APPLYING A COGNITIVE DEVELOPMENT CURRICULUM TO IMPROVE ACADEMIC PERFORMANCE AT BOYCE COLLEGE

A Thesis

Presented to

the Faculty of

The Southern Baptist Theological Seminary

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

Garnetta Sweeney Smith

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APPROVAL SHEET

APPLYING A COGNITIVE DEVELOPMENT CURRICULUM

TO IMPROVE ACADEMIC PERFORMANCE

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Garnetta Sweeney Smith

Read and Approved by:

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John David Trentham (Chair)

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Date_____

To my parents, Garnett Ellis and Bertha Frances (Wilkinson) Sweeney,

for the glory of God

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PREFACE

To say this educational journey began eleven years ago would fail to acknowledge the emphasis my parents placed on education. My parents grew up and lived in a time and place that prevented them from easily pursuing an education beyond the eighth grade. Therefore, understanding the opportunities they were not afforded and those now available to their children and future grandchildren, they encouraged me to get an education. I will forever be grateful to and for them.

My husband, Lawrence, has faithfully encouraged and supported my educational pursuits. When I was discouraged, he provided encouragement. He seemed to know when I was tired and suggested making reservations instead of me making dinner. I am grateful to our sons who, though grown and out of our home, played an important part in the completion of this project. Jason generously offered his expertise in reading legal contracts to review my thesis and provide valuable feedback. When I did not know how to convert words in an Excel spreadsheet to numbers for data analysis, Edward quickly and expertly solved a problem that would have taken me days to research and then accomplish. Ashley, my daughter-in-law, was a consistent encourager. To my family, thank you.

Dr. Carol Brown is the reason I chose this project. Over a decade has passed since I first learned of the Equipping Minds Cognitive Development Curriculum, which was in its infancy. I was captured by the real opportunity to help people, especially students, improve academically. I am thankful for Dr. Brown's support in this replication study of her research. Dr. Brown generously provided training materials for the study, including the teacher training manual, student workbooks, Equipping Minds game cards, and sound therapy. Updated training from my original cognitive training was made available through the Equipping Minds website. The completion of this project is a

testament to the ongoing, persistent grace of God, the unwavering support of family and friends, a strong belief in the value of my research, and an unrelenting desire to finish a project in which I so deeply believed.

I am grateful for the patience, expertise, encouragement, guidance, and long suffering of my doctoral supervisor and second reader, Dr. John David Trentham and Dr. Joseph Harrod, respectively. I owe you both a deep debt of gratitude. Thank you.

I am also grateful that the faculty of Southern Seminary and Boyce College showed interest in and support for my project. Dr. Timothy Paul Jones, Dr. Gregory Wills, and Dr. Justin Irving, thank you for the consistent encouragement to keep going.

My best friend, Jill Wells, enthusiastically followed this project from its inception and was a stalwart supporter and encourager. She rejoiced when I rejoiced and encouraged when I was close to quitting. Our weekly meetings provided an opportunity for me to give updates and receive input and suggestions for strengthening my work.

Dr. Megan Arledge deserves my deepest gratitude for encouraging me to continue writing, providing evidence of progress milestones along the way. I credit her knowledge, gentle words of encouragement, and expert instructions as the reason I have finished this project. More than just a coworker, she was an incredible peer mentor. Her friendship and assistance were a gift from God.

Dr. Melissa Tucker and Mrs. Sandra Carwile gave their time to help recruit students from the Teacher Education Program at Boyce College. Their efforts allowed me to go forward with the research. I am immensely grateful.

I am thankful to have partnered with CNS Vital Signs, which provided online cognitive assessments and results. They provided the assessments at a generous price point and noted the work I was doing is important (Molly Beam to author, email, January 24, 2025).

I am so grateful for my statistics team, Mr. Tanner Williams and Dr. Philip Craig. Mr. Williams went above and beyond to provide statistical data analyses, as well

as clear explanations of the analyses, in keeping with what was comparable to Brown's original study. Dr. Craig served as a consultant and encourager by using his knowledge of research methodology and how to read both data trends and statistical analyses. His understanding and ability to explain the data was reassuring.

Mr. Dylan Matthews completed the Equipping Minds Cognitive Development Curriculum training for his role as the Disability Services Advisor for Southern Seminary and Boyce College. Little did we know that training would be needed, even essential, for the completion of a doctoral thesis several years later. Thank you for being my training partner and for leading the groups in my absence.

Last, but certainly not least, I am grateful to the Boyce College students who participated in this study. Your participation, whether in the training group or the control group, was critical to complete this study. Without you, there would not have been a study. I pray that the study was not only useful for your personally, but that you will remember and take what you learn into your future classrooms. Thank you, and I look forward to sharing the results with you.

The final and most humbling words of gratitude belong to the Lord Jesus Christ. I have sensed his presence, encouragement, and a gentle but persistent push to finish this project. I trust he believes it is a worthy project that will help others, and I trust it will ultimately bring glory to his great Name.

Garnetta Smith

Louisville, Kentucky

December 2025

CHAPTER 1

INTRODUCTION

Each year, millions of young men and women enroll in public and private colleges and universities. Statista reports that since 2009, an average of over 14 million students have enrolled in public colleges, and over 5 million have enrolled in private colleges each year.[1] Even with the high numbers of those entering college, enrollment is declining, and has been for the past several years, in a climate where post-secondary education and training are necessary to secure the best-paying jobs.[2] With declining enrollment, institutions of higher education are faced with the perennial problem of retaining the students they recruit and helping them persist through graduation. Students who are not retained or do not persist do not graduate. College student retention has been the subject of research studies for nearly one hundred years.

Though a significant body of research has been produced that describes college student retention, the same research has not proven to have made an impact on increasing student retention.[3] Scholars of higher education research believe their work is valuable and useful but also recognize that research often fails to impact higher education practice.

[1] Erin Duffin, "College Enrollment in the United States from 1965 to 2020 and Projections Up to 2031 for Public and Private Colleges," Statista, August 30, 2024, https://www.statista.com/statistics/183995/us-college-enrollment-and-projections-in-public-and-private-institutions/.

[2] Rick Dalton and Jon Reidel, "To Counsel Readiness," New England Board of Higher Education, December 17, 2019, https://nebhe.org/journal/to-counsel-readiness/.

[3] Willis A. Jones and John M. Braxton, "Cataloging and Comparing Institutional Efforts to Increase Student Retention Rates," *Journal of College Student Retention* 11, no. 1 (2009): 124.

Education researcher John Braxton[4] notes that "to make research and scholarship of our field more useful to practice, a scholarship of practice needs to emerge."[5] The need for a scholarship of practice comes from the inability of many higher education institutions to put into action the knowledge to bring about the desired gains in student retention and graduation. The purpose of a scholarship of practice, according to Braxton, is to generate both "replicative knowledge (needed to guide routines of professional practice) and applicatory knowledge (entails the translation of technical knowledge into forms amenable of institutional action), both of which are used in professional practice."[6]

Michael D. Jackson, in his doctoral research, notes that scholars have continually called for better "frameworks for translating" the knowledge gained from empirical research studies to improve professional practice.[7] According to Vince Tinto, the broad dimensions of the theory of student departure have not resulted in the

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[4] John M. Braxton was

> Professor of Education Emeritus in the department of Leadership, Policy, and Organizations at Peabody College of Vanderbilt University. Braxton has two major programs of research. One centers on the college student experience with particular attention focused on college student persistence. His work on college student persistence entails the assessment of theory on college student persistence, the revision and construction of new theory on college and constructs and empirical testing of revised and newly formulated theory on this phenomenon. ("John M. Braxton," American Association of Collegiate Registrars and Admissions Officers, accessed September 17, 2025, https://www.aacrao.org/people/john-m.-braxton)

[5] John M. Braxton, "Reflections on a Scholarship of Practice," *Review of Higher Education* 28, no. 2 (Winter 2005): 285.

[6] John M. Braxton, "Toward a Scholarship of Practice Centered on College Student Retention," *New Directions for Teaching and Learning* 115 (Fall 2008): 101.

[7] Michael D. Jackson, "Cataloging and Comparing Bible College Efforts to Improve Student Retention and Completion" (EdD diss., Union University, 2017), 3. Jackson's doctoral thesis furthered Jones and Braxton's research by applying their methodology to an understudied subset of higher education institutions, Bible Colleges. Jackson's research sample was Bible colleges who are currently accredited by, or seeking accreditation, by The Association of Biblical Higher Education (ABHE). His research identified two additional retention practice subcategories: standardized studies, and benchmark comparison studies.

development of a complementary theory of action to help institutions develop "policies, programs and practices to enhance student persistence."[8]

Previous research appears to be disconnected from the realities of students. In a 2006 study, John M. Braxton, Jeffrey S. McKinney, and Pauline J. Reynolds recognized that institutions of higher education in Indiana that participated in their study had made significant investments in retention, but there were no "well-designed studies that evaluate(d) the effects of those interventions."[9] Braxton and his colleagues' research was designed to "explore the nexus between research and practice."[10] By focusing on the efforts of one state to reduce student departure, they hoped to "frame questions for examining the efforts of other states."[11]

A subsequent 2009 study to advance the earlier research was conducted by Willis Jones[12] and Braxton. This study of eight four-year colleges focused on four institutions that were the most successful in retaining students and four states that were the least successful in retaining students in their respective states.[13] The specific goal of

[8] Vincent Tinto, "Moving from Theory to Action: A Model of Institutional Action for Student Success," in *College Student Retention: Formula for Student Success*, ed. Alan Seidman (Lanham, MD: Rowman & Littlefield, 2012), 251.

[9] John M. Braxton, Jeffrey S. McKinney, and Pauline J. Reynolds, "Cataloging Institutional Efforts to Understand and Reduce College Student Departure," *New Directions for Institutional Research* 130 (Summer 2006): 25.

[10] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 26.

[11] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 27.

[12] Willis A. Jones, PhD, Higher Education Leadership and Policy, Vanderbilt University, 2011. Associate professor of higher education in the Department of Education Policy and Leadership and Department of Applied Physiology; Sport Management Chair ad interim at the Annette Caldwell Simmons School of Education and Human Development at Southern Methodist University, Dallas, TX. Dr. Jones' research uses quantitative data to examine the antecedents and outcomes of college/university behavior, strategy, structures, and policies. His primary area of interest is intercollegiate athletics, about which he has published many peer-reviewed articles exploring how intercollegiate athletics influence organizational and student outcomes. He also explores and publishes on college student retention, college rankings, Historically Black Colleges and Universities, faculty governance, community colleges, and adult learners. "Willis Jones," Simmons Methodist University, accessed June 13, 2024, https://www.smu.edu/simmons/about-us/directory/education-policy-leadership/jones.

[13] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 124.

their study was to "gain a clearer picture of the types of activities institutions of higher education are engaged in with respect to the understanding and reducing of student dropout."[14] Jackson continued the study of retention practices among Bible colleges, a subset of higher education institutions, which he notes are "understudied and under-represented" in the research literature.[15]

The study of institutional variables and practices failed to improve student retention. As with the retention studies mentioned, many studies focused on institutional characteristics or institutional initiatives rather than students' academic needs or characteristics. The institutional retention studies classified by Braxton, McKinney, and Reynolds included institutional studies, assessments of programs designed to reduce student departure, assessments of the college environment and experience, and reports of policies and programs developed to reduce attrition.[16] Additionally, Braxton and Jones reported percent-comparison studies and autopsy studies in many of the schools they studied.[17]

Jackson noted two additional retention practice sub-categories in the Association of Biblical Higher Education (ABHE) schools he studied and included in his research: standardized studies and benchmark comparison studies.[18] The study of students' academic ability, recognition of the effect(s) of a learning difference or disability, and an assessment of students' general academic performance are absent from the research of Braxton, Willis, and Jackson.

Students who start their college or university studies and subsequently stop their studies do so for a variety of reasons, including financial shortfalls, under-preparation

[14] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 123.

[15] Jackson, "Cataloging and Comparing Bible College Efforts," 3.

[16] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 27.

[17] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 128.

[18] Jackson, "Cataloging and Comparing Bible College Efforts," 65.

or ill-preparation for college-level work, academic failure, or undiagnosed learning differences or learning disabilities. One of the most common reasons students fail to finish college, and the reason least studied is academic failure related to undiagnosed learning differences or learning disabilities and differences related to neurodevelopmental learning disorders (NLD).[19] Some students enter college with diagnosed learning differences and/or disabilities and receive academic accommodation based on an Individualized Education Plan (IEP)[20] or 504[21] plan from their secondary educational institution. IEPs and 504 plans do not follow a student to college but can be used to provide academic accommodations for diagnosed or evaluated students. Neither IEP nor 504 plans are designed to address the roots of student academic concerns. In her 2016 study, Carol Brown,[22] referencing her experience as an educational specialist and cognitive developmental therapist, affirms the inability of IEPs and 504 plans to address and resolve students' academic deficiencies, "When learners with NLD enter higher education many will experience academic difficulties and are viewed as undisciplined and unmotivated. Student services for learners with NLD provide writing centers, extended

[19] Carol T. Brown, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory" (EdD thesis, The Southern Baptist Theological Seminary, 2016). Neurodevelopmental Learning Disorders (NLD) include intellectual developmental disorder or intellectual disability (ID), communication disorders, autism spectrum disorders (ASD), attention-deficit hyperactivity disorder (ADHD), specific learning disorders (SLD), and motor disorders.

[20] IEP is a written statement for each child with a disability that is developed, reviewed, and revised in accordance with section 1414(d) of this title (Title XX, Chapter 33 of the United States Department of Education). "Title 20—Education," GovInfo, accessed July 20, 2025, https://www.gpo.gov/fdsys/pkg/USCODE-2011-title20/pdf/USCODE-2011-title20-chap33.pdf.

[21] The Rehabilitation Act of 1973, Section 504, addresses protections for students with disabilities. Section 504 is a federal law designed to protect the rights of individuals with disabilities in programs and activities that receive federal financial assistance from the department. "Section 504, Rehabilitation Act of 1973," US Department of Labor, accessed July 20, 2025, https://www.dol.gov/agencies/oasam/centers-offices/civil-rights-center/statutes/section-504-rehabilitation-act-of-1973.

[22] Carol T. Brown, Doctor of Education (EdD) in Educational Leadership, The Southern Baptist Theological Seminary, 2016. Brown is the Executive Director and Educational Specialist of Equipping Minds Cognitive Development Curriculum/Program and is a contributing author in *Neuroscience and Christian Formation* (2016) and *Human Development: Equipping Minds with Cognitive Development* (2018).

time on tests, and other accommodations. However, the underlying causes of these learning difficulties are not addressed."[23] Other students enter college without a NLD diagnosis and struggle academically and socially without any foundation for understanding why.

Brown, in a 2016 research study based on the assertion that "working memory is the new IQ,"[24] sought to determine if intelligence could be enhanced by improving working memory using the Equipping Minds Cognitive Development Curriculum (EMCDC).[25] According to Brown, "Research on working memory found reliable correlations between working memory span and several other measures of cognitive function, intelligence, and performance in school."[26] Some research studies "show that aspects of working memory contribute to early arithmetic performance,"[27] and still other studies have examined the "relationship between working memory, reading, and comprehension."[28]

Brown's study, aimed at students with a specific learning disorder (SLD), asked whether it was possible to "raise the working memory and cognitive ability capacity of learners to an extent that has previously not been linked to learners with these disorders."[29] Further, Brown was interested to know if "an increase in working memory would result

[23] Brown, "Equipping Minds," 10.

[24] Brown, "Equipping Minds," 1.

[25] Brown, "Equipping Minds," 91. The Equipping Minds Cognitive Development Curriculum is based on the theory of Structural Cognitive Modifiability (SCM), Mediated Learning Experience (MLE), and a biblical worldview. EMCDC is designed to strengthen existing neural connections and, more importantly, to create missing neural pathways that may inhibit one's ability to learn. EMCDC employs a holistic approach to cognitive development training through primitive reflex exercises, sensory-motor development exercises, and cognitive developmental exercises.

[26] Brown, "Equipping Minds," 1.

[27] Brown, "Equipping Minds," 1.

[28] Brown, "Equipping Minds," 1.

[29] Brown, "Equipping Minds," 8.

in transfer effects[30] within an educational setting, measured by standardized tests of academic attainment, of non-verbal and verbal abilities."[31]

Brown, guided by her five research questions, summarized the implications of her research as follows:

1. Students with SLD have low working memory scores, which impact academic performance.
2. Working memory training does not seem to have a causative effect in relation to verbal, nonverbal, and academic abilities when using EMCDC for 30 hours of intervention.
3. In the context of this [Brown's] study, 30 hours of intervention using the EMCDC did not impact verbal and visuospatial working memory to the extent seen in the clinical setting when 60 hours of intervention are used.
4. Thirty hours of intervention with EMCDC significantly improves science scores, demonstrating far transfer effects in learners with an SLD.
5. EMCDC increases the cognitive abilities of verbal, nonverbal, and IQ composite despite insignificant measurable changes in working memory.
6. Human-mediated learning using a cognitive development curriculum, EMCDC, increases cognitive abilities of verbal, nonverbal, and IQ composite scores in learners with a SLD.
7. Gender is not a significant factor in a student's response to the training provided by EMCDC in verbal and visuospatial working memory, verbal and non-verbal abilities, and IQ Composite.
8. EMCDC impacts males more significantly than females in reading and science.
9. Older students are more likely to exhibit significant improvement in test scores on the Verbal Working Memory test.[32]

Need for Study

Brown asserts in the conclusion of her research that an area where the EMCDC could be used for further study is in a higher education context. Brown specifically notes that those serving in Christian higher education could benefit from her study:

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[30] J. S. Freund, "Learning—Transfer," in *Encyclopedia of Gerontology*, 2007, https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/transfer-effect. Transfer effects are found when learning one task either facilitates (positive transfer) or interferes with (negative transfer) learning the second task.

[31] Brown, "Equipping Minds," 8.

[32] Brown, "Equipping Minds," 116–17.

> Christian higher education administrators, practitioners, and student service professionals who serve and teach students with NLD and those with undiagnosed learning struggles can use EMCDC. By addressing the underlying deficits in cognitive abilities an increase in students' academic satisfaction may result thereby in increasing student retention and graduation rates. As the number of adult learners is increasing in higher education, it is important to continue to engage in stimulating learning activities during adulthood to manage the demands on cognitive abilities.[33]

This research seeks to further Brown's work by applying the same methodology to a group of traditional-aged college students. Brown's EMCDC has not been employed to determine its efficacy in a cohort of college-aged students. The notes in her conclusions state that one implication of her study is that "older students are more likely to exhibit significant improvement in test scores on the Verbal Working Memory test."[34]

Boyce College is the undergraduate school of The Southern Baptist Theological Seminary in Louisville, Kentucky. Boyce College is a private Christian college, limited to applicants who express a Christian commitment and affirmation of a calling to ministry. The school, founded in 1998, offers baccalaureate training in the areas of ministry and work (Business Administration, Communication, Teacher Education, Humanities, Philosophy, Politics, and Economics) and is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACS) and licensed by the State of Kentucky's Council on Postsecondary Education. Approximately 1,000 students were enrolled in the Spring 2025 semester. The retention rate[35] for first-time, full-time Boyce

[33] Brown, "Equipping Minds," 11.

[34] Brown, "Equipping Minds," 117–22.

[35] Retention rates measure the percentage of first-time students who are seeking bachelor's degrees who return to the institution to continue their studies the following year. This number reflects IPEDS data for students who began their studies in Fall 2020 and returned in Fall 2021. "Undergraduate Retention and Graduation Rates," National Center for Education Statistics, accessed August 23, 2024, https://nces.ed.gov/collegenavigator/?q=The+Southern+Baptist+Theological+Seminary&s=all&id=157748#retgrad.

College students is 83 percent. The most recent overall graduation rate[36] for Boyce College is 42 percent.[37]

According to a 2023 article, based on data[38] from the 2015–2016 academic year, 19.4 percent of the undergraduate student population reported having a disability.[39] According to the NCES, 20.5 percent of undergraduate students reported having a disability during the same period.[40]

In the 2023–2024 academic year, forty-three Boyce College students registered to receive academic accommodation through the Disability Services Office. Not all students who are currently registered take advantage of their approved accommodation. Of the forty-three who were registered, thirty (69.8 percent) receive accommodation for cognitive-related learning differences or disabilities. Thirteen students receive accommodations for non-cognitive-related disabilities.[41] Accommodations are granted

[36] The overall graduation rate tracks the progress of students who began their studies as a full-time, first-time degree- or certificate-seeking students to see if they complete a degree or other award, such as a certificate, within 150 percent of "normal time" for completing the program in which they enrolled. This number reflects IPEDS data for students who began their studies in Fall 2021 and returned in Fall 2022. "Undergraduate Retention and Graduation Rates."

[37] Retention and overall graduation rate data from IPEDS. "Undergraduate Retention and Graduation Rates."

[38] The question asking students about "difficulty concentrating, remembering, or making decisions was expanded to include examples of relevant conditions." Students were "instructed to 'consider conditions including, but not limited to, a serious learning disability, depression, ADD, or ADHD.'" Students reporting difficulty was 17 percent in 2015–2016 (after the examples were added) and 8 percent in 2011–2012 (before examples were added). Therefore, estimates from previous years cannot be compared to previous years. "Digest of Education Statistics," National Center for Education Statistics, accessed February 12, 2024, https://nces.ed.gov/programs/digest/d20/tables/dt20_311.10.asp.

[39] Lyss Welding, "Students with Disabilities in Higher Education: Enrollment Date, Outcomes, and Inclusion," Best Colleges, March 29, 2023, https://www.bestcolleges.com/research/students-with-disabilities-higher-education-statistics/. Data for this article was for the 2015–2016 academic year.

[40] In this report, students with disabilities are those who reported having deafness or serious difficulty hearing; blindness or serious difficulty seeing; serious difficulty concentrating, remembering, or making decisions because of a physical, mental, or emotional condition; or serious difficulty walking or climbing stairs. "Digest of Education Statistics," National Center for Education Statistics, accessed February 12, 2024, https://nces.ed.gov/programs/digest/d22/tables/dt22_311.10.asp.

[41] Non-cognitive-related disabilities include medical conditions that may require the student to leave the classroom, the need for flexibility in attendance, or another physical condition.

individually and may include extended time on quizzes, tests, and exams; extended time on reading and writing assignments; use of the Center for Student Success testing room; use of an in-class note taker; access to alternative-format textbooks; and permission to audio-record class lectures.[42]

This research study seeks to consider whether utilizing a cognitive brain development program can increase academic performance in college students with or without a diagnosed NLD. Specifically of interest is the transfer effects realized in Brown's research study. Brown noted that a four-year case study with a client ("Marie"[43]) implied that "cognitive development exercises do have far transfer effects to academic achievement for learners who have intellectual development disorder."[44] The gains in academic ability made and retained by Marie are confirmed by the Measures of Academic Performance (MAP) test scores completed over the subsequent four years following completion of EMCDC.[45]

Brown's study found that "thirty hours of intervention with EMCDC significantly improves science scores demonstrating far transfer effects in learners with SLD."[46] Additionally, Brown discovered that while there were no significant measurable changes in the working memory of study subjects, students realized an increase in "cognitive abilities of verbal, nonverbal, and IQ composite scores."[47]

The training group and active control group in Brown's study received the same academic instruction as part of their regular school day. Though the EMCDC program does

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[42] Information provided by Dylan Matthews, Disability Services Advisor for The Southern Baptist Theological Seminary and Boyce College, August 23, 2024.

[43] "Marie" is a pseudonym for a student with Down Syndrome who made significant academic gains using the EMCDC curriculum.

[44] Brown, "Equipping Minds," 76.

[45] Brown, "Equipping Minds," 76.

[46] Brown, "Equipping Minds," 117.

[47] Brown, "Equipping Minds," 117.

not contain academic content, the training group realized stronger academic gains than the control group, which demonstrates far transfer effect.[48]

Purpose Statement

The current study is a replication of the 2016 study by Carol Brown, who sought to improve working memory in learners with a SLD. Brown's study showed that "working memory training does not have a causative effect in relationship to verbal, nonverbal, and academic abilities when using EMCDC"[49]; however, the research concluded that the EMCDC training "increases verbal, nonverbal, and IQ composite cognitive abilities despite insignificant measurable changes in working memory."[50] One purpose of this study is to extend the scope of Brown's study by applying the EMCDC to students who are older than 14 years old.[51] A second purpose of this study was to explore whether addressing underlying deficits in cognitive abilities could have a positive impact on "student satisfaction, student retention, and graduation rates," as Brown noted in the conclusion of her study.[52] Student satisfaction can also lead to students persisting to graduation. Teacher Education Program students, aged 18–24, participated in the current research.[53]

Delimitations of the Study

This study has the following delimitations. First, this study was limited to Boyce College students, who were at least 18 years old. Second, all participants in the training group completed thirty hours of cognitive development training over a twelve-week period,

[48] Brown, "Equipping Minds," 119.

[49] Brown, "Equipping Minds," 117.

[50] Brown, "Equipping Minds," 121.

[51] One of the limitations Brown noted in her study was that "the results may not be indicative of learners younger than 9 or older than 14 years of age." Brown, "Equipping Minds," 124.

[52] Brown, "Equipping Minds," 144.

[53] Participant ages: 18 (n=1), 19 (n=7), 20 (n=4), 21 (n=2), 22 (n= 0), 23 (n= 1), 24 (n= 0)

consisting of sixty-minute sessions with a mediator trained in the EMCDC. While the recommended training with EMCDC is sixty hours, this study, as a replication of Brown's study, was limited to thirty hours of training.

Research Questions

This study is a replication of Carol Brown's 2016 doctoral thesis, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory."[54] The questions for the current research replicate Brown's questions to maintain a valid comparison of results.

1. What, if any, are the effects on working memory when applying the Equipping Minds Cognitive Development Curriculum?
2. What, if any, are the effects of changes in working memory on academic ability in learners using the Equipping Minds Cognitive Development Curriculum?
3. What, if any, is the effect of working memory on non-verbal and verbal abilities?
4. What, if any, is the effect of the gender of the learner on working memory using the Equipping Minds Cognitive Development Curriculum?
5. What, if any, is the effect of the participant's age on working memory using the Equipping Minds Cognitive Development Curriculum?

Terminology

This section contains a list of terms found in this study. These terms are specific to the study and are included to bring clarity and understanding to its background, purpose, and methodology. The terms will also be helpful in understanding the study results and conclusions.

CNS Vital Signs Assessment. CNS Vital Signs is a computerized neurocognitive assessment that utilizes scientifically validated, objective, and reliable computerized neuropsychological tests to evaluate neurocognitive status and covers a range of mental processes from simple motor performance, attention, memory, to executive functions. CNS Vital Signs contains over fifty well-known evidence-based clinical and quality

[54] Brown, "Equipping Minds," 16.

measures (behaviors, symptoms, comorbidities, quality of life) rating scales. The CNS Vital Signs "BRIEF-CORE" neurocognitive assessment captures an objective view of eleven basic brain functions: composite memory, verbal memory, visual memory, executive function, processing speed, psychomotor speed, reaction time, complex attention, cognitive flexibility, simple visual attention, and motor speed.[55] The CNS Vital Signs assessment is valid and reliable for people aged 7 to 90.[56]

Equipping Minds Cognitive Development Curriculum. The EMCDC addresses "the cognitive skills which are the foundational tools for learning" and is "designed to improve a learner's working memory, visual and auditory processing, attention, processing speed, logic, comprehension, language, social skills, attention, executive function, behavior, and self-regulation."[57]

Individual Education Program (IEP). An IEP is a requirement of Part B of the Individuals with Disabilities Act (IDEA). Development of an IEP for students guides parents, teachers, and other school staff in working together to "improve educational results for children with disabilities."[58]

Kaufman Brief Intelligence Test, Revised (KBIT-2). The *KBIT-2* is a "brief, individually administered measure of the verbal and non-verbal intelligence of children, adolescents, and adults ages 4 to 90 years."[59] The verbal intelligence score is comprised

[55] "Frequently Asked Questions," CNS Vital Signs, accessed February 6, 2024, https://www.cnsvs.com/FAQs.html.

[56] Camillo Thomas Gualtieri and Lynda G. Johnson, "Reliability and Validity of a Computerized Neurocognitive Test Battery, CNS Vital Signs," *Archives of Clinical Neuropsychology* 21, no. 7 (October 2006): 623–43.

[57] Carol T. Brown, "Equipping Minds Cognitive Development Curriculum," Equipping Minds, accessed June 11, 2024, https://equippingminds.com/equipping-minds-workbook/.

[58] "A Guide to the Individualized Education Program," US Department of Education, August 30, 2019, https://www2.ed.gov/parents/needs/speced/iepguide/index.html#Summary.

[59] Alan S. Kaufman and Nadeen L. Kaufman, *KBIT-2 Kaufman Brief Intelligence Test*, 2nd rev. ed. (Bloomington, MN: Pearson, 2022), 1-4. The *KBIT-2 Revised* is the same in administration and scoring procedures[as the previous version]. Changes include updates to the Verbal Knowledge subtest's art and to the Riddles subtest's sample responses, improvements to the Matrices subtest's ceiling, changes

of two subtests that measure verbal, school-related skills and assess word knowledge, a range of general information, verbal concept formation, and the ability to reason. The non-verbal intelligence score "measures the ability to solve new problems by assessing an individual's ability to perceive relationships and complete visual analogies."[60]

Neurodevelopmental Learning Disorder(s) (NLD). "Neurodevelopmental disorders are disabilities associated primarily with the functioning of the neurological system and the brain."[61] A neurological disorder that affects the way a child's brain receives, processes, retains, and responds to information is termed a "learning disability." Other neurological disorders that involve intellectual function, including communication, self-care, and social or interpersonal skills, are classified as "intellectual disabilities."[62]

Non-verbal knowledge/intelligence. Non-verbal intelligence refers to an individual's ability to perceive relationships and complete visual analogies. The matrices *KBIT-2* subtest measures the ability to solve new problems.[63]

Persistence. Student persistence "refers to the desire and action of a student to stay within the system of higher education from [the] beginning year through degree completion."[64]

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to increase the user-friendliness of remote administration, and inclusion of norms that are appropriate for in-person and tele-assessment. The *KBIT-2* is designed for use when using a brief measure of intelligence is sufficient for the need and should not be used to "diagnose, place, or make neuropsychological interpretations based on the obtained scores" from the assessment. Uses of the *KBIT-2* include "measuring cognitive ability as part of a gifted and talented selection process, testing job applicants for placement decisions" and "measuring the intelligence of individuals in various groups for research purposes." While the *KBIT-2* "standard scores have the same metric as numerous comprehensive intelligence and cognitive ability tests," it may not be used as a "substitute for a comprehensive measure of an individual's intelligence." Kaufman and Kaufman, *KBIT-2*, 4.

[60] Kaufman and Kaufman, *KBIT-2*, 1.

[61] "America's Children and the Environment (ACE)," United States Environmental Protection Agency, accessed June 11, 2024, https://www.epa.gov/americaschildrenenvironment/health-neurodevelopmental-disorders#About%20the%20Neurodevelopmental%%20Indicators.

[62] "America's Children and the Environment (ACE)."

[63] Kaufman and Kaufman, *KBIT-2*, 1.

[64] Joseph Berger, Gerardo Blanco Ramirez, and Susan Lyons, "Past to Present: A Historical Look at Retention," in Seidman, *College Student Retention*, 12.

Primitive reflexes. Primitive reflexes are a set of responses to stimuli designed to provide an immediate response for infants after birth. These reflexes are automatic and are controlled from the brain stem and executed without any cortical[65] involvement. These reflexes are necessary for a baby's survival during the first few weeks of life. However, these reflexes should be inhibited during the first year. If reflexes are retained, rather than inhibited, development of other reflexes may be prevented or delayed, and immature patterns of behavior may be retained or developed.[66]

Retention. Retention "refers to the ability of an institution to retain a student from admission through graduation,"[67] but how the term is used may vary from one institution to another. Retention has not been conceptualized consistently, but its definition depends on the context of the institution and has been the subject of educators and researchers for decades. Terminology used to describe the phenomenon of student departure includes "student mortality, college dropouts, student attrition, college retention, and student persistence."[68] The most widely used definition for retention is from the Integrated Postsecondary Education Data System (IPEDS):

> For 4-year institutions, retention rate is the percentage of first-time bachelor's (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions, retention rate is the percentage of first-time degree/certificate-seeking students from the previous fall who either reenrolled or successfully completed their program by the current fall.[69]

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[65] Cortical refers to the outer membrane of the brain, called the cerebral cortex. The cortex is involved in higher processes in the human brain, including memory, thinking, learning, reasoning, problem-solving, emotions, consciousness and functions related to your senses. This is in contrast to the primary reflexes controlled by the (inner) brain stem. "Cerebral Cortex," Cleveland Clinic, accessed August 19, 2025, https://my.clevelandclinic.org/health/articles/23073-cerebral-cortex.

[66] Sally Goddard, *Reflexes, Learning and Behavior: A Window into the Child's Mind* (Eugene, OR: Fern Ridge, 2005), 1.

[67] Berger, Ramirez, and Lyons, "Past to Present," 12.

[68] Berger, Ramirez, and Lyons, "Past to Present," 12.

[69] Integrated Postsecondary Education Data System (IPEDS), a branch of the National Center for Education Statistics (NCES) of the Institute of Education Sciences (IES), collects data from postsecondary institutions that includes, in part, Institutional Characteristics, Completions, Admissions, Fall Enrollment, and Graduation Rates. "Integrated Postsecondary Education Data System," National Center for Education Statistics, accessed June 13, 2024, https://nces.ed.gov/ipeds/.

Scholarship of practice. Using the findings of empirical research as a foundation for the development of institutional policy and practice.[70]

Sensory-motor development (integration). Sensory-motor development and integration is the organization of the senses that allow a "person to move and learn and behave in a productive manner" and "forms the underlying foundations of academic learning and social behavior."[71] Disruptions in this organization of the senses can lead to disorders in "visual perception, auditory processing, and language."[72]

Sound therapy. Sound therapy is a mode of therapy administered by listening to high-frequency music through headphones. The music is referred to as "filtered" because the low frequencies are filtered out, leaving only the high frequencies, or recharging sounds. Sound therapy was invented in the 1950s by Alfred Tomatis and has been used to achieve "positive results with hearing disorders, emotional disturbance, hypertension, insomnia, speech defects, epilepsy, hyperactivity, dyslexia, and even autism."[73]

Specific Learning Disability (SLD). A specific learning disability is a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations.[74]

Statistical significance. Statistical significance testing reports an assessment as to whether the observed scores reflect a pattern other than chance. A test reaches statistical

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[70] Braxton, "Reflections on a Scholarship of Practice," 285.

[71] A. Jean Ayers, *Sensory Integration and the Child: Understanding Hidden Sensory Challenges* (Los Angeles: Western Psychological Services, 2005), 5.

[72] Ayers, *Sensory Integration and the Child*, 115.

[73] Patricia Joudry and Rafaele Joudry, *Sound Therapy: Music to Recharge Your Brain*, 12th ed. (Sydney, Australia: Success Stream, 2009), 26–27.

[74] "Students With Disabilities," National Center for Education Statistics, 2023, https://nces.ed.gov/programs/coe/indicator/cgg/students-with-disabilities; "Condition of Education," US Department of Education, Institute of Education Sciences, accessed May 3, 2024, https://nces.ed.gov/programs/coe/indicator/cgg.

significance if the results are unlikely by chance to have occurred, and the null hypothesis of "no effect" can be rejected.[75]

TerraNova. TerraNova is a series of standardized achievement tests designed and used to assess K-12 student achievement in reading, language arts, mathematics, science, social studies, vocabulary, spelling, and other areas.[76]

Transfer effect(s). Transfer effect describes the effect of cognitive training on non-trained cognitive functions.

> The transfer effect refers to the ability that individuals can use the knowledge and skills learned in one scenario to achieve different goals in other scenarios. [Transfer effect] can be differentiated into near-transfer effects, post-training improvement in tasks similar to the training tasks, and far-transfer effects, post-training improvement in tasks that are different from the training tasks in nature or in appearance.[77]

Verbal intelligence/knowledge. Verbal knowledge refers to an individual's word knowledge, range of general information, verbal concept formation, and reasoning ability. This component of the *KBIT-2* assessment consists of two subtests that measure verbal, school-related skills.[78]

Verbal memory. Verbal memory

> refers to the ability to remember and process information conveyed through language, which is essential for developing literacy, reading comprehension, and academic success. This type of memory is critical as it enables individuals to encode, store, and recall verbal information, allowing them to integrate auditory input from lectures and instructions effectively. Early difficulties with verbal working memory can lead to long-term academic challenges, highlighting the importance of interventions that can support memory development in young children.[79]

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[75] John W. Creswell and J. David Creswell, *Research and Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Thousand Oaks, CA: SAGE, 2018), 251.

[76] "TerraNova (test)," Wikipedia, accessed August 19, 2025, https://en.wikipedia.org/wiki/TerraNova_(test)#:~:text=TerraNova%20is%20a%20series%20of,%2C%20spelling%2C%20and%20other%20areas.

[77] Wenqi Weng et al., "The Transfer Effects of Cognitive Training on Working Memory Among Chinese Older Adults with Mild Cognitive Impairment: A Randomized Controlled Trial," *Frontiers in Aging Neuroscience* 11 (2019): 212.

[78] Kaufman and Kaufman, *KBIT-2*, 1.

[79] "Verbal Memory and Learning," EBSCO, accessed August 19, 2025, https://www.ebsco.com/research-starters/education/verbal-memory-and-learning.

Visual memory. Visual memory is "a cognitive function that enables individuals to store and recall visual information, such as people, objects, locations, and activities. This type of memory is crucial for learning, as much of the information we acquire is visual in nature; it aids in tasks like reading, spelling, and recognizing faces."[80]

Visual-spatial working memory. Visual-spatial working memory skills "involve the ability to recall shapes and colors as well as their locations and movements. These skills aid children in letter/number recognition, reading, writing, and math."[81]

Working Memory. Working memory is the "ability [of the brain] to remember, process, and manage information."[82] Two working memory skills, verbal and visual-spatial, develop at a similar rate. Verbal working memory is used to "remember instructions, learn language, and perform comprehension tasks," whereas "visual-spatial working memory is used to remember sequences of events, patterns, images, and math skills.[83]

Procedural Overview

This research design is a mixed-methods experimental study of the effects on working memory when applying the EMCDC among college students with or without a diagnosed NLD. Boyce College students in the Teacher Education Program (TEP), who attended the fall 2024 semester, were invited to volunteer for the study. Students chose to participate in the training group or the control group. The Teacher Education Program director offered students service hours for participating in the study. Thirty service hours

[80] "Visual Memory," EBSCO, accessed August 19, 2025, https://www.ebsco.com/research-starters/health-and-medicine/visual-memory.

[81] Randy Kulman, "What Is Spatial Working Memory?," South County Child & Family Consultants, October 14, 2015, https://southcountychildandfamily.com/2015/10/14/what-is-visual-spatial-working-memory/.

[82] Tracy Packiam Alloway, *Improving Working Memory: Supporting Students' Learning* (Thousand Oaks, CA: SAGE, 2011), 1.

[83] Alloway, *Improving Working Memory*, 3.

were awarded to students in the training group who completed the entire study. Students in the control group were awarded five service hours. A total of fifteen students volunteered to participate in the study: nine in the training group and six in the control group. All study participants completed, signed, and submitted a written consent form prior to participating in the research study.[84]

The control group received no special instruction or training. The training group received instruction from EMCDC-trained interventionists three days each week in sixty-minute sessions, over twelve weeks. All students received two pre- and post-training cognitive assessments: the in-person *KBIT-2* Intelligence Test (*KBIT-2*)[85] and the online CNS Vital Signs neurocognitive test (CNSVS).[86] For the purpose of this replication study, statistical analyses were conducted for three of the eleven cognitive domains assessed by CNS Vital Signs: verbal memory, visual memory, and composite memory. The *KBIT-2* assessment's two subtests, which measured verbal intelligence and visual intelligence, produced a composite IQ standard score. Students also completed a brief pre- and post-training self-assessment of academic skills.[87]

After twenty-nine hours of cognitive brain development training, participants completed post-tests for working memory, visual and verbal memory, and verbal and non-verbal intelligence, using the same assessment tools used for the pre-test assessments. The Study Skills Questionnaire was also completed post-training.

CNSVS is a web-based, online assessment of cognitive domains and is used in clinical and research applications. The assessment is standardized + for children and

[84] See appendix 1, Participant Consent Form.

[85] Kaufman and Kaufman, *KBIT-2*, 1.

[86] The *Automated Working Memory Assessment*, 2nd ed. *(AWMA)*, used for Brown's 2016 study is no longer the preferred assessment tool. The *CNS Vital Signs (CNSVS)* assessment, currently being utilized by Equipping Minds, will be employed for participant testing. "CNS Vital Signs," accessed December 9, 2022, https://www.cnsvs.com/AcademicResearch.html.

[87] See appendix 2, Academic Skills Questionnaire.

adults. Tests are scored automatically, calculated, and interpreted by the assessment's software. Results are available immediately and accessible on the CNSVS website. *KBIT-2* is scored manually by the examiner.

After completion of all post-training assessments, all data was collected into an Excel document. Statistical analyses were completed by a statistician who looked for trends, made comparisons, determined if there was statistical significance appropriate for the sample size, and determined if relationships existed between measurements and variables. See chapters 4 and 5 for the analysis and discussion of study results.

CHAPTER 2

PRECEDENT LITERATURE

This research is a replication of the 2016 study by Carol Brown, who employed the Equipping Minds Cognitive Development Curriculum to examine the ability of the training program to increase working memory in learners with a specific learning disability, a neurodevelopmental learning disorder.[1] Among the list of recommendations for practice and research application from Brown's findings are the benefits to those in higher education contexts. Brown writes,

> Christian higher education and administrators, practitioners, and student service professionals who serve and teach students with NLD and those with undiagnosed learning struggles can use EMCDC. By addressing the underlying deficits in cognitive abilities and increase in students' academic satisfaction may result thereby increasing student retention and graduation rates. As the number of adult learners is increasing in higher education, it is important to continue to engage in stimulating learning activities during adulthood to manage the demands on cognitive abilities.[2]

The current study examines the efficacy of the EMCDC in increasing working memory in traditional-age college learners and seeks to determine whether improving the working memory in this population can enhance academic performance.[3] Improved academic performance improves academic success and results in students' likelihood of persistence to graduation. While all students in Brown's study had a diagnosis of a SLD, those participating in the current study may or may not have a diagnosis of a NLD. Brown

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[1] Carol T. Brown, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory" (EdD thesis, The Southern Baptist Theological Seminary, 2016), 23.

[2] Brown, "Equipping Minds," 144.

[3] For this study, traditional-aged college students are 18 to 24 years old. This age range assumes students begin college at age 18 and complete their degree within six years.

notes that a review of literature relevant to working memory shows its development and relationship to academic performance.[4]

Statement of the Problem

Retaining students from matriculation through graduation is a perennial concern faced by colleges and universities. Researchers have studied student retention for over eighty-five years. In fact, in the past forty years, student retention may have been the most studied phenomenon in higher education.[5] A significant body of literature about college retention has not proven to have made an impact on increasing student retention.[6]

This chapter will review the literature related to institutional practices to improve student retention and persistence, examine specific reasons students are not prepared for college-level work, and consider the potential impact of improving cognition on academic performance, using the EMCDC.

Institutional Efforts to Improve Student Retention and Completion

The following section reviews the results of three studies that evaluated institutional efforts to understand and reduce college student departure, institutional efforts to increase student retention rates, and retention practices among Bible colleges. Finally, consideration will be given to the deficiencies of these efforts and how the current study seeks to answer those deficiencies.

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[4] Brown, "Equipping Minds," 23.

[5] Michael D. Jackson, "Cataloging and Comparing Bible College Efforts to Improve Student Retention and Completion" (EdD diss., Union University, 2017), 7.

[6] Willis A. Jones and John M. Braxton, "Cataloging and Comparing Institutional Efforts to Increase Student Retention Rates," *Journal of College Student Retention* 11, no. 1 (2009): 124.

Institutional Efforts to Understand and Reduce College Student Departure

John M. Braxton, Jeffrey S. McKinney, and Pauline J. Reynolds studied efforts by institutions of higher education in Indiana to understand and reduce student departures from college in 2006. The purpose of their study was to "explore the nexus between research and practice" and sought to answer whether practitioners in the field, who work closely with students, used the research available on student persistence and retention.[7] Documentation from sixteen participating institutions was divided into four categories: institutional studies, assessments of programs designed to reduce student departure, assessments of the college environment and experience, and reports of policies and programs developed to reduce student departure.[8] Within the institutional studies category, five types of studies were identified that help schools understand institutional student retention: multivariate studies, bivariate studies, percentage comparisons on various factors between retained and non-retained students, autopsy studies, and descriptions of institutional rates of departure.[9]

Braxton, McKinney, and Reynolds note two limitations of their study that could affect its outcome. First, only 34 percent of colleges and universities responded to participate; a higher participation rate may have resulted in different retention-related categories. Second, the categories and subcategories were limited by the information presented in the documents received. If other activities or statistical procedures were

[7] John M. Braxton, Jeffrey S. McKinney, and Pauline J. Reynolds, "Cataloging Institutional Efforts to Understand and Reduce College Student Departure," *New Directions for Institutional Research* 130 (Summer 2006): 26.

[8] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 27.

[9] Braxton, McKinney, and Reynolds note that the five types of studies within the institutional studies category, vary in their methodological and statistical rigor. Multivariate studies may result in inferences about student departure. The other, less rigorous studies identified are useful in providing leads to further research. Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 27.

used, they could not be evaluated as they were not available in the documentation presented.[10]

The conclusions and recommendations of Braxton, McKinney, and Reynolds's study are aimed at state-level policymakers, but they also suggest that they provide a framework for questions other institutions should pursue. There are four conclusions from the study. First, Braxton, McKinney, and Reynolds questioned the efforts of the thirty-one (66 percent) colleges and universities in Indiana that did not respond to participate in the study by providing the requested materials. Second, the "majority of colleges and universities in Indiana have not conducted campus-based retention studies of sufficient methodological and statistical rigor (multivariate statistical procedures)."[11] Third, based on their findings, it was extremely rare for theories of college student departure to be used, noting only two documents of thirty-four using concepts derived from student departure theory. Fourth, colleges and universities should conduct studies of student departure that are "theory-driven and methodologically and statistically rigorous," as these "studies provide bases for policies and practices designed to reduce institutional rates of student departure."[12]

Braxton, McKinney, and Reynolds proposed four recommendations from their study that inform how institutions should approach student departure and retention. First, they should use studies that employ student departure "theory and multivariate statistical procedures to determine the influence of various factors on student departure."[13] Second, institutions should select the best theoretical perspective that explains their specific institution's student departure patterns. Third, colleges and universities should use

[10] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 29.

[11] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 30.

[12] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 30.

[13] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 30.

"research and evaluation to inform change on their campuses," which should be an "integral part of institutional planning." Fourth, Braxton's final recommendation was for institutions that received a grade of B or lower from the National Report Card for Higher Education to evaluate their own efforts to reduce student departure.[14] While this specific study focuses on the efforts of some colleges and universities in one state to reduce student departure, the specific academic needs of students that may affect student achievement, and by extension, decreased student departure and increased student persistence were not addressed. Willis A. Jones and John M. Braxton conducted a similar study, the results of which are discussed in the next section.

Institutional Efforts to Increase Student Retention Rates

In 2009, Jones and Braxton replicated the 2006 study by Braxton, McKinney, and Reynolds that sought to catalog institutional efforts to understand and reduce college student departure.[15] The 2006 study served as the model for Jones and Braxton, who expanded their study to review four institutions categorized as low-performing and four categorized as high-performing, specifically in relation to their success in retaining students. Jones and Braxton ranked schools using the same report as the 2006 study.[16]

The findings from Jones and Braxton's study indicate that among the institutions that chose to participate in the study, the most common type of activities engaged in were assessments of college environment and experiences."[17] More than half of the institutions sampled provided "reports of policies and programs developed to reduce student departure"

[14] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 31. The state of Indiana received a B+ in student retention and degree or certificate completion.

[15] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 124.

[16] Researchers used the grades in the Completions section of the *Measuring Up 2006 National Report Card on Higher Education.* Exceptions for geography, complexion of higher education system, and recent effects of natural disasters were made. Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 125.

[17] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 129.

and "assessments of programs designed to reduce student departure."[18] The activities associated with greater methodological and statistical rigor[19] were those least frequently reported.

Additional findings included identifying statistically significant differences between residential and commuter institutions, as well as between schools in high- and low-performing states.[20] However, there was no statistically significant difference between the institutional activities conducted at private and public colleges and universities.[21] The researchers conclude that the overall results of their study suggest "very little difference exists with regard to the activities of institutions in the states" studied.[22]

The earlier study into institutional practices employed to affect retention, as well as the 2009 study, reflect the lack of knowledge about what institutions of higher education are doing to improve retention because, according to the researchers, little has been done to systematically catalog activities aimed at improving retention.[23]

Retention Practices of Bible Colleges

A third study, conducted in 2016 by Michael A. Jackson, attempted to build on the two previously mentioned studies, applying the same methodology to Bible Colleges that were accredited by, or in the process of being accredited by, The Association for Biblical Higher Education (ABHE).[24]

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[18] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 129.

[19] Braxton, McKinney, and Reynolds, "Cataloging Institutional Efforts," 27.

[20] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 130.

[21] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 130.

[22] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 131.

[23] Jones and Braxton, "Cataloging and Comparing Institutional Efforts," 137.

[24] The Association for Biblical Higher Education Commission on Accreditation accredits institutions and programs of biblical higher education in Canada, the United States, and US Territories. "Commission on Accreditation," Association for Biblical Higher Education, accessed September 20, 2025, https://www.abhe.org/accreditation/.

Using the categories established in the prior two studies, Jackson sought to determine the overall landscape of retention practices at Bible colleges. He determined that most retention efforts among Bible colleges were in the areas of "programs and policies for retention and student environment surveys."[25] He further noted that the result of his study was congruent with the two previous studies that colleges and universities do not use statistically rigorous retention studies, considering the research theory available on student departure. Specific to the context of Bible colleges, Jackson noted the smaller size of these schools may prevent them from conducting more statistically rigorous studies because of a lack of personnel with the skill or knowledge to complete such institutional studies. Jackson recommended that Bible colleges direct their limited resources to interventions that accomplish their desired end results. He rightfully notes, "When student characteristics and other significant institutional variables are not present in an analysis of retention, retention activities may be misdirected."[26]

Finally, and germane to the current study, Jackson explains that there is "significant opportunity available for research to mature in its exploration of categories of institutional retention activity in relationship to individual student characteristics and other variables of interest."[27] He mentions that Bible colleges that have lower than desired retention and completion rates conduct more complex and statistically rigorous studies that are based on retention theory.

One hundred years of retention studies have not yielded significant increases in retention and completion rates. Therefore, it seems prudent to review and adjust retention theory based on what improves student achievement, rather than institutional activities.

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[25] Jackson, "Cataloging and Comparing Bible College Efforts," 131.

[26] Jackson, "Cataloging and Comparing Bible College Efforts," 133.

[27] Jackson, "Cataloging and Comparing Bible College Efforts," 141.

College Student Readiness

Students face barriers when they are ill-prepared for college. Included in this section is a list of characteristics that demonstrate students are ready for college, why students are not ready for college coursework, how schools can prepare students for college, and how students can prepare themselves for college. Finally, the barriers to college readiness are discussed, including implications of those barriers for both schools and students.

Understanding the barriers students face that cause them to be ill-prepared for college must start with an understanding of what it means to be ready for college. College readiness is an "elusive and multi-faceted concept that has no standard definition," according to Michael Kirst.[28] David Conley further defines college readiness as "a list of knowledge, skills, and attributes a student should possess to be ready to succeed in entry-level college courses."[29] "College-ready" is another term commonly applied to students who are "equipped with the knowledge and skills deemed essential for success" after high school, or "the kinds of educational programs and learning opportunities that lead to improved preparation" for collegiate programs.[30]

Conley suggests twelve characteristics of "students who possess sufficient mastery of key cognitive strategies, key content knowledge, academic behaviors, and contextual knowledge" that demonstrate students are ready for college. The twelve characteristics, summarized, are

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[28] Michael W. Kirst, "What Is College Readiness?," The College Puzzle, September 30, 2019, https://collegepuzzle.stanford.edu/what-is-college-readiness/.

[29] David T. Conley, "A Definition of College Readiness," All About Adolescent Literacy, accessed September 30, 2019, http://www.adlit.org/article/31527/. See David T. Conley, "Redefining College Readiness," March 2007, https://www.adlit.org/topics/college-readiness/definition-college-readiness.18-9.

[30] "College-Ready," Glossary of Education Reform, August 29, 2013, https://www.edglossary.org/college-ready/.

1. Consistent intellectual growth and development in high school
2. Deep understanding of key foundational ideas and concepts from core academic subjects and the ability to apply them
3. Strong grounding in a knowledge base that underlies key concepts of core academic disciplines, as evidenced by the ability to use the knowledge to solve problems
4. Facility with a range of key intellectual and cognitive skills and abilities that can be broadly generalized as the ability to think
5. Reading and writing skills and strategies to comprehend the full range of textual materials in entry-level college courses and to complete written assignments required in such courses
6. Mastery of key concepts and ways of thinking found in one or more scientific disciplines
7. Comfort with a range of numeric concepts and principles sufficient to complete at least one introductory-level college course
8. Ability to accept constructive critical feedback
9. Ability to assess objectively one's level of competence in a subject and to devise plans to complete course requirements in a timely fashion with a high degree of competence
10. Ability to study independently and with a study group on a complex assignment requiring out-of-class preparation over a long period of time
11. Ability to interact successfully with a wide range of persons from different backgrounds and viewpoints other than the students
12. Understanding the values and norms of colleges, and of disciplinary subjects that serve as the organizing structures for intellectual communities[31]

Why Students Are Not Ready for College Coursework

A survey reported in a 2015 article features a faculty survey in which only 4 percent of instructors in two-year colleges and 12 percent in four-year schools found that most students were "generally able to do what is expected;" the remaining instructors "reported that students had arrived to higher education with at least some gaps in

[31] David T. Conley, "Redefining College Readiness," Educational Policy Improvement Center, 2011, https://www.inflexion.org/redefining-college-readiness/.

preparation."[32] In 2004, 28 percent of instructors believed schools were adequately preparing students "for what came after high school"[33]; in 2014, that number dropped to 14 percent. Employers in the same survey also report declining preparation for work; 49 percent in 2004 compared to 29 percent in 2014.

Students themselves report that the problem is "that their high schools do not set academic standards high enough."[34] Ninety percent of students surveyed said that "they would have worked harder if their expectations for earning a diploma had been higher."[35] It is "not just the bottom high-school performers" who are not ready for college, according to educator Elaine Tuttle Hansen: "It's time to acknowledge that even top students may have a college-readiness gap."[36] Even some students who have been successfully admitted to selective colleges are not prepared for the demands of college work.

According to Stephanie Farah, in 2013, the College Board "reported that, based on the latest SAT and ACT scores, the majority of today's high school students are not adequately prepared for college-level coursework."[37] At that time, 43 percent of students taking the SAT were ready for the challenge of college courses, and 39 percent of students taking the ACT met three or more of their benchmarks for college readiness.[38] She proposed five reasons why students may not be prepared for college: (1) Students are not

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[32] Dian Schaffhauser, "Survey: Most Profs Find HS Grads Unready for College or Work," Campus Technology, July 27, 2015, https://campustechnology.com/articles/2015/07/27/survey-most-profs-find-hs-grads-unready-for-college-or-work.aspx.

[33] Schaffhauser, "HS Grads Unready for College or Work."

[34] Schaffhauser, "HS Grads Unready for College or Work."

[35] Schaffhauser, "HS Grads Unready for College or Work."

[36] Elaine Tuttle Hansen, "Top Students, Too, Aren't Always Ready for College," *Chronicle of Higher Education*, March 11, 2013, https://chronicle.com/article/Top-Students-Too-Arent/137821/.

[37] Stephanie Farah, "Five Reasons Why Your Students May Not Be Prepared for College-Level Course Work," CollegeXpress, October 2013, https://www.collegexpress.com/counselors-and-parents/college-counselors/blog/five-reasons-why-your-students-may-not-be-prepared-college-level-course-work/.

[38] Farah, "Five Reasons."

completing a core curriculum. Students who complete a core curriculum have higher retention rates, enroll in college at a higher rate, and are less likely to need remedial coursework. (2) Top students are assumed to be better prepared for college because they find high school courses easy, and they do well in AP classes and standardized exams. However, these same students have not developed the study skills and work ethic to truly be college-ready. (3) Students do not challenge themselves as readers. Beyond middle school, students are not selecting books that will improve their reading and writing skills. Instead, they tend to choose books that are below grade level. (4) Students are used to texting, social media, and technology. These modern tools have increased the speed with which they can find information, but the result has been a decrease in the accuracy with which they communicate, a reduction in intellectual sharpness, and a decline in their person-to-person communication skills. (5) Colleges may need to adjust to a new generation of students. Both low- and high-achieving students will need support as colleges accept these unprepared students, including adjusting curricula and teaching to students' expectations and abilities.[39]

How Schools Can Prepare Students for College

Conley suggests that a school's academic program of study "be designed so that students cannot make a bad decision," even as students prepare themselves for college.[40] Michael Cohen, president of *Achieve*,[41] notes, "We know that our schools can do a better job of preparing students for success in their next steps. When we set rigorous expectations, students can and will rise to the challenge."[42]

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[39] Farah, "Five Reasons."

[40] Conley, "Redefining College Readiness," 24.

[41] *Achieve* is a national nonprofit education organization focused on education reform and leading the effort to help states help make college and career readiness a priority for all students. "About Achieve," Achieve, accessed September 30, 2019, https://www.achieve.org/about-us.

[42] Schaffhauser, "HS Grads Unready for College or Work," 2.

Engaging Ill-Prepared Students

Schools employ various methods of engaging students to help bring them up to a level at which they may succeed in a credit-bearing college course. Colleges that admit students under an open-door policy bear a specific responsibility to support those who arrive ill-prepared. The City University of New York (CUNY) recognized this reality when they changed their "exclusive admissions policies of the early1960's to the open-admissions policy of 1970."[43] CUNY's decision to change their admissions policy was not without controversy. Those who were in the "disadvantaged segment of the City population" had not been able to receive the benefits of higher education; others expressed concern that "increased opportunity for minorities might come at the expense of seats for previously qualified students."[44] CUNY developed a stratified admissions model that addressed the concerns of both constituents. The CUNY concept of educational opportunity included both access and outcome.[45] They rightly recognized that their best efforts would be only an illusion of access and opportunity if there were a high rate of student failure for those who were newly granted access to college. To this end,

> The university developed extensive programs of remediation, counseling, and related services that were designed to enhance students' academic chances. In addition, the board [of trustees] decided that students should not be dismissed for academic reasons during the grace period of the freshman year. In effect, the responsibility for academic success lay not only with the students but also with the institution.[46]

Students who are not adequately prepared for college may be placed in a remedial course, often a math or English course, or a co-curricular course. Remedial

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[43] David E. Lavin and David Hyllegard, "Higher Education after World War II," in *The History of Higher Education*, ed. Harold S. Wechsler, Lester F. Goodchild, and Linda Eisenmann, 3rd ed. (Boston: Pearson, 2007), 728.

[44] Lavin and Hyllegard, "Higher Education after World War II," 730.

[45] Lavin and Hyllegard, "Higher Education after World War II," 731. CUNY's solution had three unique features that provided a bridge for under-prepared and otherwise disadvantaged students: (1) open-admissions policy designed to generate a less rigid sorting of students between senior and community colleges, with a goal of increasing minority enrollment at the senior colleges (four-year); (2) all graduates of the community colleges were guaranteed admission to a senior college with full credit; (3) comprehensive system of academic support.

[46] Lavin and Hyllegard, "Higher Education after World War II," 731.

courses are designed to provide instruction that fills knowledge gaps, enabling students to enter a course that earns academic credit. Co-curricular courses may or may not offer academic credit. These courses or activities are "additional activities that work together with those inside the classroom to enhance students' learning."[47] The downside of remedial and co-curricular courses is that they fill students' schedules and do not add completed courses to a transcript, extending students' time to complete a degree. Students often become discouraged by the required additional work without progress and stop-out before earning their degree. Additionally, ill-equipped students do not qualify for academic accommodation simply because they are not ready for college. Academic accommodations are reserved for those students with a qualifying disability. They are not intended to improve a student's academic ability, but to provide a bridge to achievement by permitting more time for reading assignments, more time to finish timed exams and quizzes, and a quiet, distraction-free setting to complete quizzes and exams.

How Students Can Prepare Themselves for College

Much of how students can employ and integrate the various dimensions of college readiness is out of their control.[48] Students should be made aware that successful college admission does not begin at the end of their junior year of high school, nor does it end if they are admitted prior to their last semester of their senior year. Unbeknownst to most students, colleges consider the entirety of a student's secondary education. Starting high school with the expectation of college admission will help students prepare for college readiness when they enter as a freshman. Conley suggests that students develop a

[47] "Co-Curricular vs Extracurricular: Small but Important Differences," Suitable Knowledge Center, accessed August 19, 2025, https://www.suitable.co/knowledge-center/blog/co-curricular-vs-extracurricular-small-but-important-differences.

[48] Conley, "Redefining College Readiness," 28.

comprehensive plan for college preparation that "ensures they will develop the necessary skills in a progressively more complex fashion over four years."[49]

Barriers to College Readiness

A review of the literature indicates barriers that contribute to students arriving on college campuses not adequately prepared for the academic rigors they will face. Increasingly, students are arriving at college ill-prepared to succeed academically. In a 2017 article, researchers report that only 30 percent of students entering college in 2014 returned for their second year.[50]

Barriers to college readiness have implications for students and schools alike. In a 2013 article, Sean Reardon noted that children of rich parents "perform better in school, on average, than children from middle-class or poor families."[51] Reardon also reports that despite efforts to reform education, there remains a significant disparity in academic performance between the children of the rich and the poor. His research suggests that schools are not the determining factor in improving achievement for these students. Children of wealthier parents often arrive at kindergarten better prepared and can attend enrichment programs during the summer months. Otherwise, the achievement gap during the school calendar is unchanged.

Reardon points to two programs focused on the poor that were aimed at closing achievement gaps. First, the Head Start program, part of President Lyndon Johnson's "War on Poverty," was created to develop programs for children born into poverty. Programs like this put into place proactive measures designed to enhance preschoolers' cognitive

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[49] Conley, "Redefining College Readiness," 28.

[50] Tiffany Dovey Fishman, Allan Ludgate, and Jen Tutak, "Success by Design: Improving Student Success in Higher Education," Deloitte Insights, March 16, 2017, https://www2.deloitte.com/us/en/insights/industry/public-sector/improving-student-success-in-higher-education.html.

[51] Sean F. Reardon, "No Rich Child Left Behind," *The New York Times*, April 27, 2013, https://opinionator.blogs.nytimes.com/2013/04/27/no-rich-child-left-behind/.

development and social skills.[52] Performance standards for the Head Start Program were revised in 2016 to "incorporate findings from scientific research, reflect best practices and lessons from program innovation, and integrate recommendations from the Secretary's Advisory Committee Final Report on Head Start Research and Evaluation."[53] Second, Title I was created to provide all children a significant opportunity to receive a fair, equitable, and high-quality education, and to close educational achievement gaps. Title I, Part A (Title I) of the *Elementary and Secondary Education Act*, as amended by the *Every Student Succeeds Act* (ESEA), provides financial assistance to local educational agencies (LEAs) and schools with high numbers or high percentages of children from low-income families to help ensure that all children meet challenging academic standards.[54] Reardon notes that these programs were aimed at the poor and were designed to reduce educational inequalities,[55] but he is quick to note that no one had been watching to see why the children of wealthy parents were making such significant academic gains.[56] He suggests investing in parents, who would then be better equipped to help their children.

Implications of Barriers for Students

The implications for students who are ill-prepared for college are varied and potentially far-reaching. Implications include delayed degree completion, increased student debt, and decreased earning potential and power. Student debt may hinder gospel ministry opportunities, especially for those desiring to serve in an international ministry context.

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[52] Jeanne Morris Hines, "An Overview of Head Start Program Studies," *Journal of Instructional Pedagogies*, accessed September 19, 2019, https://files.eric.ed.gov/fulltext/EJ1151726.pdf.

[53] "Head Start History," Office of Head Start, Administration for Children & Families, accessed September 19, 2019, https://www.acf.hhs.gov/ohs/about/history-of-head-start.

[54] "Title I, Part A: Improving Basic Programs Operated by Local Educational Agencies," US Department of Education, accessed September 19, 2019, https://oese.ed.gov/offices/office-of-formula-grants/school-support-and-accountability/title-i-part-a-program/.

[55] Reardon, "No Rich Child Left Behind," 5.

[56] Reardon, "No Rich Child Left Behind," 6.

Delayed Degree Completion

Students who enter college ill-prepared often take longer to finish their degrees, especially if they must complete remedial courses to qualify for enrollment in credit-bearing courses. Degree completion may also be adversely affected if co-requisite courses or activities are required to successfully meet course requirements, as this restricts the time a student has to devote to credit-bearing courses. Increased student debt is a consequence of delayed degree completion.

Increased Student Debt

In 2023, a study was conducted to review student loan debt between two cohorts of undergraduate students; one group had completed college, and one group had not completed college. The study reviewed the amount of student loans initially borrowed by these two cohorts to determine how much they borrowed from 2013 to 2015, and how much they owed, as a group, between 2017 and 2019, four years later. The study included students at both public and private institutions. The study concluded that students at public institutions who completed their degree owed 8 percent less than what was initially borrowed, compared to 12 percent of those attending private institutions. However, those attending public institutions who did not complete college owed 5 percent more than what was initially borrowed, compared to 2 percent more owed by those who attended private institutions.[57]

The most recent update to "The State of American Higher Education Outcomes," published by Third Way, affirms that leaving college with a credential is necessary to "fully unlock the financial and personal benefits associated with higher education," with graduation being a major indicator of future success.[58] In this report,

[57] Michael Itzkowitz, "The College Completion Crisis Fuels the Student Debt Crisis," HEA Group, January 31, 2024, https://www.theheagroup.com/blog/college-completion-crisis-fuels-student-debt-crisis.

[58] Michaeel Itzkowitz et al., "The State of American Higher Education Outcomes in 2023," Third Way, February 22, 2023, https://www.thirdway.org/report/the-state-of-american-higher-education-outcomes-in-2023.

researchers also noted that while "college graduates earn more than one million dollars more over the course of their lifetime, those who do not complete their degree are three times more likely to default on student loans."[59]

Decreased Earning Potential and Power

Decreased earning power is another implication for students who do not complete their degrees. The National Center for Education Statistics reports, "Young adults ages 25–34 who worked full time, year-round, higher educational attainment was associated with higher median earnings."[60] According to the report, the pattern of higher earnings was consistent from 2000 through 2017. The differences are significant. Median earnings of young adults with a master's or higher degree were $65,000, some 26 percent higher than those of young adults with a bachelor's degree ($51,800). In the same year, the median earnings of young adults with a bachelor's degree were 62 percent higher than those of young adults who held only a high school diploma or its equivalent ($32,000). Those who did not complete high school earned 23 percent less than those who completed high school. NCES noted the patterns for higher earnings were consistent regardless of gender and ethnicity.[61]

Hindered Ministry Deployment

A secondary implication for students who are ill-prepared for college and therefore incur significant student debt may be that they are hindered from entering the ministry for which they have prepared. Mission agencies such as the International Mission Board (IMB) of the Southern Baptist Convention have guidelines that assess applicants' debt:

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[59] Itzkowitz et al., "The State of American Higher Education Outcomes."

[60] "Annual Earnings of Young Adults," National Center for Education Statistics, February 2019, https://nces.ed.gov/programs/coe/indicator_cba.asp.

[61] Ethnicities reported: White, Black, Hispanic, and Asian.

> Long-Term Applicants: Credit Card (or any unsecured loan) $1500 maximum when IMB salary starts. Student Loans, no more than $200 maximum per month payback (Single or couple); educational debt over $20,000 needs to be reviewed in a consultant file-review meeting. Mid-Term Applicants [2-year service]: Regardless of nature of debt, maximum amount in monthly payback for total debt not to exceed $125 per couple or $75 for a single.[62]

Conley notes that it is important for students to secure the help of adults in their lives to discuss all the "academic and financial requirements" of college entrance. He is quick to note,

> Unfortunately, not all students have supportive family environments, but support can come from other quarters as well, and students need to be encouraged to reach out to, and interact with, adults who can help them navigate the college readiness gauntlet, whether these adults are relatives, community service staff, or adults at the school who may be paid staff or volunteers.[63]

Implications of Barriers for Schools

Retention of students once they arrive on college campuses is a significant concern. Students who are ill-prepared for college are at risk of not returning in the second year, and for some, they do not return the second semester. Schools must use the resources of time, money, and personnel to identify students who are academically at risk and attempt to get them "up to speed as quickly as possible, or risk losing them altogether."[64]

Tiffany Dovey Fishman, Allan Ludgate, and Jen Tutak also found that the six-year graduation rate for students entering college in 2008 (2014 graduation) ranged from 27 percent to 58 percent, depending on the type of institution.[65] Significant numbers of students in the United States fail to complete their college degrees each year.

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[62] Ted Davis, Assessment & Deployment Consultant-Affinity Representative SSAP for the International Mission Board, email to author, September 30, 2019.

[63] Conley, "Redefining College Readiness," 28.

[64] Sarah Butrymowicz, "Most Colleges Enroll Many Students Who Aren't Prepared for Higher Education," Hechinger Report, January 30, 2017, https://hechingerreport.org/colleges-enroll-students-arent-prepared-higher-education/.

[65] Fishman, Ludgate, and Tutak, "Success by Design."

Cognitive Development Training

The current study is a replication of Carol Brown's 2016 research using the EMCDC to examine the effects of the cognitive training program on working memory.

The EMCDC[66] is a method of cognitive skill development based on the theories of Structural Cognitive Modifiability (SCM), Mediated Learning Experience (MLE), and a biblical worldview of human development.[67] Brown's study was an inquiry into the cognitive modifiability of children with a Neurodevelopment Learning Disorder (NLD), the study of which, at that time, had not "previously been linked to learners with these disorders."[68] Of relevance to the current study is Brown's comment,

> Specifically, this study was interested in whether an increase in working memory would result in transfer effects within an educational setting, measured by standardized tests of academic attainment, of non-verbal and verbal abilities. . . . The objective was to determine if learners with an NLD can be educated in a more efficient and satisfactory manner.[69]

Conclusion

This chapter discussed the long-standing concern of college student retention and completion to graduation. The literature review focused on three studies that evaluated institutional efforts to understand and reduce student departure and increase student retention rates. One of the three studies specifically looked at the retention practices of Bible colleges.

Attention was given to college-student readiness, including why students are not prepared for college, what schools can do to prepare students, and how students can

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[66] Brown, "Equipping Minds," 91–92. Brown explains,

> The Equipping Minds Cognitive Development Curriculum (EMCDC) is based on the theory of Structural Cognitive Modifiability (SCM), Mediated Learning Experience (MLE), and a biblical worldview. EMCDC is designed to strengthen existing neural connections and, more importantly, to create missing neural pathways that may inhibit one's ability to learn. EMCDC employs a holistic approach to cognitive development training through primitive reflex exercises, sensory-motor development exercises, and cognitive developmental exercises.

[67] Brown, "Equipping Minds," 8.

[68] Brown, "Equipping Minds," 8.

[69] Brown, "Equipping Minds," 8.

prepare themselves. The implications ill-prepared students face can be varied and far-reaching.

Rather than studying institutional efforts to improve student retention, this study focuses on improving student academic performance using a cognitive development training curriculum. The next chapter explains the methodology employed to answer the question of whether academic performance can be improved by increasing working memory.

CHAPTER 3

METHODOLOGICAL DESIGN

This chapter describes the methodologies used in this research study. The purpose of this replication study is to consider whether utilizing a cognitive brain development program can increase academic performance in college students with or without a diagnosed neurodevelopmental learning disorder (NLD). Specifically of interest is the transfer effects realized in Carol Brown's research study. Brown noted that a four-year case study with a client implied that "cognitive development exercises do have far transfer effects to academic achievement for learners who have intellectual development disorder."[1] And, as Brown noted in the conclusions of her study, "By addressing the underlying deficits in cognitive abilities an increase in students' academic satisfaction may result thereby in increasing student retention and graduation rates."[2] Study participants completed the CNS Vital Signs (CNSVS) assessment tool,[3] which measures eleven cognitive domains. Differences in age and gender were also evaluated. Included in this chapter is an explanation of research questions, research design overview, population, sample, delimitations, limitations of generalization, and instrumentation.[4]

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[1] Carol T. Brown, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory" (EdD thesis, The Southern Baptist Theological Seminary, 2016), 76.

[2] Brown, "Equipping Minds," 144.

[3] The Automated Working Memory Assessment 2nd ed. (AWMA), used for Brown's 2016 study is no longer the preferred assessment tool. The CNS Vital Signs (CNSVS) assessment, currently being utilized by Equipping Minds, will be employed for student testing. See "CNS Vital Signs," accessed December 9, 2022, https://www.cnsvs.com/AcademicResearch.html.

[4] Research design, including curriculum used, for the purpose of this study, mirrored that of Brown's to maintain a valid comparison of results.

The study was conducted with the cooperation of the Teacher Education Program (TEP) of Boyce College. Students in the Teacher Education Program at Boyce College were invited to participate in the research, a replication of a 2016 study by Carol Brown. The program director, Melissa R. Tucker,[5] emailed students in the program, inviting them to participate.[6] The letter informed students of the requirements of the study and how to indicate their decision to participate. Students who fully participated and completed the requirements of study earned 30 of the 50 service hours required by their program.

Research Questions

This study is a replication of Carol Brown's 2016 study. The questions asked in her study are repeated to maintain a valid comparison of results.

1. What, if any, are the effects on working memory when applying the Equipping Minds Cognitive Development Curriculum?
2. What, if any, are the effects of changes in working memory to academic ability in learners using the Equipping Minds Cognitive Development Curriculum?
3. What, if any, is the effect of working memory on non-verbal and verbal abilities?
4. What, if any, is the effect of gender of the learner on working memory using the Equipping Minds Cognitive Development Curriculum?
5. What, if any, is the effect of the participant's age on working memory using the Equipping Minds Cognitive Development Curriculum?

Research Design Overview

This research was a mixed-method study of the effect on working memory and academic performance using the Equipping Minds Cognitive Development Curriculum (EMCDC) among students at Boyce College in Louisville, Kentucky, with or without a specific learning disability (SLD). Study participants, both in the training and control

[5] Melissa R. Tucker, BS, Liberty University; MEd, Rank 1, Principal Certification, Eastern Kentucky University; EdD, Walden University. Tucker is the program director for the Teacher Education Program at Boyce College.

[6] See appendix 3, TEP Study Recruitment Letter.

groups, submitted a consent to participate form[7] prior to pre-training activities.[8] The consent form included information about all required pre- and post-assessments: CNSVS (composite memory, verbal memory, visual memory, working memory), *KBIT-2* (IQ Composite, Verbal IQ, Non-Verbal IQ), and an Academic Skills Questionnaire (self-perception of study skills).

Assessments

For this study, I generated codes through the CNS Vital Signs website that were sent by email to all participants, providing access to complete the online assessment. The study group completed their pre-training CNSVS assessment in their respective groups during their designated training time. The CNSVS assessments were scored automatically, and results were made available through their online portal for review. The control group participants completed their online assessments at their convenience within ten days of the beginning of the study. Participants scheduled their in-person, face-to-face *KBIT-2* assessment as their class schedule permitted during the first week of training. Results were scored according to the *KBIT-2* testing manual instructions. A link to the Academic Skills Questionnaire was sent to each participant. Answers to survey questions automatically populated a Google Sheets document.

Trainers/Interventionists

Dylan Matthews and I conducted the cognitive training. We are both trained in EMCDC and qualified as interventionists to deliver the EMCDC materials. I planned the sessions based on the training guide provided by Brown.[9] The interventionists led the

[7] See appendix 1, Participant Consent Form.

[8] Study participants were between the ages of 18 and 24 and did not require parental consent to participate. In Brown's study, study participants were under the age of eighteen.

[9] See Carol T. Brown, "Equipping Minds Cognitive Development Curriculum: Teacher Workbook," accessed January 13, 2025, https://equippingminds.com/product/equipping-minds-cognitive-development-curriculum-2018/.

study groups through the cognitive training in sixty-minute group sessions, three days each week for twelve weeks. The study consisted of 29 one-hour sessions for both training groups. The morning and late afternoon study groups received the same training each day for the duration of the study, potentially receiving 29 hours of cognitive training.[10] I taught 49 of the 58 sessions (84 percent), and Dylan Matthews taught 9 sessions (16 percent) over a twelve-week period.[11]

After completing 29 hours of EMCDC cognitive skills training, all participants repeated the battery of assessments completed prior to the beginning of the study to measure any change in working memory and academic performance—the CNS Vital Signs, *KBIT-2*, and the Academic Skills Questionnaire. The morning training group completed their post-training CNS Vital Signs as a group during their usual training time. One late afternoon study participant and one control participant completed their post-training CNS Vital Signs Assessment during the usual meeting time for the late afternoon group.[12]

Study Population

The population for this study was Boyce College students between the ages of 18 and 24 years, with or without a specific learning disability. This is a variance from Brown's study, as her research was conducted at a school that served students with a SLD. Students with or without a known learning disability were eligible to participate in the study. Students were not required to disclose the presence of a learning disability or learning difference. During the pre-training assessments and throughout the cognitive

[10] See appendix 4, Cognitive Training Schedule.

[11] This timeframe includes a missed training day because the school was closed for inclement weather and a week off training for spring break. Cognitive training was conducted January 29 through April 16, 2025.

[12] One control participant completed his pre- and post-CNS Vital Signs assessments with the late afternoon group.

training, individual students disclosed their academic struggles. These disclosures are discussed in chapter 5.

Sample

This study was open to any Boyce College student in the Teacher Education Program who met the age criteria. Students were self-selected to enter the cognitive training group or the control group. To best accommodate the most students who were available to participate, two groups were formed; one meeting in the morning and one meeting in the late afternoon.

Delimitations

This study had the following delimitations. First, the study was limited to students in the Teacher Education Program at Boyce College who were 18 to 24 years old. This age range comprises the 150 percent, or six-year, degree completion rate for first-time college students.[13] The director of the Teacher Education Program assisted with recruitment of study participants. Second, the study was limited to two opportunities to participate. Third, limiting the study to this student population provided access to students within the desired age range as well as those with a range of academic abilities. Fourth, the study was limited to 30 training hours to replicate Brown's 2016 study, though the recommended training time is 60 hours. Training occurred three days each week, simulating the schedule of a typical college course. To reach the necessary 30 training hours, the study lasted 12 weeks, which fit within the timeframe of the academic calendar, allowing for the completion of training and post-study assessments just prior to the end of the semester.

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[13] "Graduation Rates," Integrated Postsecondary Education Data System, accessed September 20, 2025, https://nces.ed.gov/ipeds/survey-components/9#:~:text=Data%20are%20collected%20on%20the,average%20rates%20over%204%20years.

Limitations of Generalization

Generalization of the research findings had the following limitations. First, since all participants were part of the same educational program at Boyce College, the research results may not be generalizable to students in the general population of the college. Second, the research results from the study's small sample size may not generalize to a larger, more diverse student population.

Instrumentation

Three instruments were used to gather pre- and post-study data for this study: CNSVS, *KBIT-2*, and an Academic Skills Questionnaire. CNSVS is an online "neurocognitive assessment that captures an objective view of eleven basic brain functions: composite memory, verbal memory, visual memory, executive function, processing speed, psychomotor speed, reaction time, complex attention, cognitive flexibility, simple visual attention, and motor speed."[14] The eleven cognitive domain scores are derived from different combinations of seven subtests of the assessment. The test battery is based on well-known neuropsychological tests, and its psychometric properties should be expected to resemble the conventional tests upon which it is based. The normative structure of CNSVS was based on an age range of 1508 "normal" individuals aged 8 to 90. "Normals are defined as healthy individuals with no active medical condition, and with no history of neurological or psychiatric disorders. Normals may be on stable doses of medications for well-controlled medical conditions, like hypertension or arthritis, but not on any psychotropic medication."[15] The assessment is valid for subjects aged 8–90.[16] For this replication study, only the four domains that were evaluated in the original study were

[14] "Frequently Asked Questions: Technical Questions," CNS Vital Signs, accessed June 11, 2024, https://www.cnsvs.com/FAQs.html#Technical.

[15] "Frequently Asked Questions: Technical Questions."

[16] Camillo Thomas Gualtieri and Lynda G. Johnson, "Reliability and Validity of a Computerized Neurocognitive Test Battery, CNS Vital Signs," *Archives of Clinical Neuropsychology* 21, no. 7 (October 2006): 628.

assessed for this study: composite memory, verbal memory (VBM), visual memory (VIM), and working memory (WM).[17]

The Kaufman Brief Intelligence Test (*KBIT-2*)is a "brief, individually administered measure of the verbal and non-verbal intelligence" and is valid for persons 4 to 90 years old.[18] The test may be administered within 15–30 minutes by "technicians or paraprofessionals if they first receive appropriate training in standardized testing by qualified personnel."[19] The test results in three scores: verbal, non-verbal, and an IQ composite. The Verbal Knowledge and Riddles subtests comprise the Verbal score and measure verbal, school-related skills by assessing word knowledge, general information, formation of verbal concepts, and ability to reason. The nonverbal score is derived from the matrices and measures the ability to solve new problems by assessing the ability to perceive relationships and complete visual analogies. Pictures and abstract designs are used for matrices, rather than words.[20]

I designed the Academic Skills Questionnaire for study participants (training and control),[21] which included ten statements related to academic skills. They were instructed to choose the one answer that best described their current interaction with each of the ten statements in the survey. The academic skills included time management, research skills, reading comprehension, critical thinking, group work, public speaking, writing skills,

[17] The CNSVS Working Memory score is a calculation of the Four-Part Continuous Performance Part 4 subtest (4PCPT); WM= (4PCPT Part 4 Correct Responses) - (4PCPT Part 4 Incorrect Responses). "CNS Vital Signs Interpretation Guide 2003–2023," CNS Vital Signs, 2023, https://www.cnsvs.com/WhitePapers/CNSVS-BriefInterpretationGuide.pdf, 14.

[18] Alan Kaufman and Nadeen Kaufman, *KBIT-2 Kaufman Brief Intelligence Test*, 2nd rev. ed. (Bloomington, MN: Pearson, 2022), 1–4. The *KBIT-2 Revised* is the same in administration and scoring procedures. Changes include updates to the Verbal Knowledge subtest's art and to the Riddles subtest's sample responses, improvements to the Matrices subtest's ceiling, changes to increase the user-friendliness of remote administration, and inclusion of norms that are appropriate for in-person and tele-assessment.

[19] Kaufman and Kaufman, *KBIT-2*, xvii–1.

[20] Kaufman and Kaufman, *KBIT-2*, 1.

[21] See appendix 2, Academic Skills Questionnaire.

setting goals, receiving criticism, and multitasking. The survey was created in a Google Form, and the answers automatically populated Google Sheets for analysis.

The Training Program

The training program used for this study was the EMCDC developed by Carol Brown. The comprehensive curriculum included exercises that addressed primitive reflex integration, sensory-motor development, and cognitive development.

The EMCDC was developed by Brown and is "designed to strengthen existing neural connections, and more importantly, to create missing neural pathways that inhibit one's ability to learn."[22] Feuerstein's theories of Structural Cognitive Modifiability (SCM) and Mediated Learning Experience (MLE), as well as a biblical worldview, provide the foundation of EMCDC.[23] Primitive reflex exercises, sensory-motor development exercises, and cognitive development exercises provide a comprehensive approach to cognitive development training.

Primitive Reflex Integration Exercises

Primitive reflex exercises, according to Sally Goddard, replicate the stages of development that "emerge in utero, are present at birth, and should be inhibited by six months of age, and twelve months at the latest."[24] Primitive reflex exercises inhibit reflexes by "suppression of one function through the development of another."[25] Primitive reflex exercises are done in sequence and give the brain a "second chance" to register reflex inhibitory movements that should have been made at the appropriate stage of development,

[22] Brown, "Equipping Minds," 92.

[23] Brown, "Equipping Minds," 91.

[24] Sally Goddard, *Reflexes, Learning and Behavior: A Window into the Child's Mind* (Eugene, OR: Fern Ridge, 2005), 2.

[25] Goddard, *Reflexes, Learning and Behavior*, 2.

typically within the first year of life.[26] Once the retained reflexes are inhibited, many of the problems the child experienced disappear.

Sensory-Motor Development Exercises

Sensory-motor development exercises include helping learners connect words to what they see, while auditory processing exercises help learners with fluency disorders by providing auditory feedback to help them correct detection errors. Sound therapy, used to strengthen the auditory system, is also a component of the EMCDC program.[27]

Cognitive Development Exercises

The cognitive exercises used for the study were developed by Brown and aimed at improving cognitive function and are therefore not academically content-specific. The games, activities, and exercises become progressively challenging with the goal of "strengthening working memory, processing speed, perceptual reasoning, and comprehension."[28] Brown developed a manual with a structured curriculum for trained mediators to follow. Adjustments to the curriculum may be made as needed, based on the individual needs of the person or group receiving cognitive training.[29]

Ethics Committee Process and Approval

The Research Proposal, which included the Approvals for Using Human Subjects in Research form, the Assessment of Risk to Human Subjects in Research form, along with the Research Purpose, Project Goals, Research Methodology, Population and

[26] Goddard, *Reflexes, Learning and Behavior*, 3.

[27] Patricia Joudry and Rafaele Joudry, *Sound Therapy: Music to Recharge Your Brain*, 12th ed. (Sydney, Australia: Success Stream, 2009), 26–27.

[28] Brown, "Equipping Minds," 93.

[29] An example of an adjustment to the curriculum can occur when exercises need to be repeated for consecutive training days until a participant becomes quicker at completing an exercise.

Sample statements, and a copy of the instruments used for the study, were submitted to the Southern Seminary Doctoral Research Ethics Committee for review and approval.

Research Procedures

Implementation of the research design was as follows (1) recruit student participants and completion of the Consent to Participate Form, (2) administer pre-test assessments: CNS Vital Signs, *KBIT-2*, and an Academic Skills Questionnaire, (3) complete 29 hours of cognitive training,[30] (4) administer post-test assessments: CNS Vital Signs, *KBIT-2*, and an Academic Skills Questionnaire, (5) compile data into Excel spreadsheet for analysis, (6) analyze results to formulate findings and draw conclusions and implications.

Recruit Student Participants

The program director of the Teacher Education Program (TEP) at Boyce College in Louisville, Kentucky, offered to recruit study participants from that program. All TEP students received a letter explaining the study and what their commitment would be to participate. Study participants notified me by email of their interest in the study and selected to fully participate in the training group or to participate in the control group. All students completed the Consent to Participate form prior to beginning pre-study assessments.

Administer Pre-Tests

Training group participants completed the CNS Vital Signs online assessment as a group during the second meeting of their designated training time. The control group completed their CNS Vital Signs assessment according to their schedule during the first week of the study. I administered the *KBIT-2* assessments for all study participants.

[30] The training schedule was designed for 30 hours; however, inclement weather caused the campus to be closed one of the training days, resulting in 29 training hours.

Training Materials

I used Brown's EMCDC teacher manual, which contains details for implementing the cognitive exercises. Brown provided the training workbooks with sheet protectors for each participant in the two study groups. I provided additional training materials for the participants, which included a dry-erase marker, a nine-color set of interlocking cubes that matched the Equipping Minds game cards, and personal headphones. A plastic storage case was provided for each participant's training materials, which were retained by me and brought to the groups at each meeting. Additional training materials used included Equipping Minds game cards (provided by Brown), Stare Cards, Spot It, and Blink game cards. I purchased a six-way audio splitter to give participants access to the computer that played Sound Therapy music, provided by Brown.

Training/Intervention

Two training groups met at their chosen time, either 8:30 a.m. or 5:30 p.m. Five females comprised the morning group. Two males and two females comprised the late afternoon training group. Dylan Matthews and I are both EMCDC-trained interventionists, and another EMCDC-trained interventionist provided cognitive development training for the two groups. I completed 84 percent of the training; Matthews provided 16 percent of the training. The sessions were planned by me using Brown's teacher workbook as a guide. The sessions were consistent each day for the morning and late afternoon groups. Each training session began with the Starfish and Palmer Reflex exercises. The groups met in 60-minute sessions three days each week for 12 weeks. The control group received no cognitive intervention or other specified training or intervention during the twelve-week period.

Administer Post-Tests

The morning training group completed the CNS Vital Signs online assessment as a group during their designated training time. One late afternoon study participant and one control group participant completed their CNS Vital Signs online assessment during

the designated late afternoon training time. The remainder of the study group and control group completed their post-assessments within ten days. I administered the *KBIT-2* assessments for all study participants within one week.

A statistician was employed to examine the "gains as a function of cognitive development."[31] The statistician subtracted the pre-test scores from the post-test scores and compared the difference in scores as a function of group.

Statistical Analysis

A statistician conducted an analysis of the collected data. To answer research questions 1 and 3, three statistical analyses were performed: paired t-tests to examine whether participants in the training group and the control group demonstrated significant changes in memory-related domains from pre- to post-test, simple linear regression to determine whether participation in the training group predicted gains in memory scores from pre- to post-test, and an OLS (ordinary least squares) regression to assess the effect of training on post-intervention memory performance while accounting for baseline ability. Research question 2 required a variance from Brown's study and, therefore, a variance in analysis. A multiple linear regression was conducted with Spring 2025 Career GPA as the dependent variable to examine whether working memory performance predicted academic achievement following training. Research questions 4 and 5 were answered by the use of a series of OLS regression models to examine the influence of gender and age on post-intervention working memory. Pre-intervention working memory was included as a covariate in all models to account for baseline cognitive ability.[32]

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[31] Brown, "Equipping Minds," 96. The current study followed Brown's methodology for analyzing data.

[32] Brown, "Equipping Minds," 97. The same statistical analysis used on Brown's study was employed with the current study for the purpose of comparison, where possible.

Evaluate Findings and Draw Conclusions

I reviewed the statistical analyses to formulate findings and draw conclusions, thereby answering the research questions. The strengths and weaknesses of the research design were evaluated and discussed. The research questions, design overview, population, sample, delimitations, limitations of generalizations, and instrumentation were evaluated and discussed.[33]

[33] Brown, "Equipping Minds," 97. The current study, as a replication study, sought to follow Brown's methodology as closely as possible.

CHAPTER 4

ANALYSIS OF FINDINGS

This replication study examined the effect of the Equipping Minds Cognitive Development Curriculum (EMCDC) on working memory in Boyce College students with or without a known learning disorder. Of specific interest was the transfer effects realized as a result of Carol Brown's 2016 study. Study participants completed the CNSVS online assessment tool, which measures eleven domains of cognition, including verbal memory, visual memory, and working memory, which were analyzed for the current study. The *KBIT-2* was also administered to study participants. This assessment measures verbal intelligence and non-verbal intelligence and provides a composite IQ. The study also considered differences in gender and age on the effect of the EMCDC training. In addition, participants were required to complete a self-assessment of ten academic skills.

This chapter details the components of the compilation protocol, including the analysis of data, answers to research questions, and a discussion of the data in relation to the questions. It also presents the results, findings, and discussion of the Academic Skills Questionnaire. The strengths and weaknesses of the research design, as well as the general limitations of the research design and general suggestions for future studies, are also discussed.

Compilation Protocol

The study began with the recruitment of participants. Students in the Boyce College Teacher Education Program (TEP) were invited to participate in the research study. Students were offered the opportunity to earn service-hour credit if they completed all components of the study. Students selected to join the training group or the control

group.[1] Three pre-study assessments, the CNS Vital Signs, *KBIT-2*, and an Academic Skills Assessment, were administered to all participants. The training group received Equipping Minds cognitive development training. The control group received no special training or academic intervention. After the training was completed, all participants were administered the same three assessments to determine what, if any, change was realized as a result of the training.

Recruitment of Study Participants

This study was conducted with students from the Boyce College Teacher Education Program (TEP). The program director, Melissa Tucker,[2] being familiar with the Equipping Minds program, recognized its potential value to students who may have academic challenges. Additionally, Tucker believed this program was a valuable resource for future teachers, the students in her program. Tucker sent an email to all TEP students explaining the study's requirements. As an incentive, she offered 30 service hours for those participating in the training group. Students participating in the control group earned five service hours. Study participants were between 18 and 24 years old. All participants completed their consent to participate before assessments were administered.[3] Students were not required to notify me if they had a diagnosed learning difference or disability. However, some participants, during the course of the training, casually mentioned the learning challenges they had experienced.

Two training groups were formed based on the participants' schedules. Training was provided by Dylan Matthews and me, both of whom were EMCDC-trained

[1] Students' selection of which group to join was based on their schedule and need for service hours.

[2] Melissa R. Tucker, BS, Liberty University; MEd, Rank 1, Principal Certification, Eastern Kentucky University; EdD, Walden University. Tucker is the program director for the Teacher Education Program at Boyce College.

[3] See appendix 1, Participant Consent Form.

mediators/interventionists. Additionally, training was provided by Carol Brown through online delivery.

Pre-Study Assessments

Each participant completed permission documents prior to the beginning of the study. During the first meeting of the two training groups, I fully explained the requirements and expectations for the study and answered questions. The second meeting of the training groups consisted of the online CNS Vital Signs assessment. The training groups completed their CNS Vital Signs assessments as a group during their designated training time.[4] The training groups met three days each week, which was intended to mimic a typical college class schedule. The *KBIT-2*[5] assessments were scheduled during the first week of the training schedule. Control group participants completed their assessments as their schedule allowed within the first week of the study.

I administered all *KBIT-2* assessments. Each assessment was completed within an average of 30 minutes. *KBIT-2* is valid for individuals aged 4 to 90 and comprises two subtests that assess verbal and nonverbal abilities. The assessment produces an IQ standard score that includes the two distinct domains of intellectual ability and allows "examinees to demonstrate their capabilities across two very different skill areas."[6]

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[4] "The CNS Vital Signs Neurocognitive Testing Report," CNS Vital Signs, accessed February 6, 2024, https://www.cnsvs.com/SampleReports/. The CNS Vital Signs assessment includes eleven domains of cognition. Since this is a replication study, the three specific domains evaluated were the same that were evaluated for the 2016 study: Verbal Memory, Visual Memory, and Working Memory. The Composite Memory score is a computation of the Verbal and Visual Memory domains. The remainder of domains assessed were not evaluated as they were not included in Brown's original study.

[5] Alan Kaufman and Nadeen Kaufman, *Kaufman Brief Intelligence Test Revised Manual*, 2nd ed. (Bloomington, MN: NCS Pearson, 2022), 4. The *KBIT-2* Revised is nearly identical to the *KBIT-2* , with test administration and scoring procedures being essentially the same. Changes to the assessment include updates to the Verbal Knowledge subtest's art, updates to the Riddles subtest's sample responses, improvements to the Matrices subtest's ceiling, changes to the selection of response options to increase the user-friendliness of remote administration and includes norms that are appropriate for in-person assessment and tele-assessment.

[6] Kaufman and Kaufman, *KBIT-2*, 1–3.

Study participants also completed an online Academic Skills Questionnaire.[7] The survey was a self-assessment of ten common study skills. Study participants completed an online form, created with Google Forms, the results of which were automatically compiled in a Google Sheet.

Cognitive Training

The duration of the training protocol was twelve weeks. The entire protocol included orientation to the training program, pre-training assessments, sixty minutes of cognitive training three days each week on Mondays, Wednesdays, and Fridays, and post-training assessments. The curriculum, created by Carol Brown, "employs a holistic approach to cognitive development training through primitive reflex exercises, sensory motor development exercises, and cognitive development exercises."[8]

The training group participants began each session with two primitive reflex exercises: the starfish and finger-tapping. Participants were not required to complete any of these exercises at home. This was a variance from Brown's study to ensure all participants received the same training.[9] Following Brown's protocol, training group participants received sound therapy through individual headphones for the duration of each sixty-minute sensory-motor development and cognitive training exercises.

Brown recommends a five-day-a-week training schedule that includes sixty hours of cognitive training for the best results. The five-day-a-week schedule was adapted to a three-day-a-week schedule to mimic the schedule of a college course. I used an abbreviated training schedule of the EMCDC curriculum, as the study being replicated was thirty hours in duration.[10]

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[7] See appendix 2, Academic Study Skills Questionnaire.

[8] Carol T. Brown, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory" (EdD thesis, The Southern Baptist Theological Seminary, 2016), 102.

[9] Brown, "Equipping Minds," 102. Brown's study required her study participants to do primitive reflex exercises and fear paralysis exercises at home or at school for fifteen minutes each day.

[10] See appendix 4, Cognitive Training Schedule.

Post-Training Assessments

The morning training group completed their post-training CNS Vital Signs assessments as a group during their regular training time. The evening training group and the control group completed their post-training at various times according to their schedules within ten days. All study participants scheduled and completed their *KBIT-2* post-training assessments within one week of the completion of the cognitive training.

Data Analysis

Results of the CNS-Vital Signs pre- and post-training assessments were downloaded from the CNS-Vital Signs website into an Excel spreadsheet for analysis. Results of the *KBIT-2* pre- and post-training assessments were calculated and manually entered into the spreadsheet and verified for accuracy. The results of the pre- and post-training Academic Skills Questionnaire and demographic data (age and gender) were also added to the Excel spreadsheet. A statistician was employed to conduct a statistical analysis of the data collected.

Three statistical analysis methods were used to analyze the data for this study. Method 1 is a paired *t*-test. This test is appropriate when comparing pre- and post-test scores for the same participants. Method 2 is a simple linear regression analysis and is useful for examining whether participation in the training group predicted gains in memory scores from pre- to post-test. To assess the effect of training on post-intervention memory performance while accounting for baseline ability, a third analytical method (Method 3), ordinary least squares (OLS) regression, was used where appropriate or applicable.

Research Questions

This section presents an analysis of the data used to answer the respective research questions. As previously noted, three different statistical methods were employed to analyze the data. Regression models were used to align with the original study being replicated as well as to estimate the effect sizes and directional trends that could inform future studies. Findings and discussion of the analyses are included.

Research Question 1

Research Question 1 asked, "What, if any, are the effects on working memory when applying the Equipping Minds Cognitive Development Curriculum?"

Statistical analysis method 1 allowed the research to assess whether the training group showed significant improvement on the target variable (CNS Vital Signs Working Memory). A series of paired-samples *t*-tests was conducted to examine whether participants in the training group and the control group demonstrated significant changes in memory-related domains from pre- to post-test. Each group was analyzed separately across four cognitive measures: composite memory (verbal and visual), verbal memory, visual memory, and working memory.

Table 1. Comparison of mean memory scores (statistical analysis method 1)

Group	Measure	Pre-test M (SD)	Post-test M (SD)	Mean Difference	*t*(df)	Two-sided *p*
Control	Composite Memory	99.17 (7.00)	103.33 (8.19)	-4.17	-1.70(5)	0.15
	Verbal Memory	52.17 (2.79)	55.50 (3.08)	-3.33	-2.60(5)	0.05*
	Visual Memory	47 (6.13)	47.83 (6.01)	-.833	-0.35(5)	0.74
	Working Memory	11.67 (2.25)	12.67 (2.06)	-1.00	-1.94(5)	0.11
Training	Composite Memory	99.78 (9.81)	103.67 (5.61)	-3.90	-1.52(8)	0.17
	Verbal Memory	51.00 (5.94)	52.78 (4.60)	-1.78	-1.61(8)	0.15
	Visual Memory	48.78 (5.24)	50.89 (2.47)	-2.11	-1.08(8)	0.31
	Working Memory	12.00 (3.43)	12.00 (3.12)	0.00	0.00(8)	1.00

Note: A negative mean difference indicates a post-test score higher than pre-test *$p < .05$

Findings

Control Group (n = 6)

In the control group, only verbal memory showed a statistically significant change. Specifically, scores increased from pre- to post-test ($t(5) = -6.60$, $p = .05$). This suggests a moderate increase in verbal memory performance over the testing period. No significant changes were observed for the composite memory ($t(5) = -1.70$, $p = 0.15$), visual memory ($t(5) = -0.35$, $p = 0.74$) or working memory ($t(5) = -1.94$, $p = 0.11$).

Training Group (EMCDC; n = 9)

For the training group, none of the memory measures reached statistical significance at the 95 percent confidence level ($\alpha = .05$). Although it should be noted that all post-test means were slightly higher than pre-test scores, with the exception of working memory, which remained unchanged ($t(8) = 0.00$, $p = 1.00$). Changes in composite memory ($t(8) = -1.520$, $p = 0.17$), verbal memory ($t(8) = -1.61$, $p = 0.15$), and visual memory ($t(8) = -1.08$, $p = 0.31$) were not statistically significant.

The results in table 1 demonstrate a statistically significant change in verbal memory in the Control Group (n = 6). The scores for this group increased from pre- to post-test ($t(5) = -6.60$, $p = .05$). This suggests a moderate increase in verbal memory performance over the testing period. No significant changes were observed for the composite memory ($t(5) = -1.70$, $p = 0.15$), visual memory ($t(5) = -0.35$, $p = 0.74$) or working memory ($t(5) = -1.94$, $p = 0.11$).

Statistical analysis method 2, a simple linear regression, was performed on the gain score variables for the four cognitive measures targeting memory: composite memory, verbal memory, visual memory, and working memory. This analysis was useful for examining whether participation in the training group *predicted* gains in memory scores from pre- to post-test.

Table 2. Simple linear regression of memory gain scores for training group (statistical method 2)

Measure	*B* (*SE*)	*p*	r^2
Gain Composite Memory	-0.28 (3.74)	0.94	0.00
Gain Verbal Memory	-1.56 (1.71)	0.38	0.06
Gain Visual Memory	1.28 (3.10)	0.69	0.13
Gain Working Memory	-1.00 (0.59)	0.11	0.18

Note: Regression coefficient (*B*) reflects the difference between the training and control groups, where control = 0 and training = 1. *$p < .05$

None of the regression models in table 2 yielded statistically significant effects. Training group membership did not significantly predict gains in composite memory ($B = -0.28$, $SE = 3.74$, $p = 0.94$, $r^2 = 0.00$), verbal memory ($B = -1.56$, $SE = 1.71$, $p = 0.38$, $r^2 = 0.06$), visual memory ($B = 1.28$, $SE = 3.10$, $p = 0.69$, $r^2 = 0.13$), or working memory ($B = -1.00$, $SE = 0.59$, $p = 0.11$, $r^2 = 0.18$).

Statistical analysis 3, OLS Regression, assessed the effect of training on post-intervention memory performance while accounting for baseline ability. A series of OLS regression analyses was conducted. For two select memory domains (composite and working memory), post-test raw scores served as the dependent variable. The training group (0 = control, 1 = training) was entered as a fixed factor, and the corresponding pre-test raw score was included as a covariate to control for initial individual differences. This analytic approach made it possible to estimate the effect of training above and beyond what could be attributed to baseline performance. All assumptions of linear regression, including normality of residuals, linearity, and homoscedasticity, were examined. There was no evidence that the models violated these assumptions.

The results in table 3 show that participation in the training group was not a significant predictor of post-test scores for composite memory, but pre-test composite

memory scores significantly predicted post-test outcomes. Similarly, participation in the training group was not a significant predictor of post-test working memory scores when controlled for baseline ability, but pre-test working memory scores were a strong and statistically significant predictor.

Table 3. Summary of OLS regression of memory for training group (statistical method 3)

Measure	Training Group B *(p)*	Pre-Test Effect *B (p)*	R^2
Post Composite Memory	0.05 (0.99)	0.47 (0.02*)	0.38
Post Working Memory	-0.95 (0.11)	0.85 (<.001*)	0.89

*$p < .05$

Discussion

The findings from table 1 suggest limited evidence for the effectiveness of the EMCDC in producing short-term improvements in working memory and related domains. While a trend towards improvement in the various memory domains was observed in the training group, it did not reach statistical significance. Unexpectedly, the control group showed a statistically significant increase in verbal memory scores, which may warrant further investigation but is most likely attributed to sampling variability given the small sample size (n = 6).

The results of the study in table 2 did not provide evidence that the training intervention led to significant improvements in memory-related cognitive outcomes. Across all measured domains (composite, verbal, visual, and working memory) the differences in gain scores between the training and control groups were small and statistically nonsignificant. Tanner Williams explains,

> Although the sample size is small, simple regression analysis was used to assess the effects of the Equipping Minds intervention on working memory outcomes. This approach was selected to remain consistent with the methodology of the original study being replicated. While the limited statistical power reduces confidence in detecting

small to moderate effects, these analyses serve an exploratory function and provide initial effect size estimates.[11]

These estimates may be used to inform future trials with larger sample sizes. Therefore, all results were interpreted cautiously, and emphasis should be placed on the direction and magnitude of change, rather than statistical significance alone.

The results in table 3 show that participation in the training group was not a significant predictor of post-test scores for composite memory, but pre-test composite memory scores significantly predicted post-test outcomes. Similarly, participation in the training group was not a significant predictor of post-test working memory scores when controlled for baseline ability, but pre-test working memory scores were a strong and statistically significant predictor.

In response to research question 1, "What, if any, are the effects on working memory when applying the Equipping Minds Cognitive Development Curriculum?," it should be concluded that there is no statistically significant effect on working memory when applying the EMCDC. The results of this study did not provide evidence that the training intervention led to significant improvements in memory-related cognitive outcomes. Differences in gain scores between the training group and control groups across all measured domains, composite, verbal, visual, and working memory, were small and statistically insignificant. However, it should be noted that pre-test composite and working memory scores were a strong predictor of post-training scores.

Research Question 2

Research question 2 asked, "What, if any, are the effects of changes in working memory to academic ability in learners using the Equipping Minds Cognitive Development Curriculum?"

The answer to this question required a variance from Brown's study. Brown's study subjects completed academic achievement testing as part of the yearly rhythm of

[11] Tanner Williams, email to author, July 9, 2025.

their education. Brown used results from the April 2015 and April 2016 TerraNova assessment to determine if working memory affected academic ability. The context of the current study did not provide such data, as college students are not required to complete yearly academic achievement assessments.

Instead, a multiple linear regression was conducted with Spring 2025 Career GPA as the dependent variable to examine whether working memory performance predicted academic achievement following training. Predictors included (1) Fall 2024 Career GPA, to control for baseline academic performance, (2) Post-training working memory raw scores, representing final ability in the targeted variable for research question 2 after the intervention period, and (3) Group assignment (0 = control, 1 = training), to account for any gain effects of the EMCDC.

All predictors were entered simultaneously using standard entry (OLS regression). Prior to analysis, all variables were screened for missing data, linearity, homoscedasticity, multicollinearity, and normality of residuals. The inclusion of baseline GPA as a covariate allowed the model to assess the unique contribution of post-training working memory while adjusting for prior academic performance. Group assignment was dummy-coded as a binary variable.

Table 4. OLS regression model summary of spring GPA

Predictor	*B* (*SE*)	*p*	Tolerance	VIF
Intercept	0.33			
Fall 2024 GPA	0.87 (0.05)	<.001*	.78	1.28
Post Working Memory (raw)	0.03 (0.02)	0.09	.90	1.11
Training Group (0 = Control, 1 = Training)	-0.01 (0.09)	0.27	.85	1.18

Note: $R^2 = 0.98$, Adjusted $R^2 = 0.97$. *$p < .05$

Findings

A multiple linear regression was conducted to examine whether post-training working memory scores and group assignment predicted Spring GPA, while controlling for Fall GPA. The overall model was significant ($p < .001$) and explained a substantial proportion of variance in Spring GPA ($R^2 = 0.98$, Adjusted $R^2 = 0.97$).

Table 4 shows that only Fall GPA emerged as a statistically significant predictor of Spring GPA ($B = 0.87$, $SE = 0.05$, $p < .001$), indicating a strong positive relationship. Neither post-training working memory scores ($B = 0.03$, $p = .09$) nor group assignment ($B = -0.01$, $p = 0.27$) significantly predicted Spring GPA after accounting for baseline performance.

After accounting for students' GPA at the beginning of the semester, it was found that neither the training program nor memory scores made a meaningful difference in GPA. The best predictor of a student's spring GPA was still how well they performed in the fall.

Discussion

These findings suggest that while cognitive improvements may be beneficial, they do not appear to independently predict academic outcomes. One plausible explanation is that the sample in this study consisted primarily of high-achieving students (*M* GPA = 3.24) with limited room for academic growth. This potential ceiling effect could have masked any practical benefit of working memory gains or training interventions on GPA. Williams explains,

> Given the limited sample size, ordinary least squares (OLS) regression was used in an exploratory capacity to examine the relationship between working memory and academic outcomes (GPA). Although the statistical power is constrained, this approach allows for estimation of directional trends and effect sizes, while controlling for group membership and other potential confounds. This model was chosen to reflect both the conceptual aims of the research and the analytic strategies of the original study.[12]

[12] Williams, email.

With these limitations in mind, future research should prioritize sampling from a more academically diverse population, especially targeting students with mid-to-low baseline GPAs who may stand to benefit more noticeably from cognitive training.

Research Question 3

Research question 3 asked, "What, if any, is the effect of working memory on non-verbal and verbal abilities?"

Statistical method 1 used a series of paired-samples *t*-tests to examine whether participants in the training group (EMCDC) and the control group demonstrated significant changes in cognitive domains (verbal and non-verbal IQ) from pre- to post-test. Each group was analyzed separately across three measures: composite IQ, verbal, and non-verbal.

Table 5. Comparison of mean *KBIT-2* IQ scores

Group	Measure	Pre-test M (SD)	Post-test M (SD)	Mean Difference	*t*(df)	Two-sided *p*
Control	IQ Composite	222.33 (18.59)	218.67 (16.71)	3.67	1.00(5)	0.36
	Verbal	115.33 (14.88)	112.00 (12.44)	3.33	1.00(5)	0.36
	Non-Verbal	107.00 (5.62)	106.66 (5.68)	0.33	1.00(5)	0.36
Training	IQ Composite	205.11 (18.21)	215.44 (14.91)	-10.33	-4.44(8)	0.00*
	Verbal	103.89 (15.02)	109.11 (10.85)	-5.22	-2.86(8)	0.02*
	Non-Verbal	101.22 (9.30)	106.33 (8.34)	-5.11	-3.12(8)	0.01*

Note: A negative mean difference indicates a post-test score higher than pre-test. *$p < .05$

Findings

Paired-sample *t*-tests were conducted to examine changes in *KBIT-2* IQ scores (composite, verbal, and non-verbal) from pre-test to post-test within each group. In the control group (n=6), the composite IQ score increased by 3.67 points ($t(5) = -1.00$, $p = 0.36$). Verbal and non-verbal IQ scores increased by 3.33 and 0.33 points, respectively ($t(5) = 1.00$, $p = 0.36$; $t(5) = -1.00$, $p = 0.36$), but none of these differences reached statistical significance.

The training group (n=9), however, showed significant improvement across all measures: composite IQ increased by 10.33 points ($t(8) = –4.44$, $p = 0.00$); verbal IQ by 5.22 points ($t(8) = –2.86$, $p = 0.02$); and non-verbal IQ by 5.11 points ($t(8) = –3.12$, $p = 0.01$).

Discussion

The results recorded in table 5 support a meaningful relationship between the training intervention and post-intervention gains in both verbal and non-verbal IQ for the training group. By contrast, the control group showed no significant change, suggesting that natural maturation or repeated testing alone are unlikely explanations for the observed gains in the training group.

Paired *t*-tests are useful for detecting mean differences over time, but they do not account for individual variability in baseline scores or test the predictive power of other cognitive domains like working memory. While this analysis indicates a correlation between the training and gains in IQ domains, further modeling (e.g., regression analysis) was needed to clarify the independent contribution of working memory to IQ gains when controlling for other variables.

Statistical analysis method 2 used a simple linear regression analysis on the gain score variables for the three *KBIT-2* IQ Scores. This analysis was useful to examine whether participation in the EMCDC training group predicted gains in memory scores from pre- to post-test.

The results in table 6 are a series of simple linear regressions conducted to examine whether participation in the Equipping Minds Cognitive Development Curriculum predicted gains in *KBIT-2* IQ scores (composite, verbal, and non-verbal). Group membership (0 = control, 1 = training) was entered as the independent variable, and IQ gain scores (post-test minus pre-test) served as the dependent variables.

Table 6. Simple linear regression of *KBIT-2* gain IQ scores for training group

Measure	*B* (*SE*)	p	r^2
Gain Composite IQ	14.00 (4.11)	0.00*	0.47
Gain Verbal	8.57 (3.50)	0.03*	0.32
Gain Non-Verbal	5.44 (1.93)	0.01*	0.38

Note: Regression coefficient (*B*) reflects the difference between the training and control groups, where control = 0 and training = 1. *$p < .05$

Similar to the paired *t*-tests, the regression analysis revealed a statistically significant effect of training on IQ gains. The regression coefficient for composite IQ was $B = 14.00$ ($SE = 4.11$, $p = 0.00$, $r^2 = 0.47$). As expected, this effect is further seen in the regression analysis for both verbal IQ ($B = 8.57$, $p = 0.03$) and non-verbal IQ ($B = 5.44$, $p = 0.01$).

The regression analyses in table 6 suggest that students in the training group experience statistically significant gains in IQ scores when compared to those in the control group. Most notably, participants in the training group predictably improved their composite IQ scores by about 14 points when compared to participants in the control group ($p = 0.00$).

Additional Analysis: OLS Regression

Statistical method 3 (OLS Regression) was used to assess the effect of training on post-intervention composite IQ in relation to post-training working memory. A series of OLS regression analyses was conducted. In model 1, post-composite IQ, post-test raw scores served as the dependent variable. The training group (0 = control, 1 = training) was entered as a fixed factor, and the corresponding pre-test raw score was included as a covariate to control for initial individual differences. Model 2 built off of the first model but added the variable of post-working memory raw scores. This approach enabled an estimate of the effect of training beyond what could be attributed to baseline performance, and it allowed for the investigation of the effect size that post-working memory had on composite IQ scores for the training group.

Table 7. Model summary of OLS regression of *KBIT-2* composite IQ for training group

Predictor	Model 1 *B*(*p*)	Model 2 *B*(*p*)
Intercept	47.04	58.40
Training Group	10.07 (0.03*)	8.88 (0.06)
Pre Composite IQ	0.77 (<.001)*	0.66 (<.001)*
Post Working Memory (raw)		1.00 (0.33)
R^2	0.82	0.84
Adjusted R^2	0.80	0.80
Std. Error of Regression	6.87	6.86

*$p < .05$

Table 8. Multicollinearity test

Independent	Auxiliary R^2	Tolerance	VIF
Post Working Memory	.516	0.48	2.09
Pre KBIT IQ Composite	.610	0.39	2.56
Training Group	.136	0.74	1.35

Variance Inflation Factors (VIFs) and corresponding auxiliary R^2 values were examined for multicollinearity among predictors in model 2 of research question 3. Results are summarized in table 8. All VIF values were below the threshold of 5.0, suggesting acceptable levels of multicollinearity.

Findings

Table 7 presents the results of a multiple linear regression, conducted to predict post-test IQ composite scores from group membership and pre-test IQ. The overall model was significant, $p < .001$, and accounted for about 82 percent of the variance in post-test IQ scores ($R^2 = .0.82$).

Pre-test IQ significantly predicted post-test IQ *(*$B = 0.77$, $p < .001$). Likewise, training group membership was also a significant predictor ($B = 10.07$, $p = 0.03$). Similar to the simple regression above, this suggests that prior IQ performance and participation in the training largely explain post-intervention IQ outcomes.

A second multiple regression model (see table 8) was run to evaluate whether post-training working memory performance accounted for additional variance in post-test IQ scores beyond baseline IQ and group assignment. The overall model was significant ($p < .001$) and explained 84.0 percent of the variance in post-test IQ ($R^2 = 0.84$).

Pre-test IQ remained a significant predictor ($B = 0.66$, $p < .001$). The added post-training working memory variable did not reach statistical significance *(*$B = 1.00$, $p = 0.33$). With the addition of the post working memory variable, the training group variable came

close to approaching significance (p = .056), which is to be expected given the results described in research question 1.

Discussion

The regression analysis indicates that pre-test IQ and participation in the EMCDC training group are strong predictors of post-test IQ scores, even after accounting for individual differences in working memory. While working memory was positively associated with post-test IQ (B=1.00, p =0.33), it did not significantly predict outcomes when controlling for other variables.

These findings suggest that while working memory gains may coincide with increases in composite IQ scores, the direct predictive power of working memory (as measured by a raw post-test score) on IQ outcomes is limited within this model. Instead, prior IQ and exposure to the training program appear to play more dominant roles in driving post-test performance.

The two statistical methods, paired *t*-tests and gain score regression, were also used by Brown to investigate the impact of the EMCDC on verbal and non-verbal IQ outcomes. Given the small sample size, these analyses are understood to be exploratory and hypothesis-generating rather than confirmatory. The use of gain scores provides a simple, transparent method for modeling change over time. While caution is warranted due to limited statistical power, these analyses yield preliminary insights and establish a foundation for future research with larger and more diverse samples.

Research Questions 4 and 5

Research question 4 asked, “What, if any, is the effect of gender of the learner on working memory using the Equipping Minds Cognitive Development Curriculum?” Research Question 5 asked, “What, if any, is the effect of the participant’s age on working memory using the Equipping Minds Cognitive Development Curriculum?”

Although the sample size for this study is limited, linear regression analyses were conducted to explore potential relationships between working memory outcomes and participant characteristics (e.g., gender, age, training group). These analyses are understood to be exploratory in nature due to the limited statistical power associated with small samples.

The primary rationale for including regression models was twofold: (1) to align with the analytic strategy of the original study in this replication effort; and (2) to estimate effect sizes and directional trends that may inform future studies with larger samples.

While results must be interpreted cautiously and are not intended to yield definitive conclusions, regression provides a valuable framework for examining the independent contributions of multiple predictors, especially when those predictors are interrelated.

Additionally, assumptions of linear regression (e.g., linearity, normality of residuals, homoscedasticity, and multicollinearity) were examined to ensure the models were statistically appropriate given the sample. All findings are presented with transparency regarding effect sizes and *p*-values, and no inferences are made beyond the limits of the data.

To examine the influence of gender (research question 4) and age (research question 5) on post-intervention working memory, a series of OLS regression models were conducted using data from the training group. Pre-intervention working memory was included as a covariate in all models to account for baseline cognitive ability.

Table 9. Model summary of OLS regression post-working memory for gender and age

Predictor	Model 1 *B*(*p*)	Model 2 *B*(*p*)	Model 3 *B*(*p*)	Model 4 *B*(*p*)	Model 5 *B*(*p*)
Intercept	2.303	9.83	1.36	6.41	2.00
Pre-Working Memory	0.84 (<.001*)	0.90 (<.001*)	0.85 (<.001*)	0.88 (<.001*)	0.86 (<.001*)
Age	—	-0.42 (0.11)	—	-0.28 (0.31)	-0.01 (0.96)
Gender (0= Male, 1=Female)	—	—	1.20 (0.07)	0.93 (0.18)	1.34 (0.05*)
Training Group	—	—	—	—	-1.09 (0.07)
R^2	0.84	0.87	0.88	0.89	0.92
Adjusted R^2	.082	0.85	0.86	0.86	0.89
Std. Error of Regression	1.13	1.05	1.01	1.01	0.90

Model 1, which included only pre-test working memory, was a strong and significant predictor of post-test working memory ($B = 0.84$, $p < .001$), accounting for 84 percent of the variance ($R^2 = .84$)

Model 2 added age, which did not significantly contribute to the model ($B = -0.42$, $p = 0.11$). The overall model improved slightly ($R^2 = 0.87$), but age remained a non-significant predictor across subsequent models.

Model 3 substituted gender in place of age. Gender showed a marginal trend toward significance ($B = 1.20$, $p = 0.07$), indicating a possible difference in post-test working memory scores between males and females. Model fit improved slightly ($R^2 = 0.88$).

Model 4 included both gender and age, neither of which reached statistical significance, although gender retained a positive effect ($B = 0.93$, $p = 0.18$).

Model 5 added the training group variable as a final predictor. In this final model, gender reached statistical significance ($B = 1.34$, $p = 0.05$), suggesting that females demonstrated higher post-test working memory scores when controlling for pre-test scores, age, and training group. The training group was not statistically significant ($B = -1.09$, $p = 0.07$). This model had the best overall fit ($R^2 = 0.92$; Adjusted $R^2 = 0.89$; $SE = 0.90$).

Findings

Across all five models, pre-intervention working memory consistently emerged as a strong and statistically significant predictor of post-intervention working memory performance.

Table 10. Multicollinearity test

Independent	Auxiliary R^2	Tolerance	VIF
Pre-Working Memory	0.36	0.87	1.55
Age	0.44	0.57	1.77
Gender (0= Male, 1=Female)	0.26	0.74	1.35
Training Group	0.25	0.74	1.34

Discussion

These results suggest that gender may play a meaningful role in working memory outcomes following the Equipping Minds intervention, with females outperforming males in post-test scores when controlling for pre-test ability, age, and training group. However, this is most likely simply a result of the training group consisting mainly of females (n=7).

Importantly, pre-test working memory was a consistent and strong predictor across all models, reinforcing the reliability of the post-test measure and the predictive

continuity of working memory over time. The robust predictive value of baseline working memory highlights the importance of prior cognitive capacity in shaping program outcomes. In other words, participants with stronger initial working memory tended to show stronger performance after the intervention, regardless of demographic factors such as gender or age.

While the training group variable approached significance in the final model, its negative coefficient may reflect unexplained variance or interactions with gender that could not be detected due to the limited sample size. As with all models in this study, these findings should be interpreted with caution due to restricted statistical power.

Academic Skills Questionnaire Analysis

To assess the impact of the EMCDC on students' self-reported academic skills, a paired samples *t*-test was conducted separately for the control group (n = 6) and training group (n = 9). Ten skill domains were measured pre- and post-intervention using an Academic Skills Questionnaire I developed.

Findings

Most items for the control group (n=6) showed small, mean differences from pre- to post-test, indicating no improvement. Notably, none of the skill domain items reached statistical significance.

For the training group (n=9), three domains showed meaningful positive change following the intervention: Reading Comprehension ($t(8) = –2.83$, $p = 0.02$); Public Speaking ($t(8) = –3.50$, $p = 0.01$); and Receiving Criticism ($t(8) = –2.53$, $p = 0.04$).

Table 11. Comparison of mean academic skills questionnaire responses

Control Group+	Pre-Post Survey Item	Mean Change *(SD)*	*t (df)*	*p*
	1. Time Management	0.25 (0.42)	1.47(5)	0.20
	2. Research Skills	-0.50 (0.84)	-1.47(5)	0.20
	3. Reading Comprehension	0.00 (0.63)	0.00(5)	1.00
	4. Critical Thinking	-0.75 (0.76)	-2.42(5)	0.06
	5. Group Work	-0.58 (1.36)	-1.05(5)	0.34
	6. Public Speaking	-0.50 (1.64)	-1.17(5)	0.30
	7. Writing Skills	0.50 (1.64)	-0.75(5)	0.49
	8. Setting Goals	0.50 (0.55)	2.24(5)	0.08
	9. Receiving Criticism	0.00 (0.89)	0.00(5)	1.00
	10. Multitasking	-0.33 (1.03)	-0.79(5)	0.47
Training Group	1. Time Management	0.33 (1.12)	0.89(8)	0.40
	2. Research Skills	-0.11 (1.27)	-0.26(8)	0.80
	3. Reading Comprehension	- 0.67 (0.70)	-2.83(8)	0.02*
	4. Critical Thinking	-0.56 (0.88)	-1.89(8)	0.10
	5. Group Work	- 0.67 (1.12)	-1.80(8)	0.11
	6. Public Speaking	-0.78 (0.67)	-3.50(8)	0.01*
	7. Writing Skills	-0.44 (0.88)	-1.51(8)	0.17
	8. Setting Goals	-0.22 (0.97)	0.69(8)	0.51
	9. Receiving Criticism	-0.44 (0.53)	-2.53(8)	0.04*
	10. Multitasking	-0.22(0.97)	-0.69(8)	0.51

Discussion

These findings suggest that participation in the EMCDC may be associated with a meaningful increase in confidence or perception of ability in specific academic skills, such as reading comprehension, public speaking, and receiving criticism.

The training group also showed promising trends in critical thinking, group work, and writing skills, though these did not reach statistical significance. The control group results suggest that, in the absence of intervention, students may not improve their perception of ability with certain academic skills over time. The training appeared to have a meaningful impact (in some areas) on how students perceive their academic abilities and preparedness for future study.

General Limitations

The findings of this study should be interpreted in light of several important limitations. First and foremost, the small sample size significantly limits the statistical power of all analyses conducted, increasing the likelihood of both Type II errors (failing to detect true effects) and unstable parameter estimates.

Second, while regression models were used to examine relationships among variables, including predictors such as gender, age, and training group, the ability to generalize these results is constrained. Regression requires several assumptions (e.g., normality of residuals, homoscedasticity, absence of multicollinearity), all of which were examined and, for the most part, found to be within acceptable limits. However, with small samples, violations may go undetected, and estimates may be sensitive to individual data points.

Third, the use of gain scores and paired *t*-tests, while aligned with the original study and appropriate for pre-post comparisons, does not account for all potential sources of variability (e.g., measurement error, unmeasured covariates). Including baseline scores as covariates in some models helps address this limitation but does not eliminate it.

Finally, the sample may not reflect the diversity of the broader population, and the relatively high academic performance of participants may have introduced a ceiling effect, especially in analyses related to GPA. Future studies should aim to include larger and more demographically diverse samples, with a particular focus on learners with greater academic variability at baseline.

Despite these limitations, this study provides useful estimates of effect size and directionality that may inform future evaluations of the EMCDC.

Conclusion

This chapter presented and discussed the findings of the study and included an overview of the compilation protocol, data analysis, and answers to research questions. The compilation protocol section provided a review of how study participants were recruited, pre-training study assessments, the cognitive training protocol, and post-training assessments. The data analysis section reviews how the data was collected, compiled, and the statistical methods used to analyze the data. The research question section utilized data analysis to answer the five questions, incorporating the statistical methods chosen to address each respective question.

The next chapter discusses the results of the study and their potential implications, contributions to the body of research, limitations of the study, and suggestions for future studies.

CHAPTER 5

CONCLUSIONS

This chapter reviews the purpose of the research, the findings related to the five research questions, potential implications, contributions to the body of research, limitations of the research methodology, and offers recommendations for further, expanded research. Because this is a replication study, the results of this research will be compared to those of the original research study.[1]

Research Purpose

The current study, "Applying a Cognitive Development Curriculum to Improve Academic Performance at Boyce College," is a replication of the 2016 study by Carol Brown, who sought to improve working memory in learners with a specific learning disability(SLD). Brown's study showed that "working memory training does not have a causative effect in relationship to verbal, nonverbal, and academic abilities when using EMCDC," however, the research did conclude that the EMCDC training "increases verbal, nonverbal, and IQ composite cognitive abilities despite insignificant measurable changes in working memory."[2] The current research extends the scope of Brown's study by applying the EMCDC to students who are greater than 14 years old.[3] Teacher Education Program students, aged 18 to 24, participated in the current research.[4]

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[1] Carol T. Brown, "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory" (EdD thesis, The Southern Baptist Theological Seminary, 2016).

[2] Brown, "Equipping Minds," 117–19.

[3] Brown, "Equipping Minds," 124. One of the limitations Brown notes in her study was that "the results may not be indicative of learners younger than 9 or older than 14 years of age."

[4] Participant ages: 18 (n=1), 19 (n=7), 20 (n=4), 21 (n=2), 22 (n= 0), 23 (n= 1), 24 (n= 0)

Research Conclusions and Implications

The five research questions provide the framework for discussion of findings, implications of the present research, and its comparison to Brown's original study. The following is a summary of the implications from my evaluation of the analysis of the findings:

1. There is limited evidence for the effectiveness of the EMCDC in producing short-term improvements in working memory when using EMCDC for 30 hours (see research question 1).

2. There was a trend towards improvement in the various memory domains, but it did not reach statistical significance (see research question 1).

3. Assignment to the training group did not predict post-test composite memory scores, but pre-test composite memory scores significantly predicted post-test outcomes (see research question 1).

4. Cognitive improvements may be beneficial; they do not appear to predict academic outcomes independently. The best predictor of a student's spring GPA is how well they performed in the fall semester (see research question 2).[5]

5. Thirty hours of intervention with EMCDC showed significant improvement in verbal and nonverbal intelligence, apart from an increase in working memory (see research question 3).

6. Pre-test IQ and participation in the EMCDC training group are strong predictors of post-test IQ scores, even after accounting for individual differences in working memory (see research question 3).

7. Gender may play a meaningful role in working memory outcomes using the EMCDC intervention, with females outperforming males in post-test scores when controlling for pre-test ability, age, and training group (see research questions 4 and 5).[6]

8. Participation in the EMCDC may be associated with a meaningful increase in confidence or perception of ability in specific academic skills, such as reading comprehension, public speaking, and receiving criticism.

Research Question 1

The first research question asked, "What, if any, are the effects on working memory when applying the Equipping Minds Cognitive Development Curriculum?"

[5] Research question 2 for the current study was adapted to account for the population and sample differences from the original study. The analysis of Fall to Spring GPA was an attempt to determine if EMCDC affects academic outcomes.

[6] It should be noted that these results could be the result of the training group consisting mainly of females.

While a trend towards improvement in the various memory domains was observed in the training group, it did not reach statistical significance. Unexpectedly, the control group showed a statistically significant increase in verbal memory scores, which may warrant further investigation but is most likely attributed to sampling variability given the small sample size (n = 6).

The results for the current research question 1 are similar to those of Brown's 2016 study for the training group. Brown reported statistically significant results in verbal working memory scores for the training group. The active control group in her study made gains, but the gains were not statistically significant. The training group also made gains in visuospatial working memory, but the active control group decreased.[7]

Brown noted that her study "did not demonstrate it is possible to conclude that the training provided by EMCDC had a significant effect on the participants in verbal or visuospatial working memory in the 30 hours of intervention during a 7-week period."[8] My research also demonstrated that it is not possible to conclude that the training provided by EMCDC had a significant effect on verbal or visual memory with 29 hours of intervention over a twelve-week period. It is worth noting that the small sample size may have contributed to the results not reaching statistical significance.

Research Question 2

The second research question asked, "What, if any, are the effects of changes in working memory to academic ability in learners using the Equipping Minds Cognitive Development Curriculum?" This question could not be answered directly because the study groups had not participated in annual academic testing as had the participants in Brown's study. The variance for the current study was to conduct a multiple linear regression to examine whether post-training working memory scores and group assignment predicted

[7] Brown, "Equipping Minds," 117.

[8] Brown, "Equipping Minds," 117.

Spring GPA when controlled for Fall GPA. After accounting for GPA at the beginning of the 2025 spring semester (Fall 2024 GPA), it was found that neither the training program nor working memory scores made a meaningful difference. The best predictor of a student's spring GPA was their Fall GPA.

Brown's study showed that though working memory did not significantly increase, there were "statistically significant improvements in test scores for the students on the science test and tended toward statistical significance on the spelling test."[9] The training group also made more substantial gains than the active control group in language and reading, though not statistically significant. According to Brown, these results demonstrate that far transfer effects are possible when the EMCDC is used for thirty hours.

The findings of the current research suggest that while cognitive improvements may be beneficial, they do not appear to predict academic outcomes independently. One plausible explanation is that the sample in this study consisted primarily of high-achieving students (*M* GPA = 3.24) with limited room for academic growth. This potential ceiling effect could have masked any practical benefit of working memory gains or training interventions on GPA. As such, future research should prioritize sampling from a more academically diverse population, especially targeting students with mid-to-low baseline GPAs who may stand to benefit more noticeably from cognitive training.

To replicate Brown's study more closely and determine if gains in academic areas are made as in her study, a future study should include an academic achievement assessment in which the pre-training assessment is completed one year prior to cognitive training and the post-training assessment.

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[9] Brown, "Equipping Minds," 119.

Research Question 3

The third research question asked, "What, if any, is the effect of working memory on non-verbal and verbal abilities?" The results of paired *t*-tests[10] supported a meaningful relationship between the pre-training intervention and post-intervention gains in both verbal and non-verbal intelligence. The control group showed no gain.

Regression analyses suggest that participants in the training group experience statistically significant gains in IQ scores when compared to those in the control group. Participants in the training group predictably improved their composite IQ scores by about 14 points when compared to the control group. The regression analysis indicates that pre-test IQ and participation in the EMCDC training group are strong predictors of post-test IQ scores, even after accounting for differences in working memory. Prior IQ and exposure to the EMCDC training program appear to play a more dominant role in driving post-test performance. Brown's study concluded that "the training provided by the EMCDC makes a significant effect on the improvement in test scores for students in verbal, non-verbal, and IQ composite abilities. This implies that EMCDC increases verbal, nonverbal, and IQ composite abilities despite insignificant measurable changes in working memory."[11] The results of my research agree with those of Brown's study. Prior IQ and participation in the EMCDC play a more dominant role in post-test performance.

Given the small sample size of the current study, these analyses are understood to be exploratory and hypothesis-generating rather than confirmatory. The use of gain scores provides a simple, transparent method for modeling change over time. While caution is warranted due to limited statistical power, these analyses yield preliminary insights and establish a foundation for future research with larger and more diverse samples.

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[10] Paired *t*-tests and gain score regressions were also used by Brown.

[11] Brown, "Equipping Minds," 121.

Research Questions 4 and 5

The fourth and fifth research questions asked, respectively, "What, if any, is the effect of gender of the learner on working memory using the Equipping Minds Cognitive Development Curriculum?" and "What, if any, is the effect of the participants' age on working memory using the Equipping Minds Cognitive Development Curriculum?" The regression models used were aligned with Brown's 2016 study to estimate effect sizes and directional trends that may inform future studies with larger samples.[12]

The first regression model indicated that pre-test working memory was a strong and significant predictor of post-test working memory. Successive regression models added gender, age, and training group as variables. The fifth and final regression model added the training group as the final predictor. In this model, gender reached statistical significance, suggesting that females demonstrated higher post-test working memory scores when controlled for pre-test scores, age, and training group. These results suggest that gender may play a meaningful role in working memory outcomes using the EMCDC intervention; however, this may be a result of the training group consisting mainly of females.

Brown's study findings indicated "that gender was not a significant factor in how the students responded to the training provided by the EMCDC as evidenced by the improvement shown on the tests in verbal and visuospatial working memory, verbal and non-verbal abilities and IQ composite."[13] Brown did report, however, that gender played a significant role in reading and science. Brown also found that training "interacting with age is a significant predictor in the difference in test scores only for the verbal working memory test."[14] Age was not a significant factor for any of the other tests in her study.

[12] See chap. 4, table 9, and the subsequent discussion about the five regression models used.

[13] Brown, "Equipping Minds," 122.

[14] Brown, "Equipping Minds," 122.

The results of my research indicated that gender reached statistical significance in the fifth regression model. This analysis suggests that females demonstrated higher post-test working memory scores when controlled for pre-test scores, age, and training group. However, I cannot conclude from the results of my research that gender or age play a significant role in improving working memory outcomes due to the small sample size, which consisted primarily of female participants.

Academic Skills Questionnaire

I added a survey that asked study participants to provide their perspective on ten common academic skills. This survey was a variance from Brown's research and would not be appropriate for children 9 to 14 years old, the age range of Brown's study participants. This survey required study participants to be able to recognize a change in perspective of study skills after twelve weeks and twenty-nine hours of cognitive training.

The findings suggest that participation in the EMCDC training may be associated with a meaningful increase in confidence or perception of ability in specific academic skills, such as reading, comprehension, public speaking, and receiving criticism. The training group also showed promising trends in critical thinking, group work, and writing skills, though these did not reach statistical significance. The control group results suggest that, in the absence of intervention, students may not improve their perception of ability with certain academic skills over time.

The results of this study have implications for students in academic programs that do not have a minimum threshold to continue in the program. Research question 3 indicated there could be a "ceiling effect" for raising grade point averages using the EMCDC because the pre-training grades were above average. While gains in working memory were not realized, other cognitive domains were affected, as gains were realized in verbal, non-verbal, and composite IQ scores. A question for further consideration is to determine what other cognitive domains, as measured by CNSVS, saw gains after

twenty-nine hours of cognitive training. If the EMCDC program were implemented across a broader cross-section of the student population early in their college career, students could be encouraged by improvements in test scores. Students in programs that do not require a minimum to stay in the program could also be encouraged when they see their cognitive domain scores increase.

The Academic Skills Questionnaire showed significant promise for influencing how students perceived their own improvement. Students who recognize they have improved in academic skills will likely have higher satisfaction with their education and be more likely to persist to graduation. The addition of an exit interview would have allowed training group participants to discuss the training program and verbalize their thoughts on its impact and whether they see value in it for their career as teachers.

Research Limitations

The limits of generalization noted in chapter 3 state that the findings of the research study, whose participants were part of the same educational program at Boyce College, may not generalize to students in the general population of the college, and the study's small sample size may not generalize to a larger, more diverse student population. The findings and conclusions of the current study should include the following additional limitations:

1. Brown recommends a minimum of sixty hours of cognitive training to achieve the best results. The current research, as a replication study, limited cognitive training to thirty hours. For measures that were near statistical significance, it is possible that additional training would result in a statistically significant increase.

2. The small sample size significantly limits the statistical power of all analyses conducted, increasing the likelihood of failing to detect true effects and unstable parameter estimates.

3. Regression models, used to examine relationships among variables, including predictors such as gender, age, and training group, constrain the ability to generalize the results of the study.

4. The use of gain scores and paired *t*-tests, while aligned with Brown's 2016 study and appropriate for pre-post comparisons, does not account for all potential sources of variability. Including baseline scores as covariates in some models helps address this limitation but does not eliminate it.

5. The sample may not reflect the diversity of the broader population, and the relatively high academic performance of participants may have introduced a ceiling effect, especially in analyses related to GPA.

Despite these limitations, the study provides useful estimates of effect size and directionality that may inform future evaluations of the EMCDC.

Contribution to Research

This replication study confirms the results of Carol Brown's 2016 research and validates its use for increasing verbal and non-verbal abilities in students aged 18 to 24. The current research indicates that the EMCDC did not improve working memory in the training groups. However, there were improvements in the cognitive domains of verbal IQ, non-verbal IQ, and IQ composite. To determine the broader effect of the Equipping Minds program, future research should include pre-and post-assessments of other cognitive domains, such as reaction time, complex attention, cognitive flexibility, processing speed, and executive function.

Future Studies

The results of the current research agree with the results of Brown's research that cognitive domains of verbal and nonverbal intelligence were improved with the EMCDC. The answer to research question 1 informs us that working memory is not the catalyst for cognitive improvements. A logical next question is "what cognitive functions, if any, cause gains in verbal abilities, non-verbal abilities, and composite IQ?" Future research should explore which other cognitive functions contributed to the cognitive improvements in verbal abilities, non-verbal abilities, and composite IQ.

A question for future study is to isolate the results of individual participants to determine if there is a level of pre-training cognition that predicts the greatest post-training results. In other words, do participants with lower pre-training assessments realize greater gains than those who have higher pre-training assessments?

Future studies should reflect the diversity of the broader population that includes students from other academic programs and a balanced male-female representation.

An area of interest for the current study was the potential for far transfer effects in academic subjects. The college context for the current study does not require periodic (annual) academic achievement testing. A future study that includes the exploration of far transfer effects into academic areas would require long-range planning and a year-long commitment of study participants.

A future study using the EMCDC to train participants for forty-five to sixty training hours with participants in the age range of the current study would be helpful to see if the longer training results in statistically significant gains. Brown references the far transfer effects in her work with "Marie," who had the strongest academic gain in science after forty-five hours of intervention.[15]

A longitudinal follow-up could also determine whether gender and age have a delayed or cumulative impact on the intervention. Given the limitations of this study, particularly the small sample sizes and resulting low statistical power, further research with a larger sample and a more robust design using regression controlling for baseline differences is recommended.

Conclusion

The purpose of this study was threefold. First, the study was a replication of the 2016 study by Carol Brown, who sought to improve working memory in learners with an SLD. Brown's study showed that "working memory training does not have a causative effect in relationship to verbal, nonverbal, and academic abilities when using EMCDC."[16] However, the research concluded that the EMCDC training "increases verbal, nonverbal, and IQ composite cognitive abilities despite insignificant measurable changes in working memory."[17] The second purpose was to extend the scope of Brown's study by applying

[15] Brown, "Equipping Minds," 120.

[16] Brown, "Equipping Minds," 117.

[17] Brown, "Equipping Minds," 121.

the EMCDC to students older than 14 years.[18] A third purpose of this study was to explore whether addressing underlying deficits in cognitive abilities could have a positive impact on "student satisfaction, student retention, and graduation rates," as Brown noted in the conclusion of her study.[19] Student satisfaction can lead to increased student retention, student persistence, and ultimately, graduation.

The results of this study confirm the results of Brown's study. First, the EMCDC does not have a significant impact on verbal or visual working memory.[20] These results validate the results of Brown's study. Second, this study confirms Brown's findings that the EMCDC had a significant effect on improvement in verbal IQ, nonverbal IQ, and IQ composite scores.[21] Third, neither Brown's study nor my study could affirm that gender was a factor in how students responded to the EMCDC, as evidenced by the verbal IQ, nonverbal IQ, and IQ composite scores. Fourth, Brown's study found that age was a significant predictor for only the verbal working memory test.[22] This study indicated that age was not a predictor of an increase in working memory, but rather, pre-training working memory was the strongest and most statistically significant predictor of post-training working memory performance.

This study, while answering some of the research questions, in part, raises more questions that could be explored with a more robust study that includes a diversity of age, academic ability, and academic programs. However, future researchers considering replicating this study should be aware that the Equipping Minds curriculum failed to

[18] One of the limitations Brown noted in her study was that "the results may not be indicative of learners younger than 9 or older than 14 years of age." Brown, "Equipping Minds," 124.

[19] Brown, "Equipping Minds," 144.

[20] Brown, "Equipping Minds," 117.

[21] Brown, "Equipping Minds," 121.

[22] Brown, "Equipping Minds," 122.

produce the expected increases in working memory, as documented in this study and in Brown's original 2016 study.

APPENDIX 1

PARTICIPANT CONSENT FORM

The participant consent form is required for research involving human subjects. The form has two sections: “Agreement to Participate” and “Procedures.” The Agreement to Participate section explains the purpose of the research study, who is conducting the research, and the specific requirements of the study. Included is an option to withdraw from the study at any time. Participants sign and date the form, indicating their desire to participate or their desire not to participate. The age range of the sample target precluded the need to obtain parental consent.

The second section of the form, “Procedures,” outlines the required assessments, duration of each training session, and length of the study. Information on the privacy of resulting data is explained, and when their results may be requested for review. Signature and date on this section of the form constitute informed consent, allowing use of their responses in the study.

Additional information about risks and discomforts from participating in the study, as well as the benefits and uses of data obtained and the cost to participants, is explained. My contact information was provided to offer an opportunity to ask questions.

PARTICIPANT CONSENT FORM

Instructions

In Section 1, read the "Agreement to Participate" statement and confirm your willingness to participate in this study by checking the appropriate box and entering the requested information.

In Section 2, provide responses to each of the questions by entering your name and student email.

Section 1

Agreement to Participate

The research in which you are asked to participate is designed to explore the impact of the Equipping Minds Cognitive Development Curriculum on working memory and academic improvement for students with or without a specific learning disorder diagnosis. This research is being conducted by Garnetta Smith for purposes of her doctoral thesis research in educational leadership at the Southern Baptist Theological Seminary. In this research study you will be asked to complete pre- and post-study, computer-based assessments and fully participate in the intervention phase of the study. The intervention phase will consist of cognitive development training exercises. Any information you provide will be held *strictly confidential*, and at no time will your name be reported, or your name identified with your responses. *Participation in this study is voluntary, and you are free to withdraw from the study at any time.*

By completion of this form you are giving informed consent for the use of your responses in this research.

☐ I agree to participate ☐ I do not agree to participate

Participant's Name: _____ ID# _____

Date: _____

Section 2

Procedures

If you agree to participate the following will occur:

1. You will complete an online pre-assessment that measures both working memory and nonverbal and verbal ability.
2. If you are selected to be in the training group, by randomized assignment, you will receive 60 minutes of cognitive developmental training, three days each week from January 28 – April 18, 2025, using the Equipping Minds Cognitive Development Curriculum.
3. All participants will complete a post-assessment that measures both working memory and nonverbal and verbal ability.
4. Pseudonyms will be used on data and, additionally, all identifying information will be removed or changed to maintain the confidentiality of all participants.
5. You may submit a written request for your assessment results at the end of the intervention and testing after October 15, 2025.

By your completion of this *Agreement to Participate*, and entering your email address below, you are giving informed consent for the use of your responses in this research.

Name _____

Student email _____ @students.sbts.edu

Date _____

RISKS AND DISCOMFORTS

Participation in this research will involve no loss of privacy and your records will be handled confidentially.

BENEFITS AND USES OF DATA

This study provides an opportunity for institutions of higher education to learn if a cognitive development training curriculum may be able to enhance student learning. The results of this study will be used in preparation of Garnetta Smith's doctoral thesis at the Southern Baptist Theological Seminary in educational leadership. No publication or presentation of the study's findings will contain any identification of students who participated in the study.

COSTS/PAYMENT

Study participants will incur no cost as the result of taking part in this study. Participants will receive no payment for study participation. Students who fully participate in the study, by completing the entire training program, including pre- and post-assessment may earn up to 30 service hours toward their Teacher Education Program requirement.

QUESTIONS

You will have the opportunity to ask Garnetta Smith any questions about this study. Please contact Mrs. Smith by email at gsmith@sbts.edu.

APPENDIX 2

ACADEMIC SKILLS QUESTIONNAIRE

The Academic Skills Questionnaire was developed to determine if study participants could discern a difference in how they perceive their interaction with ten specific academic skills after cognitive training. Participants completed a pre-training assessment and a post-training assessment. I included this assessment because the study participants were of the age to perceive whether they had improved in their interaction with the academic skills assessed on the questionnaire.

ACADEMIC SKILLS QUESTIONNAIRE

Date _____ Student ID# _____ Birth Date

_____

First Name _____ Last Name

_____

Please answer the following statements related to academic skills. Please circle the one answer that best describes your *current* interaction with the tasks in the statement. There is no right or wrong answer, but please answer honestly.

1. I manage my schedule to get all work for classes completed before it is due.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

2. I am comfortable conducting research.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

3. I usually understand what I read.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

4. I can analyze information to solve problems and understand concepts.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

5. I work in groups without becoming distracted.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

6. I confidently speak in front of groups.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

7. I take helpful class notes and express myself in written assignments.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

8. I set and manage achievable goals.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

9. I process and respond positively to constructive criticism.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

10. I manage multiple school projects at the same time.

Almost Never	Occasionally	Often	Frequently	Almost Always
1	2	3	4	5

APPENDIX 3

TEACHER EDUCATION PROGRAM
STUDY RECRUITMENT LETTER

Participants for this study were recruited from the Teacher Education Program at Boyce College in Louisville, Kentucky. Dr. Melissa Tucker, Program Director, agreed to send a letter to students in the Teacher Education Program inviting them to participate. The letter explains why I was conducting the study, what I needed to complete the study, and the details of the study, including requirements for participation.

November 19, 2024

Dr. Melissa Tucker
Program Coordinator, Teacher Education Program
Boyce College

Dr. Tucker,
I have written an introduction of my study for you to share with your TEP students. I need 10 – 12 students to fully participate. I will need a similar number of students for the control group; their testing being completed at the same time as the study group. But I am not concerned about finding controls. Please send me a copy of the communication you share with your students to be added to my methodology.

Mrs. Garnetta Smith, Director for the Center for Student Success on our campus, is conducting a research study to fulfill a requirement for her Doctor of Education. Mrs. Smith has chosen a study that is very dear to her heart and the focus of her past 16 years at Southern Seminary and Boyce College…Student Success.

Mrs. Smith's study, entitled Applying a Cognitive Development Curriculum to Improve Academic Performance at Boyce College, is a replication of a 2016 study by Carol Brown. Dr. Brown's study participants were elementary-aged children, but one of her conclusions was that an area of further study is in a higher education context. She specifically noted that her study "may benefit Christian higher education administrators, practitioners, and student service professionals who serve and teach students with NLD and those with undiagnosed learning struggles."

The study in which you are asked to participate will begin in January 2025 and conclude on or before April 2025. The study requires you to fully participate for the entire twelve weeks. During the study you will be required to complete a cognitive assessment before the training begins and another assessment after the training is completed.

The training consists of three one-hour sessions each week, following the academic calendar, in which you will learn exercises and games to increase processing, attention, working memory, executive functioning, comprehension, thinking, and social skills. While there is no homework required, participants are expected to attend and participate in all sessions.
Individual results will be shared with students after Mrs. Smith defends her Thesis, next fall.

Thank you so much for your assistance and let me know if I can answer any questions.

Garnetta S. Smith
Director,
Center for Student Success

APPENDIX 4

COGNITIVE TRAINING SCHEDULE

This appendix details the cognitive training schedule for the study. This schedule was created from Brown's training manual and adapted for my context. This schedule represents an abbreviated schedule, in keeping with the original study. My study also differed from Brown's in that my groups met three days each week to mimic a college course schedule, whereas the context for Brown's study in a school allowed for training five days each week. The training schedule was reviewed after each session to determine whether to repeat those exercises in the next session or continue to the next exercises in the sequences. The same training was provided for the morning and evening groups.

Table A1. Cognitive training schedule, January 27–February 7

27-Jan	29-Jan		31-Jan	3-Feb	5-Feb	7-Feb
Assess.	Assess.		Day 1	Day 2	Day 3	Day 4
		Reflex Exercises Starfish, FT	Teach reflex exercises	Y	Y	Y
		Sound Therapy	Explain Sound Therapy	Y	Y	Y
		Blink				
		Set				
		EM Cards	Say color of cards 1. Lay out code cards; Sort by color 2. Sort by #. 3. Sort by #; Say #, sort by animals, sort by word, sort by letters, sort by symbols, sort by direction	Use code cards. 1. Sort by color 2. Sort by number. 3. Sort by #; say #. 4. Sort by letters, then by # 4a. Sort by Color, Number	Use Code Cards. 1. Sort by color. 2. Sort by #. 3. Sort by L, then by #(alternate). 4. Sort by P. 5. Sort by C,#, P, alternating. 6. Introduce animal sheet, use code cards 7. Sort by wrong word	Sort by number & color. Sort by number, color, & animal
		Spot It				Describe what you see on the constant card. Model "I see _____." Take turns.
		Xtreme Memory				
		Tic-Tac-Toe	page 57, S1 "I see myself on… cubes up/down	Use cubes. Use 1 board, color on number Use 2 boards	Use cubes. Use board 1-9, repeat 2-3 times. Use Double Boards	
		Stroop Effect Animals		Introduce animal sheets		P 64; P13-14
		Stroop Effect				
		Arrows				
		Letters				
		Number Hunt 1-5		Number code through 5;	Use symbols for numbers, remove sheet and read numbers. Use B & W page with color cubes.	Apply symbols for 1, 2, 3. Use cubes, G, B, R.

27-Jan	29-Jan		31-Jan	3-Feb	5-Feb	7-Feb
Assess.	Assess.		Day 1	Day 2	Day 3	Day 4
		Number Hunt 1-9				
		Vowel Hunt				P98, p 27-28 S1-S4
		Make a List				
		Stare Cards				
		Presidents				

Table A2. Cognitive training schedule, February 10–February 24

10-Feb	12-Feb	14-Feb	17-Feb	19-Feb	21-Feb	24-Feb
Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
Y	Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y	Y
Add Blink cards Sorting exercises	Sort number, color & shape	X	X	**SNOW DAY**	2 cards on discard pile; play with three cards. Match same #, C, or S. Say, "# on #", "red on red", "star on star", etc.	Sort C, N, S; Sort by any shape: say, 'card on.'
	X	X	X	X	X	~~X~~
Use Code Cards 1. Begin sorting color 2. Switch to L, then #	Alternate Number, color, animal	Sort Color, Animal, Letter	Alternate N, C, A, W		**Code Cards** Alternate N, C, A	**Code Cards** Add 6, review all cards Sort any ; Sort L, N, W
	X	EM 9 Cards (see pg. 81, S4)		X	X	X
	X	X	X	X	X	X
	X	X			P57, P8, (Use cubes)	
P66; P13	Review & add elephant	Symbols for Bear - Turtle, erase, discuss number/color	Bear - PenguinForward & Backward	P64, S14Bear - Penguin, add Bird (nest)	P13/15.	Review Bear - Bird, add unicorn P13
	X	X		X	X	x
	Up/Down Student p. 20 Page 83, S1.	Student p.20, (Page 83, S2) Color & Direction	Color & Direction		P20 Alternate C/D then alternate N/C/D using Code Card #s	N, C, D then add animals
	X	X		X	X	X
P96-97; P #27-28 Review and add #4, "line under."	Review 1-4 symbols and colors	Review 1-4 and add 5. This will be review as they already know up to 5…at least they think they do.	Review 1-5 taking turns, N,C, A	Review 1 -5 N, C, A	Cubes on # and then read back. Alternate reading N,S, A from cubes.	Review Symbols

10-Feb	12-Feb	14-Feb	17-Feb	19-Feb	21-Feb	24-Feb
Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
	X	X	X	X	X	Add slash & 6 P103/P31
P98, p27-28 Circle "a", X "e", Box the I".	a, e, i (Page 98, S6)	add o (Page 98. S7)		~~add u (Page 98, S8~~		Review vowels & add u (Page 98, S8) p29/
	X	X				
	X	X				
P128-129; p10 Add Presidents Washington through Madison. Use Aristotle's 10 categories to aid memory.	Review 1-4, add 5	Review 1-5	Review 1-6, add 7		Review 1-7 add 8	Review 1-8, use sheet protector, draw symbols and then add color cubes.

Table A3. Cognitive training schedule, February 26–March 10

26-Feb	28-Feb	3-Mar	5-Mar	7-Mar	10-Mar
Day 12	Day 13	Day 14	Day 15	Day 16	Day 17
Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y
Say N, C, S (no sort); then say all for each card	Say N, C, S (no sort); then say all for each card	P76, S10	P76, S9 P76, S10	P76, S9 P76, S10	P76, S11
X	X	X	X	X	**P74, S1** Introduce SET. Review Cards using the small set. Ask what # they see & sort by #. Then sort by color. Use language.
(Focus is on Picture & Word) Alternate Say P(icture), W(ord); Add N; Sort any & Say it.	Say C, L, N, then P, W Add #7, G card	Sort C, L, N, then P, W Add #8, H card Review contents.	X	Sort C, L, N, then P, W Add #9, I card Review contents.	
X	X	X	X	X	
3 on 3 cubes, letters, numbers, symbols; 3 on 4 cubes; **4 on 4 cubes**	Use 4 on 4 cubes with letters. Include a mix of symbols, letters, etc. Have students duplicate what they saw.	X	X	XXX	
	P58, P7	P60, P9	P60, P9	X	
P 14;Review Bear - horse;	Review Bear -Horse, add Claws on Tiger	Use Order of Animals Sheet.Review Bear - Tiger	Review Bear - Tiger, add web around spider,	X	Order of Animals SheetReview Bear - Spider, add 3 eggs under Chicken
x	x	Stroop Mini-Cards P69, P19 Read Words, ignore color. Then Read Color, ignore words.	Stroop Mini-Cards P69, P19 Read Words, ignore color. Then Read Color, ignore words.	Stroop Mini-Cards P69, P19 Alternate reading Words (ignore color), and color (ignore words) by row.	Stroop Direction P69, 70; S1-S3; P16

26-Feb	28-Feb	3-Mar	5-Mar	7-Mar	10-Mar
Day 12	Day 13	Day 14	Day 15	Day 16	Day 17
P83, P. 20;	Write & say #; alternate & say C/D/N.	X			
X	X	X			
Review Symbols, read backwards	P97, P28 S11 Read #, read C, then alternate reading #, C, A	P95, S12 P97, P28 Read numbers by adding +1. (5 is 6, 3 is 4) Read and alternate with +1, take turns reading rows.	P95, S13 P97, P28	P97(S14), P28	P95,P96; S12 P27
Use 1-9 Number hunt; mark 1-6	Circle #'s that are the same in each row. Read numbers & alternate with +1. Take turns with rows.	Circle #'s that are the same in each row.	P101, S6 103, 31	Using sheet protector, do all the symbols . Use columns, use symbols.	P101, 103; S14 P31
	X	X	X	X	X
	X	X	Make a list of fruits & vegetables. 30 seconds.	X	Make a list of zoo animals.
	X	X	X		
Review 1-6; Review out of order, with color cubes; add #9	Review. Review colors 1-7. Do you know colors for 8 & 9?	X	Review; Review with description of picture and colors (1-9). Added 10th President.	Review Presidents.	Review

Table A4. Cognitive training schedule, March 12–March 31

12-Mar	14-Mar	24-Mar	26-Mar	28-Mar	31-Mar
Day 18	Day 19	Day 20	Day 21	Day 22	Day 23
Y	Y	Y	Y	Y	Y
Y	Y	Y		Y	Y
P76, S11 3-Steps	P77, S12	Post Spring Break Day of Review	P77, S13, S14	P77, S15	P77, S16 Play the game with no words.
P74, S2, S3	~~X~~	X	~~X~~	X	~~X~~
Sort (Say) Color and word, alternate with number and letter (1 card for each, 4 cards /round)	Review EM Code Cards in detail. Students take turns.	Review			Use Code Cards; Alternate C & N, Above and Below
			P81, S1,S2	P81, S1,S2	X
				X	X
		Review		X	X
	Order of Animals SheetReview Bear - Chicken, add Bacon through the pig; this should mimic code card	Review	Order of Animals SheetReview Bear - Pig, add Giraffe.	P13Order of Animals SheetReview Bear - Giraffe, add Cow, put bucket under the cow.	P13Order of Animals SheetReview Bear - Cow, add Camel.
P69, 71; S1-3; 4-6(if time) P17 Stroop Animal/# Set *SET 1:* S1-S3 *SET 2:* S4-S6	Stroop Effect P69, 71; P17 Number Set (Set 1) (Sheet Protectors) S1-3		Stroop Effect P69, 72; P18 Number Set (Set 1) S4-5	Stroop Effect P69, 72; P17 Animal/Number Set (Set 1) S5-S6	Stroop Effect P69, 72; P18 Animal/Number Set (Set 1) S6 - S7
		Review			P83, 87; P21 Up & Down and Left & Right S1 - S2
			P89, 90 P23 S1-S2	P89, 90 P23 S1- S4	P89, 90;P23 S4-S6
P95,P96; S13 P27	P95,P96; S14 P27	Review			P95,P96; P27 S14, S15
P101, 103; S15 P31	P101, 103; S16 P31	Review			P101, 103; S16, S17 P31

12-Mar	14-Mar	24-Mar	26-Mar	28-Mar	31-Mar
Day 18	Day 19	Day 20	Day 21	Day 22	Day 23
	Make a list of states. 15 seconds to think; 30 seconds to write the list.				Make a list of code card animals in alphabetical order.
			P123, P124 (Introduce Aristotle's "10 Categories of Being.") S1-Look at Stare Card (Bears Invade Picnic) Ask students who, what they see, how many, colors, etc.	P123, P124 S2-S7 Scarecrow, crow, duck card.	Recall contents of first Stare Card, Bears Invade Picnic
Review Presidents.		Review			Review in order with description of pictures if time allows.

Table A5. Cognitive training schedule, April 2–April 14

2-Apr	4-Apr	7-Apr	9-Apr	11-Apr	14-Apr
Day 24	Day 25	Day 26	Day 27	Day 28	Day 29
Y	Y	Y	Y	Y	Y
Y	Y	Y	Y	Y	Y
P77, S16 Play the game with no words.	P77, S16 Play the game with no words.	X	P77, S16 Play the game with no words.	Sort the deck by colors: Place six cards, one of each color and say, "red on red, same color."	
X	X	X	X	X	X
Use Code Cards; Alternate C, N, A, S. Above and Below	Use Code Cards; Alternate C, N, A, S. Above and Below C-above, N-below, A-above, S-below	Use Code Cards; Alternate C, N, Pic, S, L, Arrow. Above and Below	Use Code Cards; Above and Below 1. Alternate N, C, Pic; 2. Alternate N, C, Pic, S	Use Code Cards; Above and Below 1. Alternate N, C, Pic, S. 2. Alternate N, C, Pic, S, L, A	Use Code Cards; Above and Below 1. Alternate N, C, Pic, S 2. Alternate N, C, Pic, S, L, A
X					
X					
X					
P13Order of Animals Sheet Review Bear - Camel andadd Frog.	P13Order of Animals SheetReview Bear - Frog and add Bee.	P13Order of Animals SheetReview Bear - Bee, add Zebra.	P13Order of Animals SheetReview Bear - Zebra. Add the Crab;	P13Order of Animals SheetSet 1: Say Picture, letter, symbol.	P14Order of Animals SheetSet 2: Say picture, word, symbol
Stroop Effect P69, 72; P18 Number Set (Set 1) S7-S8	Stroop Effect P69, 72; P18 Number Set (Set 2) S-9, 10	Stroop Effect P69, 72; P18 Number Set (Set 2) S7 - S8, S11	Stroop Effect P69, 73; P19 Stroop Test Mini Cards S1 - S2	Stroop Effect P69, 73; P19 Stroop Test Mini Cards S3	Stroop Effect P69, 73; P19 Stroop Test Mini Cards S4
P83, 87; P20 Up & Down and Left & Right S4	P83, 88; P22 Four Directions S1-S2	P83, 88; P22 Four Directions S3 - S3a	P83, 88; P22 Four Directions S3 - S3a		
P89, 90 P23 S6, S9	P89, 91 P24 S10, S12	P89, 91 P24 S10, S11, S12	P89, 92 P25 Use m & w	P89,92 P25 Use m & w S19-20	P89, 93 P26 Use b,d,p,q,m & w

2-Apr	4-Apr	7-Apr	9-Apr	11-Apr	14-Apr
Day 24	Day 25	Day 26	Day 27	Day 28	Day 29
P101, 103; S17, S18 P31	P101, 103; S17 P31	P101, 103; S18, S19 P31	P101, 103; S18, S19 P31	P101, 103; S19 P31 Use page protector.	P101, 103; S18 P31 (student)
					P98, 99 P29 Use page protector. Circle the a's, X the e's, box the I's, line under the o's, line over the u's. Read colors back.
		Make a list of items on Friday's Stare Card	Make a list of colors.		
Recall contents of 2nd Stare Card, Scarecrow, crow, duck card	New Stare Card (Painter with animals)	Choose new Stare Card. Use Aristotle's 10 States of Being to review card contents.			
		Review in order with descriptions of card and add next one		Review in order with descriptions of card and add next one (I think we have covered through #12, though a couple of the morning girls wanted to know more, up to #14). AM-19, PM-17	Review Presidents, through 20.

Table A6. Cognitive training schedule, April 16–April 23

16-Apr	21-Apr	22-Apr	23-Apr
Day 30	Assess.	Assess.	Assess.
Y			
Y			
X			
Use regular playing cards to play games.			
P14Order of Animals SheetSet 2: Say picture, word, symbol, letter, classification (land or water).			
Stroop Effect P69, 73; P19 Stroop Test Mini Cards S5			
P89, 93 P26 Use b,d,p,q,m & w S23-S24			
P98, 99 P29 Use color cubes to on vowels that match code cards. Read vowels back.			
List of kinds of trees!			

BIBLIOGRAPHY

Alloway, Tracy Packiam. *Improving Working Memory: Supporting Students' Learning*. Thousand Oaks, CA: Sage, 2011.

American Association of Collegiate Registrars and Admissions Officers. "John M. Braxton." Accessed September 17, 2025. https://www.aacrao.org/people/john-m.-braxton.

Association for Biblical Higher Education. "Commission on Accreditation." Accessed September 20, 2025. https://www.abhe.org/accreditation/.

Ayers, A. Jean. *Sensory Integration and the Child: Understanding Hidden Sensory Challenges*. Los Angeles: Western Psychological Services, 2005.

Berger, Joseph, Gerardo Blanco Ramirez, and Susan Lyons. "Past to Present: A Historical Look at Retention." In *College Student Retention*, edited by Alan Seidman, 7–34. Lanham, MD: Rowman & Littlefield, 2012.

Braxton, John M. "Reflections on a Scholarship of Practice." *Review of Higher Education* 28, no. 2 (Winter 2005): 285–93.

———. "Toward a Scholarship of Practice Centered on College Student Retention." *New Directions for Teaching and Learning* 115 (Fall 2008): 10–12.

Braxton, John M., Jeffrey S. McKinney, and Pauline J. Reynolds. "Cataloging Institutional Efforts to Understand and Reduce College Student Departure." *New Directions for Institutional Research* 130 (Summer 2006): 25–32.

Brown, Carol T. "Equipping Minds: Applying a Biblically Based Curriculum for Improving Working Memory." EdD thesis, The Southern Baptist Theological Seminary, 2016.

———. "Equipping Minds Cognitive Development Curriculum." Equipping Minds. Accessed June 11, 2024. https://equippingminds.com/equipping-minds-workbook/.

Butrymowicz, Sarah. "Most Colleges Enroll Many Students Who Aren't Prepared for Higher Education." Hechinger Report, January 30, 2017. https://hechingerreport.org/colleges-enroll-students-arent-prepared-higher-education/.

Conley, David T. "A Definition of College Readiness." All About Adolescent Literacy. Accessed September 30, 2019. http://www.adlit.org/article/31527/.

———. "Redefining College Readiness." Educational Policy Improvement Center, 2011. https://www.inflexion.org/redefining-college-readiness/.

CNS Vital Signs. “CNS Vital Signs.” Accessed December 9, 2022. https://www.cnsvs.com/AcademicResearch.html.

———. “CNS Vital Signs Interpretation Guide 2003–2023.” 2023. https://www.cnsvs.com/WhitePapers/CNSVS-BriefInterpretationGuide.pdf.

———. “Frequently Asked Questions.” Accessed February 6, 2024. https://www.cnsvs.com/FAQs.html.

Cresswell, John W., and J. David Cresswell. *Research and Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: Sage, 2018.

Dalton, Rick, and Jon Reidel. “To Counsel Readiness.” New England Board of Higher Education, December 17, 2019. https://nebhe.org/journal/to-counsel-readiness/.

Duffin, Erin. “College Enrollment in the United States from 1965 to 2020 and Projections up to 2031 for Public and Private Colleges.” Statista, August 30, 2024. https://www.statista.com/statistics/183995/us-college-enrollment-and-projections-in-public-and-private-institutions/.

Environmental Protection Agency. “America’s Children and the Environment (ACE).” Accessed June 11, 2024. https://www.epa.gov/americaschildrenenvironment/health-neurodevelopmental-disorders.

Farah, Stephanie. “Five Reasons Why Your Students May Not Be Prepared for College-Level Course Work.” CollegeXpress, October 2013. https://www.collegexpress.com/counselors-and-parents/college-counselors/blog/five-reasons-why-your-students-may-not-be-prepared-college-level-course-work/.

Fishman, Tiffany Dovey, Allan Ludgate, and Jen Tutak. “Success by Design: Improving Student Success in Higher Education.” Deloitte Insights, March 16, 2017. https://www2.deloitte.com/us/en/insights/industry/public-sector/improving-student-success-in-higher-education.html.

Freund, J. S. “Learning—Transfer.” *Encyclopedia of Gerontology*, 2007. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/transfer-effect.

Glossary of Education Reform. “College-Ready.” August 29, 2013. https://www.edglossary.org/college-ready/.

Goddard, Sally. *Reflexes, Learning and Behavior: A Window into the Child’s Mind*. Eugene, OR: Fern Ridge, 2005.

Gualtieri, Camillo Thomas, and Lynda G. Johnson. “Reliability and Validity of a Computerized Neurocognitive Test Battery, CNS Vital Signs.” *Archives of Clinical Neuropsychology* 21, no. 7 (October 2006): 623–43.

Hansen, Elaine Tuttle. “Top Students, Too, Aren’t Always Ready for College.” *Chronicle of Higher Education*, March 11, 2013. https://chronicle.com/article/Top-Students-Too-Arent/137821/.

Itzkowitz, Michael. “The College Completion Crisis Fuels the Student Debt Crisis.” The HEA Group, January 31, 2024. https://www.theheagroup.com/blog/college-completion-crisis-fuels-student-debt-crisis.

Itzkowitz, Michael, Kylie Murdock, Michelle Dimino, and Emmi Navarro, "The State of American Higher Education Outcomes in 2023." Thirdway.org, February 23, 2023. https://www.thirdway.org/report/the-state-of-american-higher-education-outcomes-in-2023.

Jackson, Michael D. "Cataloging and Comparing Bible College Efforts to Improve Student Retention and Completion." EdD diss., Union University, 2017.

Jones, Wills A., and John M. Braxton. "Cataloging and Comparing Institutional Efforts to Increase Student Retention Rates." *Journal of College Student Retention: Research, Theory & Practice* 11 (2009): 123–39.

Kaufman, Alan S., and Nadeen L. Kaufman. *KBIT-2 Kaufman Brief Intelligence Test.* 2nd rev. ed. Bloomington, MN: Pearson, 2022.

Kirst, Michael W. "What Is College Readiness?" The College Puzzle, September 30, 2019. https://collegepuzzle.stanford.edu/what-is-college-readiness/.

Lavin, David E., and David Hyllegard. "Higher Education after World War II." In *The History of Higher Education*, edited by Harold S. Wechsler, Lester F. Goodchild, and Linda Eisenmann, 724–74. 3rd ed. Boston: Pearson Custom, 2007.

National Center for Education Statistics. "Annual Earnings of Young Adults." National Center for Education Statistics, February 2019. https://nces.ed.gov/programs/coe/indicator_cba.asp.

———. "Digest of Education Statistics." Accessed February 12, 2024. https://nces.ed.gov/programs/digest/d20/tables/dt20_311.10.asp.

———. "Retention and Graduation Rates." National Center for Education Statistics, May 2022. https://nces.ed.gov/programs/coe/indicator/ctr/undergrad-retention-graduation?tid=74.

———. "Students with Disabilities." National Center for Education Statistics, 2023. https://nces.ed.gov/programs/coe/indicator/cgg/students-with-disabilities.

———. "Undergraduate Retention and Graduation Rates." Accessed August 23, 2024. https://nces.ed.gov/collegenavigator/?q=The+Southern+Baptist+Theological+Seminary&s=all&id=157748#retgrad.

Schaffhauser, Dian. "Survey: Most Profs Find HS Grads Unready for College or Work." Campus Technology, July 27, 2015. https://campustechnology.com/articles/2015/07/27/survey-most-profs-find-hs-grads-unready-for-college-or-work.aspx.

Seidman, Alan, ed. *College Student Retention.* Lanham, MD: Rowman & Littlefield, 2012.

Simmons Methodist University. "Willis Jones." Accessed June 13, 2024. https://www.smu.edu/simmons/about-us/directory/education-policy-leadership/jones.

Suitable Knowledge Center. "Co-Curricular vs Extracurricular: Small But Important Differences." Accessed August 19, 2025. https://www.suitable.co/knowledge-center/blog/co-curricular-vs-extracurricular-small-but-important-differences.

Tinto, Vincent. “Moving from Theory to Action: A Model of Institutional Action for Student Success.” In *College Student Retention: Formula for Student Success*, edited by Alan Seidman, 251–65. Lanham, MD: Rowman & Littlefield, 2012.

United States Department of Education. “A Guide to the Individualized Education Program.” August 30, 2019. https://www2.ed.gov/parents/needs/speced/iepguide/index.html#Summary.

———. “The Rehabilitation Act of 1973, Section 504.” Accessed July 20, 2025. https://www2.ed.gov/policy/speced/reg/narrative.html.

———. Title I, Part A: Improving Basic Programs Operated by Local Educational Agencies.” Accessed September 19, 2019. https://oese.ed.gov/offices/office-of-formula-grants/school-support-and-accountability/title-i-part-a-program/.

———. “Title 20—Education.” Accessed July 20, 2025. https://www.gpo.gov/fdsys/pkg/USCODE-2011-title20/pdf/USCODE-2011-title20-chap33.pdf.

United States Environmental Protection Agency. “America’s Children and the Environment (ACE).” Accessed June 11, 2024. https://www.epa.gov/americaschildrenenvironment/health-neurodevelopmental-disorders#About%20the%20Neurodevelopmental%%20Indicators.

Welding, Lyss. “Students with Disabilities in Higher Education: Enrollment Data, Outcomes, and Inclusion.” Best Colleges, March 29, 2023. https://www.bestcolleges.com/research/students-with-disabilities-higher-education-statistics/.

Wechsler, Harold S., Lester F. Goodchild, and Linda Eisenmann, eds. *The History of Higher Education*. 3rd ed. Boston: Pearson Custom, 2007.

ABSTRACT

APPLYING A COGNITIVE DEVELOPMENT CURRICULUM TO IMPROVE ACADEMIC PERFORMANCE AT BOYCE COLLEGE

Garnetta Sweeney Smith, EdD
The Southern Baptist Theological Seminary, 2025
Chair: Dr. John David Trentham

The purpose of this quantitative replication of Carol Brown's 2016 doctoral thesis is to use the Equipping Minds Cognitive Development Curriculum to address underlying deficits in cognitive abilities to increase academic performance in Boyce College students.

Chapter 1 discusses the need for, and the benefit of, a study focused on improving student academic performance. Chapter 2 provides a review of institutional efforts to improve student performance and explains why a study addressing student academic performance is needed. Chapter 3 describes the methodological design and components of the cognitive development curriculum employed for the study. Chapter 4 presents the findings and an evaluation of the research design. Chapter 5 offers an analysis of the study, provides recommendations for implementing the study protocol in other post-secondary settings, puts forward recommendations for future research, including a longitudinal study to determine if results of the post-study assessments change over time, and offers final conclusions.

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