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Measuring the Impact of Cognitive Behavioral Coaching with Nonverbal Immediacy on the Self-Efficacy of Undergraduate Students in STEM Courses

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Melissa Benton Acknowledgements

My grandmother always said, “Give me my flowers while I am still alive. This way I can enjoy them. Because I can’t enjoy the beautiful flowers when I am gone.” Since these words, I have made it my mission to give people flowers. The word “flowers” implies both a denotative and connotative meaning. Denotative because my grandmother loved receiving the literal flower. “Flowers” is also connotative meaning, “verbal gratitude”. I give flowers to my Higher Power which has led me to some amazing people who guided and encouraged me on this journey, family and friends, that will remain nameless, but in my heart. I specifically would honor Rachel and Ananiah Hopper, my beautiful children. Their love, smiles, and tears reminded me of my purpose in life. My mother and father for inspiring a love and passion for education. My professors and colleagues who contributed to my intellectual knowledge. A special thank you to Rita Swiener for all the dinners and more. Plus, my ace in the hole Rose Surrey. Then there is my fan-fabulous, dissertation partner, Christopher. I will always be your biggest fan. Finally, the miracle and rock, I call Daisy.

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Thank you to everyone who helped me get here. You know who you are.

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Abstract

A quasi-experimental study explored whether the practice of cognitive behavioral coaching with an intentional focus on nonverbal immediacy has an impact on the self-efficacy of undergraduate students taking college-level STEM (Science, Technology, Engineering, and Mathematics) courses. A positive impact to self-efficacy for students who receive the coaching intervention was anticipated. The research took place at a public research university located in the Midwest. Subjects included students who were required to work with a success coach as a condition of their enrollment and/or financial aid eligibility. Information obtained included perception of nonverbal immediacy of the coaches and self-efficacy of the student, as determined by existing assessments called, Nonverbal Immediacy Scale – Observers and Self-Efficacy for Learning Form – Abridged version. Success coaches provided the coaching intervention to students through a prescribed protocol of at least four face-to-face meetings throughout the semester with regular contact via email and phone. Students participated in the coaching interventions as mentees. Students received support by coaches to supplement their academic pursuits. Paired t-Tests (see Table 7) did not confirm that there was a significant difference between the pre-assessment scores, and the post-assessment scores; therefore, the null hypotheses were not rejected.

Keywords: STEM, cognitive behavioral coaching, self-efficacy, nonverbal immediacy

Chapter 1: Introduction to the Problem

The study of the urgency and importance of effective academic coaching is critical to the retention and success of students in higher education and will be explained in the appropriate contextual framework including background, significance of the problem, the theoretical basis, and the critical research questions as they pertain to cognitive behavioral coaching with special attention on nonverbal immediacy.

Background

Seeking Basic Knowledge in Science and Mathematics

According to a 2012 presidential executive report, economic projections in the United States suggest a need for approximately one million additional science, technology, engineering, and mathematics (STEM) professionals to retain its historical preeminence in science and technology (Chang, Kwon, Stevens, & Buonora, 2016; Huneycutt, 2013; President's Council of Advisors on Science and Technology, 2012). Since the call for more STEM graduates, higher education has seriously devoted much of its energy on meeting the need for additional STEM professionals (Chang, Kwon, Stevens, & Buonora, 2016; Huneycutt, 2013; President's Council of Advisors on Science and Technology, 2012).

Some critics of the STEM movement argue that the need for more STEM majors is hyperbole (Jacobson, 2017; Ossola, 2014; Yednak, 2015; Zakaria, 2015). Alexandra Ossola (2014) of the *Atlantic*, wrote several articles on the STEM movement and states that a few "economists have questioned the statistics that STEM advocates cite to validate their programs and actions" p.1) For example, some economists state that the United States has never done well on international tests, yet the country is far more

successful than others (Zakaria, 2015). United States has done well in innovation, research and development, and the number of high-tech companies (Zakaria, 2015). The three innovations that have propelled the Unites States economy the most are the computer, the microchip, and the internet (Isaacson, 2019). Crystal Yednak (2015), a writer that reports on education and parenting topics for national and regional publications, shares that STEM critics worry that the increasing emphasis on the subjects can cause students to lose other key skills such as foreign language and the arts. Fareed Zakaria (2015), host of CNN's Fareed Zakaria GPS, contributing editor for the *Atlantic* and *The Washington Post* warns that the "dismissal of broad-based learning…" (humanities, art, history, foreign language, English, philosophy, and other disciplines and skills that falls outside of STEM disciplines and skills), "…puts America on a dangerously narrow path for the future" (p.1). Zakaria (2015) continues to explain that broad general education is what helped foster critical thinking and creativity that led to the United States' "economic dynamism, innovation, and entrepreneurship" (p.1). Currently some educators and advisors believe that administrators and/or policies are forcing students to choose one area of study, instead of allowing students to explore many areas of study in order to avoid feelings that they are stuck or entrapment in a STEM field. (Jacobson, 2017).

However, the current American workforce skills require that talent must have knowledge in areas of data and computation (Business-Higher Education Forum, 2018). Moreover, the workforce in the United States is desperately seeking talent with a mixed set of skills in many fields of study (Burning Glass Technologies, 2015a, 2015b; Business-Higher Education Forum, 2018). The talent needed to fulfill positions in the

STEM fields must possess knowledge in the fields of mathematics, cybersecurity, computer science, data science, and analytics (Burning Glass Technologies, 2015a, 2015b; Business-Higher Education Forum, 2018).

Thirteen percent of students entering postsecondary education in the 2003-2004 school year graduated with a degree in the STEM disciplines or were still in one of the majors after six years (Chen & Soldner, 2013). Of students seeking a bachelor's degree, 28% were majoring in a STEM field with 52% of those students graduated or remained in STEM (Chen & Soldner, 2013). A solution proposed by policymakers is "reducing STEM attrition in college" because retaining more students leads to a wider pool of professionals in the STEM fields (U.S. Department of Education, 2014, para. 1). Students majoring in STEM who perform better in their non-STEM courses are more likely to change to a non-STEM major (Business-Higher Education Forum, 2018; U.S. Department of Education, 2014). Therefore, it is important to provide supports to these students that may influence success in undergraduate STEM courses.

The Association of American Colleges and Universities (2018), an organization that assists colleges and universities with advancing the quality, vitality, and equity in higher education has proposed that non-STEM majors need to demonstrate a proficiency in science, mathematics, and technology. They have urged liberal arts institutions to revise their general studies course curriculum for undergraduate degrees (AAC&U, 2018). The revision ensures that the curriculum intentionally includes mathematics, science, and technology (AAC&U, 2018; Botstein, 2018; Enderson & Ritz, 2016). These upgrades to undergraduate curriculum include but are not limited to creating general education courses in coding and computation; a fundamental grasp of mathematics,

statistics, probability; and advancements in technology advancements (Bolstein, 2018). Therefore, regardless of academic major, all students must demonstrate an ability to perform in STEM coursework.

Recognizing the Student Point of View

Many students feel timid when engaging in science and mathematics courses (Enderson & Ritz, 2016). This lack of courage may be a factor of or cause low self-efficacy in science and mathematics. Also, students may show apathy or dislike towards science and mathematics due to the perception that the subject matter is difficult (Enderson & Ritz, 2016). Enderson & Ritz (2016) identified five research studies conducted between 2010- 2015 that showed students demonstrated apathy and reported feelings of disregard to their need for academic support in science and mathematics courses. They found that more than 40% of college students tend to circumvent or avoid majors that require mathematics and science courses (Enderson & Ritz, 2016). Additionally, research found that students with low self-efficacy also avoid STEM courses and careers (McPhee et al, 2013; Williams & George-Jackson, 2014). However, a student's choice to avoid science and mathematics, contributes to a decline in America's economic ability to compete technologically with the rest of the world (Burning Glass Technologies, 2015; Business Higher Education Forum, 2018; Engler, 2012; Office of Science and Technology Policy, 2017; U.S. Department of Education, 2014,).

One area of concern is lower performing students in higher education courses. In a report on STEM attrition by Chen and Soldner (2013), "lower performing" was defined as having a cumulative grade point average below 2.50. Lower performing students tend to demonstrate difficulty in undergraduate introductory science and mathematics courses.

(Chen and Soldner, 2013; Endersen and Ritz, 2016). Chen and Soldner (2013) suggest that one way higher education can increase undergraduate degrees in STEM is by focusing on developing support services for lower performing students, especially in science, mathematics, and technology courses (Chen and Soldner, 2013). Recent studies have found a positive connection between academic coaching and STEM achievement in college and university lower achieving students. These studies report students who receive academic coaching are more inclined to maintain a STEM major, additionally students who achieved academic success in science and mathematics courses are inclined to switch from a non-STEM major to a STEM major (Bellman et al, 2015; Bomar, 2015; Enderson & Ritz, 2016; Gose, 2014).

Improving Student Self-Efficacy

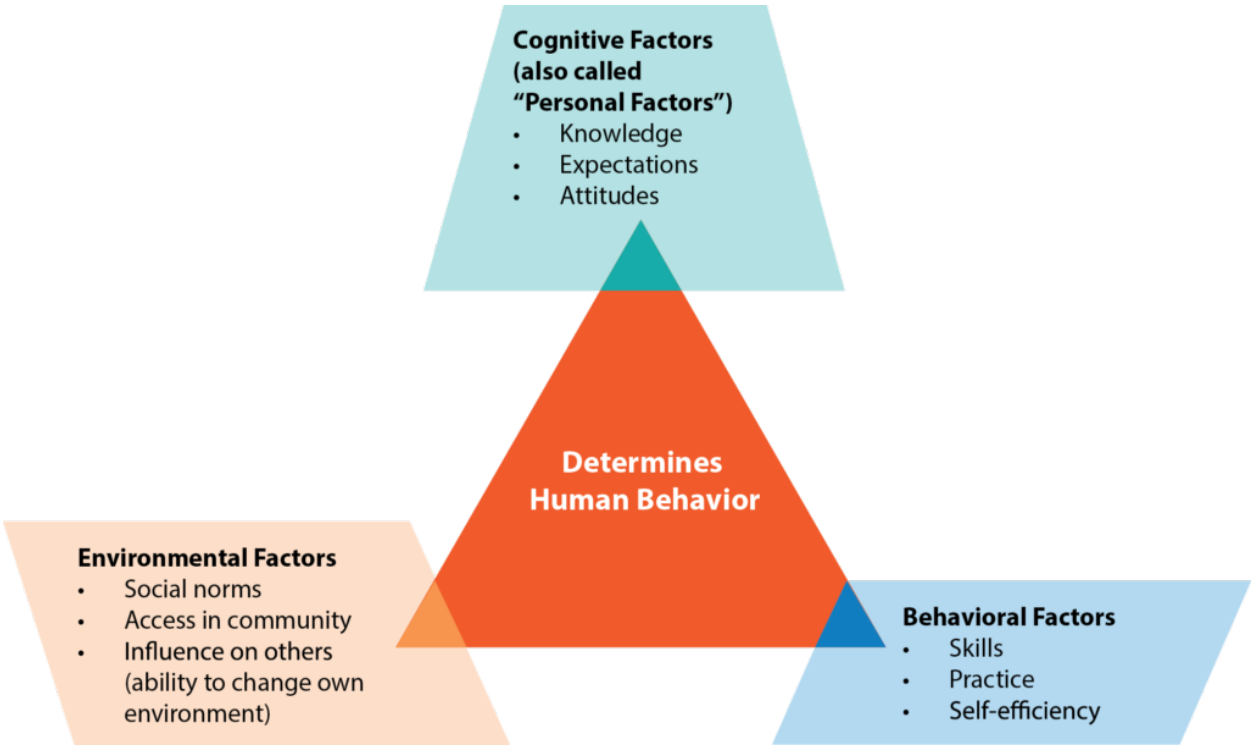
Higher self-efficacy positively contributes to persistence in STEM career paths (van Aalderen-Smeets et al, 2017). As students' positive self-efficacy beliefs regarding STEM topics increases, so does the likelihood that they will pursue a STEM degree (van Aalderen-Smeets et al, 2017). Schunk and Pajares (2009) define self-efficacy as "perceived capabilities for learning or performing actions at designated levels" (pp. 35). This is echoed by Talsma, Schuz, Schwarzer, and Norris (2018), who describe self-efficacy as the perception held by an individual with regard to their ability to achieve specific outcomes, by organizing and executing specific courses of action. That is self-efficacy represents people's beliefs about their capabilities to perform tasks at a certain level of proficiency, which in turn influences how an individual approach a task – e.g. effort, persistence, achievement (Meral et al, 2012; Schunk & Pajares, 2002; Yusuf, 2011).

High self-efficacy creates the belief that one can achieve positive outcomes; seeing difficult tasks as challenges and not threats (Putwain et al, 2013; Yusuf, 2011). As a result, individuals experience more pleasant emotions, like enjoyment, instead of anxiety and other unpleasant emotions (Putwain et al, 2013). Self-efficacy is a strong influencer of motivation, achievement, and self-regulation. An individual with high self-efficacy will show higher participation, higher persistence, and a greater interest in learning (Schunk & Pajares, 2009). Individuals tend to participate in activities and perform tasks in which they feel confident and avoid those in which they feel less confident (Schunk & Pajares, 2009). Meral, Colak, and Zereyak (2012) state that "…the beliefs that individuals hold about their abilities and outcome of their efforts influence in great ways how they will behave" (pp.1143).

To gain a better understanding of how humans develop their beliefs that influence their behavior, we turn to the research by Albert Bandura on Social Cognitive Theory (SCT). Bandura (1986) posits that "what people, think, believe, and feel affects how they behave" (pp. 3). People's behavior is caused by personal, behavioral, and environmental influences (Bandura, 1986). SCT is a learning theory based on the idea that people learn by observing others. Bandura states that the theory can be explained through three determinants – personal, behavioral, and environmental (Bandura, 1986).

Figure 1

An Illustration of Social Cognitive Theory



Adapted from John Hopkins University, 2016, from the website Social Behavior Change Communication for Emergency Preparedness Implementation Kit- Social Cognitive Learning Theory

A central part of behavioral factors that determines human behavior is self-efficacy. Bandura (1995) defines self-efficacy as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" (pp. 2). Furthermore, an individual's self-efficacy plays a major role in how goals, tasks, and challenges are approached. Bandura (1986) infers that individuals with high self-efficacy are more likely to believe they can overcome challenges and disappointments. And individuals with low self-efficacy avoid challenging tasks.

Self-efficacy is closely related to academic performance and can predict academic success in college (Han et al, 2017; Talsma et al, 2018). According to Social Cognitive Theory, self-efficacy is motivational, and it promotes persistence when faced with adversity, increases long-term planning and intentional behaviors, and encourages self-regulation (Komarraju & Nadler, 2013). A student's use of academic skills and their development is directly resultant of their self-efficacy (Schunk & Pajares, 2009). It is believed that if students are trained to increase their positive self-efficacy beliefs, their academic performance is enriched (Meral et al, 2012). Because of this, "…direct manipulation of self-efficacy has long been recommended as an intervention strategy in learning settings" (Talsma et al, 2018, pp. 137). Higher education institutions are implementing programs outside of the classroom to support and encourage students' academic success, especially with at-risk students (Moore, 2012).

Introducing the Concept of Academic Coaches

Institutions have created various academic support programs with intention to support lower performing students as a means to increase their overall retention and graduation rates. One such best practice that is gaining momentum is academic/success coaching (Kolvoord et al, 2016; Robinson, 2015). A national survey reports that the majority of programs focused on coaching were developed after 2005, with most of those being established after 2010 (Robinson, 2015). Whereas there are a number of definitions used to describe coaching, there is agreement in that coaching assists in setting/attaining goals and supporting personal development of individuals (Iordanou et al, 2015). Capstick et al (2019) define academic coaching as the following:

> Academic coaching is characterized as a collaborative relationship between an individual acting as an academic coach and a student who focuses on the student's personal and professional goals through the development of self-awareness; strength building; academic planning; and definition of the student's purpose, interests, and values in order to aid in completion of the degree (pp. 2).

It is said that the learning one experiences in coaching is lasting and emphasizes shifts in perspectives to move past barriers to success (Griffiths, 2012).

There is not a consistent theoretical or conceptual framework among the many academic coaching programs in higher education institutions (Capstick et al, 2019; Robinson, 2015). The universities, colleges, and community colleges that have implemented academic coaching programs differ among institutions (Capstick et al, 2019; Robinson, 2015). Additionally, there is limited empirical research on academic/success coaching within a higher education setting (Blakenship, 2017; Robinson, 2015). One possible explanation for the lack of research on coaching programs could be that it is still a relatively new student support mechanism (Blakenship, 2017; Capstick et al, 2019). Robinson (2015) expressed the importance of establishing "a clear sense of purpose" for coaching programs that are anchored in research. Learning is the "heart of coaching" with roots in constructivism and psychology according to the existing research (Griffiths, 2012; Robinson, 2015).

Some higher education institutions define academic coaching as the "one-on-one process of helping a student identify his or her study strengths and needs (Thomas Rivera Center, 2016, pp.4). Additionally, "academic coaches assist students with building

general and transferable skills…throughout their academic career and beyond" (Thomas Rivera Center, 2016, pp.4). In order for academic success coaches to help students achieve academic success and goal attainment, a coach must have excellent oral and written communication skills, as well as being perceived as approachable (McCluskey et al 2017; Thomas Rivera Center, 2016).

Academic coaching as an intervention strategy has shown to have significant, positive impact on at-risk student populations (such as students with disabilities seeking a STEM degree) in attaining skills needed to be successful in postsecondary institutions (Bellman et al, 2015; Lefdahl-Davis et al, 2018). In their analysis of a student coaching program, Bettinger and Baker (2014) found that students who received academic coaching graduated at higher rates and were more likely to persist during and after the intervention than students who did not receive academic coaching. Furthermore, coaching was shown to be more cost-effective than other previously studied interventions, when looking at retention and degree completion of college students (Bettinger & Baker, 2014). In fact, coaching is effective as a student support for undergraduate students across multiple domains as it is founded in positive psychology and explores the "strengths, values, goals, and dreams of students, while addressing how to overcome barriers [and] find purpose and identity" (Lefdahl-Davis et al., 2018). Academic coaching enhances the academic life of undergraduate students and their experience at an institution of higher education by providing someone to serve as a navigator to keep students connected to the resources they need to be successful.

Cognitive Behavioral Coaching

Cognitive Behavioral Coaching (CBC) developed from cognitive behavioral therapy and "focuses on individuals' cognitive appraisals of events in order to understand their emotional and behavioral reactions to these events" and can be defined as helping individuals advance their proficiencies in a particular area with a concentrated focus on "the beliefs, behaviors, and emotions that help or hinder this development" (Neenan, 2018, p. ix). It is time-limited coaching, in that CBC focuses only on the present and is supported by the theory that behaviors and actions are a result of emotions generated by beliefs that are shaped by one's thoughts and beliefs about the situation at hand (Whitten, 2014). According to Neenan (2018), CBC consists of two primary elements: removing psychological blocks that impede goal-attainment and achieving one's goal.

When writing about CBC, Whitten (2014) highlights the work of Tony Grant, a coaching psychologist from the University of Sydney who observed that the combination of cognitive and behavioral approaches was associated with increased academic performance. Grant's study showed that a group of trainee accountants who received behavioral coaching without cognitive input exhibited positive change in their academic performance, but the change did not last. In the group that received training in cognitive techniques only, without a behavioral element, academic performance decreased. It was the group who received cognitive and behavioral feedback which had a significant, positive impact on academic performance, and this change was lasting (Whitten, 2014).

Past experiences are extracted simply to gain insight as to why and how those events led to the individual's current thinking and behavior in Cognitive Behavioral Coaching (McMahon, 2007). For example, a student may have experienced great

difficulty with mathematics in high school. Because of this, the student may have developed a mental block; thinking she/he will not ever be good at mathematics. Through the collaborative process of guided discovery, a fundamental element of Cognitive Behavioral Coaching, Socratic questioning helps the student identify what past events may have created the irrational belief of never being good at mathematics and how current thoughts and behaviors can be modified to develop more rational decision-making in the present.

Confirming Immediacy

A critically important component of academic coaching is interpersonal communication, particularly nonverbal immediacy (McCroskey et al, 2017; Richmond, 2003). Nonverbal immediate behaviors are behaviors that increase psychological and psychical closeness between communicators (Mehrabian, 1969, 1971; Ozmen, 2010). These nonverbal immediate behaviors are, positive head nods, proximity (close physical distances), vocalics, smiling, oculesics (eye contact), and relaxed body position (McCroskey et al, 2017; Richmond et al, 2003). The research has "indicated that communicators who engage in nonverbally immediate behaviors with others are seen by others in a more positive way than they see people who do not engage in those communication behaviors" (Mehrabian, 1971, pp. 1; Richmond et al, 2003). Albert Mehrabian's research advanced the concept of immediacy, noting that the immediacy of the sender impacts the receiver's behavior, motivation, sense of self, and self-efficacy (McCroskey et al, 2017; Mehrabian, 1971; Ozmen, 2010; Richmond et al, 2003). Mehrabian (1971) concludes that "people are drawn toward persons and things they find comfortable, like, evaluate highly, and prefer" (1971, pp. 1). On the other hand, people

"avoid or move away from things they find uncomfortable, dislike, evaluate negatively, or do not prefer" (pp. 1). Thus, immediacy may be seen as an important coaching behavior that has a strong impact on the student's learning and motivation (Ozmen, 2010).

Communication research reports that students in science and mathematics courses seem to have a greater need for positive immediate behaviors in the teacher (sender) (McCluskey et al, 2017). Essentially, the research study by McCluskey, Dwyer, & Sherrod (2017) noted that immediacy was more important to students' academic success in science and mathematics courses. They explained why immediacy is important because some students are uncomfortable with science and mathematics. Hence, positive immediate behaviors may have played a role in academic success of students in science and math courses and whether or not the student continues additional science and mathematics courses. The Nonverbal Immediacy Scale - Observers instrument measures the degree an individual exhibits apathy, fear, discomfort, and/or distrust with the subject matter (McCluskey et al, 2017, Richmond et al, 2003 and Richmond et al, 2013). Positive nonverbal immediacy scores correlated with successful completion of the task, whereas negative immediacy scores correlated with unsuccessful completion of the task. One research study noticed a connection between teachers' immediacy to student's motivation in science and mathematics courses (Mottet et al, 2008). Researchers are recommending further study on immediacy's role in science, technology, engineering, and mathematics studies recruitment and retention efforts in the classroom and beyond the classroom (McCluskey et al, 2017). The literature review will provide more details

about the Nonverbal Immediacy-Observers created by doctors' James McCroskey, Virginia Richmond, and Aaron Johnson.

Statement of the Problem

Undergraduate students in US colleges are refraining or choosing to circumvent science and mathematics courses due to a lack of confidence in their ability to successfully complete the course work (Enderson & Ritz, 2017). Additionally, research has demonstrated student's apathy for science and mathematics due to the perception that the subject matter is difficult (Enderson & Ritz, 2017 & Kelly, 2015). According to Enderson & Ritz (2016) a majority of students agreed that they lack support in science and mathematics (Enderson & Ritz, 2016). Avoiding science and mathematics is contributing to a decline in America's ability to compete on the economic stage with the rest of the world (Burning Glass Technologies, 2015; Business Higher Education Forum, 2018; Engler, 2012; Office of Science and Technology Policy, 2017).

Higher education is encouraged to make deliberate decisions to support students and encourage academic success, especially with at-risk students (Moore, 2012). Higher education institutions that focus on the academic success and retention of lower performing students in science, mathematics, and technology courses represents one way to increase undergraduate degrees in STEM (Chen & Soldner, 2013).

Purpose of this Study

High self-efficacy contributes positively to persistence in STEM career paths, while those with lessened self-efficacy may decide to avoid STEM courses and careers (McPhee et al, 2013; Williams & George-Jackson, 2014). As positive self-efficacy beliefs in STEM increase, so does the likelihood that students will pursue a STEM degree

(van Aalderen-Smeets et al, 2017). It is believed that if students are trained to increase their positive self-efficacy beliefs, their academic performance is enriched (Meral, Colak, & Zereyak, 2012). Because of this, "…direct manipulation of self-efficacy has long been recommended as an intervention strategy in learning settings" (Talsma et al, 2018, pp. 137).

Academic/success coaching may provide the means to enhance a student's self-efficacy. However, because coaching exists in many different iterations, it is difficult to evaluate its effectiveness as a student support strategy. The lack of a uniform definition of and conceptual framework for academic/success coaching is problematic in researching its impact. Standardizing the practice to something that is a clearly identifiable construct allows for explicit research to continue in the promotion of academic/success coaching on a broader scale.

Intentionality as a positive influence on nonverbal immediacy practices can make the coaching relationship more substantive. As stated previously, a wide majority of meaning is derived from nonverbal communication. The majority of the literature on nonverbal immediacy pertains to "teacher immediacy." Utilizing Cognitive Behavioral Coaching that applies nonverbal communication immediacy will create consistency in the practice throughout the field of higher education, while helping students develop their self-efficacy. This distinction will allow for the fine tuning of the practice since it can be tied back to a concrete framework. Whereas currently, there is no uniform framework or definition of academic/success coaching.

Establishing quantitative research related to academic/success coaching while providing a model that can be replicated is essential to ensuring the success of lower

performing undergraduate students in STEM courses. Implementing an academic coaching program which emphasizes nonverbal immediacy may impact the self-efficacy of students in STEM courses. Quantitative measures are used to determine the impact of Cognitive Behavioral Coaching with an intentional focus on nonverbal communication immediacy on the self-efficacy of students taking STEM courses.

Figure 2

Academic Success Coaching Goal

Research Questions

The following research questions were addressed:

1. What impact will Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of lower performing undergraduate students?
2. What impact will Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of those lower performing undergraduate students taking STEM courses?
3. To what degree do undergraduate students in STEM courses recognize immediate behaviors when interacting with academic coaches?

Hypotheses

H_{01}: There is no significant difference in students' pre and post self-efficacy scores as evaluated by the SELF-A assessment when experiencing Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy.

H_{02}: There is no significant difference in students' pre and post self-efficacy scores as evaluated by the SELF-A assessment when experiencing Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy for students taking at least one STEM course.

H_{03}: There is no evidence that students recognize the nonverbal immediacy behaviors of the coach according to the nonverbal immediacy scale (NIS-O).

Definition of Terms

Academic/success coach (synonymous with "coach" and "sender"): A full-time staff member of an institution who will provide one-on-one support to students.

Lower-performing students: Designation given to students that have a cumulative grade point average below 2.50/4.0.

Coachee (synonymous with "receiver"): A student receiving coaching intervention.

Immediacy/immediacy behaviors: verbal and nonverbal communication that convey trustworthiness, caring, interest and attention, liking for and an attraction to another person.

Nonverbal immediacy: A set of interrelated behavioral cues that involve eye contact, touch, verbal tone, and physical distance.

Coaching: An education practice to support academic needs of lower-performing students.

Academic/Success Coaching: A collaborative relationship between an individual acting as an academic coach and a student who focuses on their personal and professional goals through the development of self-awareness; strength building; academic planning; and definition of the purpose, interests, and values in order to aid in completion of a degree.

Cognitive Behavioral Coaching: A coaching strategy that helps individuals advance their proficiencies in a particular area (in this case- academic achievement) with a concentrated focus on "the beliefs, behaviors, and emotions that help or hinder this development."

Self-efficacy: One's belief in their personal ability to accomplish a task

Higher self-efficacy: Heightened belief in one's ability to accomplish a task

Lower self-efficacy: Reduced belief in one's ability to accomplish a task

STEM: acronym for science, technology, engineering, and mathematics.

STEM courses: Refers to undergraduate academic courses in science, technology, engineering, and/or mathematics.

Significance

Cognitive Behavioral Coaching with nonverbal immediacy as an academic coaching model has the potential to improve science, technology, engineering, and mathematics success in retention and recruitment of students in STEM majors. In addition, it may help ensure that all students majoring in science, technology, engineering and/or mathematics demonstrate proficiency. With academic/success coaching being a relatively new student support service, institutions that currently do not have coaching programs may decide to implement such and may find this model useful.

Limitations

There are two major limitations. First, the coaches providing the intervention are employees of the university and have a vested interest in the students' success. As well, the coaches were not consulted during the research about their experiences using CBC nor was the frequency documented. It was assumed the strategies were being applied in sessions with students. To address this, assessments were to be disseminated by coaches and faculty as part of their regular educational experience to provide an objective and impersonal research environment. Second, one of the researchers of this study leads the support staff offering the coaching and could introduce bias. To address this, all processes for data collection will take place as regularly outlined by the policies and procedures of the program and institution and the researcher mentioned will not be directly involved in the collection of data.

Delimitations

The primary delimitation is that the research is confined geographically to a specific, four-year, public research university in the Midwest. Therefore, no broader generalizations are implied.

Conclusions

The economic reports state that STEM is essential to the survival and progress of the United States. The United States of America would profit greatly by increasing the number of successful students in STEM majors. Cognitive Behavioral Coaching focusing on nonverbal immediacy behaviors may contribute to more students enrolling in and successfully completing STEM courses, as well as increasing the number of students graduating with a STEM degree. Rooted in Cognitive Behavioral Therapy, Cognitive

Behavioral Coaching can provide a vehicle "to understand mentees' presenting issues and then moving towards the future to help them achieve their goals" through a "collaborative partnership in problem-solving and resilience-building" (Neenan & Palmer, 2012).

Therefore, to understand the mentee's (receiver) issues and create a partnership in problem-solving and resilience-building, the coach's (sender) "verbal and nonverbal communication must be similar in order for the receiver to understand" and accept "the intended message" (Beebe et al, 2018; Devito, 2019; Mehrabian, 1969 and 1971; Richmond et al, 2003). Not only does the coach need to articulate their attempt to resolve the mentee's problem, but the mentee must also perceive the coach's immediacy behaviors as trustworthy, caring and develop a liking for and an attraction to the coach (Mehrabian, 1969 and 1971 & Richmond et al, 2003). Additionally, if the receiver believes the task is difficult or too challenging or have low self-efficacy, the receiver is more sensitive to nonverbal immediacy behaviors (McCluskey et al, 2017). Since science and mathematics tend to be seen by lower performing students as difficult and too challenging, they are part of the group of receivers who are sensitive to the senders' immediacy (McCluskey et al, 2017) and therefore, an effective coaching intervention for lower performing students in science, technology, engineering, and mathematics courses needs to include nonverbal immediacy behaviors.

Delivering Cognitive Behavioral Coaching that focuses on nonverbal immediacy behaviors could provide evidence of the importance of nonverbal communication on the effectiveness of interpersonal communication and provides a replicable model that has an identified conceptual framework for undergraduate students, especially those in STEM courses. The following chapters are organized by first sharing the related literature on

the subject, the methodology that was used, an interpretation of the findings, and ends with an overall summary with recommendations for future research.

Chapter 2: Review of Related Literature

Our study is an attempt to provide research-driven advice on the impact of intentional training on cognitive behavioral coaching and nonverbal immediacy behaviors as a means to improve student's self-efficacy. The literature review will discuss cognitive behavioral coaching, nonverbal immediacy behavior, and self-efficacy. The purpose is to provide reasoning for examining self-efficacy of students in science and mathematics courses.

The STEM Crisis

By 2024, the United States will need an additional 1.1 million workers in STEM, with approximately one million of them being US citizens (Varas, 2016). To get to this number, the American Action Forum identified 184 STEM occupations and matched them to codes used by the Bureau of Labor Statistics (BLS). Data from the 2014 BLS employment projections were gathered to estimate the total demand for STEM workers over the next ten years. Projections for the number of STEM workers were made by studying the compounded annual growth rate for STEM occupations, spanning ten years from 2004 to 2014. The shortage was then calculated by comparing the number of workers with number of occupations (Vars, 2016). There are increasing concerns about the United States' ability to compete in a global economy, which has prompted a national call to action to increase the diversity and number of students pursuing a STEM degree (US Department of Education, 2014).

Unfortunately, in postsecondary education, there are frequent losses of more than 50% of freshmen entering higher education declaring a STEM major (US Department of Education, 2014). This equates to a great loss of potential STEM bachelor's degree

recipients (US Department of Education, 2014). A loss of this magnitude has great consequences, especially when there are already so few students pursuing STEM majors. In 2007-2008, only 14% of all undergraduates enrolled in an institution of higher education were STEM majors (US Department of Education, 2014). Underrepresented minority (URM) students make up only a tiny fraction of that, with only 2.5% of URM 24-year old earning a bachelor's degree in the natural sciences and engineering nationally (Xu, 2018). "The fact that racial and ethnic minorities are underrepresented in science, technology, engineering, and mathematics (STEM) fields is well-documented" (Lin et al, 2018, p.1). The National Academies of Science has promoted the idea that the STEM pipeline should be widened to ensure an adequate number of STEM graduates to meet workforce needs (Camilli & Hira, 2019).

There are many STEM occupations ranked as "well above average" when discussing risk of a shortage of laborers. These include, but are not limited to, actuaries, engineers, environmental scientists, and information security analysts (Levanon et al, 2014, p.241). In fact, it was projected that the gap between supply and demand in data science would be about 50-60% by 2018 (Camilli & Hira, 2019). In general, there is an increasing number of jobs requiring STEM knowledge and skills (Cromley et al, 2016). According to Waite and McDonald (2018), there were about five million US workers, in 2010, who were classified as having an occupation in science and engineering. However, an estimated 16.5 million workers in other fields reported that undergraduate science and engineering training was required to perform their jobs (Waite & McDonald, 2018).

Achievement in STEM courses is critical, since failing one course could add an extra year to a student's time to graduate. The extra year of school drives many students

out of STEM majors (Cromley et al., 2016). In addition to losing large numbers of STEM degree-seeking students to other non-STEM degree programs, the graduation rate of students seeking a STEM degree is about 20 percentage points below that of students in non-STEM degree programs (Xu, 2018). Hence, retention of STEM students must be addressed. It is suggested that retention and achievement in STEM should be treated as a process and not a single event, which has a great impact on student success and STEM retention in the first two years of undergraduate study (Xu, 2018).

Interpersonal Communication Theory

An integral part of the human existence is that we understand the world around us. One key aspect to understanding the world is the need to understand how people interact whether face to face or online (Devito, 2018). Interaction between people is known as interpersonal communication. Communication scholars have demonstrated through a plethora of studies that one's personal and professional success and happiness depends on their ability to communicate interpersonally (Devito, 2018). Although the definition of interpersonal communication involves many elements, a working definition for our study is necessary. Interpersonal communication is the verbal and nonverbal interaction between two interdependent people (Devito, 2018). "Interdependent" is important because research supports what one person does has an impact on the other person (Devito, 2018). In brief, the actions of one person have consequences for the other person. Relating the theory to our research hypothesis, the actions of the academic success coach have consequences on the student in a mathematics or science course.

Moreover, the theory of interpersonal communication is relational, (Devito, 2018). The way one communicates and interacts with another often determine the kind of

relationship that is developed (Devito, 2018). This interaction involves the exchange of both verbal (words that are used) and nonverbal (behaviors that are used) messages (Devito, 2018; Mehrabian, 1971). In order to establish interpersonal connection and closeness to the receiver, the sender (academic success coach) should use verbal immediacy behaviors, such as the receiver's (mentee's) name, or terms like we and us. In addition to verbal immediacy behaviors, the sender (academic success coach) should use nonverbal immediacy behaviors such as facial expressions, hand gestures, vocalics (voice and tone), proxemics (space and distance), environment (the office layout and design), and oculesics (eye contact) (Devito, 2018; Fatt, 1999; Frymier, 1993; Mehrabian 1988; O'Hair et al, 2018). Table 1 demonstrates the different ways to show immediacy.

Table 1

Different Ways to Show Immediacy in Communication

Verbal Immediacy Behaviors	Nonverbal Immediacy Behaviors
Use of pronouns (us, we)	Touch
Manner of address	Distance
Openness	Eye contact
Compliments	Body language
	Vocal tone
	Chronemic channel (being on time vs not, etc.)

Devito, J. (2018). *Interpersonal Communications.* Pearson.

Albert Mehrabian (1971) found from his research that nonverbal communication accounts for 90 percent of the meaning in a message. Whereas, Mehrabian is considered a well-respected scholar in the communication field for his research on nonverbal communication. Other communications, humanities, and social science scholars disagree with Mehrabian's empirical data that supports his nonverbal account. However, the widely accepted compromise is one's (sender) nonverbal communication is important to the other (receiver) in some contexts. For example, when the message is deemed difficult to the sender nonverbal behaviors of the receiver is looked at more to understand the message (Beebe et al, 2019, Devito, 2018, Fitzgerald, 2015, Mehrabian, 1988, and O'Hair et al, 2018). For instance, a student who deems mathematics as difficult will be more sensitive to the nonverbal behaviors of the receiver of the message, such as a teacher or academic coach (Richmond et al, 2003). Another way of viewing this theory if the teacher, tutor, or coach delivers the message about mathematics in a hopeless manner then the student will think mathematics is hopeless. This thought will permeate even if the coach in the end says positive words. If the actions of the coach are understood as hopeless then those actions speak louder than the positive words.

Science.gov (May 2017) is an active and reputable search portal. The portal has over 60 databases, over 2,200 websites, over 200 million pages of authoritative federal science information (Science.gov, 2019). Including research and development results, plus science.gov (2019) is the search portal from the United States that contributes to WorldWideScience.org a search portal that contains research and development from more than 70 nations. As of the writing of the study, Science.gov provides articles that shares research and conclusions that nonverbal immediacy is significantly important by

the other person (receiver) when the interpersonal context involves one (sender) to build trust, rapport, connection, and closeness with the other (receiver).

Teacher immediacy research is an example of the positive impact of building trust, rapport, connection, and closeness with the student. Teacher immediacy research shows a positive correlation between teacher and student when teacher's focus on their immediacy behaviors. Through a correlational analysis results on trustworthiness were r =.53, $p < .01$, goodwill (rapport) were $r = .54$, $p < .01$, social attraction (connection) were r =.44, $p < .01$, and closeness were $r = .55$, $p <.01$ (Baringer & McCroskey, 2000). The results expanded on Rosoff's study in 1978 (Baringer & McCroskey, 2000). What was found is that the two studies mirror each other in data results.

Additionally, Worldwidescience.org (May 2017) provides numerous articles that shares research from more than 70 nations on the importance of nonverbal immediacy to build trust, rapport, connection, and closeness between the following interpersonal relationship contexts: teacher-student, counselor/therapist-client, practitioner-client, employer- employee, and coach-mentee. What these contexts have in common is that the relationship between the two communicators require trust, rapport, connection, and closeness in order for the relationship to thrive. As well, to establish trust, rapport, connection, and closeness it takes more than saying the words each person needs to see gestures, facial expressions, eye contact, smiling, light touches, and being at the appropriate distance. For example, if a person is looking away from the person or has difficulty establishing eye contact, it is difficult for another person in the relationship to build trust and rapport. Research supports that people need to experience immediacy cues such as touch, appropriate distance, eye contact, and smiling in order to establish

closeness and connection (Beebe et al, 2019, Devito, 2018, and O'Hair et al, 2018). Graham, Unruh, and Jennings (1991) looked at 505 respondents and replicated Mehrabian's (1971) work in the context of business and found that the results were consistent to the literature.

Another example is if someone was asking us to take a walk down the street, this doesn't require a great deal of difficulty; saying the words is all we need. But, if we are learning a subject that we see is difficult like in a teacher -student relationship, or sharing intimate difficult feelings and events like in a counselor- client relationship, or changing bad habits like in a coach- mentee relationship. The student, client, or mentee needs to not only hear words that establish trust, rapport, connection, and closeness, but also needs the gestures, facial expressions, and eye contact to reinforce the words or the relationship will not be established. There are no scholars that report evidence against the importance of nonverbal immediacy. The sentiment is with how much nonverbal immediacy matters. For example, researchers Virginia Richmond, James McCroskey, and Aaron Johnson (2003) developed an instrument known as the Nonverbal Immediacy Scale (NIS) that measures self and other perceived nonverbal immediacy. The instrument has a "high reliability when used as either a self-report or other-report measure" (Richmond et al, 2003 pp. 504). The instrument has a total of 26 items (13 positively worded and 13 negatively worded (Richmond et al, 2003). The difference between the self and other report is the "designation of the target to be addressed" and "wording of the items ["I use my hands……" for the self-report and "He/She uses her/his hands……" for the observer-report]"(Richmond et al, 2003, pp. 508). A 5-point Likert-type response is used to

present the items. The reliability estimates for both versions of the instrument were 0.90 or above (Richmond et al, 2003).

Elements of Interpersonal Communication

Communication scholars agree that interpersonal communication involves at least two people (Devito, 2016). The next section of the literature review includes reports from research on interpersonal communication that supports students need for an intimate interpersonal relationship in order to improve self-efficacy. Each individual performs source and receiver functions. The source formulates and sends the message, which is also known as the sender. The receiver perceives and comprehends the message. The "message are signals that serve as stimuli for a receiver and received by one of our senses- auditory (hearing), visual (seeing), tactile (touching), olfactory (smelling), gustatory (tasting), or any combination of these senses" (Devito, 2016 pp. 10). The goal when interpersonally communicating is for the source-receiver (this term is used to emphasize that both functions are performed by each individual in interpersonal communication) to achieve communication competence (Devito, 2016). A source-receiver knows communication competence has occurred when the message between the two parties are effective and appropriate. One knows if the message is effective and appropriate when the message is understood in the way it was intended. For example, if you want a student to complete a homework assignment, the teacher has to make the request and model how to complete the homework assignment, plus demonstrate that the homework is going to help master the objectives learned in the course. This communication transaction is an example of ensuring the message is effective and appropriate, which is known as the Competence Model of communications (Beebe et al,

2018; Devito, 2016). The Competence Model explains that a message is effective when the goal, result, or outcome of the intended message is understood and adheres to social expectations (Devito, 2016). Using our previous example, a teacher knows that their goal of the student to complete homework is met, when the student completes the homework according to standards set by the assignment.

The research about verbal and nonverbal communications impact on an individual's self-efficacy and self-worth have been explored within the communications, psychology and education disciplines (Fatt, J, 1999; Nevins and Manning, 2002). The research has reported the same result, society is often unaware of the importance of monitoring our verbal and nonverbal communication (Nevins and Manning, 2002). The current message that is often discussed by professionals, researchers, and leaders in education, business, politics, and other work force areas is the plea for stronger interpersonal skills in the workplace. In order to establish interpersonal connection and closeness to the receiver, the sender should use verbal immediacy behaviors, such as the receiver's name, or terms like we and us. In order to establish interpersonal connection and closeness to the receiver, the sender should use nonverbal immediacy behaviors such as clothing, facial expressions, hand gestures, vocalics, proxemics, environment, and oculesics. (Fatt, J., 1999 and Frymier, 1993). These skills are considered vital for success in the job market (Beoiri, G., 2018; Burning Glass Technologies, 2015; Campbell and Kresyman, 2015; Dallimore et al, 2008; Donohue, M., 2016; Grays, D., 2004; Hopp, A., 2013). The Burning Glass Project (2015) is credited with doing the most substantial research on the urge for interpersonal communication skills. The Burning Glass Project (2015) looked at over a million job postings to determine what skill was in the most

demand. The results showed that 1 out of 3 job advertisements stated a baseline ability of communication skills.

Academic Coaching

"At least one million additional science, technology, engineering, and mathematics (STEM) degree graduates (are needed) to sustain the current demands of the national workforce" (Chang, et al, 2016 pp.14). There has been a decline in the number of graduates in the STEM field (Kolvoord, et al., 2016 pp. 8; Chang, et al, 2016 pp.14). Kolvoord and colleagues (2016) share that "researchers have looked closely at both student characteristics as well as institutional settings to identify causes and possible solutions" (pp.8). Kolvoord goes on to say, "students need guidance in four areas to increase their interest in pursuing STEM opportunities and persisting through course plans: (1) clarifying career goals, (2) developing realistic outcome expectations, (3) managing environmental barriers, and (4) building support systems to enhance their sense of self-efficacy" (Kolvoord et al., 2016, pp.8). An intervention technique to address this is academic coaching (Lefdahl-Davis et al, 2018).

According to Lefdahl-Davis (2018), coaching supports individual growth by instituting self-exploration, encouragement and accountability. Coaching has been established through its foundations in positive psychology; exploring an individual's "strengths, values, goals, and dreams, while addressing how to overcome barriers, find purpose and identity, and encourage uniqueness and individuality" (Lefdahl-Davis et al, 2018). One example of the effectiveness of academic coaching includes young male who was assigned an academic coach during his first year of undergraduate study. The student's academic coach helped him to identify academic goals, as well as advised him

on other positive academic behaviors and success strategies. By the student's second year, he was elected student-body president and continued with his education until he earned his undergraduate degree in mechanical engineering (Gose, 2014). The student praised his academic coach as the person who supported him and introduced him to other institutional academic support services that inspired him to pursue a STEM degree. While Robinson (2015) notes that academic coaching is not well-defined and that few programs fit a clear model that has been empirically evaluated, she defines academic coaching in the following context:

> Academic success coaching is the individualized practice of asking reflective, motivation-based questions, providing opportunities for formal self-assessment, sharing effective strategies, and co-creating a tangible plan. The coaching process offers students an opportunity to identify their strengths, actively practice new skills, and effectively navigate appropriate resources that ultimately result in skill development, performance improvement, and increased persistence (pp. 126).

Griffiths (2005) states that coaching facilitates "deep learning" by developing the "will to learn" and, ultimately, creating learning that is sustainable. Coaching has already been identified as a successful intervention for at-risk college students, graduate students, and students with disabilities (Bellman et al, 2015; Capstick et al, 2019; Richman et al, 2014; Lehan et al, 2018). It is through this process shaped by psychology and learning theory that an individual develops a base for understanding that endures the test of time (Griffiths, 2005).

With regard to coaching undergraduate students for success, the literature points to two primary models used at institutions of higher education: professional staff as coaches and students coaching students (Robinson, 2015). There are few sources on coaching as an academic support for postsecondary students. The literature that does exist on coaching as an academic support has little consistency in terms of a coaching model. Looking at the descriptions of coaching programs at several institutions demonstrates that coaching programs tend to vary in structure and objective. Robinson (2015) mentions that "hundreds of higher education institutions have implemented coaching models that vary greatly in their purpose, infrastructure, and framework" (pp.1). And while counselling services are readily provided to students at many colleges and universities, coaching services are still not as common (Lefdahl-Davis et al, 2018).

Academic coaching is implemented in postsecondary education to improve retention and graduation rates of students with the purpose of becoming more in tune with a student's unique academic abilities and needs (Barkley, 2010; Hunter, 2006). Many students lack basic skills needed for academic success; such as study skills and/or note taking skills. (Barkley, 2010; Perry and Kennedy, 2009). Academic coaches help build student's academic skills, as well as their social skills, which has been shown to increase retention and/or graduation rates (Bettinger & Baker, 2014; Blakenship, 2017; Capstick et al, 2019; Robinson, 2015).

Bellman, Burgstahler, and Hinke (2015) reported that students diagnosed with ADHD or a learning disability who work with a coach have lowered anxiety, better time management skills, increased motivation for taking responsibility for school-related tasks, improved study skills, and better strategies for test preparation. Additionally, they

cite that similar students who were coached had higher self-regulation than students who were not (Bellman et al, 2015). While these strategies were applied to a specific demographic of students, it is fair to assume that other student groups would benefit from acquiring and/or improving these skills. Griffiths (2005) cites "coaching creates the conditions for learning and behaviour change" and that coaching is "transformational" instead of "transactional" (pp. 58). Academic coaching is a student support that improves the academic performance, retention, and graduation of college students (Capstick et al., 2019).

Cognitive Behavioral Coaching

According to Neenan and Palmer (2001), "coaching can be defined as 'the art of facilitating the performance, learning, and development of another'…coaching can focus on any aspect of a person's life in assisting personal growth" (pp. 15). Cognitive behavioral coaching is a relatively new approach to deal with psychological and practical problem-solving and handling "stuck points" in coaching (Dryden, 2017; Neenan, 2018; Neenan & Palmer, 2012). The practice is derived from cognitive behavioral therapy and was designed to develop the client's capabilities to remove any psychological blocks to learning (Dryden, 2017; Neenan, 2018; Neenan & Palmer, 2012). To date, there is limited research on cognitive behavioral coaching (Neenan, 2008; Minzlaff, 2019; Whitten, 2014). Based on the limited existing literature, the following is our comprehensive definition of the practice:

> Cognitive behavioral coaching is an integrative approach that combines cognitive and behavioral strategies to problem-solving that is time-limited, goal-directed, and solution-focused; enabling

> individuals to reach their own conclusions and solutions to problems based on a collaborative process called 'guided discovery'.

The process of guided discovery is rooted in Socratic questioning, where a series of questions is asked that promote rational decision making by raising the mentee's awareness of their own thinking (Minzlaff, 2019; Neenan & Palmer, 2001). The primary difference between cognitive behavioral coaching and therapy is the setting in which it is applied, with cognitive behavioral coaching being focused on non-clinical settings (David & Cobeanu, 2016; Karas & Spada, 2009; Kearns et al, 2008; Whitten, 2014). One primary difference between cognitive behavioral coaching and cognitive behavioral therapy is that the coaching practice focuses on personal and/or professional fulfillment, while the practice of cognitive behavioral therapy deals with psychological difficulties that may have a negative impact on an individual's well-being or functioning (Neenan & Palmer, 2012). According to Neenan and Palmer (2012), the cognitive behavioral approach to coaching reduces self-handicapping and enhances goal-striving, resilience, emotional management, and well-being.

A study by coaching psychologist Tony Grant found that when using a combined cognitive and behavioral approach, evidence suggested that academic performance is increased, self-concepts were enhanced in relation to academic performance, test anxiety was reduced, and individuals developed deep approaches to learning (Whitten, 2014). The study followed three groups of accountant trainees through an academic experience; one group received cognitive coaching only, one group received behavioral coaching only, and one group received both cognitive and behavioral coaching. The group only

receiving behavioral coaching had increases in academic performance and decreases in test anxiety, but the effects were not lasting. The group receiving only cognitive coaching showed a decrease in academic performance, although there was a change in trainee self-perception. However, the group that received both cognitive and behavioral inputs exhibited a significant impact on self-perception and academic performance, and this effect was lasting (Whitten, 2014).

Whitten (2014) points out that cognitive behavioral coaching is supported by the theory that one's thoughts/beliefs shape emotions and emotions shape behaviors/actions. "By changing the way, they think about situations, a client comes to realize that the main freedom they have is in how they respond to events" (Whitten, 2014, pp. 152). This approach assumes that individuals must have metacognitive skills to be able to study one's thoughts and be able to challenge and/or correct them (Minzlaff, 2019). Neenan argues "the client's self-limiting/distorted thoughts and beliefs, counterproductive behaviours and problematic emotions often block the way of attaining the goals and must therefore also be addressed as part of the coaching process" (Minzlaff, 2019, pp. 21). Cognitive behavioral coaching emphasizes emotion-regulation and identifying irrational beliefs to, then, challenge and change these non-productive behaviors (David & Cobeanu, 2016; Minzlaff, 2019). The coach aids in this process by providing the mentee with tools and varying techniques that facilitate change (Minzlaff, 2019; Whitten, 2014). The three primary ways to challenge a mentee to re-evaluate their thinking are by evidence-based, logical, and/or pragmatic tasks; such as reframing, visualization, or recording one's thoughts (McMahon, 2007; Minzlaff, 2019).

The way an individual reacts to an event is mostly determined by how they view the event and not the actual event itself (Neenan & Palmer, 2001). Early research provides evidence that cognitive behavioral approaches to coaching can "enhance emotional competencies, goal attainment, leadership skills, mental health, metacognition, and quality of life" (Karas & Spada, 2009, pp. 45).

Cognitive behavior coaching (CBC) works by taking a "twin track" approach to goal-attainment: the psychological and the behavioral/practical (Minzlaff, 2019; Neenan, 2008). The psychological track assists in overcoming and/or removing obstacles that hinder change, like indecisiveness, procrastination, and self-doubt. While the behavioral/practical track provides an "orderly sequence of goal-directed" steps for taking action (Minzlaff, 2019; Neenan, 2008). A typical session in cognitive behavioral coaching involves discussing and clarifying present issues, establishing SMART goals, discussing way to change, developing an action plan, ensuring the mentee understands their responsibility in implementation of the plan, and customizing future sessions by receiving feedback from the mentee on what they found helpful and unhelpful about the current session (Neenan, 2008). A problem-solving model was developed by Neenan and Dryden that includes seven steps:

1. Identify the problem (e.g. attendance issues – missing class)
2. Select a goal (e.g. attend class every week)
3. Generate alternatives (e.g. engage through online learning management system)
4. Consider the consequences (e.g. course attendance policy may state grade will be lowered)

5. Make a decision/plan (e.g. attend virtually when not able to make it to campus)
6. Implement the plan (e.g. utilizing learning management system to engage in course activities)
7. Evaluate (Did the addition of a virtual presence help improve class attendance?)

This process is useful in identifying both self- and task-defeating beliefs related to the problem-solving process (Palmer & Gyllensten, 2008).

Kearns, Forbes, and Gardiner have shown that CBC is useful in a university setting by reducing self-handicapping and self-sabotage in their study on perfectionism in college students (Kearns et al, 2008). CBC has also been seen to improve various components of self-efficacy (e.g. resilience, core self-evaluation, significant personal and professional value, and global self-rating of performance) (Neenan & Palmer, 2012).

Self- Efficacy

According to Bandura, self-efficacy represents an individual's beliefs about their capabilities to perform tasks at a certain level of proficiency and it influences how an individual approach a task – e.g. effort, persistence, achievement (Meral et al, 2012; Schunk & Pajares, 2002; Yusuf, 2011). Rooted in social cognitive theory, self-efficacy is a construct that states, in addition to environmental conditions, a person's behaviors, thoughts, and beliefs determine level of achievement (Schunk & Pajares, 2002). Non-cognitive qualities have been identified as significant determinants of student success since the 20th Century (Kirikkanat & Soyer, 2018). At the college level, students need psychological resources that promote academic success (Kirikkanat & Soyer, 2018).

When self-efficacy is included in the development of a psychological model of support, other paradigms on academic performance decrease while the influence of self-efficacy increases (Yusuf, 2011). Because it is believed to have a positive impact on academic success, higher self-efficacy is expected to cause students to set higher goals for themselves and work harder to achieve those academic goals (Diseth, 2011; Komarraju and Nadler, 2013; Talsma et al, 2018). Several studies have shown that higher self-efficacy, in fact, does have a positive impact on the academic achievement of undergraduate students (Bong, 2001; Komarraju & Nadler, 2013; Meral et al, 2012; Yusuf, 2011).

Students who doubt their academic abilities do not work as hard, persist as long, or achieve at as high of a level as students with stronger self-efficacy (Meral et al, 2012). "Schunk and Zimmerman reported that…if students are trained to have higher self-efficacy beliefs their academic performance also improves" (Meral et al, 2012). Whether or not self-efficacy has a causal relationship with academic achievement, however, has been questioned by many researchers (Yusuf, 2011). Yusuf (2011) studied causal relationships between achievement motivation and academic achievement, learning strategies and academic achievement, and the relationship between self-efficacy and academic achievement. While he found that achievement motivation and learning strategies had an indirect effect on academic achievement, the most significant effect existed between student self-efficacy and GPA; thus, suggesting that achievement motivation and learning strategies were not the strongest causes of academic success (Yusuf, 2011). In fact, Williams and George-Jackson (2014) suggest that self-efficacy may be more important in predicting student academic success in college over cognitive

factors and predicts achievement and interest in STEM careers. McPhee, Farro, and Canetto (2013) agree that self-efficacy may be the link between academic performance and interest in STEM courses and occupations and that lower self-efficacy may cause students to avoid STEM courses and/or careers.

Self-efficacy is deemed necessary for self-regulated learning (Putwain et al, 2013). Specifically, self-efficacy is critical to motivation in self-regulated learning (Honicke & Broadbent, 2016). Students' confidence in their capacity for self-regulated learning is most relevant in higher education settings (Putwain et al, 2013). It is proposed that self-efficacy may help undergraduate students understand their persistence in STEM fields (Williams & George-Jackson, 2014).

Academic self-efficacy is simply the application of the construct of self-efficacy on an academic setting (Kirikkanat & Soyer, 2018). It has been defined as a belief in achieving an academic goal or achieving a certain outcome on an academic task (Putwain et al, 2013). It is also considered to be perceived competence in "context-specific study-related skills" that contribute to self-regulated learning (Putwain et al, 2013). Those with a higher penchant for learning work harder and persist longer when difficulties are presented, and they are academically more successful. Kirikkanat and Soyer (2018) posit that students with high academic self-efficacy are able to conquer academic tasks and responsibilities. Students with low self-efficacy often see tasks as intimidating and set low goals when dealing with them (Yusuf, 2011). "Self-efficacy beliefs influence task choice, effort, persistence, resilience, and achievement" (Meral et al, 2012). Put simply, beliefs about one's abilities will influence how they perform and students with high self-

efficacy take on more challenging tasks, put in more effort, have more determination to succeed, and exhibit great academic performance (Meral et al, 2012).

Additionally, academic self-efficacy has been shown to have a consistent correlation with academic achievement, regardless of educational setting (Honicke & Broadbent, 2016). When academic self-efficacy is applied to study skills and behaviors, it predicts future academic performance (Putwain et al, 2013). It is a predictor of test anxiety, motivation, and other psychoeducational outcomes (Putwain et al, 2013). A deeper understanding of self-efficacy provides opportunities to develop better supports for the success of students in STEM-related fields (Williams & George-Jackson, 2014).

Nonverbal Immediacy

So far, the research has shown that increase self-efficacy is vital for students to choose a college degree, let alone a STEM major. We deduce from the literature and studies, if the education community fails in recruiting people to attend college in general, there is going to be an obvious reduction in STEM majors, since STEM majors generally require additional courses in science, technology, and mathematics

"Nonverbal Immediacy has been shown to correlate positively with higher levels of learning in the classroom" (Pribyl et al, 2004, pp. 74). The correlation coefficient readings are (r=.041) positive relationship with learning, (r=.0.59) affective learning, (r=-0.54) negative relationship with perceptions of learning loss (Gorham, 1988; Pribyl et al, 2004, pp. 74). Additionally, "nonverbal immediacy is also correlated positively with higher teacher evaluations (r=0.40) (Moore et al, 1996; Pribyl et al, 2004, pp. 74).

Nonverbal immediacy behavior research has focused on identifying which immediacy behaviors are effective (McCroskey and Richmond, 2003; Mehrabian, 1975).

As a result of these studies, education and business communities are convinced that nonverbal immediacy behaviors are the main reason why receivers connect and are motivated to do things that the sender says. Since the call for additional STEM majors in the United States and around the world to fill STEM jobs, recent researchers have begun to separate the student population based on field of study in order to gain knowledge on whether student's needs in science, technology, engineering, and mathematics are different from other fields of study. Researchers inadvertently found a possibility that nonverbal immediacy behaviors are vital for students in science and mathematics courses. In other words, students in general science and mathematics college courses seem to notice the teacher's nonverbal immediacy more than other courses.

"Nonverbal immediacy (NVI) has been a major area for communication research for almost 30 years in the United States; and is defined as behaviors that enhance closeness" (Mehrabian, 1971; Pribyl et al, 2004, pp. 73). "The majority of NVI studies examined the student-reported nonverbal immediacy of teachers, focusing on behaviors such as eye contact, gestures, body position, smiling, vocal expressiveness, movement, and proximity" (Pribyl et al, 2004, pp. 73-74). "NVI is associated with approachability and availability for communication, and also with warmth, and closeness (Anderson, 1985; Pribyl et al, 2004, pp. 74) "Research indicates that students were more likely to comply with the requests of teachers who were more immediate nonverbally than less immediate teachers" (Pribyl et al, 2004, pp. 74). "Teachers who do not exhibit nonverbal immediacy behaviors frequently are thought to be projecting avoidance, dislike, coldness, and interpersonal distance" (Pribyl et al, 2004, pp. 74).

To continue the understanding of nonverbal immediacy, we must understand immediacy as a whole. **"**Immediacy is conceptualized as the degree of perceived physical and psychological distance between communicators (Anderson, 1979; Gorham, 1988; Labelle et al, 2013). Immediacy is demonstrated both verbally and nonverbally. "Instructor verbal immediacy is demonstrated through the use of humor, praise, self-disclosure, inclusive pronouns (e.g., "we" and "us"), feedback, and a willingness to converse with students both in and outside the of the classroom (Gorham, 1988; Mehrabian, 1969, 1971; Labelle et al, 2013). Instructor nonverbal immediacy is demonstrated through behaviors that indicate a desire to approach and be approached by students, which may comprise a variety of behaviors:" vocalics "vocal pitch, loudness, and temp; affect displays "smiling"; proxemics "decreasing physical barriers (e.g., lectern); kinesics "relaxed body position and forward body lean".

Ann Frymire (1993) explains immediacy as a communication variable which impacts an individual's physical and psychological closeness. She continues to explain that immediacy behaviors are perceived by the receiver. Immediacy behaviors can be verbal or nonverbal and they can be used simultaneously or separately. However, when the receiver decides between the sender's verbal and nonverbal communication to determine whether to establish a meaningful relationship, the receiver relies on the sender's nonverbal communication. (Frymier, 1993).

After understanding immediacy, researchers have further their knowledge by pointing out how immediacy impact self-efficacy. Our research is focusing on nonverbal immediacy, so the literature we show will be based on nonverbal immediacy and self-efficacy. However, there is research that links verbal immediacy and self-efficacy.

There is research that examined the impact of instructor characteristics and students' beliefs on students' decisions (Labelle et al, 2013). The study assessed students'(N=244) perception of instructors' clarity, nonverbal immediacy, and affirming style, as well as the students' own academic self-efficacy and communicative behaviors following a disagreement or difference of opinion with the instructor. (Labelle et al, 2013, pp.169). "Results indicated that students' academic self-efficacy mediates the relationship between instructor behaviors and two communicative outcomes of instructional dissent" (Labelle et al, 2013, pp.169). Students who perceived their instructors as clear were more likely to have high self-efficacy for the course and therefore engage in positives forms of dissent as opposed to more negative expressive dissent (Labelle et al, 2013, pp.169). A student's self-efficacy is not lower in dissent environment (environment were the teacher and student disagree) as long as the student perceives the teacher having positive nonverbal immediacy.

NVI Research Significance

What is missing in the literature is applying the techniques that have proven to be successful with teachers and students to other education staff that works directly with students. The ideology that the teacher alone can save our workforce is unrealistic. In order to ensure that students have the success they need, we expand the research to identify how other education staff impacts a student's self-efficacy. Since the nonverbal component of immediacy has demonstrated to impact students' self-efficacy in relation to academic success, recruitment, and retention in science and mathematics courses and majors based on co-dependent results. We are confident that expanding research to examine the relationship between coach-mentee and measuring students' perception of

self-efficacy and nonverbal immediacy who are enrolled in science and mathematics courses will offer the most impact on the workforce.

Moreover, there is one research study that has suggested further research about the importance of teacher nonverbal immediacy with a focus on students engaging with science, technology, engineering, and mathematics (STEM) higher education teachers. The study of N=66 professors at a liberal arts school, only three professors represented STEM. However, those three teachers had the highest correlation of students suggesting a lack of nonverbal immediacy behaviors. The current research study attempts to provide additional empirical data that examines interpersonal relationships in regard to specific courses of study. Measuring self-efficacy and nonverbal immediacy are important variables to understanding the impact of learning techniques on students' outside the classroom. Focusing on science, technology, engineering, and mathematics courses can yield the best results on the national shortage of STEM collegiate graduates.

Chapter 3: Methodology

The lack of a uniform definition and consistent conceptual framework for academic coaching is problematic to studying its impact. Therefore, it is important to develop an academic coaching model that is defined and demonstrated to be effective. Studying the impact of Cognitive Behavioral Coaching (CBC) with an intentional focus on nonverbal immediacy behaviors (NVI) is one way to show how CBC may be an effective model for academic coaching to influence self-efficacy.

The following research methodology describes the use of a quasi-experimental study that measured the impact of Cognitive Behavioral Coaching with nonverbal immediacy (CBC & NVI) on the self-efficacy of lower-performing students taking science, technology, engineering, and mathematics (STEM) courses at a public, Midwestern research university. Additionally, information concerning the appropriateness of the research design and a discussion of the study, setting, participants, instrumentation, validity, data collection and analysis, and ethical considerations is presented.

Research Questions

The following three research questions were addressed:

1. What impact does Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of lower performing undergraduate students as measured by the Self-Efficacy for Learning Form – Abridged version (SELF-A) instrument?
2. What impact does Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of lower performing undergraduate students

taking STEM courses as measured by the Self-Efficacy for Learning Form – Abridged version (SELF-A) instrument?

3. To what degree do undergraduate students in STEM courses recognize immediate behaviors when interacting with academic coaches as measured by the Nonverbal Immediacy Scale- Observers report?

The first two research questions seek to determine whether or not Cognitive Behavioral Coaching influences growth in students' self-efficacy. The Self-Efficacy for Learning Form – Abridged version (SELF-A) is an assessment that was developed by Kitstantas and Zimmerman (2015) to measure students' self-efficacy for learning. It was given to students before and after receiving coaching to measure changes in the students' self-efficacy beliefs. Research question number two extends the scope of the study to pay particular attention to students taking undergraduate courses in mathematics and/or science.

Research question number three investigates the role that nonverbal immediacy behaviors play in the coaching intervention of students enrolled in STEM courses. Students should have completed the Nonverbal Immediacy Scale- Observers (NIS-O) near the conclusion of coaching to highlight their level of sensitivity to the coaches' nonverbal immediacy behaviors.

Hypotheses

H_{01}: There is no significant difference in students' pre and post self-efficacy scores as evaluated by the SELF-A assessment when experiencing Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy.

H_{02}: There is no significant difference in students' pre and post self-efficacy scores as evaluated by the SELF-A assessment when experiencing Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy for students taking at least one STEM course.

H_{03}: There is no evidence that suggests students recognize the nonverbal immediacy behaviors of the coach according to the nonverbal immediacy scale (NIS-O).

Appropriateness of the Research Design

Robinson (2015) states that quantitative research evaluating academic coaching in higher education is extremely limited with regard to campus-owned programs. Andreanoff (2016) reiterates this point using the findings of David Clutterbuck, a master in coaching and mentoring, who found that the majority of literature related to coaching is qualitative. Using a quasi-experimental approach allowed for further exploration into the practice of academic coaching incorporating nonverbal immediacy, with the aim of determining if there is a link between using this focused academic coaching and increased academic self-efficacy. A quasi-experimental approach is described as a nonequivalent (pretest and posttest) control group design (Creswell, 2014). The quasi-experimental design used has an experimental Group A and the control Group B that are selected without random assignment (Creswell, 2014). Both groups take the pretest and posttest and only the experimental Group A receives the treatment (Creswell, 2014).

Group A Experimental: *Pre-Test--------Treatment----------Post-Test*

Group B Control: *Pre-Test*--------Non-Treatment-------*Post-Test*

A quasi-experimental approach is considered appropriate due to a moderate sample size for which participation in the treatment will not be randomized. More

specifically, the pre and post design will be used to compare before and after self-efficacy scores to measure for changes in values.

Research Design

The quasi-experimental pretest and posttest design was used to investigate the potential link between Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy behaviors and an increase in academic self-efficacy. Quantitative data was collected by both researchers before the intervention began (sequentially) and at the end of the intervention.

Institutional Review Board (IRB) approval was received prior to implementing the exploration of the Cognitive Behavioral Coaching with nonverbal immediacy (CBC & NVI) intervention and its influence on the academic self-efficacy of lower-performing students taking courses in science, technology, engineering, and mathematics.

Conditionally admitted students and students with a cumulative grade point average (GPA) below 2.50 were assigned to an academic coach provided by a university retention program. While these students were required to work with academic coaches, the level of compliance was subject to individual engagement in the intervention. It is expected that some students would not comply fully or at all. Minimum program commitments include four meetings with the academic coach, which included participation in skill-development workshops assigned by the coach based on student needs. The meetings essentially happened once a month, unless the student requests to meet more frequently. The number of meetings attended was captured by the coach in their case notes.

The first meeting between the coaches and mentees focused on academic goal setting, external commitments (e.g. work, family, etc.), and previous/current academic behaviors. Before the initial coaching meeting, participants were given the Self-Efficacy for Learning Form – Abridged version (SELF-A) developed by Barry Zimmerman and Anastasia Kitsantas in 2007. The remaining three meetings were designed to monitor progress and provide timely interventions and/or referrals to appropriate campus resources. In the time between the monthly meetings, academic coaches maintained open lines of communication with mentees utilizing telephone and/or email.

At the conclusion of the semester, study participants were given the Nonverbal Immediacy Scale- Observer Report (NIS-O) and Self-Efficacy for Learning Form – Abridged (SELF-A) version. Results from the second administration of the SELF-A were compared to scores obtained at the beginning of the term to evaluate if there were any changes in student self-efficacy. The NIS-O results were used to validate the existence of effective nonverbal immediacy behaviors by the coaches. A paired t-test was employed since the data distribution was normal to show that the means were different for the data sets; contributing to the validation of the control and experimental groups being different, and also to show the pre- and post-assessments were taken at separate times.

Additionally, students enrolled in a general biology course for non-majors were administered the SELF-A at the start and end of the semester. This allowed for the evaluation of a comparison control group, which would support causal inferences drawn as a result of the coaching intervention. The presence of this control group aided in

minimizing threats to internal validity: history, instrumentation/reporting, maturation, and placebo/Hawthorne effect.

Setting and Participants

A public, midsize, research-intensive, four-year college was the setting from which the population was drawn to measure the effects of the academic coaching intervention. The institution resides in an urban, Midwestern city with an estimated population of nearly 309,000 according to the 2010 United States Census. The university has a large transfer population, mostly from local community colleges. Study participants included students taking at least one course in a STEM discipline with a cumulative grade point average of 2.50 or lower at the start of the coaching intervention or students admitted on probation without an established GPA at the university. There was no maximum age limit, but study participants were of age 18 and higher. Students were full- or part-time; taking as few as three credit hours or as many as 18 credit hours.

Lower-performing students taking STEM courses at a public research university receiving the coaching intervention were compared to a control group consisting of students at various academic levels enrolled in a general biology course for non-majors. "[I]t is not normally feasible to utilize a randomized selection method to identify those in a control group" when self-selection is present (Andreanoff, 2016, p. 203). While the students receiving coaching were required to participate in the coaching research program, the student essentially self-selected to comply and attend all scheduled meetings. Quantitative data from the control and experimental groups were collected from the SELF-A pretest and posttest. In her paper highlighting issues with establishing quantitative studies on academic coaching in higher education, Andreanoff (2016)

suggests that it is unethical to deny or delay the coaching intervention to students requesting it. Therefore, the control group was selected from students in a general biology course who did not participate in the academic coaching.

Instrumentation

Two existing assessments were used in the evaluation of the coaches' nonverbal immediacy and the study participants' self-efficacy. McCroskey and Richmond's "principle of immediate communication" suggests that "the more communicators employ immediate behaviors, the more others will like, evaluate highly, and prefer such communicators; and the less communicators employ immediate behaviors the more others will dislike, evaluate negatively, and reject such communications" (Richmond et al, 2003, pp. 505). Social psychologist Albert Mehrabian (1971) found that 93% of meaning is taken from nonverbal communications (Beebe et al, 2019; Devito, 2016; Fitzgerald, 2015; O'Hair et al, 2018;). Therefore, to be most effective, coaches should have an understanding of one's own nonverbal immediacy.

Nonverbal Immediacy Measures

Previous nonverbal immediacy measures have had inconsistent reliability. The Nonverbal Immediacy Scale was designed to produce reliable instrumentations in communication research to measure either self-reported nonverbal immediacy (NIS-S) or other/observer-reported nonverbal immediacy (NIS-O) (Richmond et al, 2003). Items from previously used measures were used as the basis in the development of the Nonverbal Immediacy Scale; adding items that were negatively worded developed by the researchers to balance the positively worded items (Richmond et al, 2003). Validity tests using two-item instruments were developed to test the scale for warmth and

approachability. Measuring reliability for the warmth instrument and the approachability instrument were not considered satisfactory for the validity test. The two instruments were combined to make a four-item instrument to measure "warmth and approachability," which was considered satisfactory for the validity test with an alpha reliability of 0.80 (Richmond et al, 2003). Factor analyses revealed that the final 26 items drawn from previous research could be kept for both the self-report and the other-report versions. Reliability estimates were a minimum of 0.90.

The Nonverbal Immediacy Scale – Observer was presented as a "paper and pencil" assessment using a 5-point, Likert-type scale: 1 = Never; 2 = Rarely; 3 = Occasionally; 4 = Often; 5 = Very Often (Richmond et al, 2003). Scores were calculated using the following formula:

Step 1: Sum scores for questions 1, 2, 6, 10, 12-14, 16, 17, 19, 21, 22, and 25

Step 2: Sum scores for questions 3-5, 7-9, 11, 15, 18, 20, 23, 24, and 26

Total score = 78 + Step 1 sum – Step 2 sum

The Nonverbal Immediacy Scale – Observer (NIS-O) report has been updated from its 2003 original format (Richmond et al, 2013). The NIS-O 2013 report is the current measure of nonverbal immediacy when inquiring about immediacy behaviors from the receiver's (student) perspective (Richmond et al, 2013). According to Measurement Instrument Databases the "earlier measures have had problematic alpha reliability," which were estimated at 0.90 and the assessment was developed to target teachers (Richmond et al, 2013). The alpha reliability has an estimated value of 0.90 in its current form (Richmond et al, 2013). The "validity correlations ranged from .58 to .82", with the "disattenuated validity correlations ranged from .74 to .95" (Richmond et al,

2003, pp.515). The researchers predict that the warmth/approachability measure is the reason for the low reliability (Richmond et al, 2003).

Self- Efficacy Assessment

The Self-Efficacy for Learning Form (SELF-A) is a 19-item "paper and pencil" instrument developed by Barry Zimmerman and Anastasia Kitsantas in 2007. The original instrument was developed in 2005 and consisted of 57 items which were designed to measure reading, writing, studying, note-taking, and test-taking. The reliability and validity of the assessment were confirmed by Zimmerman and Kitsantas; with an Cronbach's alpha score of 0.97 for reliability and validity determined by factor analysis that found self-efficacy for learning to account for 67% variance (Zimmerman & Kitsantas, 2007). The abridged version focuses on studying, test preparation, and note-taking (Zimmerman & Kitsantas, 2007). Students responded to each item in the instrument using a scale that ranges from 0 to 100 in 10-unit increments. Items were then summed and averaged to establish an overall self-efficacy score. Higher scores indicate more positive academic self-efficacy (Zimmerman & Kitsantas, 2007).

A factor analysis of the abridged scale uncovered one factor accounted for 67% of the variance in scores, which was deemed self-efficacy for learning (Zimmerman & Kisantas, 2007). The reliability coefficient was 0.97 for the SELF-A and the unitary factor structure was tested using a confirmatory factor analysis; results indicated that the single factor structure was a good fit (Zimmerman & Kisantas, 2007).

Procedures for Data Collection

The academic coaches provided information on the number of meetings held, the number of emails sent/received related to the coaching intervention, and the number of phone calls made/received related to the coaching intervention for each student as an end of semester report. These measures were considered as possible influences on changes in self-efficacy. Certain demographic characteristics, such as age, classification, and gender were also collected from the students' academic records and analyzed to determine if there was a relationship between demographic characteristics of those receiving coaching and possible changes in self-efficacy scores. The before and after self-efficacy scores were recorded using the SELF-A instrument. The NIS-O instrument provided data on the existence of nonverbal immediacy behaviors. Students complete each assessment as part of their coaching intervention during the first meeting (before) and the final meeting (after).

The control group also performed a before and after assessment of self-efficacy using the same instrument for the pre-assessment and post-assessment. Control group participants were given the assessment at the start of the term (before) and at the end of the term (after), without direct intervention in the time between the two.

Data Processing and Analysis

Self-efficacy scores, as described previously, were found by utilizing the SELF-A assessment developed by Zimmerman and Kitsantis. Each of the 19 questions are evaluated on a scale of 0 to 100 in 10-unit increments. Final self-efficacy score was found by taking an average of all rankings for the 19 questions. Higher scores indicated higher self-efficacy. The goal was to analyze the data for a set of 25 respondents who

had gone through the intervention, and an equal number of students for the control group. Table 2 shows the statistical tests utilized on the control group and experimental groups.

Table 2

Control Group and Experimental Groups and Tests

Group	**Tests**
A. Control Group	Descriptive Statistics Paired t-Test Effect size
B. Coached Students (all) – experimental group	Descriptive Statistics Paired t-Test Effect size
C. Coached Students in STEM – experimental group-subset	Descriptive Statistics Paired t-Test Effect size

Descriptive statistics were employed to provide a general overview of data related to nonverbal immediacy and self-efficacy scores. These statistics included mean, median, mode, frequency, range, and standard deviation. Student demographic information, such as age, gender, and race/ethnicity were cursorily examined for any noticeable trends. Tests for normality were performed first and it was determined that the data was normally distributed. A paired t-test was employed to show that the means were different for the data sets; contributing to the validation of the control and experimental

groups being different, and also to show the pre- and post-assessments were taken at separate times.

After looking at the descriptive statistics and the outcome of the test for mean differences, the effect size was to be looked at to determine how much of an effect, if any, the coaching had on the changes in self-efficacy scores. The effect size was calculated by finding the standardized difference between the means of the post-test and the pre-test of the coached students and dividing that difference by the standard deviation (Sullivan & Feinn, 2012). The resulting number was described as effect size, named Cohen's d. An effect size of 0.2 was considered small, 0.5 was medium, and 0.8 was large (Sulllivan & Feinn, 2012).

The analysis of the Nonverbal Immediacy Scale – Observer (NIS-O) report was to be provided to the same groups of students and values calculated using the formula in the NIS-O report. Once scores were obtained, summary data should have determined the level of sensitivity students perceived regarding the coach's nonverbal immediacy behaviors.

Internal Validity

Internal validity threats are considered to be experimental procedures, treatments, or extraneous experiences of the participants that threaten the researcher's ability to draw correct inferences from the data about the population in an experiment. The internal threats to the study included history, instrumentation/reporting, and maturation. The presence of a control group minimized these threats by providing a means to compare students receiving the intervention with similar students who did not. Because the same amount of time passed for both groups – one semester, effects due to maturation were

reduced. With the students attending the same institution, the effects of institutional policies and educational experiences were minimized by having a control group. Both groups were provided the same assessment (SELF-A) for the pretest and posttest. Keeping the before and after assessments constant assisted in minimizing instrumentation threats.

External Validity

External validity threats arise when the experimenters draw incorrect inferences from the sample data to other persons, other settings, and past or future situations. These threats arose because of the characteristics of the individuals selected for the sample, the uniqueness of the setting, and the timing of the experiment. The external validity threats were listed as study limitations.

Ethical Considerations

Ethical issues were addressed at each phase. In compliance with the regulations of the Institutional Review Board (IRB), the permission for conducting the research was obtained (Institutional Review Board, 2001). The Request for Review Form was filed; providing information about the principal investigator, the project title and type source of funding, type of review being requested, number and type of subjects. Application for research permission contained the description of the project and its significance, methods and procedures, participants, and research status.

An informed consent form was not necessary for the study because it was approved as having an *Exempt* status. There were minimal to no risks involved for participants. The anonymity of participants was protected by numerically coding each returned questionnaire and keeping the responses confidential. All study data, including

survey, electronic files, and documents were kept in a locked desk in a secure office at the institution and destroyed after a reasonable period of time. Summary data was disseminated to the professional community with no trace to responses by the individual.

Summary

While there are many interventions utilized to provide student support, academic coaching is gaining traction. Therefore, it was imperative to develop a solid conceptual framework for the coaching intervention. Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy was evaluated to determine if it was an appropriate model. A quasi-experimental approach was taken to report on information garnered from academic records and evaluating the results of the assessments used. The next chapter describes and reports on the findings.

Chapter 4: Results

Many students are choosing to circumvent science and mathematics courses due to a lack of confidence in their ability to successfully complete the course work (Enderson & Ritz, 2017). Avoiding science and mathematics is creating a downfall in America's ability to compete on the economic stage with the rest of the world (Burning Glass Technologies, 2015; Business Higher Education Forum, 2018; Engler, 2012 & Office of Science and Technology Policy, 2017). Higher education must make deliberate decisions to support students and encourage academic success, especially with at-risk student populations (Moore, 2012). Higher education institutions that focus on the academic success and retention of lower-performing students in science, mathematics, and technology courses represents one way to increase undergraduate degrees in STEM (Chen & Soldner, 2013).

Background

The practice of cognitive behavioral coaching with an emphasis on nonverbal behaviors was studied to determine what impact the practice has on enhancing the self-efficacy of undergraduate students taking STEM courses at a Midwest, public, research university. Research questions posed whether or not this format of success coaching would assist in student's developing greater self-efficacy; particularly for undergraduate students taking STEM courses. The coached students would be sensitive to the nonverbal immediacy behaviors of the coaches.

The study was designed so that self-efficacy scores could be measured at the beginning of the semester and again at the end for comparison, as well as calculating results for the nonverbal immediacy scale given at the end of the term. Study participants

included students taking at least one course in a STEM discipline with a cumulative grade point average of 2.50/4.0 or lower at the start of the coaching intervention or students being admitted on probation without an established grade point average at the university.

For the control group, no intervention took place between the beginning and end distributions of the assessment. However, the experimental groups participated in Cognitive Behavioral Coaching a minimum of four times during the time between the start and end of the semester. The experimental-subset group includes the students who received coaching, but also took at least one STEM course. Students took the same assessment, the Self-Efficacy for Learning Abridged Version (SELF-A) developed by Zimmerman and Kitsantas in 2007 at both assessment points. The coaches were also asked to have the students fill in the Nonverbal Immediacy Scale – Observer Report (Richmond et al, 2003).

The questions being investigated follow:

1. What impact will Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of lower performing undergraduate students?
2. What impact will Cognitive Behavioral Coaching, focusing on nonverbal immediacy have on the self-efficacy of lower performing undergraduate students taking STEM courses?
3. To what degree do undergraduate students in STEM courses recognize immediate behaviors when interacting with academic coaches?

Results

There were ultimately 15 participants who were coached (experimental group) and completed both assessments. The control group consisted of 15 students, each taking

general biology course for non-majors. Ultimately, there were three groups being studied – control, experimental, and experimental - subset. Student demographics (gender, age, race) were analyzed and demonstrated these factors played no role in self-efficacy scores.

Table 3

Race/Ethnicity of Participants

Race/Ethnicity	N (Experimental)	N(Experimental - subset)	N (Control)
AMIND	1	1	0
ASIAN	1	1	1
BLACK	2	2	8
NSPEC	3	3	1
PACIF	1	1	1
WHITE	7	2	4
Total	**15**	**10**	**15**

Table 4

Gender of Participants

Gender	N (Experimental)	N(Experimental - subset)	N (Control)
Female	9	6	12
Male	6	4	3
Total	**15**	**10**	**15**

Table 5

Classification of Participants

Classification	N (Experimental)	N(Experimental - subset)	N (Control)
Freshman	3	3	11
Sophomore	**3**	**2**	1
Junior	5	4	3
Senior	**4**	**1**	**0**
Total	**15**	**10**	**15**

Hypotheses 1 and 2 were investigated using the same methods since H2 simply focuses on a subset of the data gathered in addressing H1.

H_{01}: Cognitive Behavioral Coaching with an intentional focus on nonverbal immediacy will have no impact on changes in students' self-efficacy scores for the experimental group, as evaluated by the SELF-A assessment.

The alternative statement is that the control group will experience statistically significantly smaller positive change in students' self-efficacy scores, as evaluated by the SELF-A assessment.

Self-efficacy scores were captured at the beginning and end of the semester using a pre-assessment and post-assessment survey. The same survey was provided both times to increase validity of the results. See Appendix A for the survey. It was expected that the experimental group would see a larger positive change in self-efficacy score when compared to the change in score for the control group. However, this was not the case.

Comparing group means of the self-efficacy scores, there was no significant difference between the pre-assessment and post-assessment scores for any group (all coached, coached + STEM, not coached + STEM) being studied. The experimental group achieved the smallest, positive growth of all groups. Paired t-Tests (see Table 7) did not confirm that there was a significant difference between the pre-assessment scores, and the post-assessment scores; therefore, the null hypotheses were not rejected. Had there been a significant difference, the effect size would have been calculated to identify the magnitude of the changes.

Hypothesis 3 was analyzed using the calculated score (See Appendix B) for the Nonverbal Immediacy – Observer (NIS-O) report. H3 stated that student scores on the Nonverbal Immediacy- Observer (NIS-O) report will show students are not sensitive to immediate behaviors of the coach. Student scores on the NIS-O were calculated according to the instructions provided by Robinson et al. (2003). Higher scores would indicate greater sensitivity to the immediate behaviors of the coach.

The SELF-A mean scores show the greatest change in the control group, with the experimental – subset group having the smallest change. However, it should be noted that the experimental – subset group had higher averages in both the pre-assessment and post-assessment scores. In fact, the pre-assessment average score for the experimental – subset group is higher than both the pre-assessment and post-assessment averages for the other two groups (see Table 6).

Table 6

Pre-Assessment and Post-Assessment Averages

SELF-A	N (Experimental)	N(Experimental - subset)	N (Control)
Pre-assessment (avg)	78.825	81.895	76.667
Post-assessment (avg)	80.893	82.287	79.847
Change	**2.068**	**0.392**	**3.180**

There was no statistical significance in the differences between the means of student pre-assessment and post-assessment scores on the SELF-A survey. With no statistically significant differences between them, it was senseless to try and calculate an effect size to measure the magnitude of change from the pre-assessment to the post-assessment.

Table 7

Paired Samples t-Test Results

t-Test Results	Experimental	Experimental - subset	Control
Mean Difference	-2.068	-0.392	-3.180
Standard Deviation of Difference	12.393	13.647	7.961
Standard Error of Deviation	3.200	4.316	2.056
Minimum Change	-15.263	-13.685	-19.474
Maximum Change	33.948	33.948	5.263
t Value	-0.650	-0.090	-1.550
P Value	0.529	0.930	0.144

The confidence level was set at $p<0.05$ for the t-tests. The confidence interval for the mean of the experimental group is (-8.931, 4.795). Because zero falls between the two values, we conclude that there is no statistically significant difference in the means for the experimental group. The same confidence level for the mean of the experimental - subset group is (-10.154, 9.371). Because zero falls between the two values, we conclude that there is no significant difference in the means for the experimental - subset group. The confidence level for the mean of the control group is (-7.589, 1.229). Because zero falls between the two values, we conclude that there is no significant difference in the means for the control group. With no significance in the score changes, the results could essentially be reproduced at random. There is no need to calculate an

effect size for either group. Unfortunately, due to a communication error, the students were not provided the NIS-O by the conclusion of that part of the study and were emailed the assessment later. There was only one response received, so this portion of the study was not analyzed.

Chapter 5: Discussion

Summary

Self-efficacy has been documented as having a positive correlation with academic performance. The aim was to determine if Cognitive Behavioral Coaching (CBC) with a focus on nonverbal immediacy behaviors had any impact on the self-efficacy of undergraduate students; particularly undergraduate students taking STEM courses. In all three groups (control, experimental, and experimental-subset), paired t-Tests revealed there was no significance in the mean differences between the pretest and posttest between any of the groups. Therefore, the null hypotheses were not rejected, and it cannot be concluded that CBC with a focus on nonverbal behaviors impacts changes in self-efficacy of the population of undergraduate college students.

Discussion

Schunk and Pajares (2009) define self-efficacy as "perceived capabilities for learning or performing actions at designated levels" (pp. 35). How an individual approach a task – e.g. effort, persistence, achievement – is influenced by person's beliefs about their capabilities to perform the task at a certain level of proficiency (Schunk & Pajares, 2002; Yusuf, 2011 & Meral et al, 2012). Higher self-efficacy leads to higher participation, higher persistence, and a greater interest in learning, due in part to the notion that individuals tend to participate in activities which they feel confident about (Schunk & Pajares, 2009). It was hoped that by incorporating Cognitive Behavioral Coaching as an academic coaching intervention, there would be an increase in students' self-efficacy for learning with the aim of indirectly supporting the growth and retention of undergraduate students in STEM courses would be seen.

According to Neenan (2018), Cognitive Behavioral Coaching (CBC) consists of two primary elements: removing psychological blocks that impede goal-attainment and achieving one's goal. Through the collaborative process of guided discovery, Socratic questioning helps the student identify what past events may have created the irrational belief that is creating an obstacle and how current thoughts and behaviors can be modified to develop more rational decision-making in the present. CBC helps individuals advance their proficiencies in a particular area with a concentrated focus on beliefs and behaviors to improve personal development (Neenan, 2018).

While results concluded that there was no statistically significant difference in the means for the preassessment and post assessment scores for all three groups, it is worth noting that each group did see an increase in overall self-efficacy over the course of the semester. The control group had the largest gain, while the subset of students in STEM courses had the smallest gain. However, the average preassessment score for this group was higher than the post assessment averages of the others. Perhaps because of starting at a higher index, the students in STEM courses (experimental – subset group) did not have as much "room for growth" as compared to peers.

According to Velez and Cano (2012), nonverbal immediacy accounts for four percent of the variance in self-efficacy. Therefore, while effective, very little variance in self-efficacy can be attributed completely to nonverbal immediacy. Bandura (1997) defined the four sources used to establish personal self-efficacy as: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. Physiological and affective states most logically connect with nonverbal influence. Nonverbal immediacy focuses on communicative behaviors such as eye contact, body

position, body movement, physical proximity and personal touch (Richmond, Gorham & McCroskey, 1987). The absence of nonverbal immediacy may translate into a lack of physiological or affective stimulus.

"Findings of previous studies on nonverbal immediacy in the classroom demonstrate a positive and meaningful relationship between instructors' nonverbal communication skills" (Yildz et al, 2013, pp. 34-35). The aim here was to produce similar results, but with the addition of nonverbal immediacy during the academic coach's relationship with mentee. Future research should look into whether coaches' arithmetic means on the nonverbal immediacy scales (NIS-O) in seven of the eight behaviors are equal to or greater than 3.5 out of 5.0; thus, showing a high level of nonverbal expressivity. Yildz and colleagues (2013) suggested eliminating the eighth behavior of "Touching students while talking" due to the low arithmetic mean of 2.78 with a standard deviation of 0.86 (pp. 35). The reasoning for this decision is due to sexual harassment laws that are in place. Most likely, touching students may always have a low score.

One aim was to add to the very minimal empirical evidence on the effectiveness of academic coaching, while providing a potential framework to guide the development of other coaching interventions. Searches in education databases and peer-reviewed journals return very few results on academic coaching for undergraduate students, of which the limited existing literature focuses on students with disabilities. Additionally, there are no guides on developing a comprehensive coaching experience for institutions wishing to deliver this type of intervention. The positive results would have added to the practice of coaching as a student support by providing a construction for the intervention.

However, the lack of statistically significant changes does not conclusively indicate that Cognitive Behavioral Coaching is unable to produce the desired effect.

One major consideration is that self-efficacy is not a one-dimensional construct. Changes in self-efficacy have been attributed to performance accomplishment, vicarious learning, social persuasion, and emotional arousal (Fencl & Scheel, 2004). While there has not been much work done on the impact of classroom experiences, Fencl and Scheel (2004) discussed the role of classroom instruction on self-efficacy with their study on academic self-efficacy in undergraduate physics courses. They noted that traditionally taught sections resulted in decreased confidence and the use of mixed pedagogies saw increases in confidence (Fencl & Scheel, 2004). They go on to say that instructor-student climate significantly correlates to all self-efficacy sources (Fencl & Scheel, 2004). This was supported by a study on mathematics self-efficacy. Peters (2013) found that "teacher-centered classroom climates had greater mathematics self-efficacy levels." It is clear that the classroom experience must be considered in the development/changes in self-efficacy for undergraduate students.

Lessons Learned

One of the primary lessons learned is that there needs to be regular follow-up with academic coaches. All coaches were given a schedule for disseminating the assessments but were not reminded. It was expected that the coaches would stick to the schedule provided at the start of the semester. However, coaches did not distribute the NIS-O as planned. There was also no follow-up to ensure the coaches thoroughly understood the process of CBC. All coaches participated in the online certification and all were certified prior to the start of the semester. Therefore, it was assumed that the coaches were

applying the concepts learned through the CBC certification. It would have been helpful to have coaches identify CBC activities that were done with the students to ensure that the student was receiving appropriate cognitive behavioral coaching and to confirm their expertise in applying the CBC procedures.

Limitations

There are two major limitations. First, the coaches providing the intervention are employees of the university and have a vested interest in the students' success. As well, the coaches were not consulted during the research about their experiences using CBC nor was the frequency documented. It was assumed the strategies were being applied in sessions with students. To address this, assessments were to be disseminated by coaches and faculty as part of their regular educational experience to provide an objective and impersonal research environment. Second, one of the researchers of this study leads the support staff offering the coaching and could introduce bias. To address this, all processes for data collection will take place as regularly outlined by the policies and procedures of the program and institution and the researcher mentioned will not be directly involved in the collection of data.

It may not be appropriate to conclude that Cognitive Behavioral Coaching with a focus on nonverbal immediacy behaviors has an impact on changes in self-efficacy. A larger sample size might have resulted in greater differentiation. Additionally, it was only expected that the coaches were applying the techniques of Cognitive Behavioral Coaching (CBC) in their meetings. There was no record, written or verbal, that gave insight to the one-on-one meetings between the coach and mentee. All coaches were trained via an online program offered by Udemy, which hosts online courses and

certifications in a vast array of topics. Udemy considers itself to be the "leading global marketplace for teaching and learning (https://about.udemy.com)" and provided certification for the practice of CBC and provided a few suggested resources for practitioners. However, there was no follow-up to ensure that the coaches had a thorough understanding of the practice and/or how to deliver interventions in this manner. More in-depth training on the practice or standardizing certain Cognitive Behavioral Coaching activities may influence positive changes in self-efficacy for undergraduate students.

Other limitations include the restricted geographical scope since all students were from the same public, research university in a Midwest state. Additionally, the control group and experimental group were studied in two different semesters. Data for the experimental group and experimental group – subset were collected over the fall semester. Because the control group did not receive the assessment early enough for the fall semester, the control group ultimately became a group of students taking a general biology course in the spring semester. However, the fact that the changes in the self-efficacy scores showed no statistical significance, it is believed that the different time intervals had little to no effect.

Delimitations

The primary delimitation is that the research is confined geographically to a specific, four-year, public research university in the Midwest. Therefore, no broader generalizations are implied. This institution has a largely non-traditional student population with students facing several hardships and responsibilities outside of school. The control group was also taken from one undergraduate biology course. Because classroom climate influences self-efficacy, a broader range of courses and instructors

would provide varying data points for classroom climate influences. All students in the experimental group were also required to utilize academic coaching at the university. Without self-selection, it cannot be said that all students took the intervention seriously.

Implications

Without supporting data it cannot be stated that Cognitive Behavioral Coaching is an effective way to increase the self-efficacy of undergraduate students, particularly those taking STEM courses. The study should likely be carried out again under stricter observation/evaluation of the coaches, and with a larger sample size. Similarly, the structure of the coaching intervention may not have included enough one-on-one meetings between the coach and mentee over the course of the semester to have the expected positive contribution to self-efficacy scores.

Recommendations for Future Research

While the study may need to be run again to definitively conclude that Cognitive Behavioral Coaching (CBC) does not have an impact on changes in self-efficacy of undergraduate students, it also establishes a precedent for studying other alternatives for coaching models. One model to consider would be the use of peer coaches as opposed to full-time university staff. Students may open up more and expose their vulnerabilities to other students easier than that of a representative of the university. Because the students participating were required to participate in the coaching intervention, it is hard to gauge how committed the students were to the process. Another consideration would be to reproduce the study with students who voluntarily participate in the coaching intervention. The level of engagement of the student may have a considerable effect on

the outcomes, as it is assumed that students being required to participate may not see the value or need for academic coaching.

It would also be worthwhile to reproduce the study in different locations across the country, and at different institution types. It is possible that Cognitive Behavioral Coaching (CBC) may have a larger impact on community college students. The general culture of the present study site is considered non-traditional with an average age of 27 for undergraduate students. Perhaps a more traditional institution with majority students ranging from 18 to 24 may find CBC of greater benefit to its students.

Additionally, regarding nonverbal immediacy, the study could be repeated with adding nonverbal immediacy training when Cognitive Behavior Coaching training is being implemented. This practice could help the coaches to be invested to find out the results which then would ensure more NIS-O reports are returned.

Because there is a special interest in students taking STEM courses, having an instrument that is created specific to learning in STEM courses may be a more accurate record of self-efficacy for this population. One suggestion would be to use an instrument that measures mathematics self-efficacy and limit the study to only students in mathematics courses. Maria Pampaka and colleagues (2011), created an instrument to measure self-efficacy in mathematics for undergraduate students in the United Kingdom based on general competencies. The assessment measures students' confidence in 10 mathematical tasks using a 4-point Likert type scale (Pampaka & Williams, 2010). Students are asked to rate their level of confidence in solving the tasks (without actually solving them); items were chosen to be relevant to a wide range of subjects that use mathematics and not just mathematics programs (Pampaka & Williams, 2010).

Conclusion

Although the results indicated that there were no significant differences between the means on the pretest and posttest for the experimental and control groups, a logical design was created to research the impact of different coaching philosophies on the self-efficacy of undergraduate students in science, technology, engineering, and mathematics. Having a clearly defined theoretical and pragmatic framework for coaching creates an academic support that can be easily replicated with established goals and objectives. This is currently lacking in higher education. As academic coaching becomes a more widely used intervention, institutions with limited resources may be able to establish their own programs by using an established context for academic coaching that aligns with the available resources.

Many education studies measuring the effectiveness of an academic support typically consist of qualitative data, or mixed methods. Being able to provide quantitative data regarding academic coaching is highly sought as institutions focus on return on investment for academic supports. This empirical research would introduce a researched model to use for academic coaching that is rooted in theory and has been tested, which is currently lacking in the literature.

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Appendix A: Self-A Assessment

SELF-EFFICACY FOR LEARNING FORM (SELF)

SELF-EFFICACY FOR LEARNING FORM (SELF) ID _____

Definitely Cannot Do it			*Probably Cannot*		*Maybe Can*		*Probably Can Do It*			*Definitely Can Do It*
0%	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*

Choose a percentage to indicate your answer and type it in the Rating box.

1. When you miss a class, can you find another student who can explain the lecture notes as clearly as your teacher did?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

2. When your teacher*s lecture is very complex, can you write an effective summary of your original notes before the next class?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

3. When a lecture is especially boring, can you motivate yourself to keep good notes?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

4. When you had trouble understanding your instructor*s lecture, can you clarify the confusion before the next class meeting by comparing notes with a classmate?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

5. When you have trouble studying your class notes because they are incomplete or confusing, can you revise and rewrite them clearly after every lecture?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

6. When you are taking a course covering a huge amount of material, can you condense your notes down to just the essential facts?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

7. When you are trying to understand a new topic, can you associate new concepts with old ones sufficiently well to remember them?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

8. When another student asks you to study together for a course in which you are experiencing difficulty, can you be an effective study partner?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

SELF-EFFICACY FOR LEARNING FORM (SELF)

9. When problems with friends and peers conflict with schoolwork, can you keep up with your assignments?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

10. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

11. When you find yourself getting increasingly behind in a new course, can you increase your study time sufficiently to catch up?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

12. When you discover that your homework assignments for the semester are much longer than expected, can you change your other priorities to have enough time for studying?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

13. When you have trouble recalling an abstract concept, can you think of a good example that will help you remember it on the test?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

14. When you have to take a test in a school subject you dislike, can you find a way to motivate yourself to earn a good grade?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

15. When you are feeling depressed about a forthcoming test, can you find a way to motivate yourself to do well?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

16. When your last test results were poor, can you figure out potential questions before the next test that will improve your score greatly?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

17. When you are struggling to remember technical details of a concept for a test, can you find a way to associate them together that will ensure recall?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

18. When you think you did poorly on a test you just finished, can you go back to your notes and locate all the information you had forgotten?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

19. When you find that you had to *cram* at the last minute for a test, can you begin your test preparation much earlier so you won*t need to cram the next time?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Rating

SUBMIT

Appendix B: Nonverbal Immediacy Scale-Observers

Instruction: Think about your academic coach. For the following statements, please circle the most appropriate number that best describes this person by using the 5-point scale below:

Never=1 Rarely=2 Occasionally=3 Often=4 Very Often=5

1 He/she uses her/his hands and arms to gesture while talking to students.

2 He/she touches students on the shoulder or arm while talking to them.

3 He/she uses monotone or dull voice while talking to students.

4 He/she looks over or away from students while talking to them.

5 He/she moves away from students when they touch her/him while they are talking.

6 He/she has a relaxed body position when he/she talks to students

7 He/she frowns while talking to students.

8 He/she avoids eye contact while talking to students.

9 He/she has a tense body position while talking to students.

10 He/she sits close or stands close to students while talking with them.

11 Her/his voice is monotonous or dull when he/she talks to students.

12 He/she uses a variety of vocal expressions when he/she talks to students.

13 He/she gestures when he/she talk to students.

14 He/she is animated when he/she talk to students.

15 He/she has a bland facial expression when he/she talks to students.

16 He/she moves closer to students when he/she talks to them.

17 He/she looks directly at students while talking to them.

18 He/she is stiff when he/she talks to students.

19 He/she has a lot of vocal variety when he/she talks to students.

20 He/she avoids gesturing while he/she is talking to students.

21 He/she leans toward students when he/she talks to them.

22 He/she maintains eye contact with students when he/she talks to them.

23 He/she tries not to sit or stand close to students when he/she talks with them.

24 He/she leans away from students when he/she talks to them.

25 He/she smiles when he/she talks to students.

26 He/she avoids touching students when he/she talks to them.

Source: Richmond et al, 2003

Appendix C: IRB Approval Form

Office of Research Administration

One University Boulevard
St. Louis, Missouri 63121-4499
Telephone: 314-516-5899
Fax: 314-516-6759
E-mail: ora@umsl.edu

DATE:	October 12, 2019
TO:	Christopher Miller
FROM:	University of Missouri-St. Louis IRB
PROJECT TITLE:	[1476367-1] Measuring the Impact of Cognitive Behavioral Coaching on the Self-Efficacy of Undergraduate Students in STEM Courses
REFERENCE #:	
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	October 12, 2019
REVIEW CATEGORY:	Exemption category # *3*

The chairperson of the University of Missouri-St. Louis IRB has APPROVED the above mentioned protocol for research involving human subjects and determined that the project qualifies for exemption from full committee review under Title 45 Code of Federal Regulations Part 46.101b. The time period for this approval expires one year from the date listed above. You must notify the University of Missouri-St. Louis IRB in advance of any proposed major changes in your approved protocol, e.g., addition of research sites or research instruments.

You must file an annual report with the committee. This report must indicate the starting date of the project and the number of subjects to date from start of project, or since last annual report, whichever is more recent.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.

This action is officially recorded in the minutes of the committee.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.