Review of Research on the Brain-Targeted Teaching® Model: Evidence from National and International Studies

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The Brain-Targeted Teaching® (BTT) Model, first introduced in 2003, has informed teaching, learning, and leading through the dedicated work of educators in pre-school to adult-learning settings. Beyond the field of education, the BTT Model has been adopted by a variety of professionals including corporate trainers, organizational leaders, and athletic coaches. Over the years, many of these practitioners have offered anecdotal information about how the BTT Model influenced and enhanced their practice. While their stories have been inspiring, we are pleased to present evidence of its effectiveness in studies conducted by researchers and doctoral students in the United States and worldwide.

This review summarizes the implementation of the BTT Model in research studies conducted across the United States, United Kingdom, India, United Arab Emirates, Chile, China, Puerto Rico, Thailand, Japan, and Indonesia. The review includes studies in which the BTT Model served as an intervention to measure the impact of professional development on teaching practices and teacher efficacy in PK–12, early childhood, and higher-education settings. Other studies, including randomized control trials, focus on the use of the BTT Model in curriculum development, second-language acquisition, and online learning. Although the research studies cited in this review are grouped into specific categories, findings frequently overlap multiple areas of study. In general, research continues to show how the student-centered approach rooted in the BTT Model has the potential to enhance traditional teaching and learning, helping to eliminate bias and delivering creative and joyful experiences for all learners.

The Brain-Targeted Teaching® Model in Professional Learning Studies

Effective professional development is characterized by its *focus* on both content and pedagogy, *alignment* with goals and standards of the institution, and *acknowledgement* of the complexities in teaching, leading, and learning environments. Building on the framework of the learning

sciences, practitioners can upskill their practice—first by experiencing the BTT Model as learners and then applying the BTT framework in the classroom and workplace.

Multiple research studies on the impact of educator professional development (PD) using the BTT Model have shown how the learning sciences inform effective teaching. For example, in a study conducted by Parr (2016), forty-four K–12 public school educators in a Mid-Atlantic school district enrolled in a six-hour professional learning session on the implementation of the BTT Model. Parr used a mixed-methods approach with pre- and post-session surveys and semi-structured interviews to record and examine the impact of the PD on teaching practices. The analysis of data yielded three major findings: an increase in participants' awareness and knowledge of neuroeducation and BTT concepts, an increase in the application of BTT strategies in the classroom, and recognition of ongoing need for continued study of the learning sciences to inform practical experiences in the classroom.

> *Studies show that the use of the Brain Targeted Teaching® Model enhances teaching practices and increases teacher efficacy beliefs.*

Other studies addressed the integration of the BTT pedagogy into professional development to increase teacher self-efficacy beliefs. Teachers' preconceived bias toward students, the school environment, and student characteristics influence teacher self-efficacy, which ultimately affects student learning. Professional learning experiences that focus on teacher efficacy are critical as a key component of effective teaching and classroom management. Jackson-Butler (2017) addresses teacher efficacy and the impact on student achievement in a study involving students living in under-resourced communities. Five teachers from a school in a northwest American state formed the focus group for the intervention. Jackson-Butler employed a mixed-method approach using a teacher efficacy scale, classroom observations, and interviews to assess teachers' perceptions of academic, socioemotional, and cultural barriers to student learning. After implementing the BTT Model, findings indicated a difference in teachers' beliefs in their ability to teach students from different cultures and various socioeconomic backgrounds. Key themes emerging from the research included the importance of cultural awareness, understanding environmental influences that affect student learning, and the association between teacher efficacy and how students are engaged and motivated in their learning. Overall, results

yielded an increase in teachers' ability to adjust lessons, manage classroom behavior, and use effective teaching approaches to increase student attention.

In a similar study in the United Kingdom (UK), Torrance Jenkins (2018) conducted a one- to two-year case study using the BTT model (along with a different neuroeducation framework) to deliver professional learning to a group of science teachers. Through observation of teaching practices, interviews, and focus groups with students, she documents ways in which the use of the BTT model and general neuroeducation principles enhanced teachers' practices with new techniques and boosted confidence in their own established practices. The study provides specific examples of how teachers used each of the components of the BTT Model in science instruction.

JohnBull and Hardiman (2023) conducted research to determine if the tenets of neuroeducation through use of the BTT Model would affect teachers' efficacy beliefs. The authors stress the importance of teacher efficacy, which is fundamental to the belief in the power of education to reach all learners and is strongly correlated with student achievement. Over the course of two years, a (PD) program using the BTT Model was delivered to three cohorts of in-service PK–12 teachers

> *Professional learning experiences that focus on teacher efficacy promote the belief in the power of education to reach all learners.*

(N=80) from a mid-Atlantic urban school district. The sessions for Cohorts 1 and 3 were conducted in ten, three-hour sessions, while Cohort 2 received the same training over a condensed timeline of two weeks during the summer. A sample of nonparticipating teachers was also included to represent a business-as-usual comparison-matched sample. Pre-and post-efficacy scores showed statistically higher self-efficacy among participating teachers for each cohort, highlighting the potential benefits of the BTT framework for influencing teacher efficacy.

The Brain-Targeted Teaching® Model in Early Childhood Studies and Across Grade Levels

Professional development as a significant aspect in curriculum implementation has further focused on researching how to apply the learning sciences across grade levels. Walker (2016) conducted a three-year study focused on the implementation of the BTT Model at early childhood centers in India. Walker's research begins to fill a gap between research and practice

in early childhood education and in particular for early-years in-service teachers. Staff and teachers received extensive training in the BTT Model and then developed curriculum based on the framework. The research identifies factors influencing the adoption of the BTT Model and its adaptation within an early childhood setting. Findings highlight how the participants found the BTT Model a valuable resource to refine their curriculum and instructional practices for early-childhood educational institutions.

Mizyed and Eccles (2023) state the urgency and relevance of professional development in the learning sciences and child-centered pedagogy for early-years teachers to enhance practices and self-efficacy. Their research first aimed to understand the challenges faced by Emirati teachers in fostering problem-solving skills development in early education in the United Arab Emirates (UAE). Challenges include combatting the gap between UAE's goal of moving to a more knowledge-based economy, the multiple factors influencing Emirati teachers' attitudes toward implementing change, and the urgency of additional educator training. They interviewed ten teachers over a two-week period and used a mixed-method approach that combined quantitative survey data with qualitative interviews. Findings indicated low teacher self-efficacy and a lack of proper exposure to professional training to develop problem-solving skills.

Following the initial study, Mizyed and Eccles (2024) implemented a thirteen-week professional development program using the BTT Model that featured collaboration, observation, and self-reflection. Results indicated a shift toward child-centered strategies, greater collaboration, and improvement in teachers' self-efficacy scores. The researchers found that applying the BTT Model increased understanding of how to implement problem-solving instructional methods across grade levels. They recommend building early-years teachers' knowledge in the BTT framework and child-centered pedagogy to advance their teaching skills.

> *Research findings show how the BTT Model enhances curriculum and teaching practices, creating child-centered pedagogy across the span of child development.*

Araya Crisóstomo (2022) provides another example of the use of the BTT Model to develop collaborative professional development across the span of early-childhood education and extended the training to adult learning. In the Bío-and Maule regions of Chile, the goal of professional development was to equip teachers with the knowledge and skills necessary to implement innovative and evidence-based teaching practices in the

classroom using knowledge from the field of neuroeducation. The study included twenty teachers who received training on the BTT Model. After the training, participants' classroom sessions were recorded, and videos were used for ethnographic observation to understand the application of the BTT Model. Elements of the physical classroom such as the physical space, conditions of the classroom, and dynamics of the students were recorded and proved to be essential for understanding the current state and evolution of teaching practices. The researcher concludes that there is a need for a paradigm shift in educational practices, integrating elements of cognitive neuroscience and constructivist approaches to enhance the quality of teaching and learning.

The Brain-Targeted Teaching® Model in Higher Education Studies

Beyond the PK–12 landscape, integrating the BTT Model into professional development has also been applied to higher education. Seegers (2020) conducted a study with community college faculty to examine the use of the BTT Model as a tool to integrate the learning sciences into their pedagogy. Faculty at a California community college were invited to participate in the Brain-Targeted Teaching® Lab (TL). Twelve participants received a minimum of six, one-hour meetings and engaged in outside reading and writing. The BTT Model was used to present effective strategies during the TL sessions. The sessions covered the six brain targets, (emotional climate, physical environment, learning design, teaching for mastery, teaching for application, and evaluating learning). Seegers reports that participants changed their pedagogy after participation in the TL. She concludes that fusing the BTT Model into higher education pedagogy has the potential to impact student success, inform education leaders and politicians, and assist faculty seeking to refine their pedagogy.

Focusing on higher education in the STEM fields, Stassinopoulos (2023) examined socioeconomic barriers related to gender bias in the classroom and workplace, particularly the gender gap for women of color in higher-education STEM fields. The researcher noted that non-STEM faculty displayed more student-

Adult learners in education and related fields benefit from the student-centered practices of the BTT Model.

centered, supportive, and accessible teaching practices than STEM faculty. To address this issue, Stassinpoloulos created a professional learning community (PLC) for STEM faculty at a west-coast community college that focused on increasing teaching self-efficacy and implementing

student-centered practices. The BTT Model was customized for the higher-education STEM environment and used as part of the intervention over the course of a nine-week program with four in-person meetings and six online content modules. After the PLC intervention, the STEM faculty treatment group demonstrated positive changes in teacher self-efficacy, improvements in instructional strategies, and stronger student engagement. The research showcases how enhancing self-efficacy and implementing student-centered instructional practices in STEM education can foster greater student engagement and an equitable environment for both educators and students. This study shows a need to address a more deeply rooted call for action for a cultural shift for educators in higher education to be able to provide more inclusive and equitable learning environments for students.

The work of Cai (2020) at the Nanchang Institute of Technology in China provides additional application of the BTT Model in higher education, focusing on developing and refining curriculum and instruction in English language courses. Cai provides examples of how faculty can employ each of the six brain targets to enhance students' achievement in college courses. Similarly, at the University of Puerto Rico, Ferrer López (2016) reported that the use of the BTT Model for course development increased the quality of the content and instructional strategies.

The Brain-Targeted Teaching® Model in Second Language Studies

Several international studies sought to improve instruction for students learning a second language by embedding the BTT Model into pedagogical practices. At a university in Thailand, Kasempi & Yoonisil (2023) developed a supplementary curriculum for foreign students by infusing the tenets of the BTT Model to advance listening and speaking competency. After receiving the enriched curriculum, a sample group of twenty undergraduate students showed a significant improvement in both listening and speaking skills. The research provides insights for educators and curriculum developers who seek to enhance language skills for students coming from different lived experiences and varying language proficiency levels.

Chowdhury (2020) also employed the BTT Model in teaching English to tenth graders in the United Arab Emirates (UAE). In an action research study, results show overall improvement in language achievement as well as gains in interpersonal and social-emotional skills. The researcher provides a detailed BTT learning unit that demonstrates how each of the six brain

targets were developed for a unit focused on the topic of the country's transit system. It is interesting to note Chowdhury's observation about the model's focus on the arts. The author states, "It was evident that this method helped the shy students to participate as individuals in artwork, group discussions, and role-plays" (p. 101).

Another example of the use of the BTT Model in the context of second-language learning focused on Japanese students who underperformed in English-language acquisition. The research focused on how the BTT Model could create a classroom atmosphere that fosters student participation and development (Wastila, 2015). The author states that many educators use a traditional teacher-centered approach, which may discourage student interaction and lead to delayed development of communication skills. The researcher proposes the need to shift toward a student-centered and team-based approach, in which students take on a more active role in their education. This work provides another example in which the BTT Model was used to improve language proficiency among students in second-language courses. The author encouraged English as a Foreign Language teachers to increase English-language proficiency through embracing the BTT Model's focus on team-based learning, alternative assessment methods, and cultural inclusivity.

> *Researchers found that the BTT Model was more effective than content-based language teaching for enhancing academic achievement and language proficiency.*

Kumar and Amin (2023) also found that using the BTT model significantly improved students' acquisition of English as a second language. They conducted a rigorous study in northeastern India in which eighty senior secondary-school students were randomized into two groups–one group receiving instruction through the BTT Model to learn English prose and poetry and the second group to receive instruction through a program focused on content-based language teaching. Each group received forty sessions of instruction over twenty days in each condition. Achievement data were collected using four validated testing measures for pre-tests and post-tests at the start and the end of the intervention. Results showed "substantial evidence that the Brain-Targeted Teaching® Model is more effective than content-based language teaching for enhancing academic achievement and language proficiency among students" (p.18). They further state that they believe their research findings have "significant

implications for educators and policymakers who seek to improve educational quality for all pupils" (p. 18).

The Brain-Targeted Teaching® Model in Online Teaching

Practitioners' beliefs and practices can be influenced by a multitude of factors—from resources, organizational climate and culture, physical environment, and the demands of the workplace. The unprecedented disruption caused by the COVID-19 pandemic significantly impacted educators and workers, leading to a need for rapid adaptation in response to school and work closures and reopening. The shift to online teaching and working provoked a new, uncertain emotional climate in the classroom and workplace and inequity in technology access and experience. The ongoing nature of the pandemic demanded that practitioners rapidly develop skills for a wide array of scenarios, including in-person, hybrid, and online. The following studies suggest that the BTT Model gave practitioners the necessary tools to redesign learning and work opportunities during this disruptive time.

In the educational environment, TeVault (2022) explains how teachers had to develop general pedagogical knowledge (GPK) of online teaching practically overnight, highlighting the importance of teacher self-efficacy (TSE),

> *The BTT Model supports effective and rigorous online learning in schools and the workplace across multiple disciplines to enhance the online learning experience.*

collective teacher efficacy (CTE), and general pedagogical knowledge in teacher adaptations and practices. The author aimed to explore the relationships between beliefs and pedagogy before and during the COVID pandemic to understand how TSE, CTE, and GPK interrelate and what practices and beliefs were and were not adapted in response to the pandemic. The study spanned three explored time periods: teachers' classroom activities and experiences before COVID-19, during Emergency Response Online Teaching, and return to in-person teaching. TeVault combined quantitative and qualitative methods first, by pulling from pre-existing surveys and referencing a Fall 2015 BTT introductory overview workshop series for 80 educators. She conducted a book study of the BTT Model, and a series of "Brain Bytes" (email messages sharing evidence-based practices aligned with BTT). She also conducted a semi-structured interview process for the end of the 2020–2021 school year with teachers in a school on the east coast of the United States to determine differences and enhancements to teaching practices.

Teachers who had prior experiences with BTT through workshops or book studies readily applied these tools during the pandemic, indicating the adaptability of the BTT framework to support teaching in challenging circumstances. The researcher claims that this shows how the BTT Model had a positive impact on educators, providing them with the necessary tools to translate research into practice, address the emotional climate for learning, and redesign learning opportunities to best meet the needs of their students during the disrupted time in their education.

Like some other studies, the following suggests how the BTT Model—its tenets and implementation techniques—can enhance the quality of online education. Also motivated by online instruction mandated by the COVID pandemic, Rukminingsih et al. (2021) conducted quasi-experimental research to determine the effects of teaching English using the Brain-Targeted Teaching® Model versus a program focused on *content schemata*. The study was conducted in a private higher-education institution in Indonesia with undergraduate students majoring in English and taking an online course in Critical Reading. The study design consisted of an experimental group of thirty students who learned English using the BTT Model and thirty students in a control group using a content schemata approach. Both groups consisted of fifteen students who were assessed to have high motivation for learning and fifteen with low motivation. Data analysis using a two-way ANOVA showed that "the brain targeted teaching model with online instruction had a statistically significant influence on the students' reading achievement and motivation" (p. 516). While both types of instruction were effective to teach reading comprehension, the researchers state that the "BTT model gave better effect than activating students' content schema with high and low motivation level" (p. 511). The researchers attributed the academic gains to the focus of BTT on stimulating positive emotions; introducing multiple modalities; employing critical thinking; and giving frequent, relevant feedback.

In the post-COVID-19 landscape, the nuances of interacting virtually bring to light the importance of emotional and physical learning environments. However, even before Covid had schools and organizations moving from in-person to online and hybrid formats, online leaning had been increasing as a mode for teaching courses in higher education and the workplace. In similar research conducted at a university in Puerto Rico, the BTT Model was used for the design and administration of online continuing education courses (Ferrer López, 2016). Ten best practices for course design and twenty best practices for course administration in a Learning Management System were identified and implemented with participants enrolled in the courses.

The practices ranged from developing discussion activities and forums for student interaction to rubric development. It underscored the importance of using each of the six brain targets in the online context. The findings further highlight the importance of comprehensive guidelines for practitioners, emphasizing the significance of student and worker engagement, clear communication, and advocating for the use of the latest technology to enhance the online learning experience. Similar to the other studies, this research underscores the use of the BTT Model's tenets to positively enhance the quality of online education in order to create a well-prepared educator workforce equipped with BTT implementation techniques.

Applying the Brain-Targeted Teaching® Model

Building a more inclusive, creative, and technologically savvy workforce requires a sustained investment in professional learning experiences, pedagogical enhancements, and curriculum adjustments. The evidence provided in this review suggests that the BTT Model can contribute to this work by guiding a system of evidence-based, effective instruction. Whether in the classroom, corporate trainings, or corporate onboarding, the model has the potential to provide a framework for the acquisition and creative application of knowledge within a positive and inclusive environment.

In summary, as neuroeducation research continues to expand, it provides unique global opportunities for cross-cultural collaboration to make learning rigorous, joyful, and relevant for all learners at any age and in any classroom, workplace, or learning experience. Anywhere.

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Learn more about the Brain-Targeted Teaching® Model and see related journal articles and book chapters at www.braintargetedteaching.org

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