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TABLE OF CONTENTS

Foreword .................................................................vii
   Terry Carter, Ph.D., AAPP Alumnus, 2002

Preface .................................................................xi
   John McFadden, Ph.D., Director, AAPP Program

AAPP SCHOLAR CONTRIBUTIONS

PART 1: COLLEGE OF ARTS AND SCIENCES

Performing African-ness through Hip-Hop in the Global Marketplace ........................................3
   Brianna R. Cornelius
   Department of English Language and Literature

PART 2: COLLEGE OF EDUCATION

Seeing the Military Family Through a Multicultural Lens: A Literature Review ..........................49
   Lorell C. Gordon
   Department of Educational Studies

Leveling the Counseling Field: Professional Identity and Racial Disparities in Counselor Education ..........67
   Stacey L. Olden
   Department of Educational Studies
PART 3: COLLEGE OF ENGINEERING AND COMPUTING

Phase Equilibrium of Essential Oils in Liquid and Supercritical Carbon Dioxide (CO₂): A Solubility Study .......................................................... 91

Odell L. Glenn, Jr.
Department of Chemical Engineering

PART 4: SCHOOL OF MEDICINE

Combined Effects of Human Intestinal Microbiota Impede Tumor Progression ........................................... 109

Yvon L. Woappi
Department of Pathology, Microbiology and Immunology

PART 5: SCHOOL OF MUSIC

Political Suppression of Saxophone Performance and Its Pedagogical Development in Select Non-Democratic Countries ........................................... 127

Sheldon J. Johnson
Music Performance

COLLABORATIVE CONTRIBUTION

PART 6: COLLEGE OF EDUCATION

Examining the Interaction of National Policy and Classroom Instructional Practices and Its Effect on Science Achievement ........................................... 145

Genine L. Blue, Bethany A. Bell, Ph.D., Mihaela Ene, and Elizabeth Leighton
Department of Educational Studies
FOREWORD

I am honored to have the opportunity to write the Foreword for the African American Professors Program (AAPP) monograph, recently renamed the Carolina Diversity Professors Program (CDPP). This publication represents one of the most enduring facets of the program because it showcases the intellectual capital of its scholars. The monograph series is now in its fourteenth year of publication, and I proudly retain copies of them in my university office for others to browse or to borrow. From my perspective, the monograph series symbolizes the excellence of the program scholars, the program itself, and the University of South Carolina just as the AAPP Director originally envisioned and stated in the 2001 premier edition.

Before I was accepted into the African American Professors Program, I spent numerous hours working on campus and off campus while a graduate student in order to ensure financial survival. I had chosen purposely to end my career in banking operations in order to pursue a master’s degree in English, but I was not prepared for the financial costs of pursuing the degree as a full-time graduate student. By the time I completed my master’s level coursework and thesis, I was financially strained. My love of writing and love of the intellectual challenge in the academy had faded due to lack of time and money. Although I qualified to continue my
studies for the doctoral degree, I was just too tired and could not afford being a full-time graduate student anymore. Subsequently, as I prepared to reconsider my studies, I learned about a scholarship program for minority students for which I qualified as a possible candidate. The aim of the scholarship program was to offer professional development, faculty mentoring, and financial support for accepted candidates to pursue a doctoral degree. It sounded too good to be true; but indeed it was true, and I also was accepted into the African American Professors Program.

The support of AAPP significantly transformed my academic work. If my memory is correct, I first felt the significance of the program on a cool fall day while on the USC campus grounds. I had been working on a component of my dissertation project, and I realized at that moment in time that my academic work had my full attention. I then had the sudden realization that AAPP was allowing me to experience academic study in a manner that was not possible before because my focus had been divided between both academic pursuits and financial survival. In fact, my concept of work in the academy began to feel genuine and fulfilling.

As a scholar, I was provided the opportunity to contribute to this monograph series during its initial years of publication. In the 2001 premier edition, I showcased a work entitled "Exploring Academic Identification: Experiences of an African American Male in Higher Education." I had chosen to contribute this selection because it revealed a narrative of how I was able to gain acceptance into graduate school in spite of personal and academic challenges as a minority student. In the 2002 monograph, I submitted a
manuscript titled, "Understanding the History of Negro Education: An Analysis Inspired by Benjamin Montgomery." That selection was a strong revision of a research project in an African American History course recommended by my faculty mentor, Dr. Nancy Thompson (Distinguished Professor Emerita, USC’s Department of English) in fulfillment of a specialization in African American Contributions to Composition Studies. I chose to contribute this selection because it seemed the best complement for the African American Professors Program. The main subject of the selection—Benjamin Montgomery—was a strong and highly educated leader who was committed to leaving an enduring legacy for his family and community. His qualities remind me of the ones that I observed and continue to see in the visionary momentum through USC’s Department of Educational Leadership and Policies. Distinguished Professors Emeriti Aretha B. Pigford and Leonard O. Pellicer, who founded the African American Professors Program, succeeded by Dr. John McFadden, The Benjamin Elijah Mays Distinguished Professor and AAPP Director, along with Mrs. Rhittie L. Gettone, the program’s dedicated and well-respected Administrative Coordinator, have exerted a critical role in perpetuating a program that is enduring and produces not only scholars but also scholarly research through its publication of this monograph.

In my concluding thoughts, I would like to state that I believe this monograph series represents the work of the "Talented Tenth" based on my understanding of how the concept was used in the early twentieth century by the prominent scholar, Dr. W.E.B. Du Bois. This definition references the responsibilities of the educated

AAPP MONOGRAPH SERIES 2015 ix
minorities of color and emphasizes the importance of their giving back and providing leadership to improve the lives of other brothers and sisters. We can extend that definition in this context by noting that the intellectual work of the monograph returns to everyone who is exposed to its content. The monograph’s research papers serve not only to enrich the minds of its readers, but it also provides educational stimuli knowledge for future scholars to build upon in ways that will continue to extend the work of the African American Professors Program/Carolina Diversity Professors Program.

Terry Carter, Ph.D., AAPP Alumnus, 2002
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PREFACE

The African American Professors Program (AAPP) at the University of South Carolina is honored to publish its fourteenth edition of this annual monograph series. AAPP recognizes the significance of offering its scholars a venue on which to engage actively in research and to publish their refereed papers. Parallel with the publication of their manuscripts is the opportunity to gain visibility among colleagues throughout institutions in national and international settings.

Scholars who have contributed papers for this monograph are acknowledged for embracing the value of including this responsibility within their academic milieu. Writing across disciplines adds to the intellectual diversity of these manuscripts. From neophytes to quite experienced individuals, the chapters have been researched and comprehensively written.

Founded in 1997 through the Department of Educational Leadership and Policies in the College of Education, AAPP was designed to address the under-representation of African American professors on college and university campuses. Its mission is to expand the pool of these professors in critical academic and research areas. Sponsored historically by the University of South Carolina, the W.K. Kellogg Foundation, and the South Carolina General Assembly, the program recruits doctoral students for disciplines in
which African Americans currently are underrepresented among faculty in higher education.

The continuation of this monograph series is seen as responding to a window of opportunity to be sensitive to an academic expectation of graduates as they pursue career placement and, at the same time, to allow for the dissemination of products of scholarship to a broader community. The importance of this series has been voiced by one of our 2002 AAPP graduates, Dr. Shundelle LaTjuan Dogan, formerly an Administrative Fellow at Harvard University, a Program Officer for the Southern Education Foundation, and a Program Officer for the Arthur M. Blank Foundation in Atlanta, Georgia. She is currently a Corporate Citizenship and Corporate Affairs Manager for IBM-International Business Machines in Atlanta, Georgia and has written the Foreword for the 2014 monograph.

Dr. Dogan wrote: "One thing in particular that I want to thank you for is having the African American Professors Program scholars publish articles for the monograph. I have to admit that writing the articles seemed like extra work at the time. However, in my recent interview process, organizations have asked me for samples of my writing. Including an article from a published monograph helped to make my portfolio much more impressive. You were 'right on target' in having us do the monograph series" (AAPP 2003 Monograph, p. xi).

The African American Professors Program continues the tradition as a promoter of international scholarship in higher education evidenced through the inspiration from this group of
interdisciplinary manuscripts. As we embark on a new phase of development by initiating the renaming of our program, the Carolina Diversity Professors Program, we are grateful for your continued interest and support of the work of the scholars. In conclusion, I hope that you will envision these published papers as serving as an invaluable contribution to your own professional and career development.

John McFadden, Ph.D.
The Benjamin Elijah Mays Distinguished Professor Emeritus
Director, African American Professors Program
University of South Carolina
PART 1:
COLLEGE OF ARTS
AND SCIENCES
Academic interest in colonization and its effects has been prevalent for well over a century. Surprisingly, a comparatively small amount of research has been conducted with respect to the ramifications of colonization and the continued globalization of African territories. In this monograph chapter, colonization will be addressed as an early form of globalization in reference to the nineteenth-century domination of the territories of Africa (with the exception of Ethiopia; Negesh, 1997; 2013) by European nations. The contact between these countries contributed to the emergence of a remarkable number of multilingual environments, resulting in linguistically diverse language repertoires (Benor, 2010) composed of multiple languages, dialects, and linguistic elements used to function both locally and globally (Blommaert, 2010). In order to navigate culturally diverse environments successfully, people living in formerly colonized countries are faced with the challenge of establishing and adhering to domains where both the local and global languages are valued based on their influence or lack thereof. Such
challenges play a significant role for individuals from formerly colonized countries attempting to participate in a global society while maintaining their own ethnic identities.

In an attempt to illustrate this process, the purpose of this monograph chapter is to investigate the use of dominant languages such as African-American English in conjunction with Standard English and Asante by the Ghanaian Hip-Hop artist Blitz the Ambassador. This combination has been used as a means of performing a multi-faceted African identity while still actively participating in the global community.

LANGUAGE AND COLONIZATION

More than any other continent significantly affected by colonization, Africa arguably has been affected the most significantly by colonization (i.e., economically, politically, and culturally). Scholars have discussed the immediate and long lasting implications of the relationship between the former colonies and their colonizers. Perhaps, one of the greatest impacts suffered by Africa has been the creation and perpetuation of racially-based ideologies directed at the people of the continent by European colonizers and Western countries of influence. To this day, the continent of Africa (i.e., historically referred to as the “Dark Continent” by Europeans in the 19th century [Stanley, 1878; 1988]) typically is treated inaccurately as a monolithic environment consumed by extreme poverty, lack of education, and helplessness with no acknowledgement of the incredible diversity, economic successes and valuable cultures it contains.
Clearly, colonization has impacted the cultural resources of all but one country in Africa greatly (i.e., Ethiopia never was fully colonized successfully but still was influenced by Italy [Negash, 2013]). While considerable research has focused on more material impacts of colonization on the pre-existing cultures, a significant portion of scholarship has evaluated the impacts on pre-existing cultures of those who were colonized (Francis & Ryan, 1998; Leglise & Migge, 2007).

One of the major cultural elements of concern is language. The effects of colonial languages and their dominance over indigenous ones still are relevant. Leglise and Migge (2007) as well as Francis and Ryan (1998) examine the conflicts presented amongst global and local languages and their impact on both communication and educational policies. It is asserted by these researchers that one of the goals of colonization is establishing the superiority of European countries; therefore, cultural and linguistic ideologies were established alongside racial ones. In the process, languages such as French, English, Dutch, and German became dominant fixtures in each colonized region (Francis & Ryan, 1998). These languages soon became the language of the colonized, devaluing and subordinating the indigenous languages of the people subjected to the influence of colonization. As a result, the indigenous languages were rendered inadequate, which effectively created a “language hierarchy” (Leglise & Migge, 2007). The colonizers established English as the language associated with prestige in the ex-colonies, and it is now globally recognized as such (Francis & Ryan, 1998; Woolard & Schieffelin, 1994).
In a broader context, Alexander Duchêne’s book (2008) *Ideologies Across Nations: The Construction of Linguistic Minorities at the United Nations* (U.N.) addresses intricacies of language, power and social-progress issues that perhaps have resulted in difficulties that linguistic minorities have in navigating commerce world-wide. He suggests that U.N. practices have evolved that may function as tools to protect nation-states rather than to support development of human-rights practices for linguistic minorities world-wide. It seems clear that linguistic minorities in numerous developing nations experience challenges in the areas of personal identity development and ethnicity, which may be understood better by examining the linguistic resources of individuals who are successful in commerce from a global perspective.

**LANGUAGE AND IDENTITY**

Because of their complex linguistic systems, ethnic groups in Africa end up managing varying linguistic resources in unique ways (Blommaert, 2010; Thomas & Clarke, 2006). Benor (2010) describes such compositions of linguistic elements as repertoires, placing her focus on how the diverse linguistic features are drawn from varying linguistic sources and are pieced together to function in a type of bricolage (i.e., a construction composed of multiple diverse elements) arrangement. These features are not necessarily exclusive to any one language or repertoire and may not be possessed by all members within a speech community; instead, the repertoire, as a whole, is what seems significant instead of specific bound languages. Blommaert’s (2010) discussion of Joseph (i.e., a Rwandan refugee seeking asylum in the United Kingdom) vividly describes the
process by which these repertoires evolve in the real world and their related social effects. Pujolar (2006) discusses the benefits of the use of diverse language varieties by African women who live in Spain, taking Catalan language courses to gain both cultural capital and prestige. Scholars have linked language to various ethnic identities (e.g., García-Sánchez, 2013; Heller, 2003; Roth-Gordon, 2007) and have discussed the role that language plays in challenging hegemonic (i.e., dominant mainstream) beliefs about language use (Bourdieu, 1977; García-Sanchez, 2013). Included is the role language plays in the construction of one’s identity (i.e., both ethnic and personal).

In instances of language contact (i.e., situations in which different languages or dialects come into contact with one another often as a result of different cultures coming into contact), Otsuji and Pennycook (2010) propose the idea of *metrolingualism* — the management of linguistic practices across cultural, historical, and political boundaries. This appears to be a viable option for youth who are faced with the manipulation of these language repertoires.

**LANGUAGE AND ETHNICITY**

Having access to multiple complex linguistic systems may create issues of identity (such as conflicting allegiances between one’s cultural and national identities), and it also may aid in the negotiation of such issues. As one example, Bailey (2001) explores the use of various linguistic sources by Dominicans in the enactment of their complex identities, which includes the performance of Hispanic-ness and the rejection of presumed Blackness, particularly as they immigrate to America. Roth-Gordon (2007) explores similar
phenomena in studying the use of the term “playboy” by Black male youth in Brazilian Portuguese slang as a method of contesting the hegemonic ideology that presents these males as less valuable or less important based on their race. The importance of language with respect to identity, today, is apparent in both the global spread of Hip Hop music and the translation of the genre into the varying languages of countless cultures.

Given the complexity of the linguistic repertoires worldwide and the need for communicative competence in diverse environments (Besnier, 2013), examining how “new forms of power and inequality” (Abstract) are shaped is valuable. Also investigating how converging global and local dynamics are manifest specifically among young people may be likely to yield valuable data.

Consider the influence of Hip-Hop music on many young people worldwide and its English origins. It seems clear that this genre that has spread globally should be considered as a contributing factor to the cultural linguistic repertoires and identities of young people in many areas of the world. As demonstrated by the data analysis that will be presented later in this monograph chapter, Blitz, in contrast to other rappers and musicians, uses the genre and its language to affirm Blackness through positive associations instead of by diminishing other races, which tends to represent the prevalent sociolinguistic features of typical Hip-Hop lyrics.

HIP-HOP AS A MEDIUM OF SOCIAL ACTION

At its origin, Hip-Hop was designed to be a tool of activism for the disenfranchised (e.g., to be used as a manner of leveling the playing field) by pushing back against the hegemonic structure
(Morgan & Bennett, 2011). Given its English origins, it is not uncommon for the Hip-Hop genre that has spread globally to carry the English language with it, which tends to add complexity to the linguistic répertoires of those who utilize it. This musical tool has been used globally as a measure of protesting oppressive governments, systems and power structures not only in Northern Africa but also in Asia and across the globe. In fact, “East and west, north and south, rappers have emerged as the voice of the revolution” even in Arab nations (Sarant, 2011, para. 4).

Notably, African Hip-Hop artists have used the medium to challenge the structure set in place by colonization (Morgan & Bennett, 2011). These researchers indicate it generally is accepted that Hip-Hop was birthed within African-American urban culture, an environment associated with violence, poverty and oppression. Furthermore, in the early 1990s, Hip-Hop was geared toward asserting the identity of a group that was no longer content with the mistreatment, oppression, and invisibility projected onto it by the hegemonic American culture. It seems noteworthy that the very medium that served as a method of expressing the plight, pride, and the political agenda of the African-American community possibly is being utilized globally to enact a similar type of agency.

RESEARCH METHOD

The artist Blitz, the Ambassador, was chosen for this research primarily because of his strong ethnic identity, coupled with his lyrical skill and efforts to preserve Hip-Hop as a means of cultural and self-expression. He has been labeled as a type of “conscious” rapper and is featured in the music of artists who fit into
that subgenera as well. His music is not simply entertainment but is frequently designed to send positive messages of empowerment and strength. His strategy fits well with the goal of this study, since one of the points of interest is the use of language as an element of social capital and power.

In light of Duchêne’s (2008) concerns regarding the lack of power and social-progress issues among linguistic minorities, examining use of linguistic resources that may be related to Blitz’s success within the music industry internationally apparently may provide knowledge that could be helpful to these individuals. Of particular interest is the song “Dikembe,” which is the object of this study. This song was written in celebration of both the title protagonist and the larger African diasporic culture that he represents.

By drawing on various resources from the approaches of critical discourse analysis (Fairclough, 2003; van Dijk, 2008) as well as indexicality (Ochs, 1990; Peirce, 1932), the lyrics of “Dikembe” were analyzed with respect to their purpose in the enactment and reproduction of positive self-identity markers by the rapper. In the following section, an exploration of the lyrics of “Dikembe” is presented with data that may substantiate the personal and cultural message of the artist Blitz, the Ambassador.

HIP-HOP DATA ANALYSIS

Blitz, the Ambassador (né Samuel Bazawule), is a Hip-Hop artist born in Ghana in 1982 (the Ambassador, 2014a) who moved to the United States (U.S.) in 2001 for his university education at Kent State University (Blitz the Ambassador, 2015a; 2015b; Blitz the
Ambassador Biography, 2012). His website “Bio” indicates he has been interested in Hip-Hop and its culture since his adolescence, and he is identified as a “conscious” rapper due to his frequently historical, political, and culturally affirming lyrics and the choice of subject matter in his music (the Ambassador, 2014a). He also is noted for openly promoting a connection to his native African culture and frequently uses the term Afropolitan (i.e., the title of his 2014 album [the Ambassador, 2015a]), which promotes a positive African image. He is quoted as saying “a new breed of Africa is here” as an admonition to all who underestimate or who wish to challenge those of African descent, which is a line featured in his performance in “Les Gens” by Les Nubians (2011; a female neo-soul duo from Caniada that employs both French and Chadian languages).

Typically, Hip-Hop artists rap in their native languages but “frequently code-switch into two or more languages within a single song” (Morgan & Bennett, 2011, p. 190), and as English is a major language in Ghana, it is likely that it is Blitz’s native language. English is clearly one of the languages that contributes to his unique linguistic repertoire, which contains elements from languages native to Ghana as well as features from African American English (AAE), which most probably is the result of his extensive exposure to Hip-Hop and his residence in the United States. Blitz’s music can be viewed as consciously pro-Africa or pro-Black, with the design of presumably reaching a global audience given its frequent message of positivity in terms of the presentation of Blackness.
Dikembe, The Song

The data for this study were drawn from a song (and its music video) entitled “Dikembe!” by the rapper Blitz the Ambassador (2013). As debuted on July 11, 2013 in Rabat, Morocco, the video had exceeded 117,000 views by September, 2015 on Youtube (the Ambassador, 2015b). Appendix A provides the transcription conventions for data collection used for this study, which are based on the work of Ochs (1979) and Bucholtz (1998). The transcript of the song itself is shown (Appendix B) divided into discourse lines. Each line was subjected to qualitative analysis procedures adapted from the work of Bucholtz and Hall (2005).

The data analysis is a search of linguistic features from Asante, English, and African-American Vernacular English (AAVE) with the goal of contextually determining their function within this artist's performance based on accompanying elements. The evaluation of these linguistic features in this performance was not unlike that of critical discourse analysis (e.g., van Dijk, 2008).

“Dikembe!” is a two-minute long rap boasting of the artist’s various strengths and punctuated by NBA star Dikembe Mutombo’s trademark “NO!, NO! NO!” that includes his finger-wagging gesture (the Ambassador, 2013). The work appears to be aimed at anyone who could be viewed as a form of opposition against Blitz, his ethnicity, or the cultures in which he participates.

Dikembe, The Man

The choice to write a song centered on Dikembe Mutombo served many purposes in terms of performing African-ness as an indicator of strength, success, and value. In general, Dikembe is
considered to be a highly public example of Africans achieving success despite probably being underestimated from a global standpoint. His ascent to fame can be attributed perhaps greatly to his large 7’ 2” stature and his ability to block the shooting attempts of opposing players, prohibiting them from scoring points in the game of basketball (Dikembe Mutombo Blocks 31 shots..., 2012). Both of these characteristics physically demonstrate a strength, skill and resilience that Blitz frequently associates with Africa in his music.

Dikembe’s achieved popularity in the U.S. and across the globe (CBS This Morning, 2015; Lee, 2015), which combined with the aforementioned attributes of strength and success, appears to make him an excellent example of cultural affirmation and of global participation as well as of considerable international influence.

“Dikembe” is an ode not just to the basketball player after which it was entitled but also to the positive qualities he possesses, which may be reflective of those of the songwriter, his culture, and global Blackness. Blitz spends the entire song exhibiting a positive message that celebrates the achievement, power and resilience that he links to being Black. Each rapidly recited verse of his song is couched in the comedic and familiar repetition of “NO! NO! NO!” (i.e., performed in a raspy voice and accompanied by the performative wagging of the index finger; the Ambassador, 2013).

This simple line has been marked as the signature of Dikembe Mutumbo, who enacts it each time he blocks an attempt at a basket from his opposing team during NBA exhibitions (Dikembe Mutombo blocks 31 shots..., 2912). Mutumbo can be seen
reenacting this trademark both on and off the court in situations such as commercial advertisements for GEICO (Government Employees Insurance Company; NBA Dikembe Mutombo GEICO..., 2013), and this occurs in quite unlikely environments such as the grocery store (Pollakoff, 2013). These commercials have contributed to making Mutombo's gesture and accompanying phrase highly recognizable in U.S. culture. By implication, Blitz's repetition of this trademark effectively illustrates his message of strength and rejection of any adversaries he associates with himself, Africa and Blackness altogether.

DATA ANALYSIS

Below, the multiple linguistic varieties are evaluated as they are employed by Blitz in “Dikembe.” These varieties include an analysis of linguistic elements from the Ghanaian Asante language, Standard American English and African-American English. These linguistic analyses are accompanied by a discussion of their respective cultural influences projected onto the song.

West-African Language Resources

Linguistically speaking, Blitz draws from a relatively small number of Ghanaian linguistic resources. In the biographical information on his website, his native language is not mentioned and as English is a major language in Ghana, it is assumed that he was raised in an English dominant environment. In such a case, this could explain why so few non-English elements are used. The only use of any West African language (in Line 7) is the recitation of the Asante (specifically Kumasi) proverb “Yese wo kum apim a Apim beba, chale koko da” (Kinkyfoofoo, 2011). This phrase is translated as “If
you kill one thousand, one thousand will come back” (Appendix B). The language of this motto presumably is Asante (i.e., a dialect of Akan) as it is associated historically with Asante and Ghanaian identity (Kinkyfoofoo, 2011). Blitz’s rapidly fluent recitation of the slogan (and the subsequent translation in Line 9) demonstrates at minimum some exposure to the language and perhaps some practice as well.

Despite the overt use of English, there are other linguistic elements upon which he relies to create “Africanized” utterances. His use of “African” accented speech (Lines 38, 39), as a means of marking (Green, 2001; Mitchell-Kernan, 1972) a Ghanaian character from a film (discussed below), is a method of performing “African speech” by using the phonology and prosodic features when the lexical ones are inaccessible. Based on the total of 2 types of observations, the procedures used yielded only 1 discrete word grouping in the rap lyrics that could be identified as West African in origin.

American Language Varieties

The section that follows contains the identified repertoire features in the words of the “Dikembe” song, which are characteristic of not only Standard American English but also general U.S. cultural references and African American cultural references. Explanatory material related to Blitz’s choice of the specific words in the lyrics also is provided.

Standard American English. It is clear that the rap performed by Blitz was delivered in English given the lexical, syntactic, and phonological features. As English is one of the
principle languages of Ghana, one might assume that the language would be used, but considering Blitz's significant amount of emphasis on his pride in his African culture, it is not necessarily expected that he would use English exclusively, which seems to reflect no knowledge of indigenous languages. It is clear that he speaks English fluently and frequently raps in the language (even in French songs such as *Les Gens*; Les Nubians, 2011). His choice to use English then could be seen as intuitive and as a means of performing Hip-Hop in a language accessible to as many people as possible, enacting a type of global reach.

**U.S. Cultural References.** Though there were few cultural references to the U.S., it is important to note the American references made by Blitz as they signal familiarity with and participation in U.S. culture. By creatively drawing from a figure who is a known athlete of a sport that originated in the U.S. (i.e., Dikembe Mutombo), Blitz aligns himself with the American ideology (e.g., see Kirsch, Harris, & Nolte, 2013) of placing athletes and athletics in extremely high esteem. This statement in no way links Blitz to this ideology exclusively, as he also references and shows appreciation for education when he mentions Chinua Achebe—a renowned Nigerian poet, writer, and Nobel Prize nominee (Flood, 2013; Italie & Gambrell, 2013; Obaze, 2006). Nevertheless, it does demonstrate at least a minimal participation in the cultural appreciation for sports. Blitz also specifically makes reference to the U.S. monument Mount Rushmore (Line 28), alluding to the sturdiness of the rock monument and the presidential figures represented in it.
**African American Cultural References.** Within the mainstream American culture, exists the subculture of African-Americans about which little is known by those who do not partake in the culture. In the 2000 film *Next Friday*, starring rapper Ice Cube, there is a brief moment of confrontation between an employee (i.e., Day-Day Jones played by actor Mike Epps; Best Mike Epps movies, 2015) in a record store and a hyper-performed, heavily stereotyped African character (played by notable Ghanaian comedian Michael Blackson; Next Friday cast, 2015). During the interaction, Blackson’s character storms into the store demanding a refund for a compact disc he had purchased, uttering the phrase “I can’t get jiggy with this shit” in an exaggerated “African” accent (Next Friday [7/10] Movie CLIP..., 2000). The utterance is almost duplicated by Blitz in these lyrics (see Lines 38 and 39). The recitation of these lines serves a two-fold purpose. First, by quoting a line from a movie created by and seen almost exclusively by African-Americans, Blitz apparently is aligning and enacting a type of solidarity with the African-American community, displaying a shared cultural experience that when referenced would be noticed immediately by an African-American. Second, by repeating the line delivered by the only African character in the film and mimicking his performed “African” accent (the Ambassador, 2013), Blitz effectively aligns himself with that character, asserting his Ghanaian and African identity even if it is during a moment of stereotypical humor.

In the second reference to American (i.e., more specifically African-American) cultural occurrences, Blitz mentions the boxing match generally known as “The Bite Fight” between Evander
Holyfield and Mike Tyson. The pay-per-view record setting 1997 fight made headlines not just for being a groundbreaking match between two formidable athletes; but it also is known infamously for Tyson’s act of biting Holyfield’s ear (i.e., thereby removing a fragment of it) during the match (Lohr, 2012). In Lines 31 and 32, Blitz boasts of his self-acclaimed skill as a rapper and warns the listener to protect his ears (as a listening mechanism) as Evander Holyfield probably should have done in reality. This metaphor is both a means of toasting and signifying (see speech acts) as well as one designed to align with the African-American community. While the Holyfield-Tyson match sparked national interest, it was of particular salience within the African American community, and common references to it are still made and recognized (Wright, 2014) quickly by members of the African-American community.

**African American Vernacular English**

*Phonological.* African American English is the non-standard variety of English spoken within the African-American community though not necessarily exclusively by African Americans (Green, 2001). According to Green, the term African-American Vernacular English (AAVE) can be used to refer to this variety of speech in general, but there are multiple other terms and the variety itself has many sub-variations linked to a number of social variables such as geography and socio-economic status. In this case, the term AAVE is used to refer to the type of AAVE used by young urban African-Americans that draws upon the culture in which Hip-Hop is rooted. This performance by Blitz is riddled with linguistic elements from AAVE. Virtually every line contains at least one element, be it
phonological (sound level), lexical (word level), or syntactic (sentence level or grammatical).

As Hip-Hop was birthed within the African-American urban culture (History Detectives, 2014), it is intuitive that the medium would possess linguistic features that typically occur in this urban culture. In terms of phonological features, the most notable ones that were presented are the absence of the post-vocalic liquid /r/ in word final position. This feature, described as the “absence” of a final /r/ occurring after a vowel has been attributed to AAVE (Rickford, 1999) and is exemplified in Lines 39 and 40 where the standard pronunciation of the words “player” and “hater” are pronounced [plejə] “playa” and “hata” [hetə] instead.

The second phonological feature presented is the fronting of the velar nasal /ŋ/ to its alveolar (i.e., consonants for which the flow of air is stopped or impeded by creating a block or a small aperture between the tongue and the alveolar ridge” [The essential components..., 2005]). This fronting of the velar nasal /ŋ/ to its alveolar counterpart /n/ in word final position is described by Rickford (1999) in the pronunciation of a word such as “singing” as [sinɛŋ] “singin.” In lines 2 and 12, Blitz fronts the nasal alveolars in the terms “taking” and “coming” as “takin” [tekɛn] and “comin” [kæmɛn], respectively. While many of these phonological features are not unique to AAVE, the use of them accompanied by syntactic and lexical components of AAVE points to a likelihood of them being from this speech variety. The combination of these elements is referred to as what creates a repertoire-like system composed of
features from multiple varieties that could, indeed, be shared by them.

**Syntactic.** The syntactic elements used in DIKEMBE! have a historically rather exclusive link to AAVE. Copula absence refers to the absence of the verb ‘to be’ in a sentence (Green, 2001; Rickford, 1999). This particular feature, which notably has been attributed to AAVE, presents itself from the very beginning of the song up until the antepenultimate (i.e., third-to-last [The Oxford Advanced Learners Dictionary, 2010]) line. In his opening line “We ø takin’ it back to the raw” (i.e., Line 2), the absence of copula is presented as an introduction to the song and is a declaration of the current influence of Blitz and his associates. There is also an absence of copula in lines 25 and 30 as he utters: “You ø forced to close your eyelids” and “My tongue ø sharper than a guillotine,” boasting about West African rap as well as his own lyrical abilities.

While copula absence can be a feature of other non-standard English varieties and also a feature of second language acquisition, its grammatical environment here is an indication of its uniqueness as a feature of African-American English. His frequent usage of such a marked term in conjunction with other elements of the AAVE repertoire attests to his proficiency in AAVE. Clearly, he is knowledgeable enough to be able to manipulate the variety in varying instances both appropriately and effectively, regardless of subject matter.

While the AAVE tense/aspectual system had been thoroughly examined (Green, 2001), there is still much work to be done. Many aspectual markers have been included in the extensive
system, such as the Remote past BIN and completive Done, but one marker that frequently goes unnoticed is referred to here as the aspectual ‘stay’ (not unlike the habitual be), which can be used to describe the continuous and habitual actions of an agent. Green (2001) defines it as the engagement “in an activity frequently” (p. 23). For example, if one were to say “she stay eating,” it could be translated into to “she is habitually eating” or does so frequently enough to be assigned this characteristic habitually. In Line 26, this aspectual marker appears as Blitz boasts that his “verbs stay slicing,” inferring that his lyrical abilities are consistently and continually dangerous for his opponents.

**Lexical.** The term “raw” refers to that which is considered to be “the actual truth or status of something” (Smitherman, 1994, p. 191) and is used by Blitz in Line 2 to refer to the realness of his rap. Given the high value placed on authenticity within the Hip-Hop community (e.g., Jacobson, 2009), initiating a song with such a declaration sets the stage for a series of bold statements about one’s rap abilities and status within the Hip-Hop culture. In Line 35, Blitz uses the term “snatched” to mean stolen as he describes a hypothetical moment of weakness for those who are ill-equipped (e.g., lacking street smarts) and who quite likely would be robbed immediately upon arriving in Africa.

The use of this lexical item is a type of “representing” as it is a common occurrence within the Hip-Hop genre to discuss the dangers of one’s native town or country as a means of indexing one’s strength through the allusion (i.e., implication) of the difficulties in survival and navigation of such an environment, which is a skill that
is not inherent to outsiders or those considered weak. Additionally, while the term “player hater” typically is used in reference to a person who displays envy towards another (Green, 2001), it can be used as a general insult, as is the case in Line 39. While the term originated within the Hip-Hop community, it has been appropriated by the mainstream, and one may still use “hater” without risk of being ridiculed.

In addition, the adjective “jiggy” is a derivative of the phrase “get[ting] jiggy” coined by Will Smith in his rap song “Gettin’ Jiggy wit it” from his 1997 album Big Willie Style (The best and worst songs…, 2015). This term may carry several meanings, but when it is used in the phrase “get jiggy,” it generally refers to dancing or (more specifically) a dance made famous by Smith in 1997 in the video for the song in which he moves his shoulders and hips rhythmically (Smith, 2011). The use of this lexical item points to Blitz’s familiarity (albeit dated) with AAE as well as the language of popular American culture in general.

The linguistic elements presented in this song indicate not only the presence of English, but more specifically, African American Vernacular English (AAVE). Paired with these elements is the use of the 3rd person plural pronoun “y’all” associated with Southern American English. The fact that Blitz is known to reside in Brooklyn (according to his Wikipedia page) and not the South, however, points to his acquisition and use of the term as a feature of AAVE that was carried from the South across the U.S. during the Great Migration (Dialectblog, 2011); thus, it is used by African Americans regardless of geographic region. Finally, Blitz’s
presentation of “tonal semantics” (Smitherman, 1977), which combined with the aforementioned elements of AAVE that seemingly point to a fluent expression of AAVE, link him specifically with the African American community.

Speech Acts

**Toasting.** Speech acts are considered to be categorized utterances that function performatively beyond the linguistic level (Searle, 1969). These speech acts may include language games to verbal sparring and occur frequently and in various forms throughout the song “Dikembe.” Various speech acts (as defined by Dandy, 1991; Hymes, 1972; Mitchell-Kernan, 1972; Smitherman, 1977) from AAE were present in “Dikembe!” alongside descriptive linguistic elements. As defined by Green (2001), Rickford and Rickford (2000) and Smitherman (1977), toasting is a verbal act designed to intimidate one’s opponent by bragging about one’s personal attributes and successes in the first person.

This specific speech act is laced with braggadocio and is a discursive resource employed by many Hip-Hop artists, during rap battles as well as in solo performances. Morgan and Bennett (2011) define the act as “a style of chanting over a beat in dance hall music” (p. 184) attributed to both African American and Jamaican verbal games. This rhythmic recanting or recitation of one’s own personal attributes often rhymes and is performed publicly.

Certainly, this act is mimicked in the boasting that frequently is featured in Hip-Hop performances. While the two are not exactly the same, a designated term for toasting within Hip-Hop has yet to
be established. As a result, the term *toasting* will be employed in reference to the act throughout this discussion.

Extensive experience as a Hip-Hop artist makes Blitz a veteran rapper and serves as a source of authenticity within the genre. This would be similar in any occupation, since experience is valued highly as a marker of ethos and professional ability. Blitz’s experience as an artist and more broadly as one who is “raw” (declared in Line 5) is a display of his authenticity (i.e., realness), as was described above when the declaration is made in Line 2. Line 27’s toast is an allusion (i.e., an implication, or “a brief, usually indirect reference to a person place or thing…” [About education, 2015]); this toast is an allusion to Blitz’s lyrical abilities and verbal stamina. He asserts that he possesses the ability to rap for extended periods of time. This statement also alludes to the idea that he raps incessantly, which would be indicative of a lifestyle that is consumed with Hip-Hop, as opposed to an ephemeral infatuation with the culture.

According to his perspective, this preoccupation is not a fad or even a job; it is a way of life. It is reasonable to conclude that it is an important part of his identity, and it is what makes him more authentic than his opponents. In lines 30 and 31, “My tongue ø sharper than a guillotine, my verbs stay slicing,” is making reference to his lyrical prowess. To deem one’s tongue sharp indicates that he sees himself as a proficient lyricist and is articulate enough as an artist that his tongue could be perceived as a weapon to other rappers. Not only is his tongue alluded to as a weapon, but it also is
dangerous and poised for attack in the event of a necessity in expression.

A self-comparison to the notable author China Achebe (Italie, & Gambrell, 2013) occurs in Lines 41 and 42, claiming that what he constructs is both a classic and a message to legions of followers; the lines appear to be an open statement of Blitz's self-perceived importance and grandeur. The apparent audacity that fuels these types of assertions (i.e., Toasting) is not viewed necessarily as offensive in AAE or the Hip-Hop world (Green, 2001). In some cases, it may be considered a requirement for participation in the culture. It seems reasonable to conclude that a rapper must have the self-confidence and boldness that is vital to be able to assert oneself and perform successfully the toasts that are associated with the genre.

This same type of audacity is similar to that which accompanies the toasts of Dolemite in his performance of "The Signifyin' Monkey" in which he rhythmically boasts of the bravery and wit of a mythological monkey engaged in a confrontation with an antagonistic lion (Moore, Toney, & Martin, 1975; Rickford & Rickford, 2000.) This similar performance is a metaphor for the character Dolemite's own self-acclaimed superiority. It seems clear that one would not be able to perform this particular speech act without such a high level of confidence.

While gender-related issues are not the focus of this paper, it would seem remiss if that particular link to allusions of strength was not mentioned. As discussed above, this presentation of strength that clearly is exhibited with masculinity has importance specifically with
respect to African-American men. Black men frequently are viewed as hyper masculine and, culturally, are drawn upon by non-Black men in order to perform masculine personae (Bucholtz, 1999; Chun, 2001). The speech acts presented by Blitz the Ambassador are an effective means of performing said acts of masculinity that inextricably are linked to Hip-Hop culture, particularly for male artists. It is typical for a male Hip-Hop artist to present at least some type of overt masculine behavior that can be perceived mistakenly (Spears, 2001) as aggression or anger (e.g., the "Thug Life" tattoo across Tupac Shakur's abdomen [Smith, K., 2012] or the infamous rants of Kanye West [Schillaci, 2014]). The performance of strength is a hallmark of Hip-Hop as well as of black masculinity (Rickford & Rickford, 2000), and it is difficult to separate these two aspects completely, as they often go hand in hand.

**Collective Toasting.** In the "DIKEMBE!" rap, there are considerably fewer occurrences of personal boasting in comparison to that which is classified as collective. The use of the third-person nominative pronoun encapsulates the song, both figuratively and literally. Not only is his message overtly collective, but Blitz both opens and closes the song with lines focused on "we" (i.e., Lines 2 and 45), encompassing the entire song as a corporate boast.

Clearly, Blitz focuses much of his attention on the strength and resilience of Africa throughout the song. He opens the rap by announcing the arrival of the "African attack" in Line 6, which is followed by the Asante slogan expressing the resilience of these people. He continues in Line 9 by making it clear that Africa is too strong to be defeated. A few seconds later he expresses that his
imagined opponent is “comin’ against the future” (Line 12), reiterating his previous assertion (“tell the people a new breed of Africa is here,” which is first used in *Les Gens* [Les Nubians, 2011]) that Africa has been regenerated and shows promise to be a force of influence in the future.

Blitz goes on to boast about the authenticity of Africa, stating “we represent the realness” (Line 20), which displays the authenticity that is revered in Hip-Hop (i.e., perception of “sincerity and commitment” not limited to professional musicians [Firth, 1996, p. 71]; e.g., Jacobson, 2009). The toasting continues throughout the song, interchanging between personal and corporate expressions, until the final lines when Blitz asserts that any plan of attack will be counteracted sufficiently by Africa (i.e., presumably the “we” to which he refers) in Line 45.

**Representing.** To *represent* is similar to boasting but is limited with respect to one’s native location, crew, or community (Morgan & Bennett, 2011). By representing or “repping,” one not only expresses a connection to his native location but rather, through deeming this space worthy of recognition, it is implied that this is a source of valuable citizens and attributes. Apparently, Blitz represents numerous geographical areas, both nations and cities such as Morocco, Accra, and the Western region of Africa collectively (e.g., Lines 40, 11, and 24 respectively).

His recurring mentions of African musicians and other famous figures functions as a means of alignment with notable figures of African descent, which can be perceived as enacting a type of African-ness through pride and unity. Clearly, his representing is
not just about his connection to his native country Ghana, but it is expanded to encompass West Africa (Line 24), North Africa (i.e., Morocco, Line 28), and the continent as a whole (lines 6 and 34) as a collective unit through varying references. His reach extends even further to fellow musicians of African descent across the globe in Europe as well as Canada (Lines 10, 11) (e.g., as indexed by his aforementioned collaboration with Les Nubians [2011]).

By dismissing and insulting those who are weak, unskilled, and less authentic, Blitz disaligns with his hypothetical opposition and the negative characteristics attributed to them. He effectively positions himself as aligned with the opposite attributes, reaffirming the value of the culture to which he is connected.

**Shout Outs.** Smitherman (1994) defines a “shout out” as a public greeting to one’s friends or associates. The act is a public means of granting recognition to another and could be considered an extension of representing. In Lines 10 and 11, Blitz sends “shout outs” to a series of fellow Hip-Hop artists of African descent who reside both in Africa and European countries. This act generally is interpreted as an expression of support for the work of fellow artists, establishing solidarity with these performers both as Hip-Hop artists and being of African descent.

**Calling Out.** While “calling out” is not a term that officially has been considered a speech act, the act itself is present frequently in African-American culture and in Hip-Hop in general. Its definition is not unlike that of “loud talking,” as presented in Green (2001), except it functions on a broader scale for a typically larger audience.
The calling-out term is used here specifically to refer to the unapologetic act of drawing attention to any behavior viewed as inappropriate or in conflict with the established mores of a culture. In the case of Hip-Hop, a major faux pas that would subject one to being called out is the exhibition or discovery of inauthenticity presented by an artist.

As mentioned above and also in Morgan and Bennett (2011), authenticity is key in the world of Hip-Hop and being exposed for the lack thereof is a common occurrence. The act of calling out briefly occurs in the final lines of “DIKEMBE!” as a male voiceover presumably addresses the assumed opponent that Blitz addresses throughout the song. The lines feature the copula absence attributed to AAVE as well as post-vocalic r-lessness in Lines 50 and 51. While these features are important, attention certainly should be drawn to the actual content of the lines and the discursive practices they enact.

Blitz’ remarks to the opposing force serve as a threat of exposure of this figure’s inauthenticity and more specifically his lack of merit in the world of Hip-Hop. He concludes the song with the threat frequently used in the African-American community: “Don’t make me have to…,” which is followed by a verb phrase (VP) as a means of warning the person who runs the most risk of the results of the VP. In this case, that VP would serve to expose publicly the accused offender by making him or her identifiable to those within the community who are not aware of his transgressions.

**African Diaspora.** The aforementioned Ghanaian features, combined with Blitz’s high proficiency and effective manipulation of
both English and AAVE, indicate an access to global resources and subsequently “globality” as a practice. Drawing from these African resources to create a song praising the success of a notable member of the African culture, Blitz overtly establishes a “dual identity” (See DuBois, 1961) that not only draws from Western and African resources and presents an identity heavily rooted in his culture of origin, but it also represents active participation in the global culture.

This dual identity is the onus upon which the concept of “Aropolitan” is placed (i.e., the Blitz “Afropolitan Dreams” album [the Ambassador, 2014b]). Completing this project led to the conclusion that this identity is (if only partially) synonymous with the “new breed of Africa” alluded to by Blitz. Apparently, the members of this new “breed” manage to preserve their African identity without interference from the larger global culture, as there appears to be no competition between the two.

The members of this community do not seem to express a perceived conflict between their own ideologies and sense of value and those of the hegemony. This same culture asserts the strength of Africa and its imminent rise while simultaneously using global resources to aid this future success. Apparently, they are not assimilating but are rather creating a multi-resourced identity much like that of linguistic repertoires in Africa that have been influenced by globalization.

In addition to the connection with the global culture, there also is an alignment with African-Americans as a means of participating in the diasporic community of blackness. This alignment tends to contribute greatly to global participation, as it
indicates a lack of assimilation to the Western/European culture, which dominates said global culture. Instead, participation in that culture in conjunction with the expression of unity with other Blacks across the world seems to constitute another aspect of global-ness. This strong sense of unity also may contribute to the lack of perceived conflict between global participation and African identity.

DISCUSSION

As only one song by one artist has been evaluated, much work remains to be done for a thorough analysis of hip-hop music lyrics as they relate to youth identity development and related concepts. Given the significant amount of interesting elements presented in this brief song, alongside the expressive nature of Hip-Hop, it is the researcher's belief that there is much left to be explored through instances where the genre is used across the globe. What has been presented here can only account for this particular song, but it lays the framework for a hypothesis concerning language, music and identity, which could involve many others cross-culturally.

The effects of globalization always have borne critical cultural consequences (e.g., Leglise & Migge, 2007; Francis & Ryan, 1998). These authors discuss one of the most notable being the threat of influence onto valuable linguistic resources due to the overwhelming usage of dominant languages such as English. The loss of the affected languages could indicate the loss or rejection of cultural identity and covert cultural prestige (for fellow community members), and it would contribute to leaving those influenced as powerless with almost no sense of agency.
In the case of the work of Blitz the Ambassador, the results indicate otherwise. Not only are global languages (such as English) employed by this West African musician deliberately, but the means of employ for these linguistic resources also reflects significant agency in their utilization. The use of the global, English-based, musical genre of Hip-Hop by this musician allows him to participate in the global economy and to use English as a means of expressing his own unique identity on a grand scale.

Given its origins in the African American community (History Detectives, 2014), Hip-Hop is inextricably associated with AAE. Through the use of said features, social actors can index a type of authenticity that is required for legitimacy within the Hip-Hop world (Tosieilo, 2015). The use of these linguistic elements and speech acts indexes a connection with African Americans, demonstrating unity within the African diaspora and promoting a positive image of global Blackness that serves to counteract the negative discourse towards Blackness in the mainstream of society.

Along with these usages of English and AAE as a means of enacting personal agency, Blitz makes it clear that his African identity is intact through the employ of non-English linguistic resources associated with his native country. Through “shout outs” to African cities, frequent references to his home town and to Africa as a whole, boasting of the continent’s strength, resilience and imminent triumph, he demonstrate that his use of global languages in no way impedes his sense of African-ness. He seems to manage these resources with a unique amount of balance allowing him to
perform and maintain who he is, while still being included in the
global sphere.

This approach to language use is significant when applied to
social actors in situations of language contact, as frequently there is a
fear that one will be forced to choose between one’s native language
and that of the hegemonic structure in order to function in society
(Leglise & Migge, 2007). Through the use of both linguistic and
discursive resources, Blitz the Ambassador manages both to
establish and reproduce positive images surrounding African
identity, challenging the broader ideologies that associate Africa and
Africans with lack, extreme poverty and also seem to disconnect
both from the dominant Western and global cultures.

This one positive example from rap/hip-hop music provides
evidence that merits more linguistic research attention and may
indicate a need for extensive investigation to apply these kinds of
observations to the work of other artists who are impacting youth
positively, which could enable them to be mimicked globally. The
approach is only one means of navigating such a difficult situation
that has emerged from conflicts between dominant and minority
languages, but it is a starting point for efforts directed toward
language preservation and global multilingualism.
REFERENCES


APPENDICES

APPENDIX A: Transcription Conventions Used

. end of intonation unit; falling intonation
, end of intonation unit; fall-rise intonation
? end of intonation unit; rising intonation
: length
~ rapid speech; speech is slurred together
- self-interruption; break in the word, choppy speech
° quiet phonation

**BOLD CAPS** emphasized speech

(.) unmeasured pause, 0.5 seconds or less
@ laughter
h outbreath
[ overlapping speech
(( )) transcriber comment
{ } stretch of talk to which transcriber comment applies
((/ )) broad transcription
" reported speech
□ lines omitted for brevity
Appendix B: Transcription of “DIKEMBE” by Blitz the Ambassador

<table>
<thead>
<tr>
<th>Lyrics by Line</th>
<th>Linguistic Features</th>
<th>Speech Acts</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  DIKEMBE!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  We <em>takin’</em> it back to the raw</td>
<td>copula absence, nasal fronting</td>
<td>collective toast</td>
<td></td>
</tr>
<tr>
<td>3  The harder they ball, the harder they fall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4  So what are the odds he lost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5  Ambassador’s been raw since ’94</td>
<td>Toastin’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6  The African attack,</td>
<td></td>
<td>force of Africa</td>
<td></td>
</tr>
<tr>
<td>7  Yese wo kum apim a Apim beba, chale koko da (.)</td>
<td></td>
<td>“If you kill 1,000, 1,000 will come back”</td>
<td></td>
</tr>
<tr>
<td>8  Let me translate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9  You can’t ___ ((expletive)) with us</td>
<td>Toastin’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Shout out Kenad, Shout out to Shad, Shout out to Nneka,</td>
<td>Shout out to Rwandan and German-Nigerian artists</td>
<td>Diasporic Africaness indexed</td>
<td></td>
</tr>
<tr>
<td>11 Shout out Baloji, Sarkodie, representing Accra.</td>
<td>Shout out to rappers from the Congo and Ghana. Repping the largest city in Ghana.</td>
<td>Diasporic Africaness and Ghanaian pride</td>
<td></td>
</tr>
<tr>
<td>Lyrics by Line</td>
<td>Linguistic Features</td>
<td>Speech Acts</td>
<td>Analysis</td>
</tr>
<tr>
<td>---------------</td>
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<td>----------</td>
</tr>
<tr>
<td>12 <del>You comin’ against the future</del></td>
<td>nasal fronting</td>
<td>Toastin’</td>
<td></td>
</tr>
<tr>
<td>13 though its futile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 I salute ya</td>
<td>/you/ —&gt; [ya]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 ‘cause I’m wavin’ a finger at you-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 -NO, NO, NO, NO, NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 DIKEMBE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Father forgive ((/diz/)) sinners</td>
<td>Christian reference (in English)</td>
<td>used to address opponents in Hip-Hop</td>
<td></td>
</tr>
<tr>
<td>19 They know not That they Ø finished</td>
<td>copula absence</td>
<td>challenge to opposition</td>
<td></td>
</tr>
<tr>
<td>20 we represent the realness</td>
<td>Toastin’</td>
<td>collective representation</td>
<td></td>
</tr>
<tr>
<td>21 So y’all could keep the gimmicks</td>
<td>ya’ll</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 <del>Took us a minute to get it started</del></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 now its auto pilot</td>
<td></td>
<td></td>
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<tr>
<td>24 West African flows</td>
<td>Representing</td>
<td>alignment w/ West Africa and Africa collectively</td>
<td></td>
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<tr>
<td>25 You Ø forced to close your eyelids ()</td>
<td>Ø copula</td>
<td></td>
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<tr>
<td>Lyrics by Line</td>
<td>Linguistic Features</td>
<td>Speech Acts</td>
<td>Analysis</td>
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<tr>
<td>26 And imagine</td>
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<tr>
<td>27 I rhyme non-stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Mount Rushmore (.)</td>
<td></td>
<td></td>
<td>Allusion to U.S. national monument</td>
</tr>
<tr>
<td>29 <strong>forcin’ dead Presidents</strong> to rock</td>
<td>nasal fronting, “dead presidents” AAE lexical item</td>
<td>Toastin</td>
<td></td>
</tr>
<tr>
<td>30 My tongue Ø sharper than a guillotine</td>
<td>copula absence</td>
<td>Toastin</td>
<td></td>
</tr>
<tr>
<td>31 My verbs <strong>stay</strong> slicing, Evander Holyfield</td>
<td>aspectual ‘stay’</td>
<td>Toastin</td>
<td></td>
</tr>
<tr>
<td>32 Guard your ears, Mike Tyson,</td>
<td>cultural reference to Tyson/ Hollifield fight</td>
<td>threat to damage your ears not physically but through his rhythmic skill</td>
<td></td>
</tr>
<tr>
<td>33 <strong>Spittin’</strong> at these lames</td>
<td>nasal fronting</td>
<td></td>
<td></td>
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<tr>
<td>34 Watch them touch down in Africa,</td>
<td></td>
<td></td>
<td>African-ness</td>
</tr>
<tr>
<td>35 get snatched for <strong>they</strong> chains</td>
<td>3 per pl pos — &gt; they</td>
<td></td>
<td></td>
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<tr>
<td>36 ‘cause we bought your bootlegs and</td>
<td></td>
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<td>37 returned it to the store like</td>
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<td>Lyrics by Line</td>
<td>Linguistic Features</td>
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<tr>
<td>38 'I can't get jiggy with this,</td>
<td>&quot;African&quot; accent</td>
<td></td>
<td>Indexing African-ness and aligning with African Americans via cultural reference</td>
</tr>
<tr>
<td>39 where's the playa hata that sold it?</td>
<td>post-vocalic r-lessness</td>
<td></td>
<td>AAE/hip-hop reference</td>
</tr>
<tr>
<td>40 Meanwhile I'm in Morocco</td>
<td>Toastin'</td>
<td></td>
<td>Global ID indexed</td>
</tr>
<tr>
<td>41 Pennin' another classic for the masses</td>
<td></td>
<td></td>
<td>indexing superiority, rhythmic skill, consciousness</td>
</tr>
<tr>
<td>42 The new Chinua Achebe get your glasses.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>43 --So however clever your plan of attack--</td>
<td></td>
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<td></td>
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<tr>
<td>44 you better react</td>
<td></td>
<td></td>
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<tr>
<td>45 we ø spinnin' it back</td>
<td>copula absence</td>
<td>collective Toastin</td>
<td></td>
</tr>
<tr>
<td>46 Cause I'm wavin' a finger at you</td>
<td>nasal fronting</td>
<td></td>
<td>Indexing African strength/ blocking plan</td>
</tr>
<tr>
<td>47 NO, NO, NO, NO, NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 DIKEMBE</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>49 ((record scratching))</td>
<td></td>
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<tr>
<td>Lyrics by Line</td>
<td>Linguistic Features</td>
<td>Speech Acts</td>
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<tr>
<td>50 You ø all up in the game</td>
<td>copula absence</td>
<td></td>
<td></td>
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<tr>
<td>51 and don’t deserve to be a pl- playa</td>
<td>post-vocalic rlessness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 Don’t make me have to - have to call your name out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53 ((record scratching))</td>
<td></td>
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</table>
PART 2: COLLEGE OF EDUCATION
Counselors, deeming themselves as multiculturally competent, characterize their ability to work well with clients who are from various cultural and ethnic backgrounds (Holcomb-McCoy & Meyers, 1999; Vera & Speight, 2003); thus, it is a counseling approach that takes into account the context of the person's culture (Sue & Sue, 2012). Multicultural competencies cover three significant areas: (a) counselors' awareness of their own biases and personal limitations, (b) the ability to understand the worldview of others, devoid of negativity, and (c) an adherence to employing sensitive strategies so as to work effectively with culturally diverse clients (Engels, Minton, & Ray, 2009). The inclusion of multicultural theory allows for effective counseling in that strategies are developed with the cultural background of the client in mind (Marbley, Steele, & McAuliffe, 2011); thus, consideration for groups, such as families, in their context or unique culture, is an example of the need for multicultural competence.

The military is defined as a specific institutional culture with norms to which military service members adhere (Wilson, 2008),
which includes a tradition of its combat, masculine-warrior framework (Dunivin, 1994). For example, the Army has its own language, manners, norms and belief systems (Reger, Etherage, Reger, & Gahm, 2008). Members of the military and their families share a unique culture and face many challenges and stressors (Burrell, Adams, Durand, & Castro, 2006; Drummet, Coleman, & Cable, 2003; Hoshmand & Hosmand, 2007). They are an integral part of our society and live within the context of the military lifestyle. The differences in the military lifestyle as opposed to that of non-military families are seen most readily in the four specific areas that reflect the demands imposed: (a) The possibility of injury or death of the service member, (b) the need for relocation due to changes in duty stations, (c) the separation from family members due to deployment, and (d) the adjustment to living in another country (Burrell, et al., 2006).

A snapshot of our society reflects an increasing diversity for which counselors are tasked to meet the specific needs of individuals and groups (Ahmed, Wilson, Henriksen, & Jones, 2011). Military families also are included in this culture, especially when considering that although many live on military bases, more than two thirds of the military community has a presence in the civilian community (Hoshman & Hoshmand, 2007). Considering the mental health needs of military families, their presence in the civilian communities is significant (Burrell, et al., 2006; Dimiceli, Steinhardt, & Smith, 2009). As communities build support systems to address the needs of the military families, multiculturally
competent practitioners are tasked with understanding the military life style (Huebner, Mancini, Bowen, & Orthner, 2009).

The purpose of this monograph chapter is to highlight (a) the unique culture of the military, (b) emotional and mental health concerns of military families, (c) some effective interventions and strategies for mental health professionals working with the military families, and (d) relevant implications for counselor educators and students. A search of available social science and medical literature yielded numerous studies related to these four aspects of developing the cultural competence to work effectively with military families.

OVERVIEW OF THE MILITARY CULTURE

The various branches of the military are an integral part of our society, and service members are relied upon to protect our nation. The branches include the Air Force, Army, Navy, Marine Corps, Coast Guard, their respective reserve components and the National Guard (U.S. Armed Forces Overview, 2015). They operate within a rigid authoritarian structure functioning in a “top-down” fashion wherein orders are given from those in the higher ranks to those in the lower ranks, which resembles the functioning of a caste society (Hall, 2008). Service members often move from one duty station to the next to meet the needs of the military mission (Blaisure, Saathoff-Well, Pereira, Wadsworth, & Dombro, 2012; Hall, 2008) as the mission is their first priority (Hall, 2008). In addition to frequent moves, service members often are absent from the home due to training and deployments (Burrell, et al., 2006; Chandra, et al., 2010; Davis, Blaschke, & Stafford, 2012; Drummet, et al., 2003; Huebner, et al., 2009).
Due to service members’ extensive involvement with the military, the military community is considered extremely different from the civilian world. The community they live in is governed by the same authoritarian structure as their work. This results in a system that governs their behavior at home, wherein officers and enlisted men and women live and work in close proximity but are not allowed to socialize outside their ranks of officer and enlisted (Hall, 2008). Additionally, military members work and may live under the isolation and security of the military base and, when overseas, in a foreign residence (Burrell, et al., 2006; Hoshman & Hoshman, 2007). When the service member has a family, the families also experience frequent moves (Burrell, et al., 2006; Chandra, et al., 2010; Drummet, et al., 2003); for example, Army families move every two to three years (Burrell, 2006).

The mental and psychological world of the service member further adds to the complexity of the lifestyle. The lifestyle encompasses being guided by a sense of secrecy and commitment to their military mission, which is not to be questioned at the lower ranks, openness is not allowed, and there is an implied expectation of stoicism (Hall, 2008).

EMOTIONAL AND MENTAL HEALTH CONCERNS

Military families endure many challenges as they cope with the demands and stressors of the military culture. The very nature of being in the military carries the risk of injury and death especially during wartime (Drummet, et al., 2003; Adams, et al., 2006; Hall, 2008; Blaisure, et al., 2012). Service members are at risk particularly for post-traumatic stress disorder (PTSD) when deployed to combat
regions. Family members also contend with the probability of their service member being killed or at risk of serious physical and psychological injury (Burrell, et al., 2006; Hoshmand & Hoshmand, 2007; Huebner, et al., 2009).

Effects of Mobility

While a majority of the military families may adjust well to relocations, the preparation and actual move, including adjusting to the move within the first year, may present challenges for both the adults and children (Blaisure, et al., 2012). The relocation poses as a cyclical process in that there is the anticipation of the move which ends months after the actual move and is re-experienced with the next expected permanent change of station (MacDermid, Weiss, Green, & Schwarz, 2007). Overseas assignments may hold an even greater challenge for service members and their families. Living in another country means living a great distance from extended family members. If the service member is not allowed to take the family along (i.e., an unaccompanied tour) this separation also creates a stressor for the family in that they are away from their loved ones (Blaisure, et al., 2012).

Hardship of Deployment

One of the greatest hardships for families is deployments, as the member is temporarily moved to an overseas location to accomplish a task or mission (Padden, Conners, & Agazio, 2011; Sareen, et al., 2007). While both unaccompanied tours and deployments result in family separations, deployments create an additional stress of the service member being in a combat zone,
which further creates uncertainty and fears about the safety of loved ones (Padden, et al., 2011).

The service member is away from the family for long periods of time with the spouse left to carry out the operations of the home. Wives, making up almost 89% of the married spouses of active duty personnel (Office of the Deputy Under Secretary of Defense [DUSD], 2011), who are unfamiliar with the military culture experience greater difficulty with deployment than wives having prior experience either from being in the military or growing up in a military family (Padden, et al., 2011).

The length of time for deployment may have an effect in that the longer time period has been correlated with more mental health diagnoses for spouses, including conditions such as depressive disorders, sleep disorders, anxiety and adjustment disorders (Mansfield, Kaufman, Marshall, Gaynes, Morrissey, & Engle, 2010). Additionally, the wife often makes sacrifices to support her spouse. Due to the nature of relocations and the increased duties that she takes on during deployments, she may need to postpone educational pursuits and career development (Blasure, et al., 2012; Burrell, et al., 2006). Deployments are a particular stressor for all family members and it is stressful especially for the marital relationship.

According to Logan’s (1987) early description of “the Emotional Cycle of Deployment (ECOD) model,” which was first used to describe “changes in Navy wives’ emotions and behaviors..., [it] has been useful in working with husbands and children as well” (Logan, 1987, para. 6).
Those experiencing the deployment process are described as progressing through seven emotional stages: (a) anticipation, (b) detachment and loss, (c) emotional disorganization, (d) recovery and stabilization, (e) anticipation of the homecoming, (f) renegotiation of the marriage contract and (g) stabilization. Although these seven stages appear to be sequential, the emotional reactions experienced by individuals during these stages may be considered quite variable (Logan, 1987). Logan’s seven stages of this ECOD emotional-cycle model are useful in dealing with contemporary military deployments, and their relevant components are described below.

The first stage is “Anticipation of Loss.” This stage actually occurs weeks before the service member leaves. In this first stage the spouse experiences anxiety about the pending deployment and may vacillate between sadness and anger, which creates some emotional distance and can be viewed as a functional preparation stage.

The second stage is “Detachment and Withdrawal,” which occurs closer to the time period that the service member will deploy, and sometimes is regarded as “the most difficult” for the couple. To deal with anxious emotions, generally the couple withdraws from one another and emotionally becomes detached.

The third stage is Emotional Disorganization, which occurs when the deployment takes place. It primarily involves the spouses dealing with various emotions such as anger, sadness, confusion and anxiety.

The fourth stage is “Recovery and Stabilization.” New routines have been established and emotions have settled along with a
sense of accomplishment and confidence about holding it all together, even though this may be a stressful stage.

The fifth stage, Anticipation of Homecoming, is an exciting time period in that there is not only anticipation of being reunited. It also is characterized by apprehension (expressed or unexpressed) that may emerge prior to the return date.

The sixth stage is marked by the “honeymoon period” and may end with the couple seeing the need to renegotiate the marriage contract. The couple may determine that they need to make significant adjustments in their roles and responsibilities.

In the final and seventh stage, “Reintegration and Stabilization,” the service member now is reintegrated fully into the family and has regained stabilization (Logan, 1987). In addition, new routines are established and emotional closeness is returning.

Due to repeated deployments, the couple may find this cycle to be a continuous process. Soon after they have adjusted from the turbulent emotional cycle of the deployment, the spouse may be in preparation for the next deployment (Knobloch & Theiss, 2012).

**Effects of Post-Traumatic Stress Disorder (PTSD)**

As military members return home from combat related deployments, they are often in need of physical and mental health treatment. Post-Traumatic Stress Disorder (PTSD) is a type of anxiety disorder that occurs when exposed to trauma and can result in a spectrum of reactions such as re-experiencing the traumatic event, avoidance behaviors associated with the trauma stimuli, numbing and increasing arousal (Blaisure, et al., 2012). It can pose a huge impact to marital functioning particularly when deployed.
military members return to their marriages. The symptoms of PTSD can cause problems with communication and marital satisfaction; for example, PTSD symptoms were negatively correlated with aspects of marriage such as, confidence and dedication for the marital relationship (Allen, Rhoades, Stanley, & Markman, 2010).

Although members meet the criteria to receive mental health treatment, due to the stigma of seeking treatment, they generally are not interested in getting the needed help (Hoge, Castro, Messer, McGurk, Cotting, & Koffman, 2004). Finding ways to reduce the stigma appears to be crucial in the treatment of service members (Dickstein, et al., 2010).

It seems clear that in addition to understanding the military culture, culturally-competent counselors need to become aware of effective interventions and strategies as they work with military service members and their families. Based on the needs of service members returning from combat zones in Afghanistan and Iraq, Litz, Williams, Wang, Bryant, & Engel (2004) called for effective, evidence-based interventions that are cost-effective and that use technology “to provide ready access to mental health information and care to underserved populations and people who may not otherwise seek or receive treatment” (p. 629). Their approach integrates face-to-face counseling with internet daily monitoring and treatment protocols, and it was developed specifically for military personnel in response to treatment needs after the 9/11 attack on the pentagon; it also is evidence-based with ongoing research (e.g., Litz, Engel, Bryant, & Papa, 2007). Consequences of non-treatment for
military personnel particularly for conditions such as PTSD are known to have adverse effects especially for family members.

**Concerns Regarding Children**

According to a report compiled by the Office of the Deputy Under Secretary of Defense (DUSD, 2011), almost 2 million children in the United States have at least one parent in the active or reserve military. This is significant as mental health professionals consider that these children may be in our communities and in need of providers for mental and physical health treatment (Davis, et al., 2012). Additionally, older children and girls of all ages who experience parental deployment are likely to have difficulties in several areas of their lives (e.g., school, family and peer-relations). For example, girls have been found to have more problems when the parent returns from deployment, as they may have difficulty connecting emotionally with an absent parent, usually the father (Chandra, et al., 2010). Of particular interest in families is that the number of separations for families is not as challenging as what was missed during the separation (e.g., important family events and holidays; Burrell, et al., 2006).

**MULTICULTURAL COMPETENCE AND MILITARY FAMILIES**

As the multicultural competencies (i.e., Ratts, Singh, Nassar-McMillan, Butler, & McCullough, 2015) indicate, the counselor's own awareness and understanding of the culture is only part of the task. The culturally-competent counselor recognizes and utilizes sensitive strategies to work effectively with this special population. The lifestyle of the service members and their families needs to be
understood within the context of the military culture (Demers, 2011; Lincoln, Swift, & Shorteno-Fraser, 2008). Clearly, there are numerous cultural factors that need to be considered in the psychological assessment and treatment of military personnel, including use of acronyms, the rank system and its implications, behavioral expectations, and belief systems (Hall, 2008; Reger, et al., 2008). It is imperative that mental health clinicians be trained on the military culture so that assessment and treatment measures are layered with cultural understanding and sensitivity (Coll, Weiss, & Yarvis, 2011; Holmstrom, 2013). Such training would enable professional helpers to understand their clients’ worldview, attitudes and the traditions of the military such as the need for secrecy and maintaining stoicism in the face of the emotional stressors, which can impact how readily the service member may share his or her emotions with a counselor (Hall, 2008).

EFFECTIVE INTERVENTIONS AND STRATEGIES

The multicultural competencies address the need for culturally-competent counselors to employ sensitive strategies in order to work effectively with culturally diverse clients (Engels, et al., 2009); thus, counselors need to be aware of approaches that are effective (Hall, 2008). Research has shown that several counseling approaches and techniques have proven to accommodate the needs of military members and their families as there is a consideration for their unique lifestyle.

A factor that has been noted to aid couples in navigating the difficulties of the military lifestyle is pre-marital counseling. Research has shown that couples who participate in and are satisfied
with premarital counseling, which focuses on morale and military personnel readiness, experience a tendency consistently to have higher marital satisfaction (Schumm, Resnick, Silliman, & Bell, 1998). The clinical implications are apparent in that working with military couples may take on a more preventive focus as opposed to seeking assistance when problems occur.

Since military wives have found coping with the emotional challenges of deployment quite stressful, the coping strategies they use are likely to make a difference in marital functioning. In a recent research study, wives indicated deployment was their most stressful experience, and they reported greater positive effects of using problem-focused coping strategies instead of emotion-focused coping strategies (Dimiceli, et al., 2009). These researchers indicate problem-focused strategies include positive reframing, acceptance, and religion; while emotion-focused strategies included denial, venting, and substance use. In fact, wives coping with deployment have met with favorable outcomes if certain protective factors (e.g., positive relationships in the unit, effective leadership, and social support from community members) were present. Additionally, during deployment, depressive symptoms among spouses are found to occur less often when they experience the protective effect of positive emotions (e.g., contentment and joy) thereby fostering an increase in cognitive and social connectedness; thus, this positive-emotion approach builds personal resilience (Faulk, Gloria, Cance, & Steinhardt, 2012).

In an interdisciplinary approach wherein services are integrated, primary care providers from various specialties such as
primary care providers, trauma specialists, vocational rehabilitation specialists, and mental health clinicians work together to treat the soldiers (Batten & Pollack, 2008). Perhaps an integrative approach will help with the stigma associated with receiving mental health services.

Litz and associates suggested this kind of approach to staffing (Litz, Williams, et al., 2004) and conclude in a more recent research report that “because many military and emergency service personnel with PTSD often do not receive evidence-based treatment” (Litz, Engle, et al., 2007, p. 1682), their initial research results need additional investigation. Since the “self-management cognitive behavior therapy” with service members “achieved high end-state functioning 6 months after treatment,” it points “to a potentially viable means to deliver rapid and effective PTSD treatment to a large population with otherwise unmet needs for PTSD care” (p. 1682). Perhaps, the provision of educational content and self-monitoring that engages participants daily in self management, which are demonstrated in this research, has potential for being used in professional development of a variety of kinds of professionals to encourage those who need PTSD treatment to receive effective services. In addition, this author is hopeful that when mental health services are arrayed with a variety of types of providers who understand military culture, service members may be more receptive to receiving services.

CONCLUSION

The goal of this literature review was to present the military family as a special group with a unique culture and specific needs
that warrant consideration for appropriate therapeutic interventions. In view of the multicultural competencies needed for effective counseling of this population, an overview has been presented regarding the concerns of members of the military and their families. This overview is a beginning step for clinicians (e.g., counselors, therapists, social workers) to begin developing their knowledge base about the current U. S. military culture. It is also a beginning step specifically for counselor educators and others who teach clinicians in that it waves the flag to acknowledge a unique culture whose presence needs to be addressed if professional helpers are being prepared adequately to meet the needs of service members and their families. This aspect of cultural competence seems to merit attention not just in military settings where mental-health assistance is offered, but it also may need to be addressed as well in continuing-education settings and university educational environments such as in graduate-school classrooms with counseling students.
REFERENCES


AAPP MONOGRAPH SERIES 2015


The 2010 United States (U.S.) census report shows that racial and ethnic minorities currently make up about one third of the population in this country and are expected to become a majority by 2050 (Taylor & Cohn, 2012). The increasing number of African American students entering doctoral programs in general (National Science Foundation, 2009) and in counselor education programs in particular (Johnson, Bradley, Knight, & Bradshaw, 2007) seem to mirror this national population growth of ethnic minorities.

Although evidence shows fair representation of African American students in counselor education programs (e.g., Johnson, et al., 2007), this trend is not reflective of the number of African American faculty employed in these college and university programs. A decade or more ago, Antonio (2002) reported that less than three percent of faculty at institutions of higher education identified as African American, which directly correlates with the underrepresentation of African American faculty members in CACREP-accredited counselor education programs documented by Bradley and Holcomb-McCoy (2004).
More recently, Michael Lynch (2013) refers to a National Center of Educational Statistics report that documents the minority faculty among full-time university faculty as 12%, while around 9% were identified as faculty of color. He concludes that progress is being made; although it is not enough, as student diversity is growing more rapidly in comparison. It seems reasonable to conclude that there continues to be a disparity in the growing diversity of counselor education doctoral students and the lack of diversity among their faculty in U.S. colleges and universities.

The upward trend of doctoral-degree attainment by African Americans and the lack of African American faculty elicits questions of possible contributors to this disparity (Haizlip, 2012). The purpose of this review is to explore these possible contributors through an examination of literature related to strong professional identity development for counselors, African American doctoral students' challenges and experiences in counselor education programs, and the relationship between the two. This review also will discuss a recent program through the National Board of Certified Counselors (NBCC) Foundation (2015c), which seeks to help build professional identity in minority counselors while alleviating some of the challenges for this group. That program is considered as a potential model program for addressing this disparity in student-faculty minority representation. Implications for counselor education programs also will be discussed.

**PROFESSIONAL IDENTITY**

Remley and Herlihy (2007) purport that an individual’s professional identity encompasses his or her values and beliefs and
helps determine how an individual chooses to engage in a chosen occupation. A professional counselor’s belief system as part of his or her professional identity may be influenced by societally defined expectations, personal values as well as participation in professional activities (Healey & Hays, 2012). A solid professional identity builds competence and makes it possible for people to confidently contribute to the community and their respective fields (Rønnestad & Skovholt, 2003).

Carlson, Portman, and Bartlett (2006) proposed a model of professional identity development that described the transition process counselors go through when moving from a community practitioner position to doctoral student to university educator as it relates to the experiences they have during their doctoral programs. From this study, Dollarhide, Gibson, and Moss (2013) asserted the importance of doctoral students building a strong professional identity in order to effectively educate future counselor education students. Furthermore, Dollarhide, et al. conclude that the experiences trainees have during their graduate programs not only will affect their professional identity directly but also will influence the way in which they interact with clients, students and other professionals.

Professional identity is thought to determine how counselors define counseling and how they function within that context. According to Emerson (2010), identity helps counselors to establish pride in themselves and their jobs and to obtain the knowledge and awareness of their roles as well as how to perform as counselors. Professional identity should begin to develop while students are
enrolled in their counselor education programs, and it continues throughout their careers (Moss, Gibson, & Dollarhide, 2014). Counselors’ training, their work conditions, and their actions in professional settings influence professional identity development (Brott & Myers, 1999).

Professional identity encompasses the development of expertise in counseling, establishing collaborative relationships, being a part of professional organizations in the counseling field, and contributing to the wealth of knowledge through scholarly writing (Council for Accreditation for Counseling and Related Educational Programs [CACREP], 2009). Moss, et al. (2014) state that integrating counselors’ professional training with their personal attributes develops professional identity. Gibson, Dollarhide and Moss (2010) explain that there are interpersonal and intrapersonal dimensions included in a counselor’s professional identity. Interpersonal dimensions involve the counselor’s interactions with the professional community (e.g., licensing boards and credentialing bodies, professional organizations, and accrediting agencies).

In addition, intrapersonal dimensions of professional identity are described by Gibson et al. as involving reflection as well as the counselor developing a personal definition of counseling, which includes progressing from an outside dependence on experts to a more internal reliance on the knowledge they have acquired from their training and experience. Much of this growth process hopefully is incorporated into the clinical supervision process. More than thirty years ago, Vasquez and McKinley (1982), in their conceptual model of supervision, addressed needs for not just knowing about cultural
differences but also for developing skills for working with individuals from diverse cultural groups; however, the challenges of successfully addressing the personal needs of culturally diverse students through supervisory relationships apparently still plagues the mental health professions.

**Influences on Development of Professional Identity**

Rønnestad and Skovholt (2003) conducted a study in which they discussed factors that lead to professional identity development. Their study found that the relationships counselors had with others in their individual circles (e.g., clients, colleagues, family, and friends) had an influence on their growth as counselors. Their longitudinal/cross-sectional study showed that counselors intentionally sought out mentors whom they believed had the ability to assist them in their growth.

There is very little research concerning diversity issues in counselor identity development or research that include the voices of minority students regarding their unique professional identity development (Nelson & Jackson, 2003); therefore, Nelson and Jackson conducted a qualitative study with eight Hispanic students enrolled in graduate counseling programs to allow them to tell their stories and to expand the scholarship on professional identity development of ethnic minority students. Their study resulted in identifying three themes consistent with previous research regarding professional identity development of students from the dominant ethnic group (i.e., knowledge, personal growth, and experiential learning).
The Nelson and Jackson study also showed four themes that seemed to be influenced by cultural issues specific to the Hispanic students in their study. Those themes were relationships, accomplishments, costs, and perceptions of the counseling field. Their research also revealed that relationships with professors, peers, site supervisors, and family were of crucial importance to this ethnic-minority group. The participants in their study specifically expressed that respect and acceptance from professors and supervisors were vital in their professional identity development. Likewise, these participants reported that the emotional support they received through friendships and camaraderie with peers positively affected their learning.

Self-worth and self-confidence have been recognized for over 20 years as components of a sense of accomplishment and are believed to influence professional identity development (e.g., Bruss & Kopala, 1993). Participants in the Nelson and Jackson (2003) study who expressed pride and status achievement saw themselves as having respect, a stronger voice as well as more options and input into work systems. In terms of costs, participants in this study repeatedly reported personal and financial sacrifices (e.g., tight budgets, part-time work, loans) in order to achieve a professional counselor identity. The authors infer that cultural issues faced by Hispanic students mediate these factors.

Regarding perceptions of the counseling profession, participants in Nelson and Jackson’s (2003) research reported at least three primary issues. They are: (a) other peoples’ perceptions of counseling generally were based on misinformation; (b) they often
had to clarify that counseling was not about giving advice; and (c) they frequently had to explain why it would be inappropriate for them to counsel family and friends. Additionally, participants reported that their friends and family were hesitant about seeking counseling from a professional, which according to the authors possibly could present an ethical dilemma for the participants. The experiences of Hispanic graduate students in counseling noted in this qualitative study are not unlike the challenges faced by African American students pursuing advanced degrees in counseling.

**Challenges Specific to African American Counselors**

There is a dearth of research on the experiences of African American doctoral students enrolled in counselor education programs. Henfield, Woo, and Washington (2013) conducted the only study that specifically focuses on the challenging experiences that African American counselor-education students face while enrolled in their graduate programs. Using critical race theory, the authors identified themes of peer disconnection, feelings of isolation, and faculty disrespect and misunderstandings. Their findings are similar to other themes found in research concerning the experiences of African American doctoral students at predominately white institutions (PWIs) who were enrolled in a variety of other academic programs and disciplines (e.g., Shavers & Moore, 2014).

Minority students have challenges related to combining their personal cultures with the culture of their graduate programs (Chavous, Rivas, Green, & Helaire, 2002; Protivnak & Foss, 2009; Rendon, Jalomo, & Nora, 2000). Difficulty integrating those different entities, may lead to students feeling isolated both
academically and socially from the rest of the student body (Daniel, 2007; Johnson-Bailey, Valentine, Cervero, & Bowles, 2009; Protivnak & Foss, 2009; Shealey, 2009). Participants in the research of Lewis, Ginsberg, Davies, and Smith (2004) reported social isolation to be a prominent issue and often described it as feelings of invisibility.

In the study conducted by Gildersleeve, Croom, and Vasquez (2011), African American students reported lacking meaningful relationships with their peers when in graduate programs as well as a lack of mentor relationships with faculty. Gay (2004) suggests that a doctoral student being able to connect to their peers is fundamental; however, peer disconnection was a salient theme found in the qualitative study conducted by Henfield, Woo, and Washington (2013).

In a study of female African Americans pursuing doctoral degrees in primarily white institutions (PWIs), a review of related literature resulted in Shavers and Moore (2014) determining that "unsupportive environments...negatively contribute to the level of engagement of African American [doctoral] students" (p. 391). In their study of African American counseling students, Henfield, et al. (2013) also found that faculty lacked cultural understanding and respect for the differences among their students. Faculty’s expectation that everyone “get along,” poor quality of mentoring relationships, and students’ perceived marginalization all were reported as experiences of the faculty’s lack of respect. The researchers suggested that the lack of respect faculty had for students’ differences resulted in minority students feeling pressure to
pretend to be someone that they were not and to assimilate into the dominant culture of the program. A participant in this study expressed disturbing feelings when she was discouraged from conducting research on cultural issues about which she was passionate, and the authors asserted that "she and her needs were invisible to the faculty member" (p. 130).

Although some investigation of multicultural issues experienced by students in counselor education programs appeared in the literature more than 25 years ago (e.g., Constantine & Gloria, 1999), this literature review provides evidence that such issues still exist. For example, in recent research, students are experiencing challenges related to African American student representation in counseling programs (e.g., Haizlip, 2012), the need to address the challenging experiences they encounter (e.g., Henfield, et al., 2013) as well as to create conditions that better prepare African American doctoral students in counseling for success in the professoriate (e.g., Johnson, et al., 2007).

As one way of addressing these concerns, the Minority Fellowship Program of the National Board of Certified Counselors (NBCC, 2015b) is described next. The program serves as a model for addressing the types of concerns that can provide counselor education doctoral programs with opportunities to maximize the potential of their minority students.

**NBCC FOUNDATION—MINORITY FELLOWSHIP PROGRAM (MFP)**

Leaders of the NBCC Foundation understand that minority counselors face various challenges while enrolled in their graduate
programs (e.g., NBCC, 2015a; 2015c). They understand the importance of professional development for counselors, particularly minority counselors. In addition, they understand that empowering minority counselors, by addressing their needs and assisting in their professional development, will strengthen the counseling field as a whole.

The mission statement of NBCC Foundation’s Minority Fellowship Program (MFP) is “Leveraging the power of counseling by strategically focusing resources for positive change” (NBCC Foundation, 2015b, p. 5). Furthermore, the NBCC Foundation MFP manual indicates that it is accomplishing its mission through utilization of the following resources for minority fellows in this program. Resources include: the MFP advisory council, leadership skill building, individual fellowship plans, personal development, the MFP mentor program, training webinars, the NBCC Foundation professional directory, clinical supervision, and monetary funding.

The NBCC Foundation MFP manual (2015c) outlines how the aforementioned resources are disseminated to doctoral MFP fellows. Specifically, all MFP fellows have access to an advisory council of faculty members. The purpose of the direct access to these faculty members is to guide and assist fellows as they complete their programs of study. The MFP Advisory Council also assists fellows in developing their fellowship plans and setting manageable, appropriate goals for personal and professional development.

The NBCC Foundation (2015c) provides leadership skill-building opportunities to increase fellows’ professional capacities. Fellows receive professional development assistance and
opportunities to connect with other professionals in the field for networking purposes and to enhance their marketability. Fellows also receive funding to support networking and professional development by attending symposiums and conferences.

Mentors are paired with fellows and cultivate a strong professional relationship by providing support and scholarly development. Fellows also receive guidance in leadership, planning, time management, self-care, professional standards and best-practice skills.

Additionally, the NBCC Foundation (2015c) offers ongoing training for fellows. Foundation volunteers who are training presenters and panelists donate their time, energy, and talent and also offer their expertise by conducting live training webinars and participating in training and discussion panels. This resource also is made available to foundation fellows.

Fellows have access to the Foundation’s directory of professionals. This directory includes names and contact information for different experts in the field of mental health/counseling that fellows can access for peer consultation, referral, and/or networking. All resource professionals listed in the directory are NBCC Foundation volunteers and serve as expert guides to fellows who are often recently graduated counselors learning the ropes in the professional arena.

Furthermore, NBCC Foundation Volunteers who are licensed and certified clinical supervisors donate their time and training to provide clinical supervision to recently graduated NBCC Foundation fellows and assist them through the licensure process.
Clinical supervision is offered without any fee for the services from the professional (NBCC Foundation, 2015c).

One of the primary highlights of the MFP program is the generous stipend fellows of the program receive to assist with the cost of graduate education (NBCC Foundation, 2015a). Funds are intended for use with direct educational expenses such as tuition, books, materials and conference fees/expenses; however, the stipend also is intended to assist fellows with basic living expenses (NBCC Foundation, 2015b).

The NBCC Foundation (2015a), as shown in a recent presentation to the Association For Counselor Education and Supervision (ACES), has experienced great success in accomplishing their mission since the inception of the MFP program in 2013. The MFP focuses on the professional development of minority counselors by alleviating some of the challenges minority counselors experience in training programs. Fellows of the MFP are minority counselors who are committed to serving the needs of other marginalized and underserved populations. NBCC Foundation reports that almost 100 percent of their minority doctoral fellows enter into careers in academia after earning doctorates from counselor education programs. Considering the entire program, NBCC Foundation’s MFP (2015b) is implementing intentional strategies that are helping to level the counseling field by addressing professional identity and racial disparities in the field of counselor education.
DISCUSSION

As the review of the literature showed, a connection exists between challenges that African American students face in graduate training programs and factors that influence the professional identity development of ethnic minority counselors. The results of the Henfield, et al. (2013) study revealed that the three main challenges African American doctoral students in counselor education programs face are peer disconnection, feelings of isolation, and faculty misunderstandings and disrespect. Several studies show that minority students have difficulty integrating their personal culture with the dominate culture of the program, which can lead to feelings of academic and social isolation (Daniel, 2007; Johnson-Bailey, et al., 2009; Protivnak & Foss, 2009; Shealey, 2009). Gildersleeve, et al. (2011) discussed the lack of meaningful peer and faculty relationships African American students experienced in their graduate programs. Protivnak and Foss (2009) discussed the lack of respect faculty have for students’ differences resulting in minority students feeling pressure to assimilate into the dominant culture of the program.

The literature review of this monograph chapter also provides evidence that some of the factors that influence professional identity development are the same as some of the above mentioned challenges African American students experience in training programs. The Rønnestad and Skovholt (2003) study revealed that relationships counselors experienced with people in their circle of influence, particularly mentors and peers, had a significant influence on their development as counselors, while the participants in the
research of Nelson and Jackson (2003) expressed that relationships were the most influential factor in their journey to professionalism. They believed that faculty members, who were accepting and respectful of their needs, were vital to establishing a healthy learning environment and to nurturing their professional identity. Additionally, peer relationships for students are essential to their educational process (Gay, 2004; McAuliffe & Lovell, 2000; Nelson & Jackson, 2003; Skovholt & Rønnestad, 1995).

Implications for Counselor Education Programs

Nelson and Jackson’s (2003) study revealed that counselor educators have a substantial influence on the professional identity development of their students. Their study indicated that student-to-faculty and student-to-student relationships when combined with an accepting learning environment had a positive impact on students’ identity development. Creative and intentional methods need to be incorporated into counselor education programs to focus on addressing the unique concerns of minority counselors (e.g., Henfield, et al., 2013). There are inimitable opportunities for counseling programs to develop purposeful programs and initiatives to encourage and empower minority counselors. It seems clear that counselor education programs should make intentional efforts not only to make their programs attractive to marginalized groups but also actively to address challenges and issues specific to the professional identity development of minority students.

Based on the related literature, it seems clear that when students begin a counselor education program they need to be provided with education on the importance and benefits of self-care,
training on healthy-living practices, and monitoring of their self-care maintenance and well being. It also is necessary to provide students with a forum for openly discussing the topics of race, experiences with oppression and discrimination, feelings of social isolation, and difficulties with cultural integration. During field experiences, counseling program faculty are encouraged to be intentional in their assessing of the existence of discrimination and be committed and consistent in their support of minority students in dealing with racial barriers, which can impede the students' clinical growth. Trainees also need to have opportunities to dialogue with faculty and peers about their experiences working with clients and their personal experiences with oppression and personal growth issues, which apparently is a privately shared benefit of programs like the NBCC-MFP. In this dialogue-type setting, it is important that students are able to receive feedback that is personalized to their individual needs and goals, which also may benefit others who are Caucasian, perhaps indirectly, to grow in their understanding of overall cultural identity and diversity issues (e.g., Richardson & Molinaro, 1996; Utsey & Gernat, 2002).

New counselors learn about the culture of counseling through supervision from more seasoned counselors and through experiences in the professional community (Dollarhide & Miller, 2006). The participants on all levels in the Gibson, et al. (2010) study recognized that learning is a life-long endeavor and discussed ways to obtain more professional knowledge. Participants also discussed the acquisition of knowledge as a necessity to reach higher levels in their professional development. Furthermore, they
explained that interpersonal development involves the person's relationship to others and their professional community, including licensing boards and professional organizations among other experiences. Clearly, faculty members in counselor education programs need to be intentional in their efforts to maximize minority students' exposure to networking opportunities with the professional community and to learning opportunities outside of the standard curriculum. One of those ways is through trainings and workshops on topics aimed at professional development. Counseling training programs also need to provide mentors that can serve as role models and supervisors for students throughout their graduate programs.

Factors that may influence the development of a strong counselor professional identity can be challenging for minority counselors-in-training. When thinking about ways to address this issue, there may be other potential models to address these needs (e.g., Butler-Byrd, Nieto, & Senour, 2006); however, counselor education program faculty and administrators need to consider assisting students in applying to programs like the NBCC MFP (2015c) or developing similar programs that utilize the intentional training practices the MFP employs with minority fellows within their specific preparation programs to address the students' specific challenges.

Since the first cohort of doctoral fellows in 2013, NBCC Foundation (2015a) MFP has had success with the personal and professional development of minority counselors and in preparing and placing minority fellows into careers in academia. According to the NBCC Foundation (2015a) reports to counselor educators and
supervisors, there are currently 69 doctoral fellows, for an average of about 23 fellows in each of the three cohorts thus far. According to this recent report, 69 of those fellows are licensed counselors in their respective states. Sixty-six fellows currently hold credentials as a National Certified Counselor (NCC), and the other three already have submitted applications. The Foundation also reports that almost 100% of minority doctoral fellows in the MFP enter careers in academia and continue working with marginalized populations after graduating from their respective counseling programs.

Given this success, it seems reasonable to assert that the NBCC MFP can serve as a model program for policies and intentional practices that focus on addressing the needs of minority students. It seems clear that to address factors influencing the professional identity of many of these minority doctoral students, which would contribute to their potential for success in their chosen profession, possibly could begin to improve the representation of minority faculty in university counseling programs.
REFERENCES


PART 3:
COLLEGE OF ENGINEERING
AND COMPUTING
In a recently published literature review, the escalation of the incidence of asthma in the United States was discussed as well as the fact that death from this disease is three times more likely to occur among African Americans than any other group (Glenn, 2013). That review provided support from the literature related to development of a novel approach to deactivating common triggers that activate asthmatic episodes. The preliminary results on this novel approach employed supercritical CO\textsubscript{2} technology and focused on two specific allergens that commonly are found in homes. The results of the preliminary research motivated the “researcher to continue the study of this novel approach to allergen deactivation” (Glenn, 2013, p. 204).

Carbon dioxide (CO\textsubscript{2}) when compressed to 6.89 Mega Pascals (MPa) or above and at temperatures around 31°C is known to have high diffusivity and low-surface tension as well as viscosity properties that facilitate rapid penetration into structures for the removal or deactivation of biological molecules (Tarafa, Jiménez,
Zhang, & Matthews, 2010). Presently, supercritical carbon dioxide is used for such things as decaffeinating whole coffee beans (Peker, Srinivasan, Smith, & McCoy, 1992).

“Essential oils are known for their antiseptic (i.e. bactericidal, virucidal and fungicidal) and medicinal properties...,” (Glenn, 2014, p. 206). In addition, “...they are used in embalmment, preservation of foods and as antimicrobial, analgesic, sedative, anti-inflammatory, spasmolytic and locally anesthetic remedies” (Bakkali, Averbeck, Averbeck, & Idamar, 2008; Glenn, 2014, p. 206). Even though support for the therapeutic benefits of herbal treatments using essential oils seems incomplete in scientific literature, “well controlled studies that support the efficacy of herbal therapies in the treatment and clinical improvement of patients with asthma” exist (p. 206). Nevertheless, Szelenyi and Brune (2002) conclude that such evidence is not sufficient to support the popularity of using such treatments for reducing the effects of asthma. It appears that there is no published research other than that of Glenn (2013, 2014) investigating the use of these oils for purposes of deactivating allergens.

A recent literature review by this author (Glenn, 2014) addressed using supercritical CO₂ technology with specific essential oils as “a mixture of several chemical species, which greatly complicates the measurement of solubility. Analytical chemistry techniques such as gas chromatography and mass spectrometry have been employed to identify the most abundant component from each oil” (p. 208). In 2014, this author identified the most abundant components of tea tree oil, cedar wood oil and hinoki oil. The most
abundant component for tea tree oil is terpinen-4-ol, while for cedar wood oil that component is alpha-cedrene. Alpha-pinene is the most abundant component of hinoki oil. At the time of this publication, there has been no known study on the solubility of these components in either the liquid or the supercritical state for CO₂. This study establishes the solubility of these oils as a function of both temperature and density.

**CRITICAL CONSTANTS, ACCENTRIC FACTORS AND BINARY INTERACTION PARAMETERS**

There has been little experimental research on the components of essential oils (Glenn, 2014); therefore, the properties of alpha-cedrene were estimated by the methods of group contribution. A group contribution method is a technique used to estimate and predict thermodynamic and other properties from molecular structures (Poling, Prausnitz, & O’Connell, 2001). Specifically, the critical temperature (T_c) of a substance is the temperature at and above which vapor cannot be liquefied; as the critical pressure (P_c) of a substance is the pressure required to liquefy a gas at its critical temperature. The acentric factor (ω) is a measure of the non-sphericity (i.e., centricity) of molecules. In addition, for spherical molecules, the acentric factor (ω) is zero, while nonspherical molecules have values above zero, but only the most severely nonspherical have values which approach unity. The group contribution method used here is the Constantinou/Gani Property Function (Poling, et al., 2001). The critical temperature, pressure and acentric factors required for solubility calculations also
were determined previously by Glenn (2014) and are listed in Table 1 below.

**Table 1.** Critical Constants and Acentric Factor

<table>
<thead>
<tr>
<th>Substance</th>
<th>T&lt;sub&gt;c&lt;/sub&gt;</th>
<th>P&lt;sub&gt;c&lt;/sub&gt;</th>
<th>Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>304.2</td>
<td>7.37</td>
<td>0.225</td>
</tr>
<tr>
<td>Terpinen-4-ol</td>
<td>754.3</td>
<td>33.22</td>
<td>0.509</td>
</tr>
<tr>
<td>Alpha-Cedrene</td>
<td>554.0</td>
<td>23.72</td>
<td>0.404</td>
</tr>
</tbody>
</table>

In addition, the binary interaction parameter between each oil and CO<sub>2</sub> has been modeled by the author (Glenn, 2014; see Table I, p. 216). In that research, the computational modeling was done from a cubic equation of state called the Peng Robinson Equation of State (PREOS; Peng & Robinson, 1976).

This current research report develops the proposed experimental work mentioned in the 2014 monograph chapter. This investigation was designed initially to accomplish the task of first determining original experimental data and comparing it to PREOS computational data for both alpha-cedrene and terpinen-4-ol, regarding their solubility in both liquid and supercritical carbon dioxide (CO<sub>2</sub>). The primary goal of this follow-up study is to determine the conditions under which these primary components of cedar wood and tea tree oils have maximum CO<sub>2</sub> solubility in both the liquid and supercritical CO<sub>2</sub> states. Subsequently, similar work also was conducted with alpha-pinene, which is the primary component of hinoki oil; thus, results are presented on all three oils.
METHOD

The vapor mole fraction of an essential oil is the ratio of the number of mole of the oil to the total number of mole of CO₂ and the oil together (Dahm & Visco, 2014). The dynamic flow method was used to measure the phase equilibrium for each major component of the oils in both liquid and supercritical CO₂ over temperature ranges from 25°C to 60°C with density ranging from 0.2 g/mL to 0.7 g/mL. “In addition, an ISCO SFX 2-10 Supercritical Fluid Extractor system...embedded with a pressure vessel and temperature control” (Glenn, 2014, p. 221) as previously described also was used. CO₂ was “fed into the high-pressure vessel, sealed, and hand-tight closed” (p. 221). The pressure vessel was “embedded in an isothermal heat block to maintain the desired temperature, ...and it also was pressurized by a high-pressure syringe pump,” which was “filled from a standard CO₂ cylinder...” (pp. 221-222) that later flowed into the pressure vessel for subsequent extraction.

The quantity of CO₂ used was determined by multiplying the volume flow rate going into the system by the total time of the extraction (Glenn, 2014). In addition, the amount of CO₂ in terms of moles was determined to establish the vapor-mole fraction of the oil in CO₂. Subsequently, an analysis was conducted of the “resulting effluent against standards with known mass and mole of the oil to find the mass and mole of essential oil removed from the original sample” (p. 223); thus, it was possible to obtain the molar fraction of oil extracted at a given temperature and density (Glenn, 2014).

According to the research design, “a solubility versus density curve then [was] generated by conducting multiple
experiments at a constant temperature and varying density and pressure. Density and phase changes with pressure and temperature... [were] composed from the National Institute of Standards and Technology” (NIST, 2011) website (Glenn, 2014, p. 223). For each density at 25°C, the CO₂ is in a liquid state, while it is in a supercritical state in all other conditions (Glenn, 2014).

Initially, this monograph chapter addressed the solubility of terpinen-4-ol and alpha-cedrene in both liquid and supercritical CO₂ at various temperatures with densities ranging from 0.2 g/mL to 0.7 g/mL. The vapor mole fraction \( y_2 \) is a measure of the amount of vapor measured for each oil in CO₂. It is determined by dividing the moles of oil extracted by the total moles (i.e., both the moles of CO₂ and the moles of the oil extracted). Once this is determined, \( y_2 \) versus density can be plotted for each oil at various temperatures to show oil solubility at each of these states.

When a mathematical model is needed “to predict and estimate the solubilities of each major oil component in CO₂, the Peng-Robinson Equation of State (PREOS)” (p. 217) has been used for data analysis. The equations used already have been explained in the Computational Modeling section of the previous work (i.e., Glenn, 2014). The next step was the comparison of experimental data with PREOS as a demonstration of reliability.

ULTRAVIOLET-VISIBLE SPECTROPHOTOMETRY (UV-VIS) RESULTS

After extracting samples from the Supercritical Fluid Extractor, a calibration curve was plotted by a UV-VIS spectrometry apparatus for both oils. UV/Vis spectroscopy is used routinely in
analytical chemistry for the quantitative determination of different analytes, such as organic compounds and biological macromolecules (Liu, et al., 2008).

Spectroscopic analysis also is carried out commonly in solutions (Stuart, 2004). Quantitative analysis with UV/VIS spectroscopy incorporates the fact that certain substances absorb either ultraviolet or visible light at a specific wavelength with the fact that the intensity of that absorbance is a function of the concentration of the substance (Ramanujan, 2011). Each of the oils was absorbed within ultraviolet light at a wavelength of 290 nanometers (nm).

A standard (calibration) curve is a type of graph that is used as a quantitative research technique, which has been established in previous research (e.g., Antonov, Gergoy, Petroy, Kubista, & Nygren, 1999; Antonov & Nedeltcheva, 2000). Using this technique, multiple samples with known properties are measured and graphed. This allows the same properties to be determined for unknown samples by interpolation on the graph. In this work, concentrations of each oil were examined, and the absorbance of each oil at each concentration was determined via the UV-VIS at various wavelengths.

The calibration curves for each of the most abundant components of all three oils (i.e., cedar wood oil, tea-tree oil and hinoki oil, respectively), which are related to future investigations of deactivation of asthma-triggering allergens, are shown in Figures 1-3 that follow. Figure 1 shows the calibration curve at 290 nm used for
alpha cedrene, and Figure 2 is the calibration curve for terpinen-4-ol at the same wavelength. The calibration curve that was produced for

**Figure 1:** Calibration of UV-VIS Spectrometry for Alpha-Cedrene

![Graph](image1)

**Figure 2.** Calibration of UV-VIS Spectrometry for Terpinen-4-ol

![Graph](image2)
alpha-pinene, which also used the same 290 nm wavelength, is shown in Figure 3.

**Figure 3.** Calibration of UV-VIS Spectrometry for Alpha-Pinene

![Graph showing calibration](image)

\[ y = 0.0062x - 0.001 \]

\[ R^2 = 0.9984 \]

After experimental data were obtained for three oils based on the UV-VIS Spectrometry shown in Figures 1-3, the vapor mole fractions \( y_2 \) of each of the predominant oil components (i.e., alpha-cedrene, terpinen-4-ol and alpha-pinene) in CO\(_2\) were plotted against density at various temperatures. The absorbance data were obtained from an arithmetic average of several measurements for each density. The standard deviations were less than 0.14 for alpha-cedrene and less than 6x10\(^{-3}\) for terpinen-4-ol. Results show that as the density increases, the solubility \( y_2 \) also increases at the specified higher temperatures. Although graphs of these plots were produced, their inclusion in this publication was not possible; thus, some relevant descriptive information taken from those plots is provided next.
The graph of the vapor mole fraction (y₂) of alpha-cedrene versus density in g/mL shows data points obtained for each of four centigrade temperatures (i.e., 25°C, 40°C, 50°C and 60°C). The 25°C temperature is representative of CO₂ in its liquid state, while 40°C to 60°C are representative of CO₂ in its supercritical state. The densities range from 0.3 g/mL to 0.7 g/mL. The plotted curves indicate a slight increasing separation between each of the four temperature conditions with the highest mole fractions for each occurring at the highest level of density (i.e., 0.7g/mL); thus, these data show that as the density increases for alpha-cedrene, solubility (y₂) also increases at specific constant temperatures. The highest data point for the 60°C plotted curve exceeds the y₂ of 0.07, while in the liquid state (i.e., 25°C) the highest level of density yielded a y₂ of only 0.01 (i.e., lowest level of solubility on the plot).

The vapor mole fraction (y₂) of terpinen-4-ol in CO₂ was plotted against the same density levels at the same temperatures as the plot for alpha-cedrene with similar results. Also similar to alpha-cedrene, these results show that as the density increases, the solubility (y₂) of terpinen-4-ol increases over the four plotted temperature levels. The mole fractions on this graphic range from 0.005 to 0.05 with the highest solubility attained at all 4 temperatures occurring at the highest level of density (i.e., 0.7g/mL). At 60°C and a density of 0.7g/mL, solubility (y₂) exceeds 0.045. Again, in the liquid state (25°C), y₂ was less than 0.01, a solubility that appears to show minimal increases over all the levels of density. For the other 3 higher temperatures, the steepest increases in solubility occurred
between the highest two levels of density (i.e., 0.6g/mL and 0.7g/mL), which seems to be a plot pattern similar to alpha-cedrene.

Finally, the vapor mole fraction \( (y_2) \) of alpha-pinene in \( \text{CO}_2 \) was plotted against the same density levels at the same temperatures as the plot for the first two oils. The mole fractions on this plot range from 0.005 to 0.05 with the highest solubility attained for all 4 temperatures at the highest level of density (i.e., 0.7g/mL), a pattern observed on the plots of all three oils. The overall pattern for this plot of vapor mole fractions of alpha-pinene versus density in g/mL seems to be gradual increases in solubility at each level of increased density for the two highest temperatures (i.e., 50°C and 60°C). The 60°C condition yielded solubility levels at the highest density (0.7g/mL) of about 0.045, while solubility, in the 50°C condition, is only near 0.03.

**EXPERIMENTAL VERSUS PREOS RESULTS**

In this section, the experimental values established for each oil the three plots discussed above were compared with the PREOS model, which provides reliability estimates. The results are contained in Tables 2-4 for each of the three oils at four temperatures and \( \text{CO}_2 \) states (i.e., one is liquid, and three are supercritical).

The results in Table 2 show that experimental solubilities are in good agreement with the PREOS in the vapor phase for alpha-cedrene. The table includes the solubility results for both the experimental and PREOS data at each of the four temperatures, and the column on the far left lists the density levels ranging from 0.2 g/mL to 0.7 g/mL, which were the same across all temperatures. Experimental data and the Peng Robinson model both show that
solubility ($y_2$) tends to increase as density and pressure increase on an isotherm.

**Table 2. Alpha-Cedrene Solubility Data (Liquid and Supercritical)**

<table>
<thead>
<tr>
<th>Density ($\rho$) (g/mL)</th>
<th>25°C (Liquid)</th>
<th>40°C (Supercritical)</th>
<th>50°C (Supercritical)</th>
<th>60°C (Supercritical)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
</tr>
<tr>
<td>0.2</td>
<td>0.003</td>
<td>0.003</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>0.3</td>
<td>X</td>
<td>X</td>
<td>0.028</td>
<td>0.057</td>
</tr>
<tr>
<td>0.4</td>
<td>X</td>
<td>X</td>
<td>0.020</td>
<td>0.030</td>
</tr>
<tr>
<td>0.6</td>
<td>X</td>
<td>X</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>0.7</td>
<td>0.009</td>
<td>0.009</td>
<td>0.028</td>
<td>0.050</td>
</tr>
</tbody>
</table>

Table 3 shows solubility data for terpinen-4-ol in both liquid and supercritical CO$_2$ states. Similarly, these results also show the phenomena as in the case of alpha-cedrene. Both the experimental

**Table 3. Terpinen-4-ol Solubility Data (Liquid and Supercritical)**

<table>
<thead>
<tr>
<th>Density ($\rho$) (g/mL)</th>
<th>25°C (Liquid)</th>
<th>40°C (Supercritical)</th>
<th>50°C (Supercritical)</th>
<th>60°C (Supercritical)</th>
</tr>
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<tr>
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<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
<td>$Y_2$ EXP. $Y_2$ PREOS $K_{12}=0.05$</td>
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<td>0.2</td>
<td>0.006</td>
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<td>0.008</td>
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<tr>
<td>0.3</td>
<td>X</td>
<td>X</td>
<td>0.036</td>
<td>0.069</td>
</tr>
<tr>
<td>0.4</td>
<td>X</td>
<td>X</td>
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<td>0.078</td>
</tr>
<tr>
<td>0.6</td>
<td>X</td>
<td>X</td>
<td>0.089</td>
<td>0.141</td>
</tr>
<tr>
<td>0.7</td>
<td>0.059</td>
<td>0.059</td>
<td>0.108</td>
<td>0.154</td>
</tr>
</tbody>
</table>

data and the Peng Robinson model show an increase in solubility ($y_2$) as density and pressure increase at constant temperatures. Table 4 presents solubility data for alpha-pinene, the major component of hinoki oil, in both liquid and the three supercritical CO$_2$ states. Consistent with the previous two analyses, these results also show that $y_2$ increases as density and pressure increase along an isotherm.
Table 4. Alpha-Pinene Solubility Data (Liquid and Supercritical)

<table>
<thead>
<tr>
<th>Density (g/mL)</th>
<th>25°C (Liquid)</th>
<th>40°C (Supercritical)</th>
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<tr>
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<td>0.003</td>
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</tr>
<tr>
<td>0.6</td>
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<td>X</td>
<td>0.011</td>
<td>0.022</td>
</tr>
<tr>
<td>0.7</td>
<td>0.059</td>
<td>0.0126</td>
<td>0.016</td>
<td>0.029</td>
</tr>
</tbody>
</table>

CONCLUSIONS

Now that this study is complete, data parameters for alpha-cedrene, terpinen-4-ol, and alpha-pinene oil solubility in both liquid and supercritical CO₂ states have been established and now are available to the research community. While deactivating the proteins of common triggers for asthma using CO₂ shows promise, additional investigations of enhanced deactivation techniques, which use both CO₂ and these oils (i.e., cedar wood oil, tea-tree oil and hinoki oil, respectively) could yield even further promising results.

Now that these results show all three oils are soluble in both liquid and supercritical CO₂, the hope is that allergen deactivation can be quantified to determine the level of deactivation with all three entities. Future work will be to determine if essential oils deactivate allergens and also determine by how much. Similarly, it also is possible to investigate how much deactivation can be done by liquid and supercritical CO₂ alone. Finally, it could be determined if a combination of liquid and supercritical CO₂ states would deactivate further than one component alone. Such studies could provide
findings potentially useful for positively impacting the environment in which those affected by asthma live.

REFERENCES


PART 4: SCHOOL OF MEDICINE
Advancements in microbiological studies have allowed researchers to characterize and discern pathogenic microbes from beneficial gut microbial species known as commensals. These distinctions are being investigated now for their contributing role in cancer development, particularly cancer arising from mucosa tissue (Boccellato & Meyer, 2015; Scanu, et al., 2015). As of today, cancer remains a major cause of death worldwide (Ferley, et al., 2011). The way by which a cancer cell is fueled typically is through deregulation of cell cycle checkpoints and induction of cell proliferation genes (Hanahan & Weinberg, 2011).

More recently, the influence that bacterial infections have on the development of certain cancers, such as gastric cancer and gall bladder cancer, have gained increasing attention. Unlike viruses, bacteria do not integrate their DNA into the host genome (Boccellato & Meyer, 2015; Scanu, et al., 2015). Consequently, the bacterial contribution to carcinogenesis involves many factors that are not host-cell specific. Some of these include the stimulation of chronic
inflammation and a dramatic modulation of the host mucosal immune landscape (Atherton & Blaser, 2009; Dethlefson, McFall-Ngal, & Relman, 2007).

Within mucosal tissue, a group of immune regulatory cells (Treg), and pro-inflammatory immune cells, Thymus helper type 1 (Th1) and type 2 (Th2), play a symbiotic supervisory role on each other to enable the maintenance of a healthy microbiome and the ongoing regulation of growth for gut microbial populations. This natural biological check and balance system is being revealed now as a potential key factor in the hindrance and, also sometimes, in the development of several lines of epithelial cancers. In this monograph chapter the therapeutic potential of enteric commensal bacteria as a cancer tool *in vivo* is exposed.

The inappropriate propagation of certain commensal species in the gut has been associated with several mucosal inflammatory diseases and cancer development (e.g., Atherton & Blaser, 2009; Dethlefson, et al., 2007). These major shifts in intestinal commensal bacteria often result in changes in CD4+ lymphocyte populations that lead to an influx of Th17 cells, which drive chronic inflammation that eventually can evolve into cancer. Recent experiments investigating the relationships between enteric bacteria and cancer have exposed the ability of certain species of intestinal commensals to significantly reduce tumor size and tumor progression in mice (e.g., Bordon, 2013; Belkaid, 2013).

In similar studies, pro-inflammatory cells (Th17 and Th1) were at times found present along with anti-inflammatory Treg populations in the intestinal mucosa (e.g., Dethlefson, et al., 2007;
Condeelis & Pollard, 2006). This antitumor response was mediated by a balanced production of pro- and anti-inflammatory cytokines, resulting in a controlled threshold of mucosal immunity, which was moderated largely by CD4+ T lymphocyte populations through a dendritic cell-dependent pathway (Dethlefsen, et al., 2007; Condeelis & Pollard, 2006; Coussens & Werb, 2012; Mazmanian & Kasper, 2006). In consideration of these studies, it is proposed that certain combinations of human intestinal commensal bacteria can be cultivated to impede tumor growth at local and distant tumor sites by modulating CD4+ T lymphocyte cell activation.

Certain species of commensals, such as the gram-negative obligate anaerobes *Bacteroides fragilis*, have enterotoxigenic strains (i.e., an enteric commensal) that stimulate colonic inflammation and enhance colonic tumor formation (Atherton & Blaser, 2009); yet, such species at times also can improve host antitumor response by contributing to immune homeostasis through the balancing of CD4+ Treg, Th1, and Th2 cell populations (e.g., Erdman, 2005; Belkaid & Hand, 2014; Belkaid & Naik, 2013; Lee & Mazmanian, 2014). More recently, Viaud, et al. (2013) demonstrated that the commensals *L. johnsonii* and *E. hirae* were able to polarize pro-inflammatory Th1 and Th17 cell phenotypes to elicit a strong antitumor response in mice treated with chemotherapy as compared to germ-free control mice (e.g., Bordon, 2013).

The findings of Bordon, as well as of Viaud and associates provide new evidence that certain species of enteric commensals can help manage subcutaneous tumor development by calibrating mucosal (i.e., a type of epithelial tissue that secretes mucus) and, in
some instances, systemic thresholds of innate and adaptive immunity (Belkaid & Hand, 2014). Given the findings in this presentation of literature, this current work is focused on the possibility that certain combinations of human intestinal commensal bacteria can be cultivated to impede tumor growth at local and distant tumor sites by balancing CD4$^+$ T lymphocyte cell activation.

**CHRONIC INFLAMMATION AND CANCER**

Infections that lead to chronic inflammation are responsible for over 15% of all cancers worldwide, and bacteria are major driving agents of these cancer-causing infections (Condeelis & Pollard, 2006; Coussens & Werb, 2002). Among the best documented of these infections is the causal relationship between the bacteria *Helicobacter pylori* (*H. pylori*) and stomach cancer. Studies describing *H. pylori*-associated health and disease have revealed that *H. pylori* colonization usually involves strong Th1 and Treg responses (Atherton & Blaser, 2009; Hansen, Melby, Aase, Jellum, & Vollset, 1999). These findings indicate that such responses may have been sufficient to suppress local gastric Th1 responses, thereby avoiding excessive gastric inflammation and gastroduodenal disease.

**Bystander Effect**

Studies such as the Hansen, et al. (1999) study have contributed significantly to the understanding of the bystander effect (i.e., the communal influence microbial species exhibit on neighboring microbial species) and the discovery that low levels of gastric Tregs (i.e., immunosuppressive T regulatory cells) were associated with an increased risk of peptic ulceration (e.g., Atherton & Blaser, 2009; Dethlefsen, et al., 2007; Hansen, et al., 1999).
Despite the several links between gut bacteria and inflammatory diseases, the relationship between intestinal bacteria and human disease is highly contextual, as enteric bacteria can exist at different points between mutualism and pathogenicity depending on the immune and microbiological landscape of the host (Belkaid & Hand, 2014; Hooper & Macpherson, 2010).

The majority of studies exploring relationships between bacteria and cancer emphasize immune changes taking place after bacteria inoculation, but the microbiological context often is overlooked. These studies typically are performed using a single murine intestinal bacteria species (i.e., bacteria species that originate from mice); thus, the combined effects of enteric microbial species may be overlooked or negated. Furthermore, the use of murine intestinal bacteria also undervalues the biological disparity between the murine microbiome and that of humans (Dethlefsen, et al., 2007; Faith, Ahern, Ridaura, Cheng, & Gordon, 2014). To address this disparity, Faith, Rey, et al. (2010) developed procedures for generating germ-free mice through embryo transfer that also permits a transplanting of human fecal microbiota inter-generationally, enabling researchers to conduct research with “humanized” gnotobiotic mice and making it possible for researchers to conduct complex investigations heretofore not possible. Among those mentioned are studies involving metabolic and signaling pathways in vivo (Faith, Rey, et al., 2010) and more recently studies for detecting effector strains from donor microbiota that shape the immune system (Ahern, Faith, & Gordon, 2014).
The shaping of human mucosal immunity depends highly upon the presence of unique groups of enteric bacteria species known as “keystone species,” the specific microbial species that have strong inhibitory or stimulatory effects on neighboring bacteria (Belkaid & Hand, 2014). Similar species, such as Enterococcus faecalis and Bacteroides fragilis, have been described as putative immune regulatory contributors, yet their roles in immune homeostasis fluctuate depending on the enteric environment. Typically, commensal transition to a pathogen is favored to occur during chronic stimulation of pro-inflammatory cytokines (i.e., small cell signaling proteins that induce inflammation) and proliferation of the Th1 and Th17 T-cell populations. Remarkably, recent findings have demonstrated that certain species of gut commensals (e.g., Lactobacillus johnsonii and Enterococcus hirae) can polarize T cells into protective Th1 and Th17 cell phenotypes that actually elicit a strong antitumor response in chemotherapy-treated mice as compared with germ-free control mice.

Analogous experiments also demonstrated that protective Th1 and Th17 responses are compromised severely in the absence of similar groups of commensal species (Faith, Ahern, et al., 2014). These findings reveal that, dependent on the microbial context, pro-inflammatory T-cell phenotypes also could be beneficial against tumor growth, highlighting the pressing need for combinatorial microbial studies to determine consortia of enteric commensals that are beneficial against cancer development and tumor growth.

Several of these studies were conducted by transplantation of intact uncultured microbiota from human donors into germ-free
mice. Then, the culture collection was divided into groups randomly, and the modulatory effects on T-cell regulation were monitored. This approach provided a more direct way to assess human microbiota T-cell modulatory effects, as it made use of human fecal content that harbored human gut microbiota (e.g., Faith, Ahern, et al., 2014; Iida, et al., 2013; Viaud, et al., 2013). This experimental design is an amelioration from previous studies, which have been limited to use of the murine microbiota only; yet, studies using humanized microbiome mice still have a persistent drawback, since they continue to perform the immune assessment in non-humanized mice strains that have immune profiles that differ significantly from that of humans. One approach or solution to this drawback could be transplantation of intact uncultured human microbiota into a humanized mouse model with mucosal immune-regulatory functions that mimic those of humans.

CD4+ T LYMPHOCYTES REGULATE MUCOSAL IMMUNITY

Studies by Faith and Gordon and their associates, using a collection of bacteria in germ-free mice, found that strains of the Bacteroides species and the broad Bacteroidales phylum were able to stimulate colonic Foxp3+ Treg cells among CD4+ T cells (Faith, Ahren, et al., 2014). In their experiments, the commensals B. intestinalis and E. coli were able to induce a significant increase in these colonic Tregs, while the normal intestinal microbiota negative-control condition (Collinsella aerofaciens) could not. These responses seemed to be influenced greatly by the host’s diet, which was composed mostly of casein and starch, indicating that microbial
metabolic by products could partake in an immune stimulatory role in the gut mucosa. These groups of commensals also have been found not only to alter immunity in local tissue but also in tissue sites distant from the gut (Belkaid & Naik, 2013; Faith, Ahren, et al., 2014; Ganal, et al., 2012).

These researchers present their findings identifying enteric microbiota as key players in the shaping of immune signaling at the mucosal and systemic levels. Analysis of splenocytes (i.e., a branch of immune cells that originate from the spleen) demonstrated that populations of CD4⁺ T cells were lower in germ-free mice compared to conventionally colonized mice; while the proportions of other lymphocyte populations, such as CD8⁺ T cells and B cells, were unchanged regardless of the presence of intestinal bacterial flora in the mice (Dixon & Misfeldt, 1994; Faith, Ahren, et al., 2014; Tzianabos, et al., 2000). These findings are indicative of the significance of CD4⁺ T lymphocyte populations in enteric-mediated immune response and are supportive evidence that intestinal bacteria modulate mucosal and systemic immunity primarily through a CD4⁺ T lymphocyte-dependent pathway.

**Intestinal Commensals Can Drive Antitumor Response**

Certain enteric commensal species, such as the commensal bacterium *Lactobacillus plantarum*, have been found to reduce intestinal inflammation through the induction of protective interleukin-10 (IL-10) and are able to protect the host against inflammation-based mucosal diseases, such as inflammatory bowel disease (IBD) and perhaps cancer (Gevers, et al., 2014; Xia, Chen, Zhang, Jiang, Hang, & Qin, 2011). In addition, other species (e.g., *E.*
*Eubacterium hirae* have been demonstrated to be able to direct pro-inflammatory T cells to elicit strong antitumor responses (Iida, et al., 2013; Marshall & Warren, 1983; Viaud, et al., 2013).

Further investigation of these dynamics also have revealed an increased survival rate in cancer-bearing mice that had been inoculated with lipopolysaccharide (LPS) (Iida, et al., 2013; Lundin & Checkoway, 2009; Won, Zahner, Grant, Gore, & Chicoine, 2003). In these mice, LPS was able to improve host antigenic memory, eradicate tumors, and increase survival when compared to the control group (Lundin & Checkoway, 2009; Won, et al., 2003).

The antitumorigenic abilities of microbial products (e.g., LPS) were explored equally in *Pseudomonas aeruginosa* by testing its signal molecule (O-DDHSL) on pancreatic carcinoma cells, where it significantly reduced pancreatic carcinoma cell mobility and viability (Kumar, Bryan, & Kumar, 2014). In their experiments, different concentrations of O-DDHSL were used on ductal epithelial cell lines (HPDE) and prostate cancer cells (Panc-1). Cell viability then was determined in both lines between 24 and 48 hours after treatment. The findings revealed that when compared to the control condition, treatment of cells with O-DDHSL concentrations between 200 and 300 \(\mu M\) resulted in a significant decrease in cell viability (Kumar, et al., 2014).

**Commensals Play Functionally Contextual Roles in Cancer Development**

Although many groups of intestinal microbiota have a mutualistic (i.e., coexisting without becoming pathogenic) relationship with their host, certain species can exist at different
points between mutualism and pathogenicity (Hooper & Macpherson, 2010). Consequently, how commensal bacteria behave in the gut is highly contextual, with often times the same microbe becoming commensal or parasitic depending on the immune and microbiological landscape of the host (Belkaid & Hand, 2014). Commensals that cause a deficiency in T-bet and Tregs (i.e., T regulatory cells) usually induce pro-inflammatory Th17 cells, chronic inflammation, and eventually cancer. In contrast, at low doses, endotoxins and commensal-associated molecular patterns (CAMPS) can mediate moderate levels of inflammatory response that impede tumor growth and retard tumor progression (Lange, 2003; Lundin & Checkoway, 2009).

*Helicobacter pylori*, the etiological cause of stomach cancer, for instance, also has been associated with protection from other types of cancers, such as esophageal adenocarcinoma, by preventing pan-gastric inflammation and reflux esophagitis (Atherton & Blaser, 2009; Hansen, et al., 1999). Such findings have been used to redefine scientists’ understanding of microbial commensalism and are consistent with the premise that combinations of bacterial species that are able to induce anti-inflammatory response with species that are able to regulate levels of protective pro-inflammatory signals can mediate a favorable antitumor environment that considerably impedes cancer development and tumor growth (Faith, Ahren, et al., 2014).

**CONCLUSION**

Many studies have demonstrated that commensal-mediated antitumor response can be directed by unique groups of intestinal
murine bacteria. In this monograph chapter, the combined effects that enteric bacteria can have on systemic and local inflammatory response were described, and their role in cancer development and tumor growth was explored. This review is innovative, as it redirects this topic in the context of the human intestinal microbiome, expanding it beyond murine biology. Furthermore, the proposed experiments exceed the mere investigation of mono-associations between bacteria and tumor regression, rather the emphasis is on the "bystander effect," focusing on the combined role of unique groups of gut commensal bacteria on host antitumor response (Belkaid & Hand, 2014; Iida, et al., 2013). Unlike previous studies, in this work, a central focus is use of a mouse model engrafted with a humanized mucosal immune profile as a reliable molecular tool for microbial studies in a model system that mimics the human immune profile.

With the pioneering advances in gnotiobiotic biology, such as that of Faith, Rey, et al. (2010), it is fitting to speculate that inoculation of mice (prior to tumor growth) with commensals that are known to maintain anti-inflammatory cells (e.g., Foxp3+ Treg cell proliferation and commensals able to induce moderate levels of inflammatory signals) will create an anti-tumorigenic mucosal environment, which considerably will impede tumor growth. It could be anticipated that once tumor growth is detected, moderate levels of inflammatory signals are likely to be stimulated to create a toxic environment for tumor cells, while Treg cells and Th2 cells will be able to keep this pro-inflammatory response acute and manageable. These major shifts in intestinal commensal bacteria often result in
systemic changes, which can have whole-tissue anti-tumor responses.

Given all these findings, the next research challenge would be to identify specific microbial strain candidates that could be maintained in vivo at sub-potent levels and administered to patients for the curation or management of cancers. The challenges that this novel treatment methodology presents are likely to require further thorough experimentation to help define each beneficial microbial combination and their respective curative modes of action. Indeed, the modulation of commensal microbiota for the stimulation of immune response against disease appears to be exceptionally promising.

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PART 5:
SCHOOL OF MUSIC
The saxophone was invented in the early 1840s by a Belgian instrument maker, Adolphe Sax, and saxophone classes appeared shortly thereafter in Western Europe at the Paris Conservatory (Murphy, 1994). Similarly, classes also are documented in the early 1880s in the United States in music schools such as the New England Conservatory in Boston and the Grand Conservatory in New York City. Conversely, such classes were not taught in non-democratic countries such as the Soviet Union until after 1970; however, it was not until the late 1980s that the saxophone appeared in Chinese conservatories (C. Leaman, Personal communication on February 5, 2014).

Although Sax was a master instrumentalist who had studied in some of the finest European conservatories, there were problems with acceptance of the saxophone as an instrument in orchstras at the time, which hindered his dream (Invention and history, 2015); actually, the struggle of saxophonists to gain acceptance and recognition in the classical music world typically has been viewed as
an uphill battle. The difficulty in gaining legitimacy began almost immediately after its invention with the frequent, mostly unfounded patent disputes levied against the inventor in court by various members of a coalition of rival instrument makers (Segell, 2005). Later, in the 20th century Segell points out that the association of the saxophone with jazz and Black Americans would hinder its acceptance in countries like Germany and the Soviet Union. This struggle coupled with the political climates in the mid-twentieth century in countries like the Soviet Union, Nazi Germany, and China made acceptance of the instrument even less likely.

The prohibition of the use of the saxophone was explicit in some settings and was implicit in others. For example, at one time, two important Soviet Publications, Pravda and Isvestia, carried out a public dispute over the legitimacy of jazz as an appropriate musical medium, causing confusion among citizens with any interest in the Western art form, which included use of the saxophone (Maugans, 2000). Maugans reports that following the Second World War, publically uttering the single word “jazz” was illegal, and this certainly would have included questioning the legality of the saxophone, as it was an instrument that was played in jazz performances.

In addition to helping to shape the trajectory of the history of the saxophone, conditions like these also affected the role of the saxophone in western music as well (Segell, 2005). According to Segell, as a result of these strictures, the use of the saxophone by Soviet composers as well as its adoption by Russian conservatories and institutions of higher education was limited; thus, it gained
acceptance relatively late compared to countries under various other types of political circumstances.

Despite such hindrances, formerly non-democratic countries such as Germany and Russia recently have emerged as significant contributors to the wealth of saxophone pedagogy and repertoire. A Russian, Sergey Kolosov, was awarded first prize at the 2006 Adolphe Sax Competition in Dinant, Belgium (International Adolphe Sax Association, 2014). According to American jury member Frederick Hemke (The jury..., 2006), this competition win shocked many in attendance (F. Hemke, Personal communication on November 16, 2006).

This quadrennial competitive event named for the inventor of the saxophone is known as the seminal event of its kind and attracts some of the best young saxophonists from all around the world. The first two of the three previous winners not only came from France but had been students at the esteemed Superior National Music Conservatoire of Paris (Doisy, 2015). Even with the comparatively well-developed saxophone pedagogy in the United States, the best showing of an American in the competition is second place; only once has an American even made it to the third and final round of the competition (Stusek, 2014); thus, for a Russian player to win was considered a major step forward in the saxophone community. Following this win in 2006, two Russian saxophonists made it to the final round, finishing second and sixth respectively in the 2010 competition (Adolphe Sax International Competition, 2010). Apparently, these placements further illustrate the continuing ascent of Russians in the world of saxophone competition.
At present, relatively little is known about the forces (e.g., people and events) that brought about the shift in policy and attitude directed towards Adolphe Sax's somewhat often maligned creation. There are far too many instances of triumph over adversity in the relatively short history of the saxophone to detail them all (Hemke, 1975), but it is the intent of this research to bring to light some of the characters that have helped and continue to help saxophonists in their pursuit of gaining an even larger foothold in the course of musical history.

**DEVELOPMENT OF THE PROPOSED HISTORICAL STUDY**

**Purpose of the Study**

This research project will explore the ways in which the political environments of various mid-twentieth century nations affected the saxophone's history and its place in the ever-evolving landscape of the western art-music tradition. Secondly, it is to identify the catalyst(s) for change from formal prohibition of the instrument to an acceptance of what subsequently has become a "staple" in many music conservatories around the globe. This investigation will clarify influences that, in only a few short decades, stimulated several countries that formerly prohibited the instrument to begin producing first-rate performers and teachers. These individuals have won international competitions (e.g., International Adolphe Sax Association, 2014) and occupy prestigious positions at institutions around the world.

The chief goal of this study will be to identify the link(s) between the modern day saxophone instruction in these various
countries and influences (i.e., whether foreign, domestic, or some combination) that helped to efface the obstacles that previously had stood in the way of a serious saxophone pedagogical establishment. Furthermore, the study will examine the link between probable pre-existing, underground saxophone instruction and its trajectory towards what it has become currently.

**Need for the Study**

Although not exhaustive, it seems that research is plentiful on the suppression of saxophone pedagogy and performance throughout its rather tough but resilient history. Naturally, through the course of their research these scholars (e.g., Maugans, 2000; Murphy, 1994) have touched on the early development of saxophone instruction, but in most cases these discussions are limited to a few pages within a book chapter (e.g., Maugans, 2000). Moreover, much of the available research appears to be outdated and in need of follow-up research. The works by Maugans, Ford (1979), and Ingham (1998) cited here are all at least fifteen years old and represent research in need of updating. Furthermore, a thorough study on the impact of the political abuses leveled against saxophonists and the subsequent results on the development of pedagogy has not been undertaken. Despite the ascent of the saxophone into musical prominence and the development of a community of competent performers in these countries, the parties and forces responsible are regarded as largely unknown (Ingham, 1998).
Limitations of the Study

The proposed research will be affected by the extended period of time between present day and the active suppression of saxophone instruction and performance in classical music as well as the related abuses of musicians in these non-Western countries. Consequently, the research will be limited to collecting data from living saxophonists and musicians knowledgeable about the subject matter as well as from existing physical materials that are of historical value. Unfortunately, some of these materials may be unavailable in the United States. As a result, there is the likelihood of encountering faulty memories and incomplete histories of the events, people, and places involved in shaping the instruction of the saxophone.

REVIEW OF RELATED LITERATURE

Since its first appearance on the musical scene in the mid-19th century, the misfortunes of saxophonists have been documented quite well. From the early abuses leveled against Mr. Sax to the mistreatment of the instrument as a result of its close association with jazz in the 20th century, the scholarship in this area appears to be robust (Hemke, 1975; Segell, 2005). As it pertains strictly to the effects of these misfortunes on the development of pedagogy, the subject is broached only tangentially and is limited in scope to a few theses and dissertations. Considering the limited scope of the research in this area coupled with its obsolescence (i.e., most of this research was conducted 20 or more years ago), the need for further scholarship is even more pressing and necessary. Furthermore, most of the previous research as it relates specifically to the saxophone
(i.e., its suppression and subsequent pedagogical development) has focused on the Soviet Union, and its well-documented eschewal of all things associated with Western culture, specifically that of the United States.

Written in 1979, Christopher Ford’s thesis, The State of Concert Saxophone Pedagogy, Performance, and Composition in the Soviet Union, provides a valuable (although limited) view into the then budding potential of the saxophone following Joseph Stalin’s death in 1953 and the loosening of the strictures inherent in the socialist realist and Zhdanovistic policies (Birch, 2015; Ford, 1979). Ford notes that Zhadovism, in English, is a term that refers to the strict control of the arts by Soviet officials, namely Andrei Zhadanov. The Communist Party insisted that all art favorably depict communist life.

Also useful is Mr. Ford’s descriptions of some of the earliest events and the people that first exposed Soviet citizens to the classical saxophone as a solo instrument. In chapter one of his thesis, Ford briefly chronicles the University of Michigan’s 1961 tour of the Soviet Union and American saxophonist Donald Sinta’s quite successful performances of Paul Creston’s Concerto for Alto Saxophone and band. In addition to the brief and important exposure to the American classical saxophone, Ford also touches on the substantial impact that French saxophonist Jean-Marie Londeix would have later, which was closer to the time of the relaxation of Soviet policies responsible for the absence of the saxophone in the Soviet musical scene up to that point. Through his visit and performances early in the 1970s, Londeix would forge an important
relationship with Russian composer Edison Denisov that would begin paving the way for the saxophone to be legitimized in the Soviet Union (Denisov, 2014).

In addition to highlighting some of the early western influences on the development of saxophone pedagogy, Ford’s document also is useful in that it makes a connection between the western influences and changes within the Russian policy relaxation. Of particular interest is Londeix’s influence that laid a large part of the foundation for the early Russian school of saxophone playing and the start of formal saxophone instruction in the Soviet Union. These classes began at the Moscow Conservatory in the early 1970s (Ford, 1979). Despite Londeix’s large influence and early visibility in the fledgling saxophone school, the connection between the early days and the contemporary saxophone pedagogical culture is less documented and apparently in need of further study.

As a result of research projects such as Mr. Ford’s and because of the subsequent popularity gained by Edison Denisov’s *Sonate for Alto Saxophone and Piano* dedicated to Jean-Marie Londeix, the special relationship forged between Messrs. Londeix and Denisov has been well-documented. At least in its early stages, the beginnings of saxophone pedagogy in Russia owed much to the exposure to the instrument and its peculiar abilities during Londeix’s tour in the 1970s (Ford, 1979). The specifics of this experience, as it relates to the early relationship between Denisov and Londeix and the development of the now canonized sonata, are preserved online in the form of letters between composer and performer (Denisov, 2014). Denisov documents that in this correspondence Londeix urges
Denisov to write for the saxophone and apprises him of some of the techniques possible on the saxophone that largely were unknown in the Soviet Union up to that point. Although not a saxophonist himself, because of his stature in the Soviet Union, Denisov's style and choice to make use of some of the saxophone's more avant-garde techniques inspired future composers, and it contributed to the development of a particularly Russian style of saxophone playing and composition.

**Research in Russia**

A more recent, but still dated, exploration of the saxophone in Russia is contained in Stacy Maugans' 2000 dissertation, *The History of Saxophone and Saxophone Music in St. Petersburg, Russia*. It is useful for its description of the state of the saxophone during the 1990s in St. Petersburg. As one of the main cultural hotspots in Russia, it is likely that the plight of the saxophone was indicative of the trajectory of its pedagogical development elsewhere in the country. In her dissertation, Maugans describes the struggle of saxophonists to remain afloat in post-Soviet St. Petersburg during the 1990s. This struggle was not attributed to a heavy-handed governmental regime, as had been the case earlier, but she concluded instead that it was because of serious economic concerns. The elimination of instruction at the St. Petersburg Conservatory, the uncertainty of future instruction, and the alternate paths available to would-be saxophonists are chronicled quite well in the Maugans document. Additionally, Maugans explores the trajectory of a saxophonist's journey as a player from an elementary-school beginner to full professor in the Russian educational system.
Research in the United Kingdom

Among the resources concerning the saxophone that are available, Richard Ingham's 1998 *Cambridge Companion to the Saxophone* represents a seminal work on the many different aspects of the historical, pedagogical, and mechanical developments of the instrument. In spite of its relative silence on the pedagogy of the saxophone in Germany, China, or Russia, Ingham's compendium is a valuable resource because of its listing of the most prominent contemporary concert saxophonists (i.e., as of its 1998 publishing date), residing within various countries around the world, even in those countries not often associated with the instrument. Conspicuously absent from this list is China; however, a couple of pedagogues and performers from both Germany and Russia are listed.

This proposed work potentially provides a useful jumping off point for further pedagogical research, since it includes important people in the instruction of saxophone in the countries specified for the proposed study (Ingham, 1998). Furthermore, in their joint chapter in Ingham's book, French saxophonists Claude Delangle and Jean-Denis Michat (1998) provide examples not only of the same aforementioned saxophonists in various countries but also of their relationships with different composers around the world. In addition to providing an interesting insight into the specific cultural leanings of the saxophone communities in these places, it may be possible, in the future, to glean information about potential connections between a certain type of repertory and specific teaching climates in these different places through the proposed research.
Research in the United States

Even absent the suppression that saxophone pedagogy has faced in countries around the world in the 20th century, the emergence of the saxophone as a serious instrument to be considered alongside other more established orchestral instruments has been a challenge in the United States. The experience of the saxophone musicians in the United States, in comparison to some other parts of the world, has been relatively unfettered, at least as far as governmental censure is concerned (Segell, 2005). Although during the rise of jazz Segell indicates there were city ordinances mandating a curfew for jazz saxophonists in places like Kansas City, it is believed that the types of prohibitions and limitations imposed on saxophonists in non-democratic societies were unusual if not non-existent in the United States. Clearly, exploration that can raise the understanding of the middle to late 20th century struggles of saxophonists, which are related quite likely to pedagogical developments and the place of the American saxophone school within the global saxophone community, will be invaluable to the researcher who is attempting a study of divergent saxophone cultures.

In his 1994 dissertation *Early Saxophone Instruction in American Educational Institutions*, saxophonist and pedagogue Joseph Murphy details not only the history of the saxophone in American universities and conservatories but also its link to the original French school of saxophone playing. More than likely, Murphy’s document will prove to be a valuable benchmark resource.
to provide details against which to compare the findings in the research of other countries.

The most recent publication that attempts to cover the entirety of the history of the saxophone is Michael Segell’s (2005) book *The Devil’s Horn*. As subtitled, “The Story of the Saxophone, From Noisy Novelty to the King of Cool,” the book covers the history of the saxophone from invention to modern day with an emphasis on the struggle for its acceptance not only in non-democratic political environments but also elsewhere.

Similar to Dr. Murphy’s (1994) dissertation, Segell’s (2005) book provides several disparate narratives of the saxophone’s development and provides a larger context in which to view the similarities and differences in the ways the saxophone has been treated societally. In the 11th chapter, he describes the degree to which Hitler and Goebbels despised any artistic expression with roots in the West, an opinion that undoubtedly included the saxophone. Similarly, the rocky, unpredictable relationship between the saxophone and the Soviet government under Stalin is explored. The periodic loosening of strictures concerning the instrument followed shortly thereafter by the inevitable round-up and exile (or execution) of saxophonists was par for the course for much of the Soviet era (Segell, 2005).

**Research Using Other Sources**

Although the need for further research on the development of saxophone pedagogy in Soviet Russia and post-Nazi Germany becomes evident in the reading of related already extant materials, available information in the United States on the early development
of the saxophone and pedagogy in China is absent from literature. Nevertheless, the late appearance of the saxophone classes in the Chinese conservatories is evidence of much needed research in that geographic area. The connections with English-speaking Chinese saxophone teachers and with American saxophone professors such as Dr. Clifford Leaman (2015) of the University of South Carolina and Dr. John Sampen (2015) of Bowling Green State University are promising avenues through which to explore the maturation process of saxophone pedagogy in China.

RESEARCH DESIGN AND PROCEDURES

The final document representing this comprehensive study (i.e., a doctoral dissertation) will be made up of five chapters and a bibliography. The first chapter will contain an introduction, the purpose for the study, need for the study, the limitations of the study, a review of related literature, and the design and procedures for the resultant research document. The second chapter will address the post-Soviet pedagogical development of the saxophone and the figures involved in aiding the process in Russia. This information will be collected by interviewing current prominent Russian saxophonists such as Sergey Kolesov (2015), discussing his formal education as well as his knowledge of documentation of the country's development that is not available in the United States. Similarly, the third chapter will discuss the development of the saxophone in the intervening years since the Nazi prohibition of the instrument and the people responsible for helping saxophonists gain a more widespread acceptance in German educational institutions. As with the former Soviet Union, interviews with saxophonists who
were educated under the tutelage of these mostly unknown transitional figures will be the primary method through which information is gained. The fourth chapter will explore the history of the saxophone in China and documentation of progress towards its acceptance under Communist rule in the 20th and 21st centuries. The fifth chapter will draw conclusions about the similarities and differences between the paths of saxophone instruction in the three countries under similar, much less than ideal circumstances, and it will provide a conclusion to the research project.

REFERENCES


COLLABORATIVE CONTRIBUTION
PART 6: COLLEGE OF EDUCATION
Evidenced by results from the 2011 Trends in International Mathematics and Science Study (TIMSS; D. Rutkowski & Prusinski, 2011), apparent persistent trends exist from 2007 findings in international rankings in 8th grade science achievement, where countries like Singapore, Korea, Finland and Hong Kong consistently perform at higher levels than other countries participating in the assessment (House, et al., 2011). Although many variables likely are related to science achievement, two important variables may include national education policy and classroom instructional practices (e.g., Angrist & Levy, 2001; Bolyard & Moyer-Packenham, 2008; Lüdemann, Wömann, West, & Schütz, 2009; Rindermann & Ceci, 2009; Tyler, Taylor, Kane, & Wooten, 2010). The relationship between these three constructs, however, often is complex; therefore, policies and instructional practices can
be conceptualized as mediating or moderating variables when examining international differences in science achievement (Heeringa, West, & Berglund, 2010).

To better understand the influence these key variables potentially have on achievement in science, the current study expands on previous work that explored the mediating effect of classroom practices on differences in science achievement across a subset of countries who were participants in the 2011 TIMSS (Blue, 2014). Specifically, given the null effects from this previous study, the current research endeavors to disentangle the unyielding international rankings in 8th grade science achievement by investigating the potential moderating role that national education policy might have on the relationship between classroom instructional practices and science achievement. Two primary research questions serve as guides for this investigation:

1. To what extent is the influence of classroom instructional practices on 8th grade science achievement moderated by a national framework on science education?
2. To what extent is the influence of classroom instructional practices on 8th grade science achievement moderated by a national emphasis on science process skills?

THEORETICAL FRAMEWORK

The current study was conceived from the pursuit of a more nuanced understanding of international trends in science achievement and the question of why certain countries consistently perform better than others. Previous work in this area shows that classroom practices are important predictors of student achievement.
(e.g., House, 2011; von Secker, 2002). Given that this one variable does not completely explain the international achievement trends in science achievement, it seems reasonable to investigate national educational policy, which may be a missing piece of the equation. Figure 1 presents a pictorial summary of the conceptual model that provides a framework for this study.

**Figure 1.** Conceptual model of effects of country-level educational policies on relationship between classroom-instructional practices and science achievement

![Conceptual Model Diagram](image)

Inquiry-based Instruction & Engagement in Science Learning

Research findings seem to suggest instruction that provides students with significant opportunity to practice science-process skills in the K-12 science classroom is likely to develop student proficiency in science (National Research Council, 1996). In their review of ten years of research on inquiry-based science teaching, Minner, Levy, and Century (2010) cited several empirical studies
that, when taken together, constitute evidence supporting a positive relationship between instructional practices that actively engage students in the process of learning science and student academic outcomes.

For example, in a cross-country analysis of TIMSS 2003 data, Kaya & Rice (2010) reported a positive relationship between inquiry-based science instruction and achievement for Singapore, Australia, and the United States but not for Japan and Scotland. These mixed results seem to indicate there may be country-level variables influencing the relationship between inquiry-based science instruction and science achievement.

**Classroom Instructional Practices & Student Achievement**

Previous research linking classroom-level contextual variables and student achievement in multiple countries has provided evidence supporting a positive association between individual teacher effects, classroom-level variables and student achievement (e.g., Angrist & Levy, 2001; Bolyard & Moyer-Packenham, 2008; Tyler, et al., 2010). In reviewing the literature on U.S. science and mathematics teacher quality, Bolyard and Moyer-Packenham (2008) reported positive relationships between student science outcomes and a teacher’s years of teaching experience, professional background or possession of a degree in science and education, and teaching certification in the science subject area. In the same study, positive relationships were reported between student outcomes and the use of instructional practices that engaged students in science learning.
Tyler, et al., (2010) used teacher observation and student achievement data from the Cincinnati (United States) Public School System to establish a general association between instructional practices and student achievement growth in reading. Similarly, Angrist & Levy’s (2001) research in Jerusalem provided evidence for a positive relationship between teacher in-service training (another teacher-level variable) and student achievement in language skills and mathematics. In analyzing mathematics achievement data from 46 countries that participated in TIMSS 2003, Akiba, LeTendre, and Scribner (2007) concluded that countries with higher teacher quality had higher achievement scores in mathematics.

In separate studies of science achievement, another teacher variable recently was investigated. Both House (2011) and von Secker (2002) found that classroom instructional practices had a significant impact on student achievement. These cross-disciplinary findings on teacher-level instruction-related variables possibly could be influenced by a country’s national educational policies; therefore, investigation of country-specific policy may reveal additional potential linkages to student achievement.

National Education Policy and Student Achievement

Review of the literature on the impact of national education policy on student achievement reveals a lack of consensus on the nature of the relationship between these two constructs. Rindermann and Ceci (2009) demonstrated that international differences in achievement partially can be explained by differences in national education systems. In a separate study in which different facets of school autonomy were examined, Lüdemann, et al. (2009) found a
beneficial effect on student outcomes when schools had more autonomy over course content. More recently, in a 2013 study, Hanushek, Link, and Woessmann found school autonomy had a positive relationship with student achievement in well-developed countries and a negative relationship in countries classified as “developing” nations.

The current study seeks to expand the literature and explore the relationship between national education policies, classroom instructional practices, and how their interaction may influence student science achievement at the international level. Approaching the variability in international science achievement through the current study, which hypothesizes an interaction between national policy and classroom practices, may provide a new perspective for education stakeholders involved in reform related to science education policy for teacher preparation programs and providers of professional development opportunities for in-service teachers.

DATA SOURCES

Sample and Data Collection

Carried out every four years, TIMSS collects data about trends in the mathematics and science achievement of fourth and eighth grade students from over 60 participating countries (D. Rutkowski & Prusinski, 2011). In each cycle, the primary goal is to measure international achievement in these two subjects, providing a mechanism for comparing achievement across countries and over time (Marsh, et al., 2012). The content assessed in TIMSS is based on an internationally agreed upon common curriculum in math and science. In addition to information collected on student achievement
in math and science, TIMSS also gathers data on teacher preparation, resource availability in the school and home, and the use of technology in the classrooms and at home (D. Rutkowski & Prusinski, 2011).

The sample design for TIMSS is a stratified two-stage cluster design, and data are collected using student-achievement booklets, questionnaires for students, teachers and administrators, as well as a curriculum questionnaire completed by the National Research Coordinator (NRC) in each country (D. Rutkowski & Prusinski, 2011). Our study uses aggregated science achievement results from 14,745 8th grade classrooms that participated in TIMSS 2011. In addition, we use questionnaire data from the teachers linked to each of these classrooms and curriculum questionnaire data from countries that participated in the 2011 TIMSS cycle.

Like many other large-scale assessments, the sampling design for TIMSS involves a variant of a balanced incomplete block (BIB) design (Beaton & Gonzalez, 1995), where individual students receive only a subset of the entire pool of items. To overcome potential error in population estimates created by this BIB design, TIMSS developers use a multiple imputation technique to generate five plausible values (PV), which provide unbiased parameter estimates related to students’ proficiency in science (Foy, Arora, & Stanco, 2013; L. Rutkowski, Gonzalez, Joncas, & von Davier, 2010). These five PVs were subsequently used in the current study.

The original sample included data from the 42 countries that participated in TIMSS 2011 and had data from the 8th grade science assessment, teacher questionnaire, and curriculum questionnaire. A
process of testing bivariate associations was used to compare missing data patterns for respondents with missing data on any of the final analytic variables with the respondents who had no missing data on these variables. This preliminary analysis revealed significant differences between these groups for specific variables. These differences related to: (a) national science education policy; (b) gross domestic product (GDP) per capita; (c) teacher gender, age, education level and post-secondary major; as well as for the variables (d) confidence in science teaching and (e) instructional practices that emphasize science investigation in the classroom.

Conversely, item non-response was not associated with variables related to instructional practices that engage students in science learning or to measures of teacher job satisfaction. Such patterns in the missing data indicate that item non-response was not due to a completely-randomized missing data mechanism (MCAR); therefore, deleting observations with incomplete data on any analytic variables (i.e., listwise deletion) may result in biased parameter estimates during the analysis.

Multiple imputation using chained equations (MICE) is the preferred method for addressing the complex survey data in which item non-response is due to a missing at random (MAR) mechanism (He, Zaslavsky, Landrum, Harrington, & Catalano, 2010; Heeringa, et al., 2010; Raghunathan, Lapkowski, Van Hoewyk, & Solenberger, 2001; Royston, 2004; White, Royston, & Wood, 2011); however, due to time constraints associated with the current project, this was not a viable option and list-wise deletion was performed on all classrooms with missing data on any analytic variable. This decision,
consequently, resulted in the elimination of Italy, Oman, and the Syrian Arab Republic from the analysis, yielding a final sample of 14,745 classrooms nested within 39 countries, with an average of 378 classrooms per country (i.e., ranging from 106 to 906).

Measures

To measure classroom-level science achievement, we created a continuous variable representing classroom 8th grade science achievement by averaging across each of five student-level plausible values provided in the TIMSS 2011 data set and aggregating to the classroom level. This variable was non-normally distributed across all countries in the sample.

Two variables represented classroom instructional practices used by science teachers whose students participated in TIMSS 2011. They are: (a) Instructional practices that emphasize science investigation and (b) Instructional practices that engage students in science learning. To measure the frequency by which a teacher used instructional practices emphasizing science investigation, we used the TIMSS 2011 Teachers Emphasize Science Investigation (ESI) Scale, Eighth Grade (Foy, et al., 2013). Based on teachers’ responses to seven Likert-type items (Table of Items and Responses is available on request, see p. ii), this scale prompted teachers to report on how often they ask students to engage in certain inquiry-based activities (e.g., observing natural phenomena and designing experiments). Using these seven items, we conducted a principal component analysis (PCA) to create a new continuous variable, where higher values on the component score represent more frequent use of instructional practices that emphasize science investigation.
The new standardized variable, INVESTIGATE, was non-normally distributed across the 39 countries and had a Cronbach’s alpha reliability coefficient of \( \alpha = 0.74 \).

To measure the frequency at which teachers used instructional practices designed to engage students in learning science, we used the TIMSS 2011 Instruction to Engage Students in Learning (IES) Scale, Eighth Grade (Foy, et al., 2013). The original scale was created based on teachers’ responses to four Likert-type items regarding how often they used instructional practices such as summarizing instructional goals and effective questioning techniques. Using PCA, we created a continuous composite variable, with higher values representing greater use of these practices. The new standardized variable, ENGAGE, was non-normally distributed across 39 countries and had a Cronbach’s alpha reliability coefficient of \( \alpha = 0.54 \).

To represent the structure and scope of national science education policy in participating countries, we created two new variables using responses to three items from the TIMSS 2011 Curriculum Questionnaire. Based on responses to items regarding the existence of a national science curriculum and specific aspects of the curriculum, we created a sum score representing the strength of the national framework for science education, where higher scores represent a greater number of curricular components mandated at the national level (i.e., National Science Education Framework [National Research Council, 2012]). Countries that did not have a mandated national curriculum (e.g., Australia and the United States) received zeroes for this variable. The newly-created variable,
NAT_FRAME, was non-normally distributed across the sample and had a Cronbach’s alpha reliability coefficient of $\alpha = 0.84$.

The second national policy measure, National Emphasis on Science Process Skills, was based on responses to checklist items which asked how much emphasis the national science curriculum placed on five specific science process skills. To operationalize this construct, we created a continuous variable using a PCA procedure based on the individual responses to each of the five items on the checklist, with higher scores representing greater national emphasis on process skills in 8th grade science classrooms. Again, Australia and the United States, which did not have a national science curriculum, were assigned zeroes for this measure. This derived variable, NAT_PROC, was non-normally distributed across the sample and had a Cronbach’s alpha reliability coefficient of $\alpha = 0.97$.

To control for the unique effects of classroom covariates associated with achievement, six classroom-level measures were included in the analysis. Respondents reported their years of teaching experience as a continuous control variable, which was non-normally distributed over the 39 sample countries. Three dummy-coded categorical covariates in the study included age of teacher, highest level of formal education, and post-secondary major. Two continuous control variables were created using a PCA on teachers’ responses to two separate scales—the 6-item TIMSS 2011 Teacher Career Satisfaction (TCS) Scale and the 5-item Confidence in Teaching Science (CTS) Scale.
Component scores generated from each of these procedures were standardized to have an approximate mean of zero and a standard deviation of one unit. The new standardized variable, SATISFACTN, served as a measure of how satisfied science teachers were with their current careers and generated a reliability coefficient of $\alpha = 0.71$. Similarly, the derived CONFIDENCE variable represented how confident they were in teaching science to their eighth-grade students. The reliability coefficient for this newly-created standardized variable was $\alpha = 0.75$.

One national economic indicator was the last data examined as a control variable in this preliminary analysis. GDP per capita (i.e., a general indicator of a country’s economy; Amadeo, 2015) has been shown to be a significant predictor of national achievement (Baker, Goesling, & LeTendre, 2002; Schmidt, 2001). In the current study, this variable also was distributed non-normally throughout the sample.

A more detailed summary of all variables is found in Table A2 in the Appendix. Due to the restrictions of page size for this monograph, readers who desire a copy of the description of items used to construct the composite variables and the variables’ descriptive statistics in a standard 8.5 by 11 page format can make that request from the AAPP office (see p. ii).

METHODS OF ANALYSIS

All univariate, bivariate, and multivariate analyses were conducted using Stata ® v12 (StataCorp., 2011). Univariate analyses included descriptive statistics that provided information about the distribution of the sample data; and bivariate analyses validated the
statistical associations between each covariate and 8th grade science achievement. To examine the multiple levels of influence (e.g., classroom and country) that explain variations in science achievement outcomes, each research question was examined using a series of two-level linear multilevel models (MLMs) with classrooms nested within countries. Due to the non-probability sampling of countries at the highest level, survey weights were not incorporated into this study in accordance with the procedures used in Heeringa, et al. (2010).

To examine the unique effects of classroom and country level covariates as well as the hypothesized moderating effects of national education policy on classroom science achievement, six MLMs were examined using a model-building strategy as discussed by Raudenbush and Bryk (2002). The MLMs were examined in order of complexity.

To examine the unique effects of classroom and country level covariates as well as the hypothesized moderating effects of national education policy on classroom science achievement, six MLMs were examined using a model-building strategy as discussed by Raudenbush and Bryk (2002). The MLMs were examined in order of complexity.

The analysis begins with the simplest model that included no predictors, and it ends with the most complex models, which were designed to test the hypotheses, with cross-level interaction terms. More specifically, the simplest model is an unconditional model (Model 1) with no predictors, which is used to examine classroom science achievement in a typical country and estimates the variability
of achievement across countries. Next, a level-1 model (Model 2) is used to test the extent to which science achievement varied based on classroom-level context variables, including instructional practices and teacher background characteristics. Model 3 was used to investigate the combined effects of country-level and classroom-level predictors on science achievement.

Subsequently, to address the study’s research questions and investigate the potential moderating effect of national science policy on the relationship between classroom instructional practices and 8th grade science achievement, four distinct interaction models (i.e., Models 4a-d) were examined. Model 4a contained the fixed effects from Model 3 as well as the cross-level interaction between national science education framework and instructional practices that engage students in science learning. Model 4b examined the cross-level interaction between national science education framework and instructional practices that emphasize science investigation. The cross-level interaction between national emphasis on science process skills and classroom instructional practices that engage students in science learning was examined in Model 4c. Finally, Model 4d inspected the cross-level interaction between a national emphasis on science process skills and classroom instructional practices that emphasize science investigation. Table A1 (see Appendix, pp. 170-171) specifies the Level 1 and Level 2 mixed model equations examined in this study.

All MLMs were estimated using maximum likelihood estimation with a simple variance-components structure for the cross-country random effects of the INVESTIGATE and ENGAGE
variables, which represent classroom instructional practices. Beyond
the unconditional model, likelihood-ratio tests were used to
determine if each successive model (i.e., with more parameters) was
significantly better than the previous model in fitting these data.
Formal tests of the tenability of the assumptions for MLMs were
conducted using diagnostic tools available in Stata@v12 and
validated using the MIXED_DX macro in SAS®v9.4 (Bell,
Schoeneberger, Morgan, Komrey, & Ferron, 2010).

RESULTS

The sample characteristics are described briefly here, but a
full table of all variable parameters is available on request from the
first author (see AAPP contact information, p. ii). Primary
descriptors of the sample show that over 60% of teachers were
female, and teachers reported (on average) about 17 years of
teaching experience. A little over half of teachers in the sample
reported an age between 30 and 49 years. Over 90% of teachers had
the equivalent of a Master’s degree or higher, and more than 80%
majored in science during post-secondary studies.

Table 1 shows the Means and Standard deviations for the
composite variables created to measure three major concepts
relevant to the hypotheses of this study. As previously described and
discussed in the measurement section, the table contains variables
related to Science Achievement (Plausible Values 1-5), Instructional
Practices (4 teacher-level variables) and National Policy (3 country-
level variables). Means and standard deviations (SD) are reported for
raw data and factor scores as indicated by superscripts a and c.
Table 1. Sample characteristics for Science Achievement, Instructional Practices and National Policy variables

<table>
<thead>
<tr>
<th>Composite Variables</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avg. Classroom Science Achievement</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plausible Value #1</td>
<td>490.43</td>
<td>75.76</td>
</tr>
<tr>
<td>Plausible Value #2</td>
<td>490.46</td>
<td>75.37</td>
</tr>
<tr>
<td>Plausible Value #3</td>
<td>491.40</td>
<td>74.64</td>
</tr>
<tr>
<td>Plausible Value #4</td>
<td>490.28</td>
<td>75.61</td>
</tr>
<tr>
<td>Plausible Value #5</td>
<td>491.11</td>
<td>75.12</td>
</tr>
<tr>
<td><strong>Classroom (teacher level variables)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction with teaching&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.00</td>
<td>.86</td>
</tr>
<tr>
<td>Confidence in teaching science&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.02</td>
<td>.85</td>
</tr>
<tr>
<td>Emphasis on investigation&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-.01</td>
<td>.87</td>
</tr>
<tr>
<td>Engaging students&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.00</td>
<td>.73</td>
</tr>
<tr>
<td><strong>Country-level variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP per capita, in trillions</td>
<td>1.11</td>
<td>2.74</td>
</tr>
<tr>
<td>National framework for science education&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.71</td>
<td>1.41</td>
</tr>
<tr>
<td>National emphasis-science process skills&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.05</td>
<td>.86</td>
</tr>
</tbody>
</table>

<sup>a</sup> Reported as mean of raw data  
<sup>b</sup> Reported as percentage  
<sup>c</sup> Reported as mean of factor score

Results from the multilevel model-building process are not displayed in this monograph due to page-size restrictions; however, a results table is available on request from the first author (See AAPP contact information, p. ii). The baseline unconditional model (Model 1) revealed that more than 50% of the variance in 8th grade classroom science achievement could be attributed to the country with which each classroom is affiliated.

**Classroom-level effects on 8th grade science achievement**

The level-1 model (Model 2), which is conditioned on classroom and teacher fixed effects, revealed significant associations with 8th grade classroom science achievement for virtually all covariates included in the model (from $p < .05$ to .001). Results from Model 2 indicated differential fixed effects for each classroom-level
covariate, adjusting for all other level-1 covariates in the model. Results show that average classroom science achievement for 8th graders increases with teachers' increasing years of teaching experience ($p < .05$) among other teacher variables most of which attained higher levels of significance.

In addition to the teacher-experience variable, seven other other factors also contributed to classroom science achievement. Average 8th grade science achievement also was higher for teachers over the age of 30 ($p < .001$), was greater when the classroom teacher was female ($p < .001$), and was higher for teachers who attained advanced graduate degrees ($p < .001$). Teachers who majored in science and science education tended to have, on average, classroom science scores that were higher than scores for teachers who majored in other subject areas ($p < .001$). Furthermore, average classroom science achievement also was higher for teachers who were satisfied with their teaching careers ($p < .001$) and for those who felt more confident in teaching science to their 8th grade students ($p < .001$). Average classroom science scores also increased for teachers who frequently use instructional practices that emphasize science investigation ($p < .05$) but decrease the more teachers used instructional practices that engage students in science learning; however, this latter effect was not statistically significant. Similar fixed effects also were found for these classroom-level covariates when country-level variables were added to the model (Model 3).

Country-level effects on 8th grade science achievement

Results from Model 3 revealed unique country-level effects on 8th grade science achievement when adjusting for both classroom
and country-level covariates. An examination of the individual country-level effects from Model 3 revealed that, on average, classroom science achievement in Grade 8 was higher for more affluent countries based on \textit{GDP per capita} \((p < .01)\). In addition, a \textit{national framework for science education} appeared to have a negative effect on classroom 8\textsuperscript{th} grade science achievement; the more extensive the framework mandated at the national level, the lower the average 8\textsuperscript{th} grade science scores that a country achieved, on average \([p < .01]\)). The opposite effect occurred for the \textit{national emphasis on process skills} variable (i.e., average 8\textsuperscript{th} grade science scores increased the more a country’s national science-education curriculum stressed the use of select science inquiry practices in the classroom \([p < .01]\)).

Model 4a investigated the extent to which a \textit{national framework in science education} influenced the relationship between \textit{instructional practices engaging students in science learning} and classroom science achievement. As shown in Figure 2, the relationship between 8\textsuperscript{th} grade science achievement and the use of instructional practices engaging students in science-learning changes, depending on the magnitude of the curriculum framework mandated by a country. For classrooms with higher than average use of these instructional practices, it appears that the magnitude of the national policy framework is not related significantly to science achievement. Conversely, for classrooms with lower than average use of these practices, those located in countries with a minimal national framework have higher average classroom science achievement than those within countries with a more mandated framework of science.
Figure 2. Cross-level interaction between national framework for science education and instructional practices, engaging students in science learning.

Statistical results also reveal that the magnitude of a national framework in science education did not moderate the relationship between average classroom science achievement and the use of instructional practices that emphasize investigation in science instruction (Model 4b, $p=N.S.$). Additionally, these results show that the emphasis that a country’s science education curriculum places on science-process skills did not affect the relationship between average classroom science achievement and instructional practices that engage students in science learning (Model 4c, $p=N.S.$) or the
relationship between 8th grade science achievement and instructional practices that emphasize science investigation (Model 4d, $p=N.S.$).

**DISCUSSION**

The current study found evidence supporting a significant influence of certain national policies on the relationship between instructional practices and 8th grade classroom science achievement. Specifically, the relationship between instructional practices that engage students in science learning and average classroom science achievement seems to be influenced by the magnitude of a country's national framework in science education.

Another finding from our analysis was the negative relationship between instructional practices that engage students in science learning and classroom science achievement. Moreover, this negative relationship was strengthened and became statistically significant when the model was adjusted for the cross-level interaction between the engagement variable and the national framework for science education, suggesting the relationship between instructional practices that engage students in science learning and science achievement may be dependent on other conditions at the country level not accounted for in this study. Furthermore, the plot of the significant cross-level interaction in Figure 2 is evidence that the negative relationship between instructional practices that engage students in science learning and science achievement appears to be driven by countries with a minimal national framework in science education (e.g., Australia and the United States). Given that previous research into the interrelationships between these three constructs is inconclusive, the
nature of the unexplained phenomenon found in this study presents a topic for future research.

CONCLUSIONS

The findings in the current study are limited by several design factors. The unweighted analysis (due to lack of available survey weights at the country level) restricts the generalizability of the results; thus, findings can only be associated with the 39 countries included in the analysis.

In addition, the use of self-reported questionnaire data from teachers means that variables used to represent classroom instructional practices may not reflect actual teacher behaviors. Future studies may include students' views of classroom practices to validate teacher responses, resulting in a more comprehensive view of what really is occurring in the classrooms. Consequently, the statistical models in this study do not control for student variables that are known to affect student achievement (e.g., home resources, academic self-concept, parental factors, etc.; Kaya & Rice, 2010). Future studies that include student-level covariates may find that more variance in student achievement can be explained.

Finally, only two variables were used to represent national policy on science education and one covariate (GDP) was used to control for variance at the country level. Future studies may explore additional country-level variables related to educational outcomes to explain more of the variance at this highest level.

This study was designed to shed light on the persistent trends in international rankings in 8th grade science achievement by investigating the potential moderating role that national education
policy might have on the relationship between classroom instructional practices and science achievement. Examining differences in cross-country classroom instructional practices could hold policy implications at all levels of educational systems. It also may provide a lens through which policy makers, educators and researchers discover target areas in science instruction to inform decisions related to teacher preparation programs, professional development opportunities for in-service teachers, and teacher assessment instruments. Given the recent widespread policy focus on classroom and teacher effects on student achievement (National Council on Teacher Quality, 2012), continuing the inquiry into these factors and their relationship to national policy is recommended highly as a focus for future research.

REFERENCES


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## APPENDIX

**Table A1.** Mixed model equations for the National Policy, Instructional Practices, and Science Achievement Study

<table>
<thead>
<tr>
<th>Model</th>
<th>Mixed-model Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>( \text{AVGSCIACH} = \gamma_{00} + \gamma_{01}(GDP_{2011}) + \gamma_{02}(NAT_FRAME) + \gamma_{03}(NAT_PROC) + \gamma_{10}(TEACH_YRS) + \gamma_{20}(TEACH_AGE) + \gamma_{30}(GENDER) + \gamma_{40}(EDUCATION) + \gamma_{50}(MAJOR) + \gamma_{60}(SATISFACTN) + \gamma_{70}(CONFIDENCE) + \gamma_{80}(INVESTIGATE) + \gamma_{90}(ENGAGE) + \gamma_{92}(ENGAGE \ast NAT_FRAME) + u_{0j} + u_{8j}(INVESTIGATE) + u_{9j}(ENGAGE) + e_{ij} )</td>
</tr>
<tr>
<td>4b</td>
<td>( \text{AVGSCIACH} = \gamma_{00} + \gamma_{01}(GDP_{2011}) + \gamma_{02}(NAT_FRAME) + \gamma_{03}(NAT_PROC) + \gamma_{10}(TEACH_YRS) + \gamma_{20}(TEACH_AGE) + \gamma_{30}(GENDER) + \gamma_{40}(EDUCATION) + \gamma_{50}(MAJOR) + \gamma_{60}(SATISFACTN) + \gamma_{70}(CONFIDENCE) + \gamma_{82}(INVESTIGATE \ast NAT_FRAME) + \gamma_{90}(ENGAGE) + u_{0j} + u_{8j}(INVESTIGATE) + u_{9j}(ENGAGE) + e_{ij} )</td>
</tr>
</tbody>
</table>

*Table A1 (continued). Models 4c and 4d on next page*
\[
4c \quad \text{AVGSCIACH} = \gamma_{00} + \gamma_{01}(\text{GDP}_{2011}) + \gamma_{02}(\text{NAT\_FRAME}) + \gamma_{03}(\text{NAT\_PROC}) + \gamma_{10}(\text{TEACH\_YRS}) \\
+ \gamma_{20}(\text{TEACH\_AGE}) + \gamma_{30}(\text{GENDER}) + \gamma_{40}(\text{EDUCATION}) + \gamma_{50}(\text{MAJOR}) \\
+ \gamma_{60}(\text{SATISFACTN}) + \gamma_{70}(\text{CONFIDENCE}) + \gamma_{80}(\text{INVESTIGATE}) \\
+ \gamma_{90}(\text{ENGAGE}) + \gamma_{93}(\text{ENGAGE} \times \text{NAT\_PROC}) + u_{0j} + u_{8j}(\text{INVESTIGATE}) \\
+ u_{3j}(\text{ENGAGE}) + e_{ij}
\]

\[
4d \quad \text{AVGSCIACH} = \gamma_{00} + \gamma_{01}(\text{GDP}_{2011}) + \gamma_{02}(\text{NAT\_FRAME}) + \gamma_{03}(\text{NAT\_PROC}) + \gamma_{10}(\text{TEACH\_YRS}) \\
+ \gamma_{20}(\text{TEACH\_AGE}) + \gamma_{30}(\text{GENDER}) + \gamma_{40}(\text{EDUCATION}) + \gamma_{50}(\text{MAJOR}) \\
+ \gamma_{60}(\text{SATISFACTN}) + \gamma_{70}(\text{CONFIDENCE}) + \gamma_{80}(\text{INVESTIGATE}) \\
+ \gamma_{83}(\text{INVESTIGATE} \times \text{NAT\_PROC}) + \gamma_{90}(\text{ENGAGE}) + u_{0j} \\
+ u_{8j}(\text{INVESTIGATE}) + u_{9j}(\text{ENGAGE}) + e_{ij}
\]
### Table A2. Description of variables used in predicting classroom science achievement, TIMSS 2011, Grade 8

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>AVGSCIACH</td>
<td>Classroom average of science plausible values for TIMSS 2011, Grade 8. Continuous variable.</td>
</tr>
<tr>
<td><strong>Classroom (Level 1) variables</strong></td>
<td></td>
</tr>
<tr>
<td>TEACH_YRS</td>
<td>Teacher’s total number of years teaching. Continuous variable.</td>
</tr>
<tr>
<td>TEACH_AGE</td>
<td>Teacher’s age in years. (0= under 30 years; 1= 31-49 years; 2= over 50 years)</td>
</tr>
<tr>
<td>GENDER</td>
<td>Teacher’s reported gender (0=female; 1= male)</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>Teacher’s education (0=Bachelor’s or below; 1=Master’s; 2=Doctoral)</td>
</tr>
<tr>
<td>MAJOR</td>
<td>Teacher’s major or main area(s) of post-secondary study (0= science and science education; 1= science education only; 2= science only; 3= all other majors)</td>
</tr>
<tr>
<td>SATISFACTN</td>
<td>Standardized index of teacher’s satisfaction with career in teaching. Continuous variable.</td>
</tr>
<tr>
<td></td>
<td>Standardized index of teacher’s confidence in teaching science to</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>INVESTIGATE</td>
<td>Standardized index of the frequency in which teachers use instructional practices that emphasize science investigation. Continuous variable.</td>
</tr>
<tr>
<td>ENGAGE</td>
<td>Standardized index of the frequency in which teachers use instructional practices that engage students in science learning. Continuous variable.</td>
</tr>
</tbody>
</table>

*Country (Level 2) variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAT_FRAME</td>
<td>Standardized index representing the extent to which a country mandates a nationwide curriculum in science education. Continuous variable.</td>
</tr>
<tr>
<td>NAT_PROC</td>
<td>Standardized index representing the degree to which country’s nationwide curriculum for science education emphasizes the use of science process skills. Continuous variable.</td>
</tr>
</tbody>
</table>