on paraphrase in contemporary classrooms, not least because it retards implicit learning and functions as an attractive nuisance leading to unintentional plagiarism.

Despite somewhat confusing and not necessarily accurate diagrams of paragraph structure, Kaplan (1966) turns the focus of L2W instruction from sentence level mechanics to rhetorical contrast that depends on cultural factors. Logic, he tells us, “is not universal” (p. 12); neither is the definition of “good writing.” Second language writers who have mastered the basic forms of English may still produce writing “employing a rhetoric and sequence of thought which violates the expectations of the native reader” (p. 13).

In a writer-responsible communication tradition such as English (especially academic English), violating reader expectations (Hinds, 1987) is to be avoided:

Take as a starting point the position that English speakers, by and large, charge the writer, or speaker, with the responsibility to make clear, and well-organized statements. If there is a breakdown in communication, for instance, it is because the speaker/writer has not been clear enough, not because the listener/reader has not exerted enough effort in an attempt to understand. [...] In Japan, it is the responsibility of the listener (or reader) to understand what it is that the speaker or author had intended to say. (p. 65)

Such cultural differences might predict a lack of detail in the writing of learners from Japan as well as anywhere else where reader-responsibility is inherent in beliefs regarding communication. High context cultures require less explicit explanation of what everybody knows (Hall, 1977). In this regard, the US is low context: we want explanations, details and specificity for everything. Indeed, these words are prominent in teacher feedback on L2W compositions.

Educators have long been aware of negative transfer from native to target language in phonology and syntax as well as the “false friends” of semantics (the German verb *bekommen* does not mean *to become* but *to get* or *receive*). Kaplan (1966, 1987), Hinds (1987), Raimes (1985) and others observe different peculiarities of the L2W development process that get in the way of accuracy. Raimes (1985) reports that good writers think about audience, consider what they know about a topic, reflect, plan --- and when they actually write, go back over their text recursively in ways that enable them to learn and change course as new ideas occur to them. Poor

writers plan less well, read their work over less often, and focus on sentence level instead of content issues. “In addition, inexperienced writers spend little time considering the reader: they find it difficult to move from their ‘writer-based prose’ to prose that conveys a message unequivocally to the reader (Flower 1979)” (as cited in Raimes, 1985, p. 38).

The process approach to composition with its emphasis on “generating ideas, writing drafts, producing feedback, and revising” (Raimes, 1985, p. 38) was introduced to help inexperienced L1 writers improve their composing skills by imitating the winning ways of successful writers. Studies of L2W process writing seemed to indicate similar strategy use among L1 and L2 writers, leading Jones and Tetroe (1987) to claim, “second language composing is not a different animal from first language composing” (p. 55). This statement seems to overlook the role of both cultural awareness and language proficiency, given for most native speakers, in composition.

In his classic article on “the distinct nature L2 writing,” Silva (1993) reported similar “composing process patterns” between L1 and L2 writers, but the similarity ended when sub-processes were examined. In fact, Silva’s (1993) review of literature existing at the time indicated that NNS students performed less well than their NS peers in every category of academic and oral production, often matching the predictions of Kaplan (1966, 1987) regarding the effect of cultural background in textual composition. He concludes, “Clearly, L2 writing is strategically, rhetorically, and linguistically different in important ways from L1 writing” (p. 201).

In an early effort to discern such differences, Raimes (1985) involved L2 writers in a think-aloud study and found they talked to themselves about sentence level and vocabulary issues, verbally rehearsed their ideas, reread recently composed phrases and sentences, revised in

terms of sentence placement/paragraph organization, had skewed understandings of audience (as indicated by one student who spoke a poignant example into the think-aloud tape but did not include that prose in his writing), but rarely produced a new draft. While there were only eight participants, these students did indeed participate, seriously with attention “riveted on their writing,” contradicting at least one previous study (Perl, 1979) that indicated L2 writers tried to complete writing tasks as quickly as possible to the extent of counting words in an effort to be finished.

The result caused Raimes (1985) to question the use of “rapid free writing” as an aid to fluency in favor of giving L2 writers time to produce ideas as well as language during the act of composition, using writing as a learning tool. To their infrequent self-editing, she attributes the idea that they expect teacher corrective feedback and view themselves as incomplete learners who should be expected to make mistakes. The findings, she says, point to a need for emphasizing writing and acknowledging its generative quality. This advice resonates with learning through writing and writing across the curriculum as well as English for Academic Purposes.

The pedagogical paradigm shift from product to process in composition studies (Connor, 1988) and understandings (or presumptions) about the universality of process writing resonated with Zamel’s (1976) suggestion that L2 writing instruction incorporate successful L1 composition strategies. Previous ideas about writing assumed the writer had all her ideas in her head and poured them, relatively fully formed on the basis perhaps of an outline, onto the page in words, sentences and paragraphs. Now, however, writing was seen as a process, one that involved learning as well as expression, and flowed from invention (brainstorm, pre-writing,

various kinds of outlining) to drafting, receiving and responding to feedback through revising before final draft creation.

The important difference was the recognition that writers create new knowledge in their interaction with the text, topic and real or imagined reader. “Writing is primarily a social act” (Bruffee, 1986, p. 784). Echoing social constructionist theory, “Phelps [1985] offers an analysis of the dynamic interactions between readers and writers [...] whereby readers and writers construct meaning together” (as cited in Connor, 1988, p. 75). In this regard, awareness of audience is a perception often absent from texts produced by L2 writers (Spack, 1988). It should also be noted, however, that the process approach with its big picture emphasis was often given mere lip-service in ESL classrooms where product focused attention to sentence-level grammar and mechanics continued to be the practice of some teachers who attended primarily to local rather than global issues although both existed (Ferris, 2014).

The issue of audience is tied up with that of genre (Hyland, 2007; Johns, 2011). Addressing advice to teacher trainers, Hyland (2007) suggests genre-based pedagogy lets writing teachers help their students “produce effective and relevant texts [...] by] grounding their courses in the texts that students will have to write in their target contexts, thereby supporting learners to participate effectively in the world outside the ESL classroom” (p. 148). This effectiveness is achieved because “genre-based writing instruction offers students an explicit understanding of how target texts are constructed and why they are written in the ways they are” (p. 152).

While Christie (1987) claims genre-based writing instruction empowers writers, Benesch (2001) sees the possibility of overvaluing the dominant culture by adopting its genres. Hyland (2007) counterclaims, “Learning about genre does not preclude critical analysis but, in fact, provides a necessary basis for critical engagement with cultural and textual practices” (pp. 151-



2). Johns (2011) recognizes the need for L2 writers to be able to identify and produce different kinds of texts and proposes instruction that enables “high transfer” – an intellectual activity that involves analysis, critical assessment and appropriate rhetorical choices, rather than “low transfer” which involves memorizing formats to be applied without much critical thinking. She also cautions about the difficulty students may face when teachers give different names to assignment genres; students wonder if a term paper, an essay question and an essay follow the same form. Graphic organizers, such as those produced by Grabe (2009) provide information about organization and structure that can help students create their own texts as well as analyze assigned readings (pp. 262-3).

However, “[N]o amount of prior knowledge from a generalized composition course will help students know how to cope with genres that, as Elizabeth Wardle describes them, ‘are context-specific and complex and cannot be easily or meaningfully mimicked outside their naturally occurring rhetorical situations and exigencies’ (Wardle 2009, 767)” (as cited in Anson, 2015, p. 211). Anson’s statement resonates with what brain science reveals. Biology teacher James Zull (2002) explains,

Neuronal networks grow by building on existing networks, so our entree to reasoning in one subject comes through the neuronal networks for information in that subject. Often we don’t have the networks that connect one subject with another. They have been built up separately, especially if we have studied in the standard curriculum that breaks knowledge into parts like math, language, science, and social science. (p. 192)

In a footnote, he tells an anecdote about a chemistry class in which students couldn’t get the concept of chlorophyll until the teacher connected it to the growing of plants and a student “piped up, ‘Oh, you mean *that* chlorophyll!’” (Zull, 2002, p. 201).

Spack (1988) reports, “L1 and L2 research shows the interdependent relationship between reading and writing processes. [She concludes that] to become better writers, then,

students need to become better readers” (p.101). According to Grabe (2014), “Reading can simply be defined as a complex ability to extract, or build, meaning from a text. However, this definition, by itself, is not very informative” (p. 8). This crucial skill does transfer to some extent from L1 to L2; however, the same elements of language and culture that constrain L2 writing proficiency are operational here. Leki (1993) discusses reading and writing research, conducted independently but concurring in results. Less effective readers and writers focus on the words of a text instead of its meaning, to form rather than connection; poor writers look at sentence level instead of global issues (pp. 175-6). “Good readers and writers, on the other hand, are better able to focus on broader concerns related to communication, [...] The unifying characteristic of good readers and writers seems to be flexibility, the ability to use and reuse different strategies as the moment calls for them” (p. 176). These findings downplay the importance of explicitly teaching grammar and vocabulary in favor of cognitive strategies:

We know that reading builds knowledge of various kinds to use in writing and that writing consolidates knowledge in a way that builds schemata to read with (Bereiter & Scardamalia, 1987; Sternglass, 1988). We also know that, for example, biology professors learn to write articles the way biology professors do by reading articles that biology professors have written. We do not have courses that teach biology professors to write like biology professors. Yet we continue to separate ESL reading courses from ESL writing courses. (Leki, 1993, p. 176)

The reasons Leki speculates for the separation include reading teachers’ expressed preference for separation, the former use of readings as sources for imitation in ESL writing (perhaps the aftertaste remained at the time of her writing), the remedial status reading courses carry in colleges (presumably L1 students are rarely seen as needing specific reading instruction), and the absence of university exit exams in reading (whereas, some schools did at the time have exit exams in writing). These reasons may explain but do not justify the separation.

Spack (1988) refers to Bazerman (1980) acknowledging that “intelligent response to reading [...] begins with an accurate understanding of a text --- not just the facts and ideas, but also what the author is trying to achieve. But this is not easy for second language readers. Even advanced highly-literate students struggle in a way their NS counterparts do not” (p. 101). The struggle is compounded in discipline courses when the complexity of the material students are expected to understand joins constraining forces with their developing linguistic ability and cultural barriers. One of my former students dropped by my office last summer with the news that he was lost in another course: he didn’t understand the assignment prompt (an issue addressed by Johns, 1991) and his NS teammates used idioms that confused him. “They told me to hang in there,” he said, “Where am I supposed to be hanging?” A 5-minute explanation of what his teacher expected and what the idiom meant sent him on his way knowing his teammates were supportive and the assignment was doable. I also directed him to his teacher’s office hours, and happily, he was able to create a helpful relationship with that professor. He did mention, however, that other discipline teachers at this school merely advise students to send them an email instead of conferring during office hours. I wonder if the avoidance of one-on-one face-to-face communication might be connected to the teacher’s understanding of the student’s pronunciation.

My student could not understand a prompt (see Hampton-Lyons & Kroll, 1996, for prompt design guidelines, p. 232) that gave his NS classmates no problem. Had he approached his professor, no doubt an explanation would have been forthcoming. Instructors know students have a right to understand what is required of them; for this reason, it is rare to find a teacher who intentionally writes an unclear prompt. However, despite our best intentions, L2 students continue to misread instructions, adding one more villainous arrow to their quiver of writing

constraints. Their reticence to ask for help, however, may result from pragmatic differences, both linguistic and cultural. Bardovi-Harlig (1996) encourages a communicative approach while hinting at a connection to pragmatic universals:

Our position is, therefore, that the real responsibility of the classroom teacher is [...] to make students more aware that pragmatic functions exist in language, specifically in discourse, in order that they may be more aware of these functions as learners. We believe that if students are encouraged to think for themselves about culturally appropriate ways [...], then they may awaken their own lay abilities for pragmatic analysis. (p. 31)

“With such instruction,” she adds in the preface to an online book, *Teaching Pragmatics*, published by the Office of the English Language Program of the U.S. Department of State, “learners can maintain their own cultural identities, participate more fully in target language communication, and gain control of the force and outcome of their contributions” (2003, p. 38).

The issue of identity has long been key to understanding the L2W situation. In 1994, Reid advised teachers to forget their fear of “appropriating texts [...] because] teachers should accept their responsibility as cultural informants and as facilitators for creating the social discourse community in the ESL classroom” (p. 210). Extensive research by Zawacki and Habib (2010) indicates continuing cultural pitfalls for L2 writers, many of them in below-the-radar categories such as:

- students who fail to exhibit forceful argumentative skills because doing so --- for instance, in a rhetorical situation that requires critique of government programs --- might be regarded as criminal in their native country (Writing Across Borders, 2010), and
- students whose organization is based on non-academic English standards, intending context that is not clear to assessing instructors (Matsuda, 1997), among other such difficulties.

The voices of L2 writers, expressing their multiple issues (cultural, linguistic and academic) in STEM and other discipline courses have been sensitively reported (Writing Across Borders, 2010; Zawacki et al., 2007). However, testimony from college STEM teachers about their classroom experiences with international students is rare in the literature, the predominant focus of which seems to be the problems students face and the perceived need for schoolwide partnerships. At this private technical university, where almost 20% of enrolled undergraduates are international students, dealing with L2 writing is perceived to be a schoolwide concern.

International students face cultural, academic and linguistic issues. As Mallinson and Charity-Hudley (2014) comment, “Culturally and linguistically diverse students do not leave their language patterns at the door when they enter STEM classrooms” (p. 13). Moreover, many of the international students attending college STEM courses began to communicate in English during their teen years, and as substantial literature, from Newport and Johnson (1989) to Long (2015), testifies adult language learners face predictable difficulties and are generally unable to achieve native or near native proficiency.

Inability to reach native speaker status pales beside the struggle to meet academic writing standards. Even native speakers report being challenged by the requirements of academic language (Bartholomae, 2005; Shaughnessy, 1977) for “disciplined and persistent inquiry, control of sensation and emotion by reason, and an imagined reader who is likewise rational and informed” (Thais & Zawacki, 2006, p.8). The technical content of STEM subjects, with its specificity and requirement for developing heteroglossic (Robinson, 2011) usage, taxes all college students, but especially such multilingual students (Ferris & Hedgecock, 2005; Matsuda & Jablonski, 1998). It is obvious that international students bring a multiplicity of cultural backgrounds; what may not be so obvious is that those cultures hold very different rhetorical

understandings in aspects not limited to sentence and paragraph construction.

Moreover, the issue of teacher bias has serious implications on pedagogy; whether it functions similarly in the STEM field where experts tend to be the instructors is uncertain but probable. In an innovative exploration of teacher cultural bias through reactions to fictional characters, Shim (2013) records opinions clearly based on sociocultural backgrounds and predicts these biases and beliefs influence teaching for at least two very good reasons:

First, the biases or beliefs that teachers use to make sense of the information they encounter have a strong affective component in their pedagogical actions. Second, teachers' beliefs which largely serve as a filter for how they interpret the information they encounter in education, is most likely to have developed long before the teachers entered their classrooms. Therefore, teachers' pedagogical practices are influenced by the factors that are beyond the immediate context of classrooms. (p. 17)

It seems logical to assume that Shim's (2013) study, while confined to K-12 teachers, may have broader implications, increasing the need to pursue qualitative research with college STEM teachers.

Lindsey and Crusan (2011) report on teacher bias in assessment:

Earlier research on assessment suggests that even when Native English Speaker (NES) and Non-Native English Speaker (NNES) writers make similar errors, faculty tend to assess the NNES writers more harshly. [...] Results [of their more recent research] indicate that while faculty continue to rate international writers lower when scoring analytically, they consistently evaluate those same writers higher when scoring holistically.

In a footnote, the authors add, "The Schreyer Institute for Teaching Excellence at Penn State offers useful definitions for understanding holistic vs. analytic scoring: 'Holistic rubrics provide a single score based on an overall impression of a student's performance on a task.... Analytic rubrics provide specific feedback along several dimensions.'"

Among those dimensions, analytic rubrics are likely to include grammar and mechanics, aspects of writing at which international students cannot be expected to excel. In other findings,

the authors report teachers may grade the work of non-native speakers more leniently --- giving international students higher than deserved grades, perhaps taking to heart Silva's (2010) admonition that "people accept that someone from a foreign country will speak with a foreign accent. [...] It's the same thing to suggest that people will write with an accent. And usually that accent consists of things like missing articles or wrong prepositions or things like that, things that really don't make much difference."

Even in the face of innovative educational approaches such as student-centered classrooms, peer-led teamwork and "just in time learning" (also known as "flipping the classroom"), designed to focus on engagement that does make a difference, Labov, Singer, George, Schweingruber, and Hilton (2009) report, "communication across the STEM disciplines and within their sub-disciplines is often lacking." They ask whether these approaches are being used in STEM classrooms, whether there is evidence they have helped STEM students increase their understanding of complicated concepts, and whether faculty are "willing to change their teaching when presented with evidence that certain approaches to teaching are more effective than others?" The question remains, however, whether requests for change should be unilaterally addressed to STEM teachers? Responses from STEM faculty can add light here.

Substantial research under the rubric of Writing Across the Curriculum and Writing in the Disciplines (WAC/WID) recommends that those specifically trained to teach language share their insights with instructors of STEM and other courses (McCarthy, 1987; Thaiss & Zawacki, 2006; and others) and reflect the expressed needs of multilingual college students in situations requiring them to not only acquire new and complex linguistic and rhetorical skills, but to adopt logical and rhetorical understandings of the target culture (Writing Across Borders, 2010; Zawacki et al., 2007; Zawacki & Habib, 2010). Studies on student reactions, such as those

expressed in the video “Writing Across Borders” (2010) when students reported difficulty completing evaluative essays that required argument against government programs, because they might be jailed for such an action in their home country, and the multiple case study “Valuing Accented Writing” where NNS teachers and students discussed their experiences of writing in someone else’s language, give voice to this population’s concerns about identity, voice and culture. Similar content is found in the particularly poignant article by Zawacki and Habib (2010) entitled “Will our stories help teachers understand?”

While we don’t know everything about student opinions on this topic, we do have a substantial stack of evidence. What seems to be missing is a similar stack devoted to teacher perspectives. True, many journal articles are written by teachers, but these are usually writing teachers whose input, illuminating as it is, is not the same, one would think, as what we could get from STEM teachers. Among a far from abundant literature involving interviews with engineering and business teachers, we find a dissertation about transfer by Saenkhum (2007) in which all of the teachers negatively criticize L2 writing and writers (for mechanics as well as content and style errors), positing reasons for substandard work including not proofreading and putting assignments off to the last minute --- charges unfound by triangulated student interviews. Not a word of positive contribution to the learning environment. Ives *et al.* (2014) as well as Zawacki and Habib (2014) also report “faculty ambivalence [in terms of their dealings with L2 writers], finding that faculty ‘want to be fair and ethical in working with linguistically diverse students, but don’t know how to do so while still sticking to the commonly held standards for writing in the disciplines and institutions.’” (p. 8). Leki (2006) found that some professors did accommodate L2 writer needs by allowing additional time and repeating directions to clarify, but other teachers absolutely refused to accommodate and said non-native speakers should expect



lower grades. Lindberg (dissertation in press) reports that while most of the tenured professors he interviewed expressed positive attitudes toward the multi-language students they taught,

The qualitative interviews revealed that in some fields there is impetus for teachers to make accommodations for EAL [English as an Additional Language] students. These were mostly in the humanities and social sciences in classes that valued global opinions. In other classes, particularly in nursing and safety science, students had to pass difficult exams and work in fields that were potentially dangerous. In these classes, there was impetus for teacher not to accommodate EAL students” (email, 4 Oct. 2016).

Will STEM teachers at my university reflect the perspective of those teaching nursing and safety science in Lindberg’s study? Is potential danger a motivating factor in insisting that NNS students meet the same academic requirements as NS students? How do professors assess ability to meet those requirements through the screen of varying language proficiency?

Moreover, Kobayashi and Rinnert (2013) investigating the writing of multilingual writers, found

that: (1) both commonalities and distinctions co-exist in the textual, process, and social aspects of [the subject of their longitudinal study’s] writing, (2) the writer’s personal and cultural identity affect her text construction and composing process, and (3) boundaries become blurred among both the textual and the linguistic features in [the students’] languages. The results imply that partially overlapping theories of multicompetence, genre, and identity can help elucidate the unique character of multilingual writers. (p. 4)

To what extent do STEM teachers recognize multicompetence and identity as they involve international students in the genre writing of their specific field?

Land (2015) recalls hearing

distinguished Hungarian scholar Ference Marton, founder of phenomenography and variation theory, observe, ‘The one single thing that would improve the quality of teaching and learning in higher education would be if academics in different disciplines took time to meet together and discussed what they should be teaching in their subject, and how they should be teaching it’ (Marton 2009). (as cited in Adler-Kassner & Wardle, 2015, pp. xiii-xiv).

That seems to be exactly what the WAC/WID proponents are trying to facilitate with research indicating the need for every teacher to be a writing teacher and other studies stressing

the difficulty of transfer and a less than effective record of writing teachers preparing students for STEM and other discipline coursework (Atkinson, 2003; McCarthy, 1987; Smit, 2004; Yancy, Robertson, & Taczak, 2014; and others).

In terms of contemporary STEM pedagogy, Henderson, Beach, and Finkelstein, (2011), looked at decades of academic journal articles written by STEM educational researchers, discussing “Four broad categories of change strategies [...]: disseminating curriculum and pedagogy, developing reflective teachers, enacting policy, and developing shared vision” (p. 952) and they found only 21% presented “strong evidence to support claims of success or failure of the strategy.” These authors concluded that the state and claims of change strategies were weak and researchers were isolated. The assumption that change is needed in undergraduate STEM instruction is shared by Allen, Webb and Matthews (2016) who promote, as one way to enable it, adaptive teaching, which they define “as a process that teachers initiate when they recognize and gauge their students’ STEM-related conceptual development, inquiry processes, and real-world connections and then maneuver their instruction to further develop these features of students’ learning” (p. 217).

But is this attitude that change is needed accurate? In a 2009 dissertation, Schell debunks widespread negative opinions about STEM professors who work at major American research universities, reporting that the twenty professors who participated in her study “devote extensive energy toward improving their introductory teaching[,...] indicated extensive knowledge of introductory STEM subject matter, students, and pedagogies[, ...] and employed] over 30 innovative pedagogies [...] in their classrooms” (p. 3).

At our school, the use of “clickers” --- forerunners to cellphone-based strategies for relatively anonymous Q&A participation preliminary to class discussion and negotiation of

meaning --- started in STEM classrooms and eventually found its way to other departments through innovative practices workshops supported by the Center for Teaching and Learning Excellence. This student involvement technique resonates with Astin's (1984/1999) suggestion

that the most precious institutional resource may be student time. According to the theory, the extent to which students can achieve particular developmental goals is a direct function of the time and effort they devote to activities designed to produce these gains. (p. 522)

Certainly active participation in non-stressful learning activities, such as "clickers" and other web-based techniques used by STEM teachers, predicts a high degree of student involvement.

According to Spack (1988),

English teachers cannot and should not be held responsible for teaching writing in the disciplines. The best we can accomplish is to create programs in which students can learn general inquiry strategies, rhetorical principles, and tasks that can transfer to other course work" (p. 100).

Her expressed reasoning is that English teachers understand the subject they teach and should not be expected to understand STEM subjects or try to teach material they do not understand. Could this attitude be responsible for the seemingly one-way message WAC and WID programs provide, or is that message an indication of reality: as long as a course has a writing requirement, and L2 writers are still acquiring the needed skills, every teacher is or should be a writing teacher? Hearing the testimony of those who teach college STEM courses may illuminate this inquiry.

In fact, Thrush (2016, personal conversation) reports that early experiments with WAC didn't work at her university because of a lack of relevant examples. English classes had students reading *New Yorker* articles and literature related to history, for example, but that was not what their history teachers required them to write. What is needed, she states, is a book of examples of

what is passing work: a collection of A work and B work, giving student something to aim for. Recent textbooks attempting to rectify this lack include Bahls (2012) which focuses on math course writing, but not specifically L2 writing.

While it is not the only focus of my interest in this study, writing has a huge impact on any college student's success. The role it plays in international student achievement is even more significant. Clearly, L2 writing is a relative latecomer even to the literature on second language learning; however, focus on L2W has increased exponentially during the last 60 years.

Silva (2016) lists the topics on which academics concentrated in their publications about second language writing from 1950 until 2010. The role of writing in non-composition classes is addressed in instructive and informative articles aimed at STEM and other discipline course teachers. While quite a few articles about teacher perceptions of ESL students writing have been published since 2010 (Crusan, 2010; Lindsey & Crusan, 2011; Shim, 2013; and others), a focus on STEM teacher attitudes and perceptions (except to deal generally with biases connected to assessment) is hard to find. A build of such concentration among WAC/WID advocates is to be expected but not yet evident; studies continue to focus on students and writing teachers almost to the exclusion of STEM discipline college instructors. Existing teacher-focused studies tend to concentrate on K-12 populations (Mallinson & Charity-Hudley, 2014; Tyler, Boykin, & Walton, 2006; and others), focusing on the very real needs of African American students for cultural understanding.

If, as Virginia Burr (2003) states, “people construct [knowledge] between them,” then how are college STEM teachers and their international students participating in “the social processes and interactions in which people are constantly engaged with each other” (pp. 4-5)?

Why does the testimony of STEM teachers matter? Aside from the obvious argument to fairness, the solicitation of STEM teachers' opinions about their experience with international students has the potential to explain the relatively slow and incomplete acceptance of WAC/WID programming in post-secondary STEM schools and provide insights into contemporary teaching practices in these courses that may or may not benefit from revision, and open up a dialogue between teaching linguists and scientists that could benefit both. In harmony with the preliminary efforts of Professors Ives and Perez in a program sponsored by the Center for Teaching and Learning Excellence to promote course revision and reflection on the place of writing across the university, these stories could propel WAC/WID to success or provide a hint of an explanation why it might or might not be happening.

## **Chapter 3**

### **Methodology**

To answer my research questions, I employed a case study methodology, with an appreciative inquiry approach, utilizing thematic analysis of data gathered through semi-structured interviews as well as a limited amount of document analysis, within a social constructionist theoretical approach. In this chapter I discuss the appropriateness of that methodology, how my chosen methods (interview and document review) enabled it, and how social constructionist theory supported it. I also discuss the site of my research (the technical university at which I have been teaching international students in Freshman Composition courses since 2010), participants (professors who teach STEM courses at this school), the interviews and document analysis that I conducted during January and February 2017, and the thematic analysis of interview results completed between February and March 2017, for the formal dissertation text submitted in April 2017.

My interest in this topic developed after hearing a senior writing teacher at our school express his impatience with some of my former international students' inaccurate comma use as well as inappropriate pragmatic classroom behavior. If a writing teacher had trouble with international students, I wondered, how much more difficulty would teachers of other courses experience. Our school is a nationally-recognized university with alumni who are pilots, astronauts, engineers, internet technicians, inventors, and homeland security professionals. Many of them have job offers the day they receive their diploma, with more than 95% employed within a year of graduation according to a recently published survey on the class of 2013-2014 (Alumni survey, 2016). Almost 20% of enrolled undergraduates are international students, many of whom began to learn English during their teenage years (see Johnson & Newport, 1987, for critical

period discussion) or studied from an earlier age in EFL classrooms where, in some cases, reading was not emphasized or only reading (to the exclusion of speaking) was emphasized (personal conversations with numerous foreign students). Many of the international students I teach speak and write with an accent (Silva, 2013) that ESL teachers have come to accommodate in NNS Freshman composition courses. Substantial literature (Thaiss & Zawacki, 2006; Zawacki et al., 2007; Zawacki & Habib, 2010, and others) has documented student perceptions of their difficulties in academic writing, including cultural as well as linguistic challenges. I wondered what STEM teachers were experiencing. Colleagues were attempting to found a WID program at our school, and I also wondered how much support STEM professors would offer. Case study methodology offered a promising way to let these professionals tell their stories.

### **Methodology Theory**

According to Schwandt (2015), “Methodology . . . is a theory of how inquiry should proceed” (p. 201). He goes on to explain that what this means in terms of a qualitative research study includes deciding what is worth studying, how research questions should be framed, which data gathering tools are appropriate, and how to logically connect data, analysis and argument to the research question. Acknowledging that different philosophical approaches may define methodologies in different ways, he also reports that qualitative data can be “generated in different ways and acquire different meanings in light of different methodologies” (p. 203). So methodologies can vary in how they are defined as well as in how the data can be gathered and what it can mean. A narrative methodology, for instance, can generate data through interviews that produce “joint construction of accounts of social life in conversation and reflection”; whereas, interview gathered data in an ethnographic methodology “is understood from the actor’s perspective” (p. 203). These examples indicate that methodological choices really do

control how a study may be accomplished. It is an early decision, coming immediately after the selection of a philosophical approach, and as Schwandt (2015) indicates, it serves to connect the chosen philosophical theory to available methods. In layman's terms, methodology is an encompassing theory while methods are tools (such as interviews, emails, blogs and observations) for collecting data.

### **Case Study Methodology**

Case study may be heading for its 200<sup>th</sup> birthday according to those who trace its origins to Le Play in 1829; however, in more contemporary times, two researchers connected it to education (Yin, 1984, and Slake, 1995, both cited in Savin-Baden & Major, 2013, p. 151) and two more called it "one of the primary research traditions in qualitative research" (Merriam, 1988, and Creswell, 1998, both cited in Savin-Baden & Major, 2013, p. 151). No wonder that it is considered a primary tradition, when one recognizes the plethora of different types and applications to common research paradigms (pp. 158-9). Creswell (1994) includes case study among the four most often described qualitative research methodologies, along with ethnography, grounded theory, and phenomenology (p. 12).

Case study methodology offers an appropriate way to explore the way teachers perceive the challenges and contributions international students bring to their STEM classrooms: it lets them tell their stories. Few similar case studies have been published, certainly none focusing on STEM teacher perceptions at this university. Existing qualitative research (Mallinson & Charity-Hudley, 2014; Tyler et al., 2006), focuses on the needs of K-12 African American students for understanding and accommodation. Zamel (1995) did include testimony from two teachers in a similar study, but her participants were English and art history teachers. The few recent studies that do consider college teachers in the disciplines (Ives et al., 2014; Zawacki & Habib, 2014)



report teacher ambivalence regarding their L2 students. A recent dissertation by Lindberg (in press) indicates teachers accommodate L2 writers in social science courses but not in ones perceived as “dangerous” such as nursing and safety science. Certainly airplane pilots face danger as much as safety science professionals. Does that mean aeronautical science teachers do not accommodate their L2 students? This is among the questions I explored in this study.

Baxter and Jack (2008) report, “qualitative case studies afford researchers opportunities to explore or describe a phenomenon in context using a variety of data sources” (p. 544). They further state this approach “facilitates exploration [... and] ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood” (p. 544). According to these authors, both Stake (1985) and Yin (2003) --- two of the major theorists concerning this aspect of research --- believe truth “is dependent on one’s perspective” (p. 545). While my theoretical approach is constructionist and not constructivist (the difference is explained elsewhere in this paper), both depend upon “the close collaboration between the researcher and the participants, while enabling participants to tell their stories (Crabtree & Miller, 1999). Through these stories the participants are able to describe their views of reality and this enables the researcher to better understand the participants’ actions (Lather, 1992; Robottom & Hart, 1993)” (Baxter & Jack, 2008, p. 545).

Yin (2009) indicates a case study approach is appropriate in situations when one seeks answers to “how” and “why” questions, believes context is relevant to what is being studied and when the relevant [participant] behaviors cannot be manipulated” (p. 11). While my focus is primarily on “what” questions (in sync with the exploratory nature of the work), aspects of how and why will undoubtedly be uncovered; context is crucial to teacher perspectives; and there is

no desire to manipulate the behavior of my participants by involving them in an experimental activity.

One of the many ways qualitative research differs from quantitative research is in determination of who to involve as participants: quantitative researchers use “inclusion and exclusion criteria for sample selection” (Baxter & Jack, 2008, p. 547); qualitative research establishes boundaries. This study is bounded by people, place and time, involving as participants STEM teachers who taught during the FA16 term at this university and who volunteered to be interviewed to share their perspectives on international students they teach. While the aspect of volunteering for interviews no doubt reduced the number of participants (an anonymous Survey Monkey mixed approach might have attracted more), it increased the opportunity for rich data because teachers were prepared to share reflections on their experience. The appreciative nature of interview questions and opportunity for participants to review text for possible researcher misunderstanding increased the collaborative nature of this study which meets Stake’s (1995) definition of “intrinsic,” meaning “the intent is to better understand the case [... because] the case itself is of interest” (Baxter & Jack, 2008, p. 548). Although their research is based on business management, Avital and Carlo’s (2004) finding “that appreciative inquiry can motivate organizational-wide adoption and it can provide language-based mechanisms that facilitate effective knowledge exchange” (p. 57) also predicts positive outcomes for using an appreciative approach in this study. If new policy is proposed, this approach paves the way for cooperative adoption.

An earlier definition of this study as a multiple case study has been refined with the realization that although I interviewed several teachers, I studied a single holistic case, focusing on one group of professors who teach STEM courses at a particular university.

## **Epistemology, Philosophy, and Social Constructionism**

Epistemology is about “the nature of knowledge,” and theory is about explaining it, about the “paradigm” (Savin-Baden & Major, 2013, p. 56). In plain terms, epistemology is about how we can know and what is worth knowing. “Kenneth Bruffee (1993) cites several examples of research that show that cognitive development is essentially a reciprocal, interactive social process from the very beginning. What we call thought is actually in its origins internalized conversation or social communication” (Warmoth, 2000). The theory of social constructionism is thus explained by many social scientists (Bergman & Luckman, 1966; Bruffee, 1993; and Vygotsky, 1978 --- all cited in Warmoth, 2000; and others) as an epistemology. Its tenets present a way of understanding how knowledge is constructed, not discovered through intellectual contact with an external “real world.”

According to Kelly (2009),

The role of theory in qualitative research is often underplayed but it is relevant to the quality of such research in three main ways. Theory influences research design, including decisions about what to research and the development of research questions. Theory underpins methodology and has implications for how data are analyzed and interpreted. Finally, theory about a particular . . . issue may be developed, contributing to what is already known about the topic that is the focus of the study. (p. 285)

The major benefit of using the social constructionist paradigm for this research is its denial of value-free description, the happy side effect of which is to see value in the way one talks about something and the recognition of multiple views, multiple perspectives (Gergen, 2010). It enables narrative case study research methodology, suggests the use of interview among other methods, and guides my research questions by its recognition that knowledge is socially created, questioning “taken for granted knowledge,” but also understanding that power does play a role. As J. C. Hall (2005) reports in his dissertation, *Social Constructionism: A Unifying Metaperspective for Social Work*:

Witkin and Gottschalk (1988) have outlined four basic tenets of social constructionism: (a) understanding of the world is created largely through linguistic conventions and cultural/historical contexts, (b) understanding occurs through social interaction, (c) dominant ways of understanding are socially negotiated, and (d) the categorization of understanding social phenomena “constrain certain patterns and reinforce others” (p. 211).

Taken as a whole, these four tenets may best be understood and described as a social process in which dominant notions of truth are negotiated and maintained. (p. 21)

Thus, the “reification” (Berger & Luckmann, 1966) of dominant truths could be playing a role in the way teachers see international student challenges and contributions. Or, something else could be going on. The iterative nature of knowledge development in social constructionism (not emphasized in the above quotation), the ability to challenge existing knowledge through reflection and discourse, guides my interview questions, designed to elicit authentic responses to the research questions.

By providing the theoretical framework, social constructionism “frames” the study (Savin-Baden & Major, 2013, pp.131-147), providing philosophical focus and setting its parameters (whether narrowing or widening the potential field of inquiry). My use of social constructionism, therefore, was appropriate for investigating a process such as teacher perspective, lead me to develop appropriate research questions recognizing answers that are socially constructed, underpinned interview and document review methods, and guided the analysis and interpretation of data.

Within the belief that social knowledge (upon which teacher decisions about the international students they teach may be based) is developed through interaction with other human beings, this philosophical approach --- which comes from psychology and sociology (Denzin & Lincoln, 2005; Savin-Baden & Major, 2013; and others) --- dictates that the worth of

my study depends on plausibility rather than claiming definitive findings. According to Andrews (2012),

Burningham and Cooper (1999) maintain that . . . social constructionists do not present [their results] in objectivist terms, but rely instead on the plausibility of their findings. In other words, they set out to have their findings accepted by presenting a convincing argument rather than arguing that their results are definitive. This is consistent with the idea in constructionism that the findings of research are one of many discourses. The suggestion here is that far from being neutral, social constructionism can generate real debate and lead to change.

That plausibility will be assessed in terms of questions such as: *Has my research captured and presented a fair representation of teacher perceptions?* In this way, the social constructionist theory which “focuses on interpretation of subjective meaning and shared knowledge that is developed through interaction” (Savin-Baden & Major, 2013, p. 22), a belief echoed by Burr (2003) who says objectivity is impossible because “No human being can step outside of their humanity and view the world from no position at all which is what the idea of objectivity suggests . . .” (p. 152), gave me a framework in which to collect data through interviewing STEM professors, and triangulating with appropriate documents (copies of papers containing teacher comments on international students’ work, representative prompts, and course syllabuses), subject my findings to thematic analysis leading to a somewhat intuitive interpretation, and present results in an academic dissertation.

### **Why Case Study Fits**

According to Yin (2006, 2009), the case study methodology has been accepted as an effective way to do educational research. It is particularly appropriate for exploratory projects such as this one because of its “focus on a contemporary phenomenon with a real life context” (2009, p. 2) and use of questions that “require an extensive and ‘in depth’ description of some social phenomenon” (2009, p. 4). In his chapter in the *Handbook of Complementary Methods for*

*Research in Education* (2006), Yin offers summary points on the advantages and demands this methodology offers educational researchers, including:

- looking deeply at an event in its everyday setting,
- gaining a first-hand understanding to describe or explain questions,
- using detective skills to keep the big picture in view during data collection,
- choosing a specific justifiable case while openly (on purpose) taking on or lessening the importance of theory,
- being sure the selected case actually is connected appropriately to the study,
- triangulating to verify and achieve robust data,
- presenting data in many ways (in addition to narrative) to increase clarity, and
- potentially using analysis throughout data collection to build the argument.

Applying these points to my research in an effort to justify the choice of case study methodology, I found the ability to investigate teacher perceptions through semi-structured interview gave me first-hand opportunities to explore the process named in my research question. The use of documents, illustrating teacher feedback on student papers, copies of syllabuses and typical writing prompts to verify data obtained during the interview, served to increase data validity. Using thematic analysis throughout the data collection is certainly a piece of advice I was able to follow in this study as surprising themes emerged. It is the advice about presenting data in many ways that stifled me: if I were talented enough, I would have presented it in a graphic novel. Meanwhile, I needed to be sensitive to the issue of clarity by presenting and connecting detailed specificity. At the end of the day, case study methodology fit the research question, the social constructionist philosophy, and the educational discipline.

## Methods

### Data Collection Methods

Among the tools linked to this methodology, interview and document analysis offered the best chance to gather rich data.

**Interviews.** To collect data focused on elucidating my research question, I used appreciative inquiry. Why an appreciative inquiry approach? According to Savin-Baden and Major (2013), an appreciative approach “examines what is positive in an organization and uses what it positive as the beginning of future growth and development, [...] focusing on what has worked well” (p. 262). Further, these authors report this approach encourages risk, redesign and implementation of new plans. “The idea is that by recognizing and appreciating what is good and already in existence those involved are confident enough to suggest alternative futures” (p. 262). It is a collaborative perspective, valuing the concept that “all voices must be heard” (p. 262). This philosophy certainly resonates with my understanding of those who teach out STEM courses. Our school has been a leader in the field for almost a century; at every opportunity, the chairman of the board acknowledges the primacy of teaching excellence in that achievement. By giving these professionals a chance to discuss their practice and their challenges, this study made surprising discoveries with positive as well as challenging implications.

For this work, I was able to take advantage of a pilot study done by Ives and Perez (2106) to develop appropriate interview questions that zero in on the concerns teachers raised. For a list of semi-structured interview questions, see Appendix A. Member checking (discussed elsewhere) will add to authenticity by reducing the chance for misrepresentation of teacher views. Within bounds, the interview went where the teacher responses lead. In addition, the

appreciative inquiry approach reduced the time needed to create rapport by eliminating any suspicion of critique (which was definitely not the goal of this exploratory study).

**Documents.** Student assignments on which teachers provided feedback served as verification of student experience; does teacher process match expressed perceptions; do they do what they say they do (Ferris (2014), found many teachers give lip service to techniques they rarely use). I reviewed written work (including teacher feedback) of international as well as domestic students who completed the course during the FA16 term as well as copies of syllabuses and typical writing prompts. This ability to triangulate was implicit in the fact the documents were not created for a research purpose but represent a normal incidence in the real-life process of instruction. Interview responses and documents provided enough data for thematic analysis to make sense.

## **Trustworthiness and Ethics**

### **Trustworthiness**

According to Yin (2009), “Case study designs need to maximize their quality through for critical conditions related to design quality: (a) construct validity, (b) internal validity [which he elsewhere indicates is not a requirement for exploratory studies], (c) external validity, and (d) reliability” (p. 24).

**Construct validity.** Yin (2009) advises researchers to use “multiple sources of evidence, establish chain of evidence, [and] have key informants review draft case study report” (p. 41). Multiple sources of evidence will include not only the several participants (all part of one “case”) but also the documented student work and syllabuses. Comparing participant testimony with their actual feedback on student work acts to triangulate, verifying practice with philosophy and increasing validity of reported findings. For logical verification of research chain of evidence, I



discussed my emergent findings with my committee chair and committee members (one of whom is a significant faculty member at the university where the study takes place) to ensure that analyses were grounded in the data (Lincoln & Guba, 1985). In harmony with an appreciative inquiry approach, the collaborative aspect of this study was enhanced by utilizing “member checking,” inviting participants to review and respond to research presentations of their testimony. Recommended by Yin (2009), this practice also takes into consideration the social construction of knowledge. According to Burr (2003), social constructionism recognizes that “The task of the researcher therefore becomes to acknowledge and even to work with their own intrinsic involvement in the research process and the part that this plays in the results that are produced. The researcher must view the research as necessarily a co-production between themselves and the people they are researching” (p. 152). Member checking uses this co-production to advantage accuracy as well as validity. It reduced the potential for misinterpretation and unintentional bias that could have marred this study.

**External validity.** How well interpretation of results resonates with existing pedagogical theory provides evidence of external validity. The absence of predictive theory/proposition in this exploratory research made this point difficult for me to address.

**Reliability.** Usually, it is the ability to replicate a case study that indicates reliability. I trust someone asking the same questions of the same participants would get the same answers and make the same interpretations.

### **Ethics**

Ethical considerations were addressed in Institutional Research Board applications submitted to the appropriate authorities at both the site of the research and the University of Memphis, the degree granting university, a copy of which appears at the end of this document.

Ethical treatment of human sources included protection of anonymity through in-text descriptions as well as the use of pseudonyms and the removal of all student identification from documents of written work with feedback. The use of member checking also facilitated the catching of any unintended revelation of identity by the researcher.

### **Constraints**

There were two potential constraints to my ability to carry out this research effectively: my identification with and sensitivity about international students in academic settings derived from my years as a college ESL teacher, and my respect verging on awe for the professional instructors who teach at our school. My interaction with L2 writers has produced understanding and empathy for their plight in academia, enhanced by my experience of learning a foreign language as an adult and never managing to acquire the fluency I see in my students despite their incomplete acquisition. Their L2 interlanguage is better than mine. The teachers I interviewed outrank me in almost every qualification, degrees as well as real world experience. They have been recruited as practitioners who bring technical knowledge and experience to our college classrooms. I needed to consciously suppress both of these somewhat emotional responses. The generosity and patience of my participants made the experience enjoyable and eliminated the stress I had imagined. Luckily, social constructionist theory does not favor emotion, according to its critics (Burr, 2003), so this handicap of the theory probably worked in my favor.

### **Site Selection**

This private technical university was chosen because of my familiarity, based on having taught there since 2010, my concern for the plight of international students making their way through STEM courses with academic, cultural, and linguistic challenges, and my curiosity about the perspectives of their teachers in view of a less than enthusiastic response to a recent attempt

by English teaching colleagues to inspire course revision. My place as full-time non-tenured faculty and reputation as having been selected the department's Adjunct of the Year in 2010 and invited to pursue full-time status in 2011 were expected to facilitate access which had already been verbally granted by the coordinator of NNS programming and a supportive department head, and recognized by the university's Institutional Review Board.

### **Participants**

I interviewed nine professors who taught mathematics, engineering, aerospace engineering, computer science, aeronautical science, and business management courses during the FA16 semester at the Southeast campus of this private technical university. These participants responded to an email requesting full-time STEM teachers to be interviewed about their experience teaching international students during the FA16 semester. Since I teach at this university, I was able to access email addresses of full-time STEM teachers and permission to email them. Email text appears in Appendix B. The idea of focus groups was rejected because of the possibility of groupthink or even polite surface agreement with colleagues. Depending on volunteers was purposive, because these professionals were likely to (and indeed did) produce useful data. The participants signed consent forms which assured them of anonymity. Pseudonyms were promised to be used in any published work and identifying information about teachers or their students was assiduously avoided.

### **Data Analysis**

In general, analysis involves taking something apart to examine those parts for meaning. Data analysis, according to Savin-Baden and Major (2013), applies this procedure to making sense of the information gathered during qualitative research. Ideally, the process is repeated

many times as the researcher thinks about the relationships that emerge and develops an interpretation of what the data is saying in relationship to the research question.

### **Thematic Analysis**

Thematic analysis has the advantage of connecting intuitively to the data while being applicable to many different kinds of qualitative research and the disadvantage of being misidentified when another analysis method such as narrative or discourse analysis is actually being used, according to Savin-Baden and Major (2013, pp. 439-440).

It was the recommendation list of Braun and Clark (2006, as cited in Savin-Baden & Major, 2013, p. 440) that motivated my choice of this analysis method for the current study.

Savin-Badin and Major (2013) admit thematic analysis

is not the most scientific method but [...] one of the best. The researcher can rely on intuition and sensing, rather than being bound by hard and fast rules of analysis. Braun and Clark (2006) recommend doing the following when conducting thematic analysis:

- familiarize yourself with your data
- generate initial codes
- search for themes
- review themes
- define and name themes
- produce the report.

What is unique about thematic analysis is that it acknowledges that analysis happens at an intuitive level. (p. 440)

Basically following these recommendations, I expected understanding to “emerge” from the data during the process of identifying themes. Keyword analysis, for example, would not have accomplished it. In addition to my data being too voluminous, the corpora approach applies quantitative principles while my study needed the intuitive principles that thematic analysis enables. According to Aronson (1995), thematic analysis focuses on “identifiable themes and patterns” (p. 1), and leads “to build[ing] a valid argument [...], mak[ing] inferences [...], and formulat[ing] theme statements to develop a story line” (p. 2). In addition, she reports that the

interweaving of literature with the interview testimony strengthens the research because “a developed story line helps the reader to comprehend the process, understanding, and motivation of the interviewer” (p. 2). While this short paper is more than 20 years old, it highlights the advantages of this data analysis method, and those advantages have not changed. Andrews (2012) supports the effectiveness of social constructionist theory in the production of valid arguments as he reacts to those who say social construction doesn’t *do anything*, that it isn’t *active enough*. In the situation in which this research took place, an active critical approach was neither necessary nor appropriate. Sometimes the most long-lasting change is enabled by engaging stakeholders in empathetic listening. With that realization, it is fair to say this data analysis method supported the explorative nature of this inquiry.

### **Representation**

The intended audience for the data this study produces consists primarily of the teachers at our school, but also includes professional college STEM teachers across the country. There might also be some interest among the WAC/WID community. International students come to this country to study in the technical fields. It is a rare college that does not contain some of this sort of diversity. While acknowledging the limited readership of dissertations in general (if I had the talent I would present my findings in a graphic novella), this is the format in which the academic community expects to receive the discoveries of professionals who are new to the field.

That the case study methodology lends itself to educational research is not news (Yin, 2006, 2009), nor is it unusual to rely on thematic analysis of narrative data collected through semi-structured interviews backed up by collaborative data from documents. What is unusual about this study is focus on what teachers think in this regard. And what is interesting about it is

the possibility for learning from and about the perceptions those teachers offer with the potential application of that knowledge to improve academic offerings for international students who are coming to this country in ever increasing numbers to participate in STEM education. Follow-up activities arising from the information teachers provide are discussed elsewhere, but I can anticipate results leading to some mild revision of first year writing programs at our school as well as the creation of more carefully crafted writing and text prompts in STEM courses as teachers become more reflective about their practice. In summary, results could possibly be generalized to STEM as well as WID pedagogy, in harmony with other projects being introduced at the school.

## Chapter 4

### Research Findings: The First Three Questions

The nine full-time professional educators (3 assistant professors, 3 associate professors, 2 full professors, and 1 visiting professor), participating in this study include 2 math teachers and 3 teachers of engineering fundamentals, as well as an aerospace engineering, computer science, aeronautical science (flight) teacher and a business management professor. The group was composed of 3 women and 6 men. All but two participants had earned doctoral degrees. College teaching experience ranged from a recent Ph.D. earner in the second year of post-doctoral instruction to veterans of more than 20 years. Two professors were retired military officers with extensive experience specifically related to the courses they teach. Three respondents spoke English as a second (or third) language and retained distinct foreign accents.

The themes that emerged from participants' testimony often blurred the lines between questions, combining answers to the first three queries about the impact of international students in the classroom, perceptions of academic ability, and contributions. Therefore, I combine those responses in this chapter and report participant suggestions (responses to the fourth question) in Chapter 5. The research questions to which findings reported in this chapter connect are the following:

1. How does the presence of international students affect the learning dynamics of the STEM classroom?
2. What are the perceptions of STEM teachers about the academic skills (reading, writing, pragmatics) international students bring to the STEM classroom and how effective are those skills in meeting the requirements of contemporary STEM pedagogy?

3. What are the perceptions of STEM teachers about the contributions international students make to the STEM classroom?

When discussing the ways international students impact learning in the classroom, participating STEM professors initially say “no difference,” but follow with anecdotes indicating international students do indeed perform differently, if not better or worse, in class. While decrying a general lack of “transfer” among almost all students, STEM professors in this study report accommodating the occasional international student who needs more time to read instructions and complete assignments, and acknowledge the use of varying grouping strategies, while admitting that learning styles can be confusing. In addition, they value the way international backgrounds mold motivation that leads to innovative project choices and enriches class discussion. Overwhelmingly, they praise diversity as advantageous in itself but go back to “no big difference” when discussing general academic abilities, referring to a “normal bell curve.” Academic issues tending to be challenging, resulting from incomplete understanding or production of the English language, are universally reported as insignificant, occurring only occasionally and intuitive to accommodate. The issue of plagiarism is addressed from different perspectives: most see a relationship to culture and the need for explicit instruction; one teacher connects the practice to poor teaching strategies. Contributions, they claim, are obvious in enrichment of discussion and project choices that international students offer in class and in group work, but more apt to result from maturity, experience, preparedness and personality type than country of origin or native language.

### **Learning Styles**

Much of the discussion focused on aspects of education involving all STEM undergraduates, not just internationals. For a capstone class in aeronautical science, students are



required to write a major research paper. Finding that overall students couldn't cite sources, Dr. Tom Carnegie asked communications teachers what they did in Technical Writing. "We teach them how to cite," the writing instructors said.

"Something happens where it all goes away," the flight teacher reflects.

Asked if more international than domestic students failed to cite sources, he says, "I really don't see a difference."

And then he adds,

I see differences in the classroom. Right now, I have a Chinese student, and I've had [Chinese students] in my other classes too and their level of understanding varies. For instance, this particular Chinese student, I am not really sure if he is understanding me or not, but he writes perfect. I've received a couple of notes from him and it's perfect English. But when I am in the classroom and I ask him a question, I can see the process going from English to Chinese and then forming the idea and translating it back from Chinese to English . . . .

In a related conversation that indicates his humor as well as flexibility, he explains a change in his approach:

I teach using the Moving Finger of Death, when I put up a power point slide, I point to one student, so that's the way I teach: keep them engaged. And so, my old method, and it was before I went to a CTLE [Center for Teaching Learning and Excellence] session, is if I went to a foreign student that was taking too long, I'd move on. But now what I do is stay with him. I may have to prompt, but I won't leave them until they give me an answer of some sort no matter how painful it is for the entire class.

He laughs and concludes, "You know 30 seconds or 90 seconds is an eternity in the classroom." The other students take this practice "as a normal event," and he recalls no indications of discomfort from classmates.

However, foreign students do not always require more time. Explaining his active learning pedagogy, Dr. Carnegie rattles off requirements:

I expect students to perform. They have homework every class. We have discussions every class. We go to the board every class. [...] If we have a question of the day, every student in the room has to respond. And that's where the Chinese student may take longer

than any other student in the class to answer the question. And some of it may be homework, so they should have come in prepared. Like read this article and tell me the top three things you take from it. It's funny because we did that yesterday and the Chinese student had an answer right away. You know, the one who has difficulty understanding. And I was prepared to wait, but he had a very good answer.

Dr. Edwards reports similar experience with his senior business management students and also admits to being confused at times by international students' learning styles which he acknowledges are the result of "a different way of thinking and making decisions":

I found that the international students are what I would call *sleepers*. They don't appear to be absorbing the information, but when you give them a pop test, [...] they understand the subject matter very well. So I've learned not to underestimate nor to accept it at face value because, you know, looks can be deceiving.

He then describes international students whose note-taking and non-note taking practices varied greatly, but both aced tests causing him to admit, "I never know what to expect from them," and adds, "overall, I think that they probably perform a little better."

It seems significant that not one single participant referred to international students in general as "a little bit worse."

While Aeronautical Science Professor Carnegie discourages "ventriloquists," students who answer questions that were put to another classmate, he sometimes allows (and actually appreciates) translators:

I had one student a year and a half ago and he could barely understand the questions I was asking and I couldn't understand his answer. But he had his friend sitting alongside him who was a perfect translator. So I'd ask him this question and he'd answer me back and I said, "I'm sorry I don't understand," and his friend would say, "This is what he said." And I guess he said it.

Carnegie is not alone in reporting that he accommodates international students and gauges the tempo of his instruction to the foreign students in the class. To encourage note-taking, he refrains from posting his power point presentations but color codes the material. What's in gold text will be on the test, so he directs students to make notes, especially of the information in

gold. He notices international students take longer to make these notes, often copying verbatim instead of summarizing, and he “keep[s] an eye on them and as soon as I see they’re done writing, that’s when I move on to the next slide.”

“I probably have more experience dealing with foreign students than the average professor because of my military background,” he asserts, and briefly references his extensive background in administration and instruction at this and other institutions. Military experience is evident in his approach to the “impossible” research paper where most students are reluctant to follow instructions until he demands, “Bring me your cover page on Tuesday, just the cover page.” Then, “Next one to bring me is your abstract.” A few days later, it’s “Bring me your first page; bring me your reference page.” Each of these pre-deliverables gets immediate feedback, and if students take advantage of the help, they master the format and can concentrate on content. Despite all the help he offers, including just giving them a sample paper and saying, “Put your name on it; it is perfectly formatted,” many students still don’t get it. His power point presentation contains a few slides with illustrations of bringing horses to water. He has students keep bringing the pages back until they get the concept. “But at some point, I stop. I’ve done it for you two or three times. Next submission you live or die on. You get the grade deserved.”

Despite the heavy workload, discussing a picture of the day, reading an article of the day, reporting on a contemporary flight issue, summarizing and recognizing key points and composing short as well as long academic papers, every student passes this capstone course. Somehow Dr. Carnegie makes it impossible to fail with short term assignments, copious homework and timely, precise feedback. Documents indicate his comments on student written work, mostly underlining errors and occasional marginal comments (one better than average paper got a “Wow”), is consistent across native/non-native lines.

While there is “not much writing” in Dr. Edward’s quantitative business methods course and he does not join the majority of participants in characterizing writing skills as dreadful, he wants students to make their explanations succinct for busy managers and clear enough for them to understand. “If somebody is reading that worksheet,” he cautions students, “they’ve got to be able to figure out why you’re giving that answer.” After saying, “From my perspective I think they are prepared,” he echoes Carnegie’s comments as he recounts his practice of enabling transfer although he does not use those words:

By the time they get to me, they’ve had their tech writing, they’ve had their introduction to computer systems, so they’re pretty quick on it. Matter of fact, some of them ask for review. They need to review it because, you know, when they walk out the door from that last class, it’s an automatic: they erase that disk; it’s gone.

Realizing that it is necessary, he begins by calling their attention to the application of old knowledge to new situations, a practice in line with advice from transfer theorists and neuroscientists (Fishman & Reiff, 2011; Zull, 2002; and others). He may also be enabling what DePalma and Ringer (2011) call “adaptive transfer,” the ability to not only apply old knowledge to new situations but to change it, “reshape it” to fit new situations.

### **Response to Accents**

Concerning accents, Dr. Edwards believes students have to get adjusted to his Southern drawl as much as he and they have to adjust to international accents; he models careful listening.

Dr. Jameson, an engineering professor, tells a revealing story to explain his reaction when he encountered a “situation” in which an international student didn’t want to “present” in front of the class because of his accent. The professor said,

Tough, you need to speak and other people need to listen and hear what you say because it’s a global environment and I have had conversations with engineers from France and China at two o’clock in the morning and they were talking as fast as they could because there was a problem with something that we did. And I couldn’t sit there and say, “I’m

sorry, I don't understand you. Can you please like speak more with an American dialect or something like that." It doesn't work that way!

He also told the student that the grade would be based on content.

Professor Erika Samson speaks protectively of the 30% international population in her engineering classes. If they are quiet in class, she interprets that as shyness, accepting that someone might feel nervous about speaking "out loud in their not native tongue"; she makes sure to check understanding when she circulates during the in-class activities and homework preview that characterize every class.

That's how I can say confidently that there's not a higher percentage of international students that struggle with the visualization concept, because I walk over and my Chinese students are doing fine and my Indian students, you know, maybe one of them is struggling, but three of them are doing fine. So then we communicate, and they generally do not have a problem communicating. I have had in the past one or two of them being very nervous, but eventually they were able to communicate their idea. And sometimes they'll stick around after class. I think maybe they get a little embarrassed or just overwhelmed with a bunch of other students standing around or looking over as they're talking. My takeaway is it does serve as an extra challenge for them, but I wouldn't call it a barrier. I think they can get around it if they have a professor who can have that one-on-one time. I think that one-on-one time is very important.

She provides one-on-one attention during and after class as well as at her office where she says, "I wouldn't say it's a higher percentage" of international students who come with questions. Indeed, she reports that only two in eighty of her recent international students exhibited writing issues that required substantial feedback. She does provide more comments on grammar and sentence structure for international students, dealing mostly with word choice and awkward phrasing, but identifies a general lack of details and organization as well as inappropriate use of colloquial language in the early submissions of almost all her students.

Nor does she see much difference in students' manner of participating in ungraded in-class exercises. She does notice that some international students "tend to clump together," but

their communication is carried out in English, at least until they hit the door on the way out of class.

### **Grouping Philosophies**

Since the majority of class activities consists of teamwork, grouping plays a significant role. Primarily Professor Samson encourages students to populate groups based on shared topic interest. If foreign students do not self-assign into groups, she suggests placement “to avoid tension,” partnering them with domestic students likely to be welcoming. She reports encountering no group issues that concerned international students, maybe because she is so sensitive about putting them together with empathic classmates who might not mind doing a bit more proofreading. Samson explains:

If they didn't self-select into a team, then I am making that final decision and I can say without a doubt the fact they are international vs. [native] English speaking does play a role in my decision making and I'm trying to make it --- maybe this is bad --- but I don't want there to be tension. I'm trying to avoid tension. Someone might say they're going to have to cope with --- or they need to learn those skills [coping with uncooperative teammates], but I don't know that a first-year engineering course is the right place for them to learn those skills.

Most group selection focuses on project topics, choosing a product that they are going to reverse engineer. She smiles when talking about a group composed almost entirely of international students who were all interested in model cars and won “poster” recognition with an excellent final project.

And what about domestic students' attitudes? Professor Samson calls it “a non-issue”:

I've never actually had a situation where anyone has really said, “No, I don't want to work with [someone who] is not from this country or doesn't speak English.” They've never articulated that to me. I've never seen it in peer evaluation. [...] At the end of the semester where they get to rate one another on their contribution, participation levels and general attitude, I would say the international students are scored just as high as everybody else.

Indeed, no participant in this study provided much evidence of domestic or international students complaining about each other based on language proficiency or country of origin. Bad team members were those who did not participate energetically, who did not show up for meetings, who did not hand in their part of the project on time. There seemed to be no domestic/international predictor of who those bad apples would be. However, Professor Bradley, who teaches computer science among other courses, recalls a time when a couple of international students' discomfort with the language caused them to pull back from group participation; he describes such occasions as rare and explains that "the group does what student groups always do: they carry on and try to get by with smaller group participation."

### **Language and Academics**

Dr. Bradley believes the rarity of language issues in STEM class results from the university's requirement for international students to demonstrate competency in English before they are permitted to take undergraduate courses in major subject areas. In general, he says,

Language issues have not primarily been a problem. Sometimes I'll have a foreign language student who needs a little bit of clarification on a problem but that's pretty rare, actually. I'm fortunate enough to be teaching math which is a fairly universal thing, and also programming is widely universal, so if you looked on, say over the shoulder of a programmer in South Korea, they're probably programming in Java and they're using English characters or [laughing] Arabic characters, so it's the same alphabet across the world.

Indeed, his feedback takes the form of "response" in the sense that Spooner (2002) suggested when he called for "one that proceeds from a valid understanding of the text, its purpose, its audience, its traditions, and [...] conventions within those parameters" (p. 166). He doesn't mark errors but indicates misunderstanding of content and engages students in conversations about the text. Bradley continues,

I don't think I see a difference in willingness to participate in class based on language capability. I think I see it based on comfort with the material, so if I have a foreign

student who's comfortable with the material and outgoing, they're going to participate in class just as much as anybody else and more than the average student. But I don't see that as a group I have to draw out the foreign students particularly in a special intentional way. It just happens, and the ones who are going to be quiet are quiet.

When pressed for opinions about international students' academic skills and ability to fulfill course requirements, professors responded that international students were as good as their native English-speaking classmates in every category except those in which they were better. In this regard, they contradict findings reported by Silva (1993) that predict less successful outcomes for second language students.

Math professors Chan and Balan do identify academic deficits, observing there are quite a few enrolled undergraduates, domestic and international, who lack preparation for college math --- so much so that the school is developing a remedial program in which students may be able to access online remediation parallel with calculus courses. Dr. Chan blames domestic K-12 inadequacies and family influence or its lack. Visiting Professor Balan's recent graduate work in math remediation will play a helpful role in the evolving program. Both professors refuse to be intimidated by stereotyping charges, stating European and Asian students are simply better at math because "their countries take it more seriously." Indeed, Balan finds Americans more quiet in her calculus classes and attributes this anomaly to their lack of preparation. This observation resonates with general reports of prepared students being among the most active contributors to class activities.

Dr. Marcelle Falconi identifies another source of excellence in her aerospace engineering classes, testifying that Spanish-speaking students from South American are consistently in the top 5% of her airplane design course. Some of these students have transferred from South American colleges where she says the curriculum is extremely demanding with longer programs and more courses than she has noticed in American universities, so these students are better



prepared than their classmates for the rigors of the program from which they will earn double degrees in the United States as well as their native country.

An international student herself, Dr. Falconi is not always aware of the native language of her students. Sometimes a name that suggests international status belongs to a student who grew up twenty miles from the school. She often learns about country of origin in conversations with students about job opportunities “because for aerospace engineering, being a citizen it’s important for getting a job.”

In some cases, an accent will reveal non-native language status as will “some differences in their writing,” but Dr. Falconi reports a lack of clear, structured writing from almost all her students at least at the beginning of the course. “Writing is hard even in your own language,” she states, reflecting the general opinion of study participants.

They really don’t know how to write. And I think it is actually true: I think we have this perception that as we are STEM, it’s all about numbers and we really don’t have to write. It’s completely wrong, and I was even a bad writer. It was only after grad school that I realized how important it was, that it really needs to be learned and learned well to communicate your thoughts. [...] Many engineers don’t know how to write. Even the top engineers in industry. You see reports on the internet that are available: they are very badly written. I mean you don’t understand anything that is in it. It’s impossible to reproduce. I am trying to encourage them to realize it is an important skill to have. [...] And it’s mostly not the grammar; it’s just the structure of the report. They don’t know how to put it together so it’s easy to read. Drives me crazy!

She resists requests for examples, providing guidelines instead, because she wants students to struggle and use critical thinking. She sees student complaints about exam questions that are not exactly like homework examples as an indication of overreliance on received knowledge. And these comments are not confined to international students but characterize most of the students she teaches, foreign or domestic. In fact, she repeatedly refers to her top 5% of the class: students who consistently get A’s and come from South America as she does.

Dr. Falconi is one of two professors in the study with distinctly foreign accents who report receiving negative end-of-course evaluations from students who complained that teacher accents got in the way of their understanding content, even though both professors augment their oral instruction with written explanations on the board as well as posted on Canvas and also routinely provide time for in-class practice. Such student reaction is not unusual in the literature with studies showing general tendencies of native speakers to rate communication less understandable if accompanied by a foreign accent (Zawacki et al., 2007).

Unsurprisingly, she relates to international students

because they are having the same challenges that I had. I came here not speaking the language very well, so I understand that they want to hang out with their friends from the same country. While you get used to it, you need something that is familiar to you.

This explanation might be clarifying to the faculty member in Leki's (2006) study who "criticized L2 students for associating primarily with other L2 students instead of making friends with domestic students in order to practice English" (p. 143).

Falconi relies on her own early preference to be with fellow Spanish-speakers when allowing students to set up their own groups after one experience with computer selection that students "hated." In what she calls "a special case," American students complained about international teammates, but foreign students almost never complain. Indeed, she described a bad group experience in which one student expressed extreme annoyance about having to do all the work and getting a bad grade because of uncooperative teammates initially as a mix of domestic and international students only to check her records and find it was a totally American group.

In her first post-doctorate year of teaching, Falconi was surprised to find many students seemingly unaware of the prerequisite knowledge for instance from their Statics course. Eventually she realized she needed to review the work of previous courses before students were

prepared to go forward. Still, she expresses frustration at preparation levels, and that is not limited to international students who, she asserts, are generally under more pressure to succeed: “If you don’t do well, you have to go home and it’s like a wasted opportunity.” In addition, she believes that many of this school’s international students are the best that their countries have to offer. The preponderance of international students admitted to the university’s graduate programs would seem to substantiate her opinion (Enrollment Factsheet, 2017). Yet, not every international student excels in her course, not even all the Spanish speakers. She frowns when she recalls a recent experience in which three Spanish-speaking students were not able to pass, unable to understand content despite her repeated efforts. “I explained even in Spanish because I have that ability, and they just didn’t seem to understand.”

Several respondents admitted to the occasional foreign student who seemed lost, disappeared from class or never showed up after registration; however, their pass/fail records did not indicate much difference in achievement of course requirements between international students and their American counterparts.

The issue of plagiarism, while surely not confined to international students, is often identified as a cultural characteristic. “They know it’s wrong and they do it anyway,” one professor maintains describing departmental cases of academic dishonesty that involved students from the Middle East. He describes two kinds of plagiarism: that committed by students who do not know the citation rules and American intellectual property laws, and that done by students who break the rules on purpose. Anecdotal evidence, especially from communications and social sciences faculty, identifies Middle Eastern students as more likely to plagiarize than others, but Dr. Jameson, an engineering professor, vehemently disagrees:

I’ve seen as many American student pairs cheat as international students, and I have no anecdotal or statistical evidence that says my international students cheat more or share

more or have this cultural expectation that it's allowed. I don't buy that! I would say if they're cheating, it's not their fault, it's something I'm doing that's encouraging or making them feel that cheating is necessary to make them demonstrate their learning --- or to get points, and I refuse to teach them that way. I tell them I don't care about points. I care that you can show me what you know. You'll get the points or the grade at the end of the semester. My way around cheating is to de-emphasize points. They still cheat, right? It happens when they do it, but I can't say there are real cultural ties to that. I *refuse* to say there's a cultural tie.

Dr. Jameson also believes the institution could do more to capitalize on “international perspectives and international contexts in global engineering.” He admits, “It is one of those things like ‘I hope it happens,’ but I never actually do anything within the course to make it happen.” He would like to see more projects coming from non-Western perspectives.

Fellow engineering teacher Dr. Langston is not conscious of doing anything special to encourage it, but he sees significance in the motivation and project choices of his international students:

I have recognized [in international students] a greater need to benefit society and those that are less privileged, and maybe it's based on some of the countries they're coming from. It just seems like more of our [international] students are concerned with those issues. [He adds,] I do actually hear international students saying more things like “I want to go back home and impact this community in a positive way,” or “There's this problem and I want to solve it”; whereas, with American students, it seems like “I want to work for this corporation” or “I want this kind of a job.”

He recognizes perspectives that are broader and not what he calls “just US-centric”; then he describes a low-tech water purification project that two international students, working on a team with two domestic students, created. Their choice was clearly related to conditions back home; it involved designing a purification system for an individual water bottle.

Such project choices, along with globally-based examples of course-related material, are clear indications of international student contribution, the kind of events that happen when they are in our classrooms that would be unlikely to happen if they were not there. International students in Dr. Carnegie's capstone class contribute examples of flight experience in their home

countries to classroom discussion: “If someone is sharing a story, most students will be more attentive when a peer is sharing personal experience than me,” Dr. Carnegie shrugs. Even their mistakes are fascinating. A Middle Eastern student argued against the Wright Brothers as the first men to fly, claiming the role for an Arab pilot. The professor was able to recognize the student’s contribution, acknowledging the early flight by the Arab pilot, but comparing the dates which indicated the flight came several years after that of the Wright Brothers. Without the student’s comment, however, the class might never have realized how early Arab pilots were involved in human flight.

Most respondents, however, described students who contributed the most to their classes as mature, experienced, prepared and outgoing. The emphasis on work experience and personality type along with studiousness plays a more significant role than native language or country of origin. Military service predicted significant student contribution, and it mattered not at all if the student had served in the U. S. military or the Korean Army.

According to Dr. Bradley, an unusual or remarkable contribution is

not about the national boundary. It’s about the experience level. For example, when we have vets in my class, they can sometimes say, “Oh, we did that in the field; now I know why we did that,” and that may also have happened with a student who was not as young as some of the others and might have been an international student, they might have had experience that they brought into the classroom, but I can’t recall anything off the top of my head. But I would argue that that’s about did they have some experience out in some kind of real world job rather than national boundary.

Dr. Jamison sees a distinct difference in student behavior outside the classroom. He affirms that foreign students are more polite and gives examples of Middle Easterners going out of their way to greet him with “Good morning, sir” or “Good afternoon, sir,” even after they have completed his course while a former American student might say something flippant such as, “I’m glad to see you still have a job here.” Jamison chose an international student for his TA

(teaching assistant) and says, “I didn’t hire him because he was international. I just hired him because he did good work in my classes and he was dependable and had a good rapport with the students in the class at the same time.”

While not every participant instantly recalled a specific incident of international student contribution, each of them expressed appreciation for their presence at the university using phrases such as: “I think international students’ diversity as a whole adds value to any course,” “They make an impact that is positive,” “I think they fit in,” “I am happy they are here,” and “We need them.”

## Chapter 5

### Research Findings: The Fourth Research Question

This chapter reports on participant response to the fourth research question: What (if any) changes would STEM teachers like to see in the preparation of international students for STEM courses they teach.

Few respondents expressed strong opinions about needed changes in student preparation specifically focused on international students. That said, two professors did call for “more writing practice” for the minority of non-native speakers whose texts lacked clarity resulting from wrong word choice and awkward phrasing, and several recounted instances of accommodating student needs in terms of listening, speaking and reading. The accommodation was almost exclusively provided in terms of additional explanation and allowance of more time. It was considered a normal part of teaching: molding instruction to individual student needs.

Most participants expressed the wish that all students had been better prepared for the kind of writing required in STEM courses. Several saw a mismatch between the efforts Writing Center tutors and the needs of engineering students, and every one of them recognized a lack of transfer in the students they teach whether manifested in subject knowledge covered in a previous STEM course or organizational and citation skills covered in Technical Writing.

While Professor Samson believes there is not enough writing in her graphical communications course to team teach it with a writing instructor, she suggests such a relationship might work with EGR 101, Introduction to Engineering, in which students are required to write a technical report.

Her colleague, Dr. Jamison, describes lack of intramural communication as “a pervasive problem across all the colleges”:

I hate to break it down this way, but we work in silos. I do work in my department. I have [students] work on resumes. They do technical reports in my classes. They create technical engineering drawings, things along those lines. All of them tell stories or narratives about some things. We even have them create resumes in EGR 101. Some of the programming classes have them document processes like user kinds of things, but we never reach over to Communications, saying, “Hey, is there a way we can integrate this?” I think that there could be value in doing that. I am on a couple of committees with [a member of the Communications Department] or at least I was, and he said he has them creating resumes and things along those lines, and I said, “That’s funny, so do I.” He’s just like “Why aren’t we talking?” and I’m like “I don’t know.” And we’ve never talked since then. We said, “Hey, we’re going to talk to each other about what each of us do, but we never have.” So I think it would be valuable to create an avenue of communication. [...] It would be phenomenal.

In addition, Dr. Jamison says, “Hardly any of us are trained in writing. A lot of us participate in scholarly writing, but that doesn’t mean we know how to teach writing.”

He was not the only participant to express this sentiment. Dr. Falconi recalled consulting a writing book designed for teachers but says she did not like it. Obviously, it did not meet her needs as well as a short book by Bahls (2012) might have. This math teacher provides the kind of advice one sees in Dr. Carnegie’s course, including short assignments to enculturate students into the practices of academic writing in quantitative courses. Dr. Carnegie assigns a series of one-page reports so students can practice the summarizing skills needed for his final research report as well as the technical explanations they will have to create, succinct and clear, in their flying careers. Dr. Edwards echoes his advice and his practice in a senior year business management course. Neither professor, however, identifies international students as encountering more serious writing difficulties than their American classmates. This anti-intuitive finding (for a writing teacher such as myself), is pervasive. Data indicates STEM educators look beyond mechanics, often the focus of writing teachers, to more practical indications of potential career success. As an interesting side note, when the school administration cancelled a class day so all students could attend a Career Fair, some communications teachers grouched about the loss of



class time while STEM teachers adjusted instruction to prepare students to take advantage of the employment opportunity.

Dr. Langston calls for an addition to “some general course showing them [the difference between] high school writing [...] and how people are expecting you to write in technical courses, [...] showing them the difference between various audiences.” He is among the majority of STEM teachers in this study who, without specifically using rhetorical jargon, believed student writing suffers from the lack of genre awareness.

Langston also believes students could benefit from electronic resources and videos, and admits he “could probably do a better job of promoting” Writing Center use. Located in an airy room in a new building, the Writing Center is a well-respected facility, consistently praised by social sciences and communications teachers for the effectiveness of its tutors in helping international and domestic students improve their writing assignments. However, the tutors who work there may not be sufficiently informed about STEM topics and procedures, according to STEM teachers. Like Langston, computation math professor Bradley observes:

I don't know why I can't get my students to go to the Writing Center. I advertise it constantly. And I don't know why they don't go there for writing and language. For math, they don't go there because COAS doesn't teach that kind of math. The tutors aren't aware it's continuous math over here. We do discreet math. There's no fractions in our world; that's a different kind of language that we develop, so we have our own tutoring system.

Perhaps the addition of STEM students to the Writing Center tutor list (which already contains tutors who speak English as a second or third language) or an invitation to STEM professors to address the tutors at the onset of the school year would be helpful.

Sometimes international student issues are neither their fault nor that of the school. Dr. Bradley describes an unusual case:

I had a student. He was participating, but failing. Out of desperation, he did have a plagiarism issue, still failing. And when we did the interview with him about the plagiarism, it turned out the only way his government would pay was for him to take a major he had no interest in. So this is something that is not going to happen to most American students. This [Middle Eastern] government was constraining this person's choices. What he wanted to do was fly, so he's taking flight courses, but his major of record was something he hated but had to take courses in. Of course he is failing those courses; of course you would.

Professor Bradley opined that one-semester Technical Writing courses seem to be too short, providing insufficient opportunity for students to practice. He also sees confusion about citation styles (Technical writing classes use APA; engineers use a much simpler style prescribed by the IEEE, the Institute of Electrical and Electronics Engineers), as well as serious organizational deficits that manifest throughout student text:

Where I see students who are fluent with the language, the mistakes they make are content mistakes and you see it at the sentence level, the paragraph level, the section level, and the paper level. A sentence may start out, "This sentence talks about x, y," right? "Hey you told me you were going to talk about x and now you are saying y. Where did x go?"

Or there will be a paragraph introductory sentence on topic, then "what is this doing here?" It happens at the section level. They don't understand. So for example let's do a typical research paper. There should be an introduction that says what I am doing and why you should care, right? And talk in very general ways about the domain. Then a background section that in my opinion should provide definitions for every term you're going to use for the meat of the paper that's coming up. If you do an experiment, you have to describe the experiment set up, again no new terms there; that's all in the background. [After] experiment setup, experiment results summarized, conclusion, related work and future work. That to me is a good outline. They put stuff all over the place inside that paper [laughter], so when they're doing their conclusion, maybe they'll define a new term. That's practice in my opinion. They're fluent with the language, but they're not clear yet on how to organize their thoughts in the way people who read these papers are used to seeing it.

With the international students, if they're fluent with the language, they'll still have that problem. If they are not fluent with the language, [...] on top of that they'll have the mechanics of non-verb agreement and that kind of stuff or maybe not even being clear on the best word choice. [...] Most of the time international students are pretty fluent though, so they don't usually have that kind of a problem. I don't see weird idiomatic expressions trying to creep in, cultural things: I don't see that.

Returning to the need for longer technical writing coursework, he offers a tongue-in-cheek proposal:

If I did add a course, I would do it for all the students and that would be, take the Tech Writing course and have Tech Writing II [where] we're going to study and then write conference papers, just technical conference papers. Maybe have them read a dozen of them to understand what the pattern looks like and then write it. That's not going to happen and I don't think it should because I don't want to add three credits to my degree program. Some of those degree programs are already bursting at the seams. But maybe what would be interesting is if we have a collaboration [in which a writing teacher ...] comes and does some kind of oversight in a course that happens to have a writing component.

Thinking outside the box, he wonders if student organizations based on student interest or country of origin, even something as specific as a tech writing club, might be encouraged to sponsor workshops for students to work on these skills. The pervasive nature of the need predicts success in attracting financial support from the administration in response to such a proposal from a student group.

Paralleling their belief that international students present no extreme challenges and perform no better or worse, in general, than any other students while adding a distinctive spice to the occasional discussion or project selection process, the nine professors who participated in this study direct their primary suggestions at efforts to benefit all students. And those suggestions focus on the need for better student writing and the possibilities cooperation with writing teachers may offer. It is exactly the testimony technical writing instructors initiating a college WID program will welcome.

## Chapter 6

### Discussion

The purpose of this study was to enable STEM teachers to reveal their perspectives about the international students they teach because the literature abounds with evidence from international students about the challenges they face, but not much testimony from their teachers. Asking a series of open-ended questions to nine full-time STEM teachers at this Southeastern technical college and checking their opinions against documents from their courses seemed to be a legitimate way to accomplish that purpose.

The stories these participants tell reveal attitudes that are welcoming, generous, practical and a little surprising. The data indicates:

1. International students are perceived as neither better nor worse academically:
  - a. a few of them excel, as reported by teachers who acknowledge some cultures value math and science more than others
  - b. bell curves of student grades are normal
2. The few non-native speakers who are perceived to exhibit writing and speaking challenges are accommodated quite naturally by professors and almost always by teammates, with emphasis on the practical application of written and oral work
  - a. Differences are apparent between writing teacher perspectives provided in anecdotal evidence and those reported in ESL literature in this regard
3. Contributions of unique non-Western examples and home-country influenced motivation leading to innovative projects are appreciated and celebrated, but most contributions come from students who are mature, experienced, studious and outgoing no matter their nationality or first language, and

4. Writing deficits and lack of “transfer” are seen as universal, far from confined to students who did not grow up speaking English.

The comment of Professor Jamison seems to encapsulate the general attitude about international students at this campus: “They fit in.”

The extent to which STEM teachers regard their international students as just as successful as domestic students contradicts expectations of some major ESL researchers (see Silva and Zawicki & Habib) and their approach to differences that do exist reflects the advice of others (see Truscott and Ferris). The appreciative attitude they exhibit in testimony as well as tone of voice resonates with their actions: willing accommodation of writing and speaking challenges that the occasional international student presents (one professor rated 2 in 80 of her recent international students as facing substantial language difficulties), welcoming thought-provoking examples and project topics emanating from foreign experience, and insistence that the major problem college undergraduates present in STEM classes is not confined to international students at all.

### **Normal Academic Bell Curves**

Every participant referred to pass/fail records that indicated little if any difference between the rate at which native and non-native speaking students met course requirements, reporting normal bell curves except for cases in which internationals excelled and clustered at the top of the class. Falconi’s top 5% Spanish speakers from South America and Edwards’ low key indication that students who grew up in other countries “do a little bit better” in his quantitative methods course testify to a moderate level of superiority. Students in Edwards’ class are senior year business majors who might be expected, overall, to exhibit higher communications skills in recognition of their career choices. Bradley’s recognition that European students come in with a

higher understanding of sophisticated mathematical concepts and math teachers Balan and Chan's indication foreign countries prepare students more effectively in math introduce a general expectation of increased mastery that is moderated in pass/fail rates showing little if any difference between these more talented or well-prepared foreign students and their American classmates. What accounts for this normalcy in a situation where Silva's (1993) review of ESL literature predicted inferior academic accomplishments by non-native speaking students, and Matsuda and Jablonski's (1998) belief such students would have a harder time meeting academic requirements?

Perhaps Falconi is accurate when she claims foreign countries send their best students to the United States for college education and that these students are under more pressure to succeed than their American counterparts? Clearly there is little evidence of foreign countries sending students who are unqualified, so there is a certain amount of logic to Falconi's belief.

Silva's evidence was compiled more than twenty years ago and did not exclusively deal with international college students in STEM courses. It could be that concentration on math and science levels the L1/L2 playing field not only with superior content preparation in some countries but also with often- expressed recognition that math is a language (Wakefield, 2000). It should not be overlooked, however, that Leki (2006) found somewhat similar responses about accommodation (offering needed time and restating confusing sentences), although not exclusively from STEM teachers and not exclusively accommodating either. One of her responding teachers said, "foreign students will just have to accept' the fact that they would be getting lower grades in her classes" (p. 146). Not one of the STEM teachers in this study expressed such a belief. Quite the contrary, they consistently reported international students accomplishing course goals on a level with or slightly above their domestic classmates.

In addition, it is not news that interest drives studiousness: students who want to fly or design airplanes will be motivated to apply themselves to courses that offer specific preparation for desired careers:

Paul Silvia of the University of North Carolina speculates that interest acts as an “approach urge” that pushes back against the “avoid urges” that would keep us in the realm of the safe and familiar. [...] Interest is at once a cognitive state and an affective state, what Silvia calls a “knowledge emotion.” The feelings that characterize interest are overwhelmingly positive: a sense of being energized and invigorated, captivated and enthralled. As for its effects on cognition: interest effectively turbocharges our thinking. [...] In fact, scientists have shown that passionate interests can even allow people to overcome academic difficulties or perceptual disabilities. (as cited in Paul, 2013)

Matsuda and Jablonski (1998) objected to the use of the L2 metaphor to describe academic learning because it muted the additional efforts required from second language students. No study participant downplayed student effort; indeed, most of them both recognized and appreciated increased studiousness on the part of STEM students who had not grown up speaking English. That increased studiousness may be overcoming predicted language issues for international students who are choosing these challenging fields at higher rates than domestic students: Neuhauser (2016) reports,

The number of U.S. citizens and permanent residents earning graduate degrees in science and engineering fell 5 percent in 2014 from its peak in 2008. At the same time, the number of students on temporary visas earning the same degrees soared by 35 percent, according to survey data collected by the National Science Foundation and National Institutes of Health.

Thirty-three percent of this school’s incoming Spring 2017 freshmen are international students as are the majority of those enrolled in the school’s masters and doctoral programs (Enrollment Factsheet, 2017).

STEM teachers welcome this increased enrollment and their concerns differ from those expressed anecdotally by social science and writing teachers at the university. One rhetoric and composition teacher commented that some Korean students whose parents are paying their

tuition tend avoid fundamental courses when possible in a rush to complete degrees in the shortest time. No participant in this study mentioned such a point although it seems from my experience to be accurate. They were quicker to see the advantages in web-based skills a Korean student might demonstrate. This tendency toward the practical is also reflected in their reaction to a cancelled class day so students could attend a Career Fair: they prepared students for the employment opportunity without a complaint about the missing teaching hour.

While writing courses often focus on “raising awareness of cultural differences” (Matsuda & Silva, 2009, p. 251), these STEM teachers recognize, often celebrate, cultural differences when they arise, but rarely elicit them except for questions such as, “How does this play out in your country?” Whether this lack of specific focus on cultural difference for its own sake is positive, negative or neutral is beyond the scope of this study but might inspire another.

International students told Zawicki et al. (2007) stories of being misunderstood by teachers and assignments that disregarded their cultural expectations and preconceptions. Despite the following examples, my participants did not emphasize culture in their discussion even in response to queries such as, “How do you accommodate cultural diversity?” That said, a business management professor who had worked in the Middle East was aware of learning and decision-making differences, some teachers used international status as a basis for grouping strategies (either not isolating them or exactly isolating them but on teams designed to be welcoming), three professors celebrated culture-related contributions to class discussions and project choices, and one engineering teacher wondered if he were committing a micro-aggression by not being more explicitly aware of cultural issues.

Dr. Carnegie observes what Canagarajah (2006) describes as “shuttling” between languages as one of his students translates back and forth in his head before answering a



question. He and other participants in this study report giving international students time to compose their thoughts and stressing clarity rather than making irrational demands for perfect mechanics. If writing with an accent (Silva, 2009) is clear and concise, it is accepted. If an accent presents unusual rhythms and vowel sounds, it is addressed with opportunities to repeat and explain. American classmates are not reported to object --- although participants are quick to add such objections would probably not be made in front of the teacher.

Descriptions of the 10-30% of international students in their classes consistently brought the response “not much difference.” What does that say about teacher perspectives: that they are democrats with a small d, taking students as they come and responding to needs on an individual basis? Are students indeed so similar in their interests (flying, engineering, technology) that language differences are dwarfed? This seems a logical interpretation of their perceptions, based on participants’ reported willingness to accommodate along with reports of normal bell curves and pass/fail results. Do these responses point to differences between this school and those from which international student complaints emanate, or has no one asked our international students about their satisfaction level? The anonymous nature of end-of course evaluations keeps that source of information from being elucidating in the case of mixed STEM courses.

Of course language challenges exist for students who were not immersed in English-speaking cultures as children. How much those challenges affect proficiency in STEM classes, however, might be less than composition teachers such as myself imagined. In addition, STEM teachers may be following Canagarajah’s advice: “rather than treating language or culture as the main variable, [...] focus more on the changing contexts of communication, perhaps treating context as the main variable [...]” (2006, p. 591). Falconi does that: her whole focus is on organization and content, giving short shrift to grammatical issues --- indeed ignoring them if

they do not interfere with clarity, specifically stating, “If there are grammar errors that do not affect clarity, I ignore them.” Here, she follows the findings of Truscott (1996) on the futility of written corrective feedback, perhaps recalling the development of her own English language skills as a graduate student. Dr. Carnegie takes a different approach; his practice of underlining errors, seen in his feedback on both native and non-native reports, parallels the finding of Chandler (2003) that such indirection is preferred by students and promotes self-correction. The extent to which *correction lite* works in this senior year capstone course is seen in its 100% pass rate.

While participants differ in their feedback practices, document review indicates rare differences between marks on the papers of international or domestic students. Surely these results do not counter 60 years of L2 writing research (Silva, 2016); however, they reflect STEM teacher perspectives about the extent to which they see language impacting learning. The impact is substantial and it applies to everybody, not just L2 writers.

### **Bad Writing and Failure to Transfer across the Disciplines**

The two points characterizing the testimony of every participant were not particular to international students, but applied to almost all the undergraduates in all classes: they don’t remember what they “learned” in past classes and their writing is far from acceptable.

Indeed, almost all students are viewed as inexpert writers, producing text that is more conversational than academic and exhibiting illogical organization, lack of detail and incorrect punctuation along with other signs of sloppy proofreading. Citation knowledge is not displayed even though Technical Writing teachers concentrate on that “instruction following” activity in courses specifically designed to prepare students for the kinds of writing required in STEM courses. Study participants see this lack as systemic and not specific to international students.

Even when they acknowledge typical sentence level errors in verb agreement and word choice, they downplay emphasis in two ways: the percentage of international students writing such sentences is low and such mistakes are seen as insignificance if they do not muffle clarity. This attitude resonates with contemporary ESL literature in which educators such as Ferris (year) recommend just that: accentuate textual clarity and avoid overemphasis on incidental grammar mistakes.

Students, in general, do not demonstrate knowledge transfer, neither technical facts from a Statics course nor sentence and paragraph structure protocols; therefore, the need for review is commonly recognized throughout academia. It is the extent of the need that causes STEM teachers to shake their heads. These results would not surprise the Writing across the Disciplines educators and researchers (see Thaiss & Zawacki, 2006, and others), nor would they amaze rhetoricians and neuroscientists doing research in academic writing and transfer (see Salomon & Perkins, 1989; Zull, 2002, and others). What is surprising is the lack of emphasis from study participants on the language/writing issues international students present, and maybe that's a good thing.

### **Limitations**

The stories of nine people may not accurately represent the perceptions of the all STEM professors who teach international students at this institution; however, the substance of their testimony converges on four factors repeated in various contexts by each of them. Study data indicates recognition that international students

1. compete more than adequately with their American classmates,
2. collaborate effectively in teams contributing insightful suggestions and project topics based on their singular experience,

3. present an acceptable level of language irregularities that are accommodated appropriately by teachers whose focus is on practical rather than pedantic concerns, and

4. join their American classmates in evidencing academic writing needs related to lack of genre awareness and various types of transfer.

This convergence of evidence provides reason to believe this study may indeed shed light on professor perceptions of the international students who are increasingly choosing to pursue STEM programs here. Testimony connecting student behavior to cultural background includes acceptance of different learning styles, recognition of distinct motivation (perhaps reflecting group rather than individual backgrounds), examples of global applications and examples, and less than unanimous opinions about plagiarism, not an insignificant element (one social sciences administrator identified Middle Eastern students as producing most of the plagiarism/cheating issues the department encounters). Beyond these factors, however, there seems to be a mindset of taking students as they come which could certainly be viewed as positive even though Dr. Jamison wonders if his lack of comprehensive cultural knowledge is some sort of micro-aggression. How students interpret their teachers' cultural reactions (or lack) is beyond the purview of this study, but pursuing such a question could present an interesting follow-up.

### **Conclusion**

In sum, the study paints a mural of acceptance and appreciation. STEM professors enjoy their international students, recognize their talents, value their unique contributions to class discussion and project selection, downplay language anomalies --- seeing relatively few indications of serious issues and refraining on insistence on conformity to "near native" standards (cite) --- and include them among the overall undergraduate population who display

disappointing writing skills and have often forgotten what they learned last semester in pre-requisite courses. If this study represents the preponderant perspective of STEM professors teaching at this school, international students should feel very comfortable here.

## Chapter 7

### Recommendations and Suggestions for Future Research

Participants overwhelming agreement on the dearth of student writing ability across the campus population, surely not peculiar to our school nor to international students, leads me to recommend the mandated inclusion of a genre awareness module in first year composition courses and to second the intention of colleagues to organize paired classes between Technical Writing and STEM courses. Discussions of the effect of culture on learning makes me want to ask international students how well their needs are being met in this regard.

### Changes to Course Offerings

There is significant support in the literature for genre awareness instruction in the academic curriculum of our colleges, even high schools. In a dissertation advocating the introduction of genre awareness in high school, Griffith-Johnson (2013) promises:

If teachers can successfully instill an understanding of genre and its implications in students, these students will have a much better chance of correctly negotiating between their background knowledge, including what they have learned in previous writing courses and their own values, and the new genres they will be asked to take up in other disciplines.

Dressen-Hammouda (2003) indicates linguistic competence “goes well beyond knowing the ‘mere structure’ of language and includes mastering a wide range of knowledge(s) that allow individuals to actively and efficiently participate in the specific social structures around them.” That competence includes the ability to recognize and create genre-appropriate texts.

In general, teachers and students balk at adding a genre awareness module to the already loaded FYC production requirements; however, as the CCCC (Conference on College Composition and Communication) 2007 resolution “affirms [, ...] many genres and uses of writing must be taught well in the nation’s schools, colleges, and universities.” Downs and

Wardle (2007) caution that we should teach students about writing rather than how to write; this meta-approach could enable the “adaptive transfer” that DePalma and Ringer (2013) describe as they also caution about attempting to teach specific genre: “[because] genre are necessarily fluid [...] inseparable from their social contexts [which are ...] always in a state of change” (p. 468).

A mandated module in genre awareness in first year communications courses could prepare the way for students to pair their required Technical Writing class with a STEM course. An optional template of such a module could ease its introduction.

Despite the attempts of writing program administrators to help discipline teachers deal with the challenges inadequate college student writing (of both native speakers and non-native speakers as this study also indicates), earlier testimony from STEM teachers at this technical university indicated little desire to participate in WID-type activities while decrying the lack of student preparation for the kinds of writing their courses require, along with little student appreciation of the role writing plays in academic and professional success. Recent experience paints a different picture with a representative from each college agreeing to participate in a Writing Fellows Program led by technical writing teachers.

A different experience is reported by Menefee-Libey (2015) who surveyed teacher attitudes regarding their experience teaching writing at a small STEM college that could not afford a full humanities and communications department in which professional writing instructors taught Freshman composition classes. Instead, the college created a team-teaching approach that trained tenured and tenure track teachers of other disciplines to teach Freshman Composition. Five years into the experiment, participating teachers report enjoying positive professional development including increased sense of community, shared vocabulary when discussing writing about writing, increased attention to critical thinking, and deepened

understanding of the “ways of knowing across disciplines.” Teachers say they now think more seriously about rhetorical issues of audience and organization when they create writing assignments for students. The experience changed their opinions about the situation.

While our school is blessed with a full and professionally accredited department of Humanities and Communication, the possibilities for increased sense of academic community would be welcome. The academic divide Menefee-Libey (2015) described from the writing of C. P. Snow in 1959 in which the sciences had to fight for a level teaching and learning field seem to be flipped: communications departments now battle for equality. Becoming aware of symbiotic relationships would benefit the entire college, theirs seems to have begun to appreciate the possibilities, and ours could do it too --- with an appropriate although different approach.

Not every STEM teacher needs writing instruction nor even to attend a WID workshop, but every professor I spoke with teaches writing to one extent or another in their courses. Some have developed the skills through years of experience; others are such intuitive and reflective teachers that instructional practices flow naturally. Professors in the latter category use different vocabulary, but the lack of rhetorical jargon does not seem to handicap them or their students. Several participants indicated eagerness or at least willingness to work with writing teachers, indeed saw benefits in such collaboration. One or two might be candidates for paired courses.

The multidisciplinary design of paired courses would recognize the objections of Spack (1988), who cautioned, “English teachers cannot and should not be held responsible for teaching writing in the disciplines. The best we can accomplish is to create programs in which students can learn general inquiry strategies, rhetorical principles, and tasks that can transfer to other course work” (p. 100). It would be possible to go beyond general inquiry and rolling the dice on transfer; indeed, we can go quite far into the weedy details if we work with domain experts.



By collaborating with willing STEM professors to create learning opportunities for a shared cohort of students and tweaking Freshman composition courses to introduce the concept of genre awareness, English teachers who would not know an ablating nose cone from a chocolate chip waffle cone can ease the burden on STEM professors by introducing appropriate genre awareness to students studying engineering and other technical courses that require specific kinds of rhetoric that might not have been included in first year writing courses.

The benefits to L2 writers might be expected to outweigh the advantage such a course offers native speakers in terms of meeting requirements for “disciplined and persistent inquiry, control of sensation and emotion by reason, and an imagined reader who is likewise rational and informed” (Thaiss & Zawacki, 2006, p.8); however, McCarthy’s (1987) work indicates native speakers fail to “transfer” just as much as non-native speakers do. The “Dave” in her study faced each new course as a brand new experience much as the experience of Beaufort’s (2007) “Tim” led to the conclusion first year writing courses do not prepare students to enter into other writing spaces” (Yancey et al., 2014, p. 30).

Smit (2004) says writing instructors should teach for transfer because “The bottom line for writing instruction may be this: we get what we teach for” (p. 134). Basically, this is what Fishman and Reiff (2011) want when they urge writing program administrators to, “find programmatic ways to help teachers reconceive what it means to teach writing” (p. 128). When the authors asked colleagues to abandon their traditional syllabuses and teach for transfer, they “asked most of them to step outside the circumference of their training” (p. 131). Basically, that is what I am prepared to do, encouraged by Salomon and Perkins’ (1989) prediction that mindful, reflective teaching really can help students apply abilities they take for granted to new situations (p. 129).

In an effort to prepare students for writing across the disciplines, Mark Blaauw-Hara (2014) wanted to incorporate transfer theory and threshold concepts into first year composition and admits he experienced better luck with the former than the latter. In an effort to “cue for transfer,” he collected sample writing prompts from several disciplines and analyzed their requirements (secondary research, summary, critical evaluation of sources, headings and subheads, and description of systems or discipline-specific objects). He was surprised not to find strong support for argumentation or thesis statements; ongoing research indicates results at our school might find strong support for both elements (Ives & Perez, 2016/2017 in process). Based on his results, he modified his own writing prompts to include secondary research and headings and added a final module to his writing course in which students “discuss[ed] how we would structure essays in response to [prompts from other disciplines]” (p.359). While students might be better prepared to write in response to exactly those prompts, further transfer is uncertain and there is no data indicating better performance from the students he prepared by previewing prompts.

Dean (2014) found that institutions shun linked courses because they are inherently complicated in terms of timing and staffing and advocates are more interested in planning the course than in placing it in the administrative environment of bureaucratic concerns. I wonder if institutional resistance would weaken if the writing link were offered as a hybrid, with opportunities for in-person teacher conferences.

Fishman and Reiff (2011) report yet another difficulty when they revised writing courses to “hug” and “bridge”: faculty member resentment from those who felt they were being asked to teach outside their area of expertise. This reaction reflects Spack (1988). Voluntary participation by teachers who welcomed the challenge might overcome this objection.

The question remains whether such a course pairing could work. Since research indicates it might be easier for students to accept and profit from than for universities to accept (Dean, 2014), how might the idea be presented to administrative decision-makers to increase acceptance? Additional research should include surveying students on their genre understandings and perceived needs, meeting with STEM teachers to elicit their cooperation and planning assistance around shared needs, and presenting proposals to course development committees in the involved departments, giving them choices (and being open to their suggestions) of scenarios in which such a linked course or other program might work.

### **Student Views on Cultural Needs**

Even though three participants were indeed internationals and two more had extensive experience working and teaching in other countries, there was little specific reference to the cultural needs of international students beyond acknowledging “different ways of learning and decision making” and appreciation of unique contributions. While a general openness to, indeed valuing of, diversity characterized every conversation, I wonder how well international students believe their cultural needs are being met at our school. A mixed methods study of international students, brief survey followed by interviews, individual or group, might shed light on this important aspect of our university’s mandate.

### **Conclusion**

This university operates from strength in terms of serving a diverse national and international student population. Participating professors appreciate the contributions foreign undergraduates bring to their STEM classrooms and estimate their academic abilities and course completion rates on a par with (when they do not exceed) those of native-speaking classmates. Additional research, especially into student perceptions, could increase our ability to serve the

increasing number of international students who grace our campus. Meanwhile, collaboration on writing skill development and genre awareness promises educational benefits for all our students.

## References

- Adler-Kassner, L. & Wardle, E. (2015). *Naming what we know*. Logan, UT: Utah State University Press.
- Allen, M., Webb, A.W., & Matthews, C. E. (2016). Adaptive teaching in STEM: Characteristics for effectiveness. *Theory into Practice*, 55 (3), 217-224.
- Alumni Survey: One Year After Graduation. Class of 2013-14. Institutional Research. (2016). Retrieved 7 Oct. 2016 from [http://ir.erau.edu/Surveys/Alumni/PDF/RES\\_1YRAlumni13\\_14\\_Employment%20Outcomes%20Report.pdf](http://ir.erau.edu/Surveys/Alumni/PDF/RES_1YRAlumni13_14_Employment%20Outcomes%20Report.pdf)
- Andrews, T. (2012). What is social constructionism? *Grounded Theory Review*, 11 (1). Retrieved 1 July 2016 from <http://groundedtheoryreview.com/2012/06/01/what-is-social-constructionism/>
- Anson, C. (2015). Crossing thresholds. *Naming what we know: Threshold concepts of writing studies*. In L. Adler-Kassner & E. Wardle, (Eds.). Boulder, CO: University Press of Colorado.
- Aronson, J. (1995). A pragmatic view of thematic analysis. *The Qualitative Report* 2 (1), 1-3. Retrieved 24 July 2016 from <http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=2069&context=tqr>
- Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel*, 25 (4), 297-308.
- Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco: Jossey- Bass.
- Astin, A. W. (1999). Involvement in learning revisited: Lessons we have learned. *Journal of College Student Personnel*, 40 (5), 587-598.
- Atkinson, D. (2003). Writing and culture in the post-process era. *Journal of Second Language Writing*, 12, 49-63.
- Avital, M., & Carlo, J. L. (2004), What knowledge management systems designers can learn from appreciative inquiry. In D. L. Cooperrider & M. Avital (Eds.) *Constructive Discourse and Human Organization (Advances in Appreciative Inquiry, Vol. 1*, pp. 57-75) Bingley, West Yorkshire, UK: Emerald Group Publishing Limited.
- Bahls, P. (2012). *Student writing in the quantitative disciplines: A guide for college faculty*. New York, NY: John Wiley & Sons.

- Bardovi-Harlig, K. (1996). Pragmatics and Language Teaching: Bringing Principles and Pedagogy Together. In L. Bouton, (Ed.). *Pragmatics and Language Learning. Monograph Series, 7*, 21-39.
- Bardovi-Harlig, K. & Mahan-Taylor, R. (2003). *Teaching Pragmatics*. Washington DC: U.S. Department of State Office of English Language Programs. Retrieved 12 April 2007 from <<http://exchanges.state.gov/education/engteaching/pragmatics.htm> >
- Bartholomae, D. (2005). *Writing on the margins: Essays on composition and teaching*. New York, NY: Bedford/St. Martins.
- Baxter, P. & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report, 13* (4), 544-559.
- Bazerman, C. (1980). A relationship between reading and writing: The conversational model. *College English, 41* (6), 656-661.
- Benesch, S. (2001). *Critical English for academic purposes*. Mahwah, NJ: Lawrence Erlbaum.
- Berger, P. L., & Luckmann, T. (1966). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Garden City, NY: Doubleday.
- Beaufort, A. (2007). *College writing and beyond: A new framework for university writing instruction*. Logan, UT: Utah University Press.
- Blaau-Hara, M. (2014). Transfer theory, threshold concepts, and first year composition: Connecting writing courses to the rest of college. *Teaching English in the Two Year College, 41* (4), 364-365. Retrieved 24 Nov 2016 from <https://secure.ncte.org/store/2014-may-tetyc-v41-4>
- Bruffee, K. (1986). Social construction, language and the authority of knowledge: A bibliographic essay. *College English, 48*, 773-790.
- Burr, V. (2003). *Social constructionism*. 2<sup>nd</sup> ed. New York, NY: Routledge.
- Canagarajah, S. A. (2006). Toward a Writing Pedagogy of Shuttling between Languages: Learning from Multilingual Writers. *College English, 68* (6), 589-604.
- CCCC Statement on multiple uses of writing. (2007). Conference on College Composition and Communication. Retrieved 20 Nov. 2016 from <http://www.ncte.org/cccc/resources/positions/multipleuseswriting>
- Chandler, J. (2003). The efficacy of various kinds of error feedback for improvement in the accuracy and fluency of L2 writing. *Journal of Second Language Writing, 12*, 267-296.
- Chomsky, N. (1988). *Language and Problems of Knowledge*. Cambridge, MA: MIT Press.

- Christie, F. (1987). Genres as choice. In I. Reid (Ed.), *The place of genre in learning: Current debates* (pp. 22–34). Deakin, Australia: Deakin University Press.
- Connor, U. (1988). Research frontiers in writing analysis. *TESOL Quarterly*, 21 (4), 677-696.
- Cox, M. (2011). In response to today's "felt need": WAC, faculty development, and second language writers. *Across the Disciplines*, 8. The WAC Clearinghouse.
- Creswell, J. (1994). *Research design: Qualitative and quantitative approaches*. Thousand Oaks, CA: Sage Publications.
- Crusan, D. (2010). *Assessment in the second language classroom*. Ann Arbor: University of Michigan Press.
- Curtis, S. (1977). *A Psycholinguistic Study of a Modern-Day Wild Child*. New York, NY: Academic Press.
- Dean, A. C. (2014). Understanding why linked courses can succeed with students but fail with institutions. *WPA: Writing Program Administration* 38(1). Retrieved 10 Nov. 2016 from <http://connection.ebscohost.com/c/articles/100262183/understanding-why-linked-courses-can-succeed-students-but-fail-institutions>
- Denzin, N. & Lincoln, Y. (2005). Introduction: The discipline and practice of qualitative research. In N. Denzin & Y. Lincoln (Eds.), *The Sage handbook of qualitative research*. 3<sup>rd</sup> ed. (pp. 1-32). Thousand Oaks, CA: Sage Publications.
- DePalma, M. J., & Ringer, J. M. (2011). Toward a theory of adaptive transfer: Expanding disciplinary discussions of "transfer" in second-language writing and composition studies. *Journal of Second Language Writing*, 20 (2), 134-147.
- DePalma, M. J., & Ringer, J. M. (2013). Adaptive transfer, genre knowledge, and implications for research and pedagogy: A response. *Journal of Second Language Writing*, 4 (22), 465-470.
- Devitt, A., Reiff, M. J., & Bawarshi, A. (2004). *Scenes of writing: Strategies for composition and genre*. New York, NY: Pearson Longman Publishing Company.
- Downs, D., & Wardle, E. (2007). Teaching about writing, righting misconceptions:(Re) envisioning "first-year composition" as "Introduction to Writing Studies". *College Composition and Communication*, 552-584.
- Dressen-Hammouda, D. (2003). Contributions of an integrated genre theory of text and context to teaching LSP. *Varia*, 39-40. Retrieved 19Nov16 from <https://asp.revues.org/1306>
- Enrollment Factsheet. (2017). ERAU Institutional Research. Retrieved 4 March 2017 from [http://ir.erau.edu/Publications/Factsheet/PDF/Spring%202017\\_fact%20sheet.pdf](http://ir.erau.edu/Publications/Factsheet/PDF/Spring%202017_fact%20sheet.pdf)

- Ferris, D. (2014). Responding to student writing: Teachers' philosophies and practices. *Assessing Writing*, 19, 6-23.
- Ferris, D. R. (2009). *Teaching college writing to diverse student populations*. Ann Arbor, MI: University of Michigan Press.
- Ferris, D. R. & Hedgecock, J. (2005). *Teaching ESL composition: Purposes, process and practice*. (2<sup>nd</sup> ed.). Mahway, NJ: Lawrence Erlbaum.
- Fishman, J. & Reiff, M. J. (2011). Taking it on the road: Transferring knowledge about rhetoric and writing across curricula and campus. *Composition Studies*, 39 (2), 121-144.
- Foucault, M. (1971). *The archaeology of knowledge & the discourse on language*. New York, NY: Pantheon Books.
- Gergen, K. J. (2010). "Ken Gergen talks about social constructionist ideas, theory and practice." *Taos Institute*. Retrieved 7 July 2016 from <https://vimeo.com/15676699>
- Grabe, W. (2009). *Reading in a second language: Moving from theory to practice*. Cambridge, UK: Cambridge University Press.
- Grabe, W. (2014). Key Issues in L2 Reading Development. In CELC Symposium Bridging Research and Pedagogy (pp.8-18). Retrieved from <http://www.nus.edu.sg/celc/research/symposiumproceedings.php>
- Griffith-Johnson, T.S. (2013). *Bridging the gap: Creating a high school course in genre awareness*. Diss. Western Illinois University.
- Hall, E. T. (1977). *Beyond Culture*. New York, NY: Anchor.
- Hall, J. C. (2005). *Social Constructionism: A Unifying Metaperspective for Social Work*. (Doctoral dissertation). University of Louisville, KY. Retrieved 23 October 2016 from [http://www.taosinstitute.net/Websites/taos/files/Content/5694614/dissert\\_Hall.pdf](http://www.taosinstitute.net/Websites/taos/files/Content/5694614/dissert_Hall.pdf)
- Hampton-Lyons, L. & Kroll, B. (1996). Issues in ESL writing achievement: An overview. In T. Silva & P.K. Matsuda (Eds.), *Landmark essays on ESL writing* (pp. 225-240). Mahway, NJ: Lawrence Erlbaum Publishers.
- Henderson, C., Beach, A., & Finkelstein, N. (2011). Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature. *Journal of Research in Science Teaching*, 48 (8), 952-984. doi:10.1002/tea.20439
- Hinds, J. (1987). Reader-writer responsibility: A new typology. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahway, NJ: Lawrence Erlbaum Associates, Inc.



- Hyland, K. (2007). Genre pedagogy: Language, literacy and L2 writing instruction. *Journal of Second Language Writing*, 16, 148-164. Retrieved 20 Nov. 2016 from [www.sciencedirect.com](http://www.sciencedirect.com)
- Ingalls, R. (2011). Writing “eyeball to eyeball”: Building a successful collaboration. *Writing Spaces: Readings on Writing*, 2, 122-140. Retrieved 1 Dec. 2016 from <http://www.parlorpress.com/pdf/ingalls--writing-eyeball-to-eyeball.pdf>
- Ives, L. *et al.* (2014). “I don’t know if that was the right thing to do”: Cross- Disciplinary/Cross-Institutional Faculty Respond to L2 Writing. In T. M. Zawacki & M. Cox (Eds.). *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices* (pp. 183-210). Fort Collins, CO: The WAC Clearinghouse.
- Ives, L. & Perez, M. (2016). Faculty Writing Expectations. Embry Riddle Aeronautical University. Unpublished report, pdf.
- Johns, A. M. (1991). Interpreting an English competency examination: The frustrations of an ESL science student. *Written Communication*, 8(3), 379-401.
- Johns, A. (2011). The future of genre in L2 writing: Fundamental, but contested, instructional decisions. *Journal of Second Language Writing* 20, 56-68. Retrieved 20 Nov. 2016 from [www.sciencedirect.com](http://www.sciencedirect.com)
- Johnson, J. & Newport, E.L. (1989). “Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language.” *Cognitive Psychology* 21, 60-99.
- Jones, S. & Tetroe, J. (1987). Composing in a Second Language in A. Matsuhashi (Ed.), *Writing in Real Modeling Production Processes* (pp. 34-57). Norwood, NJ: Ablex.
- Kaplan, R. B. (1966). Cultural thought patterns in intra-cultural education. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahway, NJ: Lawrence Erlbaum Associates, Inc.
- Kaplan, R. B. (1987). Cultural thought patterns revisited. In U. Connor & R. B. Kaplan (Eds.), *Writing across languages: Analysis of L2 text*. (pp. 9-22). Reading, MA: Addison-Wesley.
- Kelly, M. (2009). The role of theory in qualitative health research. *Family Practice* 27, 285-295. Retrieved 1 July 2016 from <http://fampra.oxfordjournals.org/content/27/3/285.full.pdf>
- Kobayashi, H. & Rennert, C. (2013). L1/L2/L3 writing development: Longitudinal case study of a Japanese multicompetent writer. *Journal of Second Language Writing*, 22, 4-33.

- Labov, J. B., Singer, R., George, M. D., Schweingruber, H. A., & Hilton, M. L. (2009). Effective practices in undergraduate STEM education Part 1: Examining the evidence. *CBE – Life Sciences Education*, 8, 157-161.
- Land, R. (2015). Preface. In Adler-Kassner, L. & Wardle, E. (Eds.). *Naming what we know*. Logan, UT: Utah State University Press.
- Leki, I. (2006). Negotiating socioacademic relations: English learners' reception by and reaction to college faculty. *Journal of English for Academic Purposes*, 5 (2), 136-152.
- Leki, I. (1993). Reciprocal themes in ESL reading and writing. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing* (pp. 173-190). Rahwah, NJ: L. Erlbaum Associates Press.
- Lindberg, N. W. (in press). *Faculty Perceptions of Teaching Writing to English as an Additional Language Students*. (Unpublished doctoral dissertation). Cornell University, Ithaca, N.Y.
- Lindsey, P. & Crusan, D. (2011). How faculty attitudes and expectations toward student nationality affect writing assessment. In T. M. Zawacki & M. Cox (Eds.). *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices* (pp. 183-210). Fort Collins, CO: The WAC Clearinghouse.
- Long, M. (2015). *Second language acquisition and task-based language teaching*. West Essex, UK: Wiley Blackwell.
- MacNamee, S. (2004). Relational Bridges Between Constructionism and Constructivism. Draft for J.D. Raskin & S.K. Bridges (Eds.), *Studies in Meaning2: Bridging the personal and the social*. Retrieved 18 June 2016 from [http://www.taosinstitute.net/Websites/taos/Images/ResourcesManuscripts/McNamee%20-Relational\\_Bridges\\_Between\\_Constructionism\\_and\\_Constructivism.pdf](http://www.taosinstitute.net/Websites/taos/Images/ResourcesManuscripts/McNamee%20-Relational_Bridges_Between_Constructionism_and_Constructivism.pdf)
- Mallinson, C. & Charity-Hudley, A. H. (2014). Partnering through science: Developing linguistic insight to address educational inequality for culturally and linguistically diverse students in U.S. STEM education. *Language and Linguistics Compass* 8 (1), 11–23.
- Marshall, C. & Rossman, G. (2016). *Designing qualitative research*. 6<sup>th</sup> ed. Los Angeles, CA: Sage Publications, Inc.
- Matsuda, P. K. (1997). Contrastive rhetoric in context: A dynamic model of L2 writing. *Journal of Second Language Writing* 6 (1), 45-60.
- Matsuda, P. K. (2003). Second-language writing in the twentieth century: A situated historical perspective. In B. Kroll (Ed.), *Exploring the dynamics of second language writing* (pp. 15-34). New York, NY: Cambridge UP.

- Matsuda, P. K. & Jablonsky, J. (1998). Beyond the L2 metaphor: Towards a mutually transformative model of ESL/WAC collaboration. Paper presented at the Annual Meeting of the Midwest Modern Language Association.
- Matsuda, P. K., & Silva, T. (Eds.). (2001). *On second language writing*. Mahwah, NJ: L. Erlbaum Associates.
- Matsuda, P. K. & Silva, T. (2006). Cross-cultural composition: Mediated integration of U.S. and international students. In P. K. Matsuda, M. Cox, J. Jordan, & C. Ortemeir-Hooper (Eds.). *Second language writing in the composition classroom: A critical sourcebook* (pp. 246-259). New York, NY: Bedford/St. Martin's. From *Composition Studies*, 27 (1), 15-30.
- McCarthy, L. (1987). A stranger in stranger in strange lands: A college student writing across the curriculum. *Research in the teaching of English*, 21 (3), 233-265.
- McWhorter, J. (2011). *What language is*. New York, NY: Penguin Group, Inc.
- Menefee-Libey, W. (2015) The First-Year Writing Course as a WAC Cultural Bridge for Faculty. *Double Helix*, 3. Retrieved 4 April 2017 from [qudoublehelixjournal.org/index.php/dh/article/download/61/244](http://qudoublehelixjournal.org/index.php/dh/article/download/61/244)
- Neuhauser, A. (2016). Foreign students outpacing Americans for STEM graduate degrees. *US News.com*. Retrieved 18 October 2016 from <http://www.usnews.com/news/articles/2016-05-17/more-stem-degrees-going-to-foreign-students>
- Nordquist, R. (2016). What is writing. *Thoughtco.com*. Retrieved 29 Sept. 2016 from <http://grammar.about.com/od/advicefromthepros/a/WhatIsWriting.htm>
- Paul, A. M. (2013, Nov. 4). How the Power of Interest Drives Learning. *Mind/Shift*. Retrieved 5 March 2017 from <https://ww2.kqed.org/mindshift/2013/11/04/how-the-power-of-interest-drives-learning/>
- Perl, S. (1979). The composing processes of unskilled college writers. *Research in the Teaching of English*, 13(4), 317-336.
- Pincas, A. (1962). Structural linguistics and systematic composition teaching to students of English as a foreign language. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahway, NJ: Lawrence Erlbaum Associates, Inc.
- Pinker, S. (1994). *The language instinct*. New York, NY: William Morrow and Company.
- Raimes, A. (1985). What unskilled ESL students do as they write: A classroom study of composing. *TESOL Quarterly*, 19, 229–258. doi:10.2307/3586828

- Reid, J. (1994). Responding to ESL students' texts: The myths of appropriation. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahway, NJ: Lawrence Erlbaum Associates, Inc.
- Robinson, A. (2011). In theory Bakhtin: Dialogism, polyphony and heteroglossia. *Ceasefire Magazine*. Retrieved 22 Sept. 2016 from <https://ceasefiremagazine.co.uk/in-theory-bakhtin-1/>
- Saenkhum, T. (2007). *Transfer of knowledge from first year ESL classes to writing in the disciplines: Case studies of writing across the curriculum*. Diss. Southern Illinois University, Carbondale, IL.
- Salomon, G. & Perkins, D. N. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. *Educational Psychologist*, 24 (2), 113-142.
- Savin-Baden, M. & Major, C. H. (2013). *Qualitative research: The essential guide to theory and practice*. New York, NY: Routledge.
- Schell, J. A. (2009). *Venturing toward better teaching: STEM professors' efforts to improve their introductory undergraduate pedagogy at major research universities*. Teachers College, Columbia University, ProQuest Dissertations Publishing, (Order No. 3368259). Retrieved from <http://search.proquest.com.ezproxy.libproxy.db.erau.edu/docview/304869520?accountid=27203>
- Schwandt, T. A. (2015). *The Sage dictionary of qualitative inquiry*. 4<sup>th</sup> ed. Thousand Oaks, CA: Sage Publications.
- Shaughnessy, M. (1997). *Errors and expectations*. New York, NY: Oxford University Press.
- Shim, J. M. (2013). Teacher's viewpoints about other's actions: Implications for multicultural education. *Transnational Curriculum Inquiry*, 10 (2). Retrieved 22 Sept. 2016 from <http://nitinat.library.ubc.ca/ojs/index.php/tci>
- Silva, T. (1993). Toward an understanding of the distinct nature of L2 writing: The ESL research and its implications. In T. Silva & P. K. Matsuda (Eds.). *Landmark essays on ESL writing* (pp. 191-208). Mahwah, NJ: Lawrence Erlbaum.
- Silva, T. (2010). Writing across borders film clips. *Youtube*. Oregon State University. Video file. Retrieved 22 Sept. 2016 from <http://writingcenter.oregonstate.edu/writing-across-borders-3>
- Silva, T. (2016). An overview of the development of the infrastructure of second language writing studies. In R. M. Manchon & P. K. Matsuda (Eds.), *Handbook of second and foreign language writing* (pp. 19-43). Berlin, Germany: De Gruyter Mouton.

- Smit, D. (2004). Transfer. *The end of composition studies* (pp. 119-137). Carbondale, IL: Southern Illinois UP.
- Spack, R. (1988). Initiating ESL students into the academic discourse community. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahway, NJ: Lawrence Erlbaum Associates, Inc.
- Spooner, M. (2002). An essay we're learning to read. In C. Schroeder, H. Fox, & P. Bizzell (Eds.), *Alt dis* (pp. 155-177). Portsmouth, NH: Boynton/Cook Publishers, Inc.
- Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Strozer, J. (1994). *Language acquisition after puberty*. Washington, DC: Georgetown UP.
- Thaiss, C. & Zawacki, T. (2006). *Engaged writers and dynamic disciplines: Research on the academic writing life*. Portsmouth, NH: Boynton/Cook/Heineman.
- Truscott, J., (1996). The Case Against Grammar Correction in L2 Writing Classes. *Language Learning* 46(2), 327-369.
- Tyler, K. M., Boykin, A. W., & Walton, T. R. (2006). Cultural considerations in teachers' perceptions of student classroom behavior and achievement. *Teaching and Teacher Education*, 22 (8), 998-1005.
- van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Walnut Creek, CA: Left Coast Press, Inc.
- Vygotsky, L. S. (1963). Learning and mental development at school age. (J. Simon, Trans.). In B. Simon and J. Simon (Eds.), *Educational Psychology in the U.S.S.R.* (pp. 21-34). London: Routledge & Kegan Paul.
- Wakefield, D.V. (2000). Math as a second language. *The Educational Forum*, 64 (3), 272-279. Retrieved 4 March 2017 from <http://dx.doi.org/10.1080/00131720008984764>
- Writing across borders. (2010). *Youtube*. Oregon State University. Video file. Retrieved 22 Sept. 2016 from <https://www.youtube.com/watch?v=quI0vq9VF-c>
- Yancy, K. B., Robertson, L. & Taczak, K. (2014). *Writing across contexts: Transfer, composition, and sites of writing*. Boulder, CO: University Press of Colorado.
- Yin, R. K. (2006). Case study methods. In J.L. Green, G. Camilli, and P. B. Elmore (Eds.), *Handbook of Complementary Methods for Research in Education*. 3<sup>rd</sup> ed. Washington, DC: Routledge.
- Yin, R. K. (2009). *Case study research: Design and methods*. 4<sup>th</sup> ed. Thousand Oaks, CA: Sage.

- Zamel, V. (1976). Teaching composition in the ESL classroom: What we can learn from research in the teaching of English. In T. Silva & P. K. Matsuda (Eds.), *Landmark essays on ESL writing*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Zamel, V. (1995). Strangers in academia: The experiences of faculty and ESL students across the curriculum. *College Composition and Communication*, 46 (4), 506-521.
- Zawacki, T. M. & Habib, A. S. (2010). Will our stories help teachers understand? Multilingual students talk about identity, voice, and expectations across academic communities. In M. Cox, J. Jordan, C. Ortmeier-Hooper, and G.G. Schwartz (Eds.). *Reinventing identities in second language learning* (pp. 57-74). National Council of Teachers of English. Retrieved 22 Sept. 2016 from [http://www.ncte.org/library/nctefiles/resources/books/sample/39820intro\\_x.pdf](http://www.ncte.org/library/nctefiles/resources/books/sample/39820intro_x.pdf)
- Zawacki, T. M. & Habib, A. S. (2014). Negotiating “errors” in L2 writing: Faculty dispositions and language difference. In T. M. Zawacki & M. Cox (Eds.). *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices* (pp. 183-210). Fort Collins, CO: The WAC Clearinghouse.
- Zawacki, T. M. & Rogers, P. M. (2012). *Writing across the curriculum: A critical sourcebook*. New York, NY: Bedford/St. Martin’s.
- Zawacki, T. M. et al. (2007). *Valuing written accents: Non-native students talk about identity, academic writing, and meeting teachers’ expectations*. George Mason University, Fairfax, VA. Pdf.
- Zull, J. E. (2002). *The art of changing the brain*. Sterling, VA: Stylus Publishing.

## Appendix A: Research and Interview Questions

Preamble: Our school attracts and graduates more international students every year. Indeed, the majority of our graduate students are second language speakers. Their success rate is impressive and logically accentuates the success rate of the STEM teachers at our school in dealing with a complicated educational situation that includes native and non-native speakers with diverse cultural backgrounds. The voices of international students and writing teachers are easy to find in the pedagogical literature. STEM teachers' voices are quiet or absent. I believe we can learn something of value from listening to you, and that is why I chose to pursue this research. I see it as appreciative (you have obviously done an awesome job of preparing STEM students to lead the global technical world) and exploratory.

### **RQ 1: How does the presence of international students affect the learning dynamics of the STEM classroom?**

**Interview Question 1:** Tell me about the course(s) you teach.

- What are the most challenging parts of your course(s) for your students?
- How many international students do you usually have in your course(s)?
- What are the most challenging parts of your course(s) for your international students?
- what do you do to help international students deal with those challenges?
- how does that usually work?

**Interview question 2:** Tell me about the STEM pedagogy you use.

- How do your students respond to those activities? Is there a difference between the way international and native students get involved?
- Please give me an example.
- How do you integrate international students into class activities: teamwork, peer review, etc.?
  - How do you learn about your students' linguistic and cultural background?
  - How do you accommodate cultural diversity?
- How do their speaking and listening skills affect the way they participate?
- How do you and their native speaking classmates respond?
  - Please give me an example of a typical response.
  - What do you think about native speakers' response? Is it okay or would you like to see it change? In what way? Is there something you can do?

**Interview question 3:** Tell me a bit more about your usual classroom activities and the way your students engage in those activities and discussions.

- How do you set up groups, for instance? What is your rationale for combining or not combining NS and NNS in a group or team?
- Do NS and NNS students address their comments and questions to each other?
- Please describe an average class discussion in which both NS and NNS students are engaged.
  - Why do you think that happens?
- What was the best cooperative activity you saw this past semester?
- What was one with lots of challenges, one that needed improvement?
- What did you do; what did the students do?

**RQ 2: What are the perceptions of STEM teachers about the academic skills (reading, writing, pragmatics) international students bring to the STEM classroom and how effective are those skills in meeting the requirements of contemporary STEM pedagogy?**

**Interview question 1:** Let's talk specifically about your international students' academic skills. How do you see them adapting to American college academic standards?

- In what way? Please give me an example?
- What is the pass/fail rate of international students in comparison to native English speakers?

**Interview question 2:** What kinds of writing assignments do you give your students (ask for copies of prompts at end of interview)?

- What indications do your international students give you about their preparation for that kind of writing?
  - What do you think gives them the biggest challenges in terms of writing, their linguistic or cultural differences?
  - What do you do to help them meet your standards?
  - Tell me how that usually works, maybe an example or two?

**Interview question 3:** In a pilot study that Professors Ives and Perez conducted, a STEM professor remarked that international students seem to "spend a lot of time trying to figure out how to write" assignments, perhaps lacking genre awareness. Have you encountered similar situations?

- What do you do in those cases?
- How do students react?
- What do you think the major problem is and how we, as educators, be dealing with it?

**Interview question 4:** What kind of feedback do you give your students on writing assignments?

- How does the feedback you give NS students differ (if it does) from that you give NNS students?
- Would you send me some samples of your feedback --- perhaps a term's writing assignments with your feedback from two or three international students (that would be extremely helpful, and of course, remove all student identification from those files).
- How do your international students respond to your feedback? Do they make changes for instance, do they have a chance to revise and resubmit? How does that work in your course?
- Do recommend that students go to the Writing Center?
  - Do you follow up on their visits or prepare handouts for them to bring to the tutors (perhaps suggesting they bring the writing assignment prompt)?
  - Do you believe they incorporate the tutors' advice into their assignments?
  - How well do you think the tutors at the Writing Center understand the assignment requirements for your course? What can anyone do to improve that?
- What percentage of the course grade depends on writing?



- Do you grade NNS writing assignments similarly to the way you grade NS writing assignments?
- What are your reasons?
  - Interview question 5: Tell me about your international students' reading ability. Do they seem to understand the content of the reading assignments?
  - How much reading is involved in your course?
  - What role does that play in classroom activities and student ability to deal with course requirements?
  - How do native speakers respond?
  - What do you do to accommodate students who have reading difficulties?

**RQ 3: What are the perceptions of STEM teachers about the contributions international students make to the STEM classroom?**

**Interview question 1:** Tell me about the kinds of contributions international students make during your class.

- Do their cultural backgrounds ever add something to the discussion?
- How do native speakers react to contributions by international students?
- Tell me about a specific instance when an international student (or group) made a comment or contribution that improved the learning situation.
- What was the response?
- What other examples can you think of when an international student offered something new or fun or surprising in your class?

**RQ 4: What (if any) changes would STEM teachers like to see in the preparation of international students for STEM courses and/or in the courses they teach?**

**Interview question 1:** What changes would you like to see in your international students' preparation for your course?

- Can you give me an example?
- How does that affect their involvement/success in the course?
- Why do you think that is?
- What do you do about it?
- How does that work?

**Interview question 2:** what would you like to see happen to increase that level of preparation for your international students?

- What would that involve/look like/require?
- How involved in making that happen would you be willing to be

**Interview question 3:** What, if any, changes do you plan to make in your course?

**Interview question 4:** What, if any, changes would you like to see others at our school make to improve the success of international students in STEM courses?

- Do you think the preparation COM122 offers in writing argumentative research papers prepares students for the writing required in your course?
- Are you familiar with WAC/WID? Do you think what that philosophy offers could work here?
- Do you think team teaching with writing instructors would be beneficial?

- Would you consider team teaching with an English teacher?
  - If not, would you consider helping an English teacher plan a course (or include in an existing course) in your field's writing genre?

**Interview question 5:** What else would you like to tell me about your experience with international students in your STEM classes?

## Appendix B: Email Inviting Participants

Dear Professor:

I am a non-tenure track full-time instructor in the HU/COM Department and have taught international students in COM122NNS for the past five years. Our school has kindly agreed to support my doctorate work at the University of Memphis where I have chosen to focus my dissertation on the role of international students in STEM classrooms. I hope you will agree to participate in my research.

Our school attracts and graduates more international students every year. Indeed, the majority of our graduate students are second language speakers. Their success rate is impressive and logically accentuates the success rate of the STEM teachers in dealing with a complicated educational situation that includes native and non-native speakers with diverse cultural backgrounds. The voices of international students and writing teachers are easy to find in the pedagogical literature. STEM teachers' voices are quiet or absent. I believe we can learn something of value from listening to you, and that is why I chose to pursue this research. I see it as appreciative (you have obviously done an awesome job of preparing STEM students to lead the global technical world) and exploratory.

As a participant, you will be asked to do the following:

1. To read and sign a voluntary consent form (attached) that indicates your participation is totally voluntary and that your identity will not be compromised (I will use pseudonyms if I quote you and I will secure recorded interviews in password-protected files)
2. To share your perceptions of the role international students play in your STEM courses during an interview with me that will probably last an hour
3. To review my prose related to what you say during interviews to preserve clarity and guard against any misinterpretation on my part (this is part of the collaborative nature of my work)
4. To provide me copies of your prompts for written coursework for your FA 16 courses
5. To provide me a copy of the syllabus of your FA 16 STEM courses
6. To provide me copies (with all student identification except NS or NNS removed) of FA16 written coursework with your feedback for two international students and two native speakers.

If you agree to participate, please respond to this email with a suggested interview time (between December 15, 2016 and January 15, 2017, or your suggestion for after that timeframe) at the location of your choice on the ERAU campus (Dr. Pedersen has said we could meet at the CTLE location).

Thank you for taking the time to read this long email. I hope you will agree to help me complete this important work.

## Appendix C: Participant Consent Form

### Participant Consent Form

I volunteer to participate in a research project conducted by Barbara Feeney Abendschein from Embry-Riddle Aeronautical University for her doctoral dissertation at the University of Memphis. I understand that the project is designed to explore the perceptions of STEM teachers at ERAU about how the participation of international students affects the learning dynamics in their classrooms. Benefits of this study will include improved understandings about STEM teachers' experiences with the international student they teach. At ERAU, it will inform future conversations, acknowledging faculty experience dealing with the linguistic, cultural and academic issues inherent in teaching mixed (native and non-native speaking) undergraduate populations. Nationally, information gathered from participants will benefit the fields of undergraduate STEM studies, composition studies, second language writing, and writing in the disciplines by contributing information about teacher experiences in aviation and aerospace-related fields, information not readily available at institutions that other researchers have studied.

I will be one of up to 10 people being interviewed for this research.

a. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one on my campus will be told.

b. I understand that there are risks of stress, inconvenience, and possible loss of privacy and confidentiality associated with participating in any research study. Symptoms of stress that I may experience during this study include difficulty answering questions and discomfort with providing the requested information. If I feel uncomfortable in any way while participating in this study, I have the right to decline to answer any question or to discontinue my participation. Should I decide to withdraw, the audio recording of my partial interview will be immediately deleted. I understand that possible risks from this study are minimal and not likely to be serious.

c. I understand that participation involves answering semi-structured interview questions focused on my perceptions and expectations of international student classroom challenges and contributions to the course(s) I teach, including academic, linguistic and cultural issues. The interview will be audio recorded and should take approximately one hour to complete.

d. I understand that the researcher will not identify me by name in any reports using information obtained from this study and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies, which protect the anonymity of individuals and institutions. In addition, I will have the right to "member check" the researcher's interpretations of my contributions for accuracy.

e. Faculty and administrators do not have access to study responses or participant information. This precaution will prevent my individual comments from having any negative repercussions.

f. I understand that this research study has been reviewed and approved by the Institutional Review Boards (IRB) for the use of Human Subjects in Research at Embry-Riddle Aeronautical University and the University of Memphis. For research problems or questions regarding subjects, the ERAU Institutional Review Board may be contacted through Teri Gabriel at [teri.gabriel@erau.edu](mailto:teri.gabriel@erau.edu). The University of Memphis Institutional Review Board may be contacted at [irb@memphis.edu](mailto:irb@memphis.edu). Questions about the researcher's doctoral studies may be directed to her dissertation committee chair, Dr. Emily Thrush at [ethrush@memphis.edu](mailto:ethrush@memphis.edu).

g. I have read and understand the explanation provided to me.

I consent:        Yes                    No

---

Participant Signature

---

Print name

---

Date

## Institutional Review Board Approval



Institutional Review Board  
Office of Sponsored Programs  
University of Memphis  
315 Admin Bldg  
Memphis, TN 38152-3370

Dec 22, 2016

PI Name: Barbara Abendschein

Co-Investigators:

Advisor: Emily Thrush

Submission Type: Initial

Title: College professors discuss international student impact on the learning dynamics of STEM classrooms: How do non-native speakers and writers collaborate, compete and contribute?

Expedited Approval: Dec 22, 2016

Expiration: Dec 22, 2017

Approval of this project is given with the following obligations:

1. This IRB approval has an expiration date, an approved renewal must be in effect to continue the project prior to that date. If approval is not obtained, the human consent form(s) and recruiting material(s) are no longer valid and any research activities involving human subjects must stop.
2. When the project is finished or terminated, a completion form must be submitted.
3. No change may be made in the approved protocol without prior board approval.

Thank you,  
James P. Whelan, Ph.D.  
Institutional Review Board Chair  
The University of Memphis.