

EQUIPPING MINDS FOR CHRISTIAN EDUCATION: LEARNING FROM NEUROSCIENCE FOR CHRISTIAN EDUCATORS



Carol T. Brown
Equipping Minds, Danville, KY

Abstract: The purpose of this article is to use the discoveries in neuroscience and the theories, programs, and research of Dr. Reuven Feuerstein to bring hope to parents, Christian educators, and interventionists of learners with neurodevelopmental learning disorders (NLD): autism spectrum disorders, attention-deficit hyperactivity disorder (ADHD), specific learning disorder, intellectual disability (Intellectual Developmental Disorder), communication disorders, and motor disorders. For sake of privacy, the name used in the case study is a pseudonym.

Key Words: Neuroplasticity, Cognitive development, Feuerstein, Equipping Minds, Working memory, Neurodevelopment disorders, Down syndrome, Mediated learning

Introduction

“Have you seen the test scores?” inquired the local elementary school principal. “No. What were you wanting to see?” asked the educational therapist. “We like to see a 3–5 point gain in each subject. Marie has increased 20 points in reading, 11 points in math, 25 points in science, and 17 points in language arts. No one goes up double digits in all four areas in a few months.”

The principal could not believe this had happened. Until this time, Marie had made minimal progress, and her academic test scores had remained static from third to fourth grade. The change in these scores had been achieved over the last 9 weeks through one-on-one cognitive developmental exercises for enhancing processing, working memory, comprehension, and reasoning, which was divorced from academic content. Previously, she had received the standard interventions: remediation of content, learning strategies, and accommodations. These may have short-term benefits, but were not targeting the underlying cognitive deficits in processing and working memory, which would increase her cognitive abilities.

Marie would continue the cognitive developmental exercises and continue to progress academically for the next 4 years. In 2015, she scored in the 39th percentile in mathematics, 36th percentile in science, and the 7th percentile in reading on the Stanford 10 National Assessment Ranking as a seventh grader. Marie's progress is significant for those who still believe 85 percent of the measureable intelligence is due to nature or one's genetic factors and only 15 percent due to nurture or environmental factors (Herrnstein & Murray, 1994), which holds to a limited potential for change. Marie has Down syndrome and an intellectual developmental disorder, which many believe limit her ability for significant academic gains. However, Marie's improvement implies that cognitive developmental exercises can be generalized to apply to academic achievement for learners who have an intellectual developmental disorder. Her test scores over a 4-year period are found at the end of this article.

Over the last 20 years, research on working memory found reliable correlations between working memory span and several other measures of cognitive function, intelligence, and performance in school (Alloway, 2011). Recent studies on individual differences in mathematical abilities show that aspects of working memory contribute to early arithmetic performance (Raghubar, Barnes, & Hecht, 2010). Further studies examine the relationship between working memory, reading, and comprehension (Andreassen & Braten, 2010; Carretti, Borella, Cornoldi, & DeBeni, 2009). The key to intelligence is being able to put those facts together, prioritize the information, and do something constructive with it. "Working memory capacity refers to the ability to hold information in mind while maintaining other information to achieve a cognitive task" (Camos, 2008, p. 38). Working memory is the skill that gives a person the advantage of managing all this information and is a stronger indicator of a learner's academic and personal potential than an IQ test (Alloway & Alloway, 2013).

The purpose of this article is to use the discoveries in neuroscience and the theories, programs, and research of Dr. Reuven Feuerstein to bring hope to parents, Christian educators, and interventionists of learners with neurodevelopmental learning disorders (NLD): autism spectrum disorders, attention-deficit hyperactivity disorder (ADHD), specific learning disorder, intellectual disability (Intellectual Developmental Disorder), communication disorders, and motor disorders. Dr. Feuerstein is a clinical and cognitive psychologist who has shown that cognitive functioning is modifiable through mediated learning interventions (Feuerstein, Falik, & Feuerstein, 2015). Parents, teachers, and interventionists need to be informed and equipped with the methods and tools to improve a learner's cognitive abilities rather than focusing on remediation of subject content alone. New concepts of a learner's ability and development are needed.

Educational Approaches

Christian educators have come to accept the theories of human development embraced by the American educational system that discount spirituality and have a naturalist worldview. These developmental theories inform our curricula, determine who may or may not attend Christian schools, define what is normal, and identify one's cognitive potential based on an intelligence quotient (IQ), a static assessment (Feuerstein, Feuerstein, & Falik, 2010). Educational psychology and human and child development textbooks have been the primary guide for understanding learners and have historically begun with Piaget's theory on cognitive development (Ormrod, 2010). Educators, psychologists, and interventionists in turn embraced Piaget's views, as they are the most well-known, accepted, and influential. Piaget's theory stated that a person's intelligence was not only fixed, but that it developed in predictable stages at predetermined times with each stage needing to be mastered before moving to the next (Piaget, 1973). Piaget believed every learner was responsible for generating his own "logical structures." The progression and acquisition of these abilities resulted from a learner's successful interactions with the environment (Piaget, 1952). This belief system led many to view learners with neurodevelopmental learning disorders as having a fixed limit to their cognitive abilities since they were not able to acquire these abilities on their own. This belief led to the different approaches for learners with developmental disorders.

The first group of educators follows a traditional approach where one finds those who believe in full integration of all children in typical schools and classrooms, usually with an individual aide. The curriculum is adapted to suit the individual, as academics are a secondary focus, which excludes reading instruction beyond a basic functional level. The primary focus is on social adaptation and vocational and daily living skills (Nevin, 2000).

The second group of educators follows a progressive approach and believes that academic skills such as arithmetic and reading are crucial to survive and sees social skills as a secondary emphasis. This group tends to prefer specialized schools or separate classes within typical schools. When pupils are integrated, this group tends to prefer the use of "resource rooms" and "pull outs" in order to teach basic reading, writing, and arithmetic skills. Early Intervention as a specific program and an Individualized Education Plan (IEP) are considered a basic necessity for every learner in this group. It should be noted here that neither of these basic groupings is exclusive. Many researchers and educators combine the two approaches in different ways (Katims, 2000). Julie Lane and Quentin Kinnison in *Welcoming Children with Special Needs* (2014) follow a combined approach by informing Christian schools on the policies and procedures for developing a special needs program. The schools

are encouraged to follow the public school model that focuses on remediation, accommodation, modification, and intervention.

There have been advances in effectively including learners with NLD in terms of educational policy, philosophy, and curriculum. Numerous researchers have studied the development of reading and mathematical skills in learners with learning disabilities. However, the cognitive enhancement of learners with severe NLD receives inadequate attention. Research on the impact of cognitive development programs of children with developmental disabilities of Down syndrome and other genetic syndromes, intellectual disabilities, and cerebral palsy is limited (Kozulin et al., 2010). Yet the research that has been done substantiates that learners with intellectual disorders can participate and benefit from cognitive development and enrichment programs. The Bright Start program of Brooks and Haywood, which is based on Feuerstein's theories, increases intelligence quotient (IQ), enhances logical reasoning and problem-solving skills, allows children to be included in the regular classroom, and increases academic performance and intrinsic motivation (Haywood, 2004). Paour's (1993) "transformation box" program and Klauer's (2002) inductive reasoning program have demonstrated the ability of learners with intellectual disorders to move beyond the pre-operational level of thinking.

In response to the developments in neuroscience and Feuerstein's work, a third group merges the goals of both of the above groups by emphasizing neither of those basic approaches but rather the idea of cognitive development or cognitive education as a goal in itself. A learner's social and intellectual development are interrelated (Feuerstein & Rand, 1997). The teacher is a mediator who invites the learner to identify a problem, to analyze it, to use inductive thinking processes to develop a strategy for its solution, and to connect it to other knowledge networks. Teachers who apply these principles of mediation enable learners to find a greater level of success as independent and active students (Feuerstein et al., 2015).

Neuroscience Confirms the Brain Can Change

The belief that cognitive abilities are fixed and non-modifiable has been prevalent in the United States for many years (Tan & Seng, 2008). An individual's intellectual ability has been measured by his or her "intelligence quotient" (IQ) (Patel, Aronson, & Divan, 2013). Proponents of this *fixist* point of view believe that change in functioning and behavior cannot be made beyond a certain level (Sternberg, 1984). Over the last two decades, the field of neuroscience has used non-invasive technologies, such as the fMRI and PET, to show the plasticity of the brain, or *neuroplasticity*, which is the brain's ability to heal, grow, and change (Boleyn-Fitzgerald, 2010). These imaging

techniques show brain activity during development and learning. “It is now increasingly recognized that the brain is not a static structure and is in fact a modifiable system that changes its physical and functional architecture in response to its complex interaction with its internal processes and the environment” (Tan & Seng, 2008, p. ix).

According to Boleyn-Fitzgerald (2010), research confirms the modifiability of the brain through experience and training as stated by Richard Davidson, neuroscientist at University of Wisconsin – Madison:

There is tremendous potential for plasticity and for change and for this new knowledge to transform the health care system and our entire education system. Neuroplasticity is the most important general discovery in all of neuroscience in the last decade. The brain is built to change in response to experience and in response to training. And it is really because of this active neuroplasticity that we can learn (Boleyn-Fitzgerald, 2010, pp.21–22).

In 2000, Eric Kandel received the Nobel Prize. He showed that learning can ignite genes that change neural structure. In *The Brain’s Way of Healing* (2015), Norman Doidge recounts the current advances of international neuroplasticians, scientists who demonstrate the brain is plastic. He traveled to five countries to learn the stories of individuals who were told their brain could not be changed but whose brain cells are forming and reforming new connections.

Knowing that intelligence is not fixed, is not limited, and can be grown and improved demands that Christian educators and schools acknowledge this discovery, and that it is reflected in their teaching and student population to include learners with NLD: autism spectrum disorders, attention-deficit hyperactivity disorders (ADHD), specific learning disorders, intellectual disabilities (Intellectual Developmental Disorders), communication disorders, and motor disorders. If intelligence is constantly changing, or even potentially changing, the Christian school educator must embrace these families and students who are created in the image of God for his purposes and his glory.

Reuven Feuerstein: Pioneer of Neuroplasticity

The first program to increase intellectual performance with learners with neurodevelopmental learning disorders was developed more than 50 years ago by Reuven Feuerstein, clinical and cognitive psychologist, who believed that intelligence was changeable and modifiable regardless of age, genetics, neurodevelopmental conditions, and developmental disabilities (Feuerstein

et al., 2010). Feuerstein worked with a wide range of different groups of people—from Holocaust survivors, to people who had suffered from brain damage, Down syndrome, and autism, to those who are intellectually gifted. When he began working with the children who had survived the Holocaust, the goal was to rehabilitate them from their traumatic experiences. He asked himself,

How will I be able to speak to them tomorrow morning about what they had learned, or about Bible chapters, or about any other study subject? The question that bothered me most of all was: Were these children capable of change after all they had been through?” (Feuerstein et al., 2010, p. xvii)

He also disagreed with the accepted concepts of the *critical period* or *critical age*, which states that if a person has not reached a particular function by a certain age, he or she no longer has the ability to learn that skill. According to Brian Boyd (2007),

Feuerstein believed that when someone presents himself or herself as unable to understand something, one does not make the assumption that he or she is unintelligent. Rather, it is assumed that the person’s intelligence is lying dormant, and the process of mediation by a teacher allows that intelligence—that latent intelligence—to come to the surface.

In speaking of the two components of modifiable intelligence, the intellect and the emotion, Feuerstein would begin with an unusual perspective, an expression of faith:

But the point we wish to emphasize is that in the beginning there must be a need—a need that will generate the belief in human modifiability. I must have the need to have my students and those with who I am engaged reach higher potentials of functioning. This need energizes me to act and motivates my faith (belief) that there are positive, effective, and meaningful alternatives to be found, to fight for, and to bring this faith into being. I believe that the student is a modifiable being who is capable of change and capable of changing according to his or her will and decisions. Human beings’ modifiability differentiates them from other creatures and, according to the Rabbinic Midrash, ‘even from the angels.’ Herein lies the main uniqueness of human beings. (Feuerstein et al., 2010, p. 6)

“Belief in modifiability” is an essential element of Feuerstein’s theory of Structural Cognitive Modifiability (SCM) (Feuerstein et al., 2010). According

to Alex Kozulin, Academic Coordinator of the International Department at the Feuerstein Institute, Feuerstein was often criticized for deliberately including a “belief system” into his theory, because according to the critics there is no place for “beliefs” in scientifically based programs. (A. Kozulin, personal communication, August 20, 2015). In *Changing Minds and Brains* (2015), Feuerstein states, “I have come to believe that spiritual thinking and behavior produces changes in the gray matter of the brain” (Feuerstein et al., 2015, p. 123). Christian educators agree that our beliefs do impact who we are.

Where did this belief and faith originate? Reuven Feuerstein was born in the village of Botosani, Romania, in 1921. He was raised in a devout orthodox Jewish family, studied the Bible throughout his life, and credited the daily discussions of Scripture with his father as developing his cognitive abilities (Feuerstein & Lewin-Benham, 2012). Feuerstein was a theist who believed that man was created in the image of God. He stated, “The individual is asked to act in the image of [God] as is stated: [God] made man in his image” (S. Feuerstein, 2002, p. 5).

Feuerstein studied under Andre Rey and Jean Piaget at the University of Geneva, completing degrees in general and clinical psychology (1952) and obtaining a license in psychology (1954). In 1970, he earned his Ph.D. in developmental psychology at the Sorbonne where his major areas of study were developmental, clinical, and cognitive psychology from a cross-cultural perspective. He held the positions of Professor of Educational Psychology in Bar Ilan University School of Education (Israel) and Adjunct Professor at Vanderbilt University’s Peabody College of Education. He was the chairman of the International Center for the Enhancement of Learning Potential (ICELP) in Jerusalem, Israel, until his death in 2014. The primary focus of the ICELP and his life’s work has been the development of the theories of structural cognitive modifiability (SCM), mediated learning experience (MLE), the Learning Propensity Assessment Device (LPAD), which is a dynamic assessment, and the Feuerstein Instrumental Enrichment (FIE) Basic and Standard programs, an active intervention to modify cognitive structures.

Intelligence is Modifiable

Since the 1950s, Feuerstein observed the modifiability of the brain through the application of MLE. However, when he addressed the Association for Supervision and Curriculum Development’s national convention in the United States fewer than 40 years ago and stated, “Intelligence is modifiable,” some walked out (Feuerstein & Lewin-Benham, 2012). Today the discoveries in neuroscience confirm and support Feuerstein’s theory known as structural cognitive modifiability (SCM) that presents an optimistic view of

the learner and one's propensity to be modified. Feuerstein's theory of human development includes three basic ideas:

1. Three forces shape human beings: environment, human biology, and mediation.
2. Temporary states determine behavior: How someone behaves—namely emotional, intellectual, and even habitually learned activities—represents a temporary state, not a permanent trait. This means that intelligence is adaptive. In other words, intelligence can change; it is not fixed once and for all.
3. The brain is plastic: Because all behaviors are open and developing, the brain can generate new structures through a combination of external and internal factors (Feuerstein, Feuerstein, Falik, & Rand, 2006).

Feuerstein insisted that human cognitive abilities can be changed regardless of etiology, severity, or a person's age, even if the condition is generally considered irrevocable and irreparable. "Don't tell me what a person is," said Feuerstein. "Tell me how he is changeable!" (Feuerstein & Lewin-Benham, 2012, p. 30).

Learning through Mediation

The theory of mediated learning experience (MLE) initially grew as part of Feuerstein's theory of structural cognitive modifiability (SCM). Mediation is an interaction in which a mediator who possesses knowledge conveys a particular meaning or skill to a child and encourages him or her to transcend, that is, to relate the meaning to some other thought or experience. Mediation is intended to help children expand their cognitive capacity, especially when ideas are new or challenging. Piaget advocated for a natural progression of learning through direct exposure to stimuli, or the "stimulus-organism-response (S-O-R)" model, which holds that it is enough for a person to simply dialogue with nature and the environment for cognitive development to occur (Feuerstein et al., 2015). Piaget is correct in saying that when you explore on your own, a natural progression leads to a natural limitation. Feuerstein believes a human mediator is needed, or "stimulus-human-organism-human-response (S-H-O-H-R)," allowing the mediator to take the learner beyond the natural limitations to reach his or her full cognitive potential and generate new cognitive structures (Feuerstein et al., 2015).

While Piaget and Feuerstein are both giants in the field of human development, the greatest differences are their beliefs in fixed versus change-

able intelligence and the role of a human mediator in developing a child's intelligence (Feuerstein et al., 2010). Piaget did not believe that adults are any different from other objects that provide information, and thus they should not intervene in a child's activity. He believed in spontaneous development: "I will call it psychological—the development of the intelligence itself, what the child learns by himself, what none can teach him, and what he must discover alone" (Piaget, 1973, p. 2). Feuerstein, however, sees the human mediator as crucial for a learner's development (Feuerstein et al., 2010). Feuerstein has sought to identify and correct these deficits to enable students to reach their full cognitive potential, as well as to increase their internal motivation and personal confidence. By using mediation, these deficient functions can be formed and modified in significant ways (Feuerstein et al., 2010).

Instrumental Enrichment

The theory of structural cognitive modifiability (SCM) and the applications of the mediated learning experience (MLE) are the foundation of Feuerstein's Instrumental Enrichment (FIE) Standard and Basic programs that were developed over 40 years ago. FIE is a cognitive development program emphasizing critical thinking strategies. Fourteen instruments are designed to build the perquisites and processes of learning rather than academic content or skills. They can be implemented in a classroom or as a therapeutic intervention in a small group or an individualized basis. FIE initially focused on culturally deprived and low-functioning children and adolescents with chromosomally determined conditions to build their cognitive functions and structures. The program has expanded to include learners of all ages and abilities to strengthen their learning capacity (Feuerstein et al., 2006).

Research Studies on Cognitive Enhancement

The Feuerstein Institute has conducted research for the last five decades that confirms that cognitive abilities can be modified (Tan & Seng, 2008). Instrumental Enrichment (FIE) and MLE have been found to have positive effects on many types of learners, including neurodevelopmental learning disorders (Kozulin et al., 2010). Many of these learners also have cultural deprivation and differences. These studies have encompassed many types of student populations using FIE (Feuerstein et al., 2006). Studies in the following areas are discussed: attention deficit disorders, Autism, learning disabilities, and developmental disabilities.

Attention Deficit Disorders

In regard to learners with attention deficit disorder (ADD), Krieger and Kaplan (1990) found a significant increase in reading accuracy and comprehension. Roth and Szamoskozi (2001) found students with ADHD increase their precision, their written expression of ideas on paper, their ability to find relevant cues in problem-solving situations, and their declarative knowledge.

Autism

Research in the field of Autism continues to develop. The research staff at ICELP are reviewing all of the studies that use Feuerstein Instrumental Enrichment (FIE). A study in Canada with 20 autistic learners who used FIE indicates a high level of success using MLE, and the results were reported at several international conferences (ICELP, 2001). In another study, Gross and Stevens (2005) demonstrated improvements in visual attention and tracking, following directions, understanding cause and effect, turn taking, making choices, and predication and persistence.

Learning Disabilities

IE approaches were found to impact reading scores in sixth grade students who were reading 2 years below grade level in remedial classes in Westchester County, New York (Brainin, 1982). In a 3-year study with students who had deficient language skills a significant increase was found in oral and written language, vocabulary, and grammar (Sanches, 1994).

Developmental Disabilities

Alex Kozulin et al. (2010) conducted a study with 104 learners from Canada, Belgium, Italy, and Israel who had developmental disabilities, cerebral palsy, genetically based intellectual impairments, Autism, or ADHD in 2010. The FIE Basic program that is designed for young learners was used over 30 to 45 weeks. The intervention emphasizes systematic perception, self-regulation, conceptual vocabulary, planning, decoding emotions, and social relationships. These are then transferred to principles in daily life. The research subjects showed statistically significant improvements in the WISC-R subtest of Similarities, Picture Completion, and Picture Arrangement, as well as on Raven's Colored Matrices.

In 2014, Krisztina Bohács's Ph.D. thesis, *Clinical Applications of the Modifiability Mode: Feuersteins Mediated Learning Experience and the Instrumental Enrichment Program*, studied learners from 2 to 14 years of age with mild to moderate intellectual developmental disorders: genetic syndromes, cere-

bral paresis, ADHD, and Autism. The Raven Colored Matrices showed an increase in general intelligence, and there were significant changes in the cognitive development. There was also growth in domains necessary for school readiness. Bohács concludes,

If applied systematically with children with intellectual disabilities for a longer period of time (maybe even for 3–4 years) the applied systems are expected to lead to increased learning effectiveness, more effective basic cognitive processes and thinking skills, and to prepare children for school learning and a better adaptation to the challenges of everyday life. (p. 18)

Case Study with Equipping Minds Cognitive Development Curriculum

Despite all the support from Marie's teachers and principal in third grade, her Measures of Academic Progress (MAP) scores—yearly academic tests that measure student growth from semester to semester—stayed stagnant for a full year. In the fall of fourth grade, the first MAP scores again showed no growth. Her parents consulted the director of Equipping Minds for advice. She evaluated Marie and designed a cognitive training program for her that specifically worked on visual and auditory processing speed, comprehension, short-term memory, working memory, long-term memory, and reasoning skills. No remedial subject work was done.

Marie was able to read words phonetically at her grade level, but her comprehension was still at a first-grade level. With the support of the school system, the director worked with Marie an hour of every school day for the next 12 weeks. Below are the results of the MAP tests after that first 9 weeks and over the next 4 years (Figures 1, 2, 3, and 4). Marie has made significant gains across the board. It should be noted that while Marie has Down syndrome, the only accommodations she received on MAP testing was extended time and having a reader for math, science, and language. She read the reading assessments herself.

Over the summer of 2012, Marie did a 10-week daily program. The director continued working with Marie privately 3 days a week through the 2012–2013 school year. The spring 2013 scores showed a decline after strong scores in the winter of 2013. Marie has juvenile rheumatoid arthritis, which can impact her results.

Marie only did 2 weeks of cognitive exercises at the beginning of summer of 2013 and then continued doing exercises at home, but not in a strict fashion. The family traveled extensively, and they moved just prior to school starting. This was a big transition for Marie to a middle school in a new city with all new friends. During the school year they did a few daily exercises,

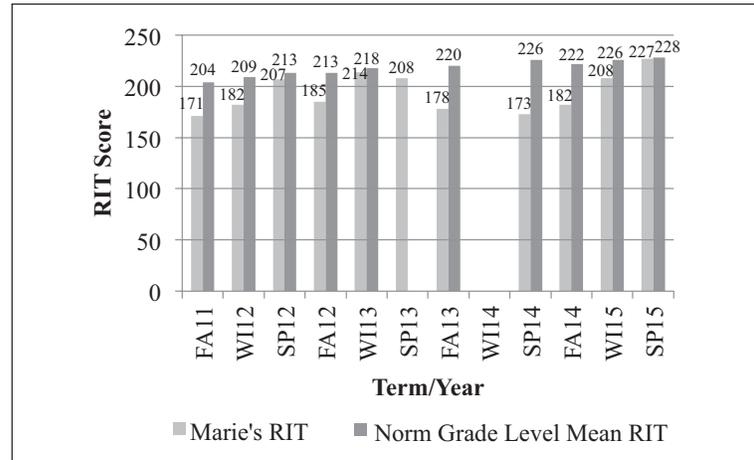


Figure 1. Marie's Mathematics RIT Scores

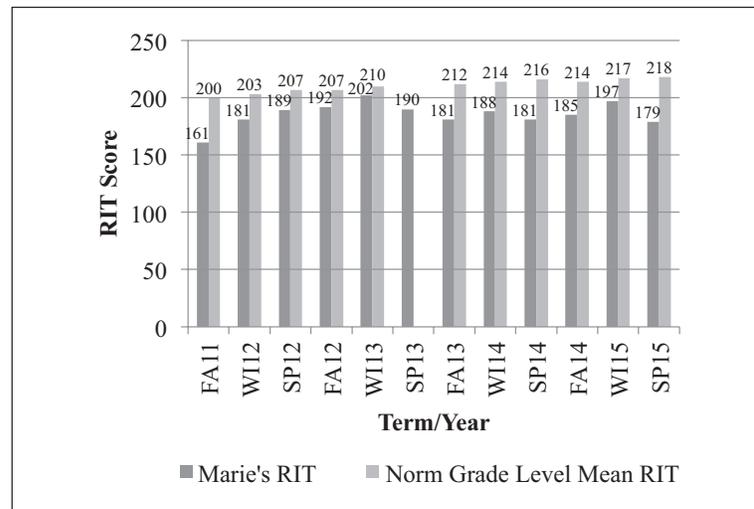


Figure 2. Marie's Reading RIT Scores

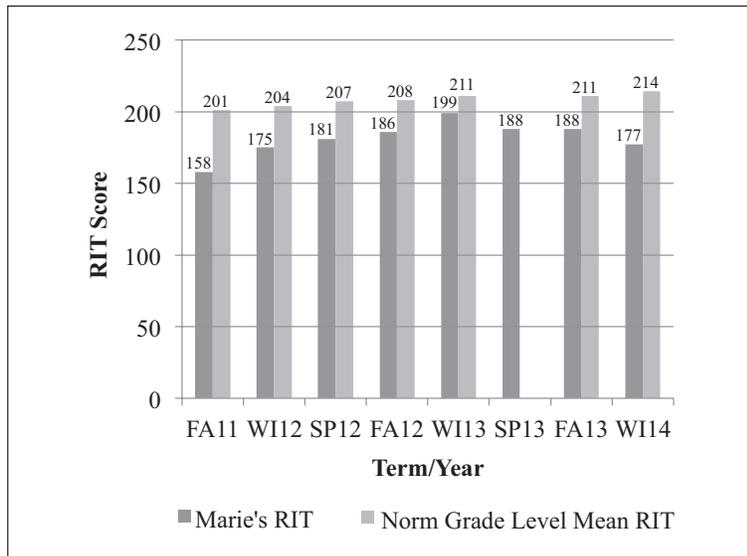


Figure 3. Marie's Language Use RIT Scores

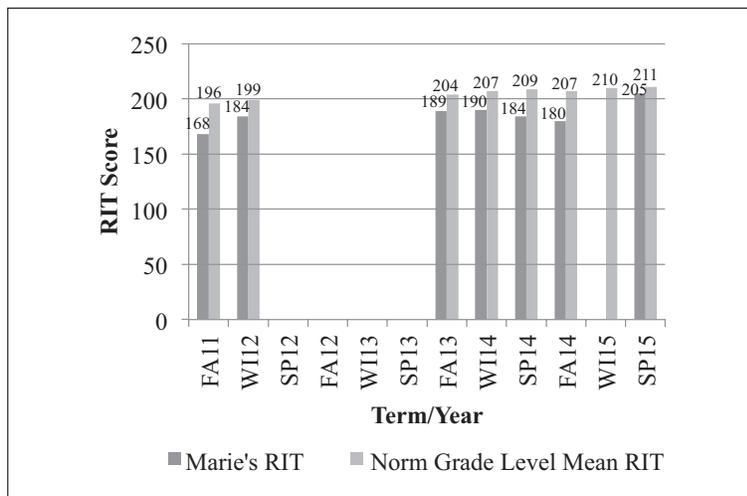


Figure 4. Marie's Science RIT Scores

but not as intensively as in the past. The fall of 2013 is the first time her MAP scores declined. The director believes this was a result of not doing the cognitive exercises with fidelity and the transition to a new school. However, her Kentucky Performance Rating for Educational Progress (KPREP) scores in 6th grade showed strong growth (Figures 5, 6, and 7). The KPREP test

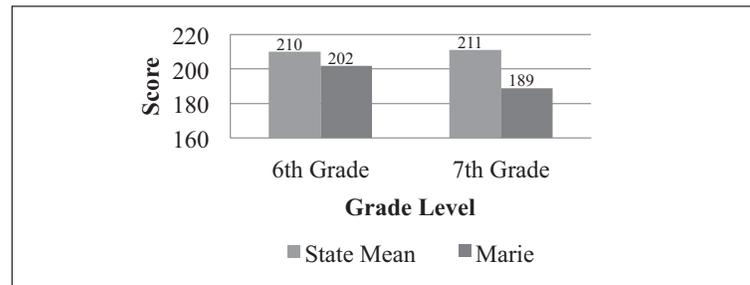


Figure 5. KPREP Reading Scores (Marie 202 Apprentice 189 Novice)

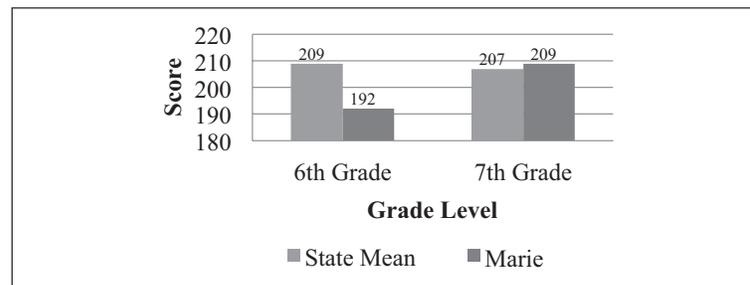


Figure 6. KPREP Math Scores (Marie 192 Apprentice 209 Apprentice)

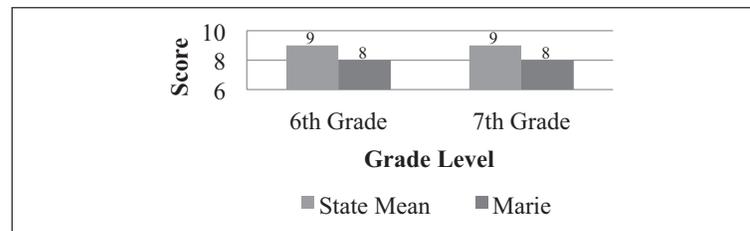


Figure 7. KPREP On-Demand Writing Scores

is more comprehensive and has historically been difficult for Marie. However, her results have further convinced the staff of Equipping Minds that this specific cognitive training is helping her to acquire information and store it. The new report also includes Students Growth Percentile (SGP). Kentucky considers a 40 percent or higher SGP as meeting the goal of yearly growth. In reading, Marie's SGP was 93 percent and 63 percent in math as a sixth grader.

Then Marie did more focused training throughout the summer of 2014 between sixth grade and seventh grade for 1 hour a day, 5 days a week. She was back on track making gains on the MAP test. Her gains in math and science were exceptionally high. Marie's seventh-grade KPREP scores also showed considerable gains in her mathematic abilities (Figure 6). She scored 2 points above the state mean and was 1 point from a proficient status. The apprentice level for the seventh grade states that a student can compute a percent of a number, use ratios to solve problems, evaluate mathematical problems using order of operations with integers, solve two-step equations, evaluate algebraic expressions with two or more variables using order of operations, select and apply basic geometric formulas, identify cross sections of a 3-D object taken parallel to a base, identify an appropriate sample for a population, and compute measures of central tendency. Her Stanford 10 National Assessment Rankings were at the 39th percentile in math, 36th percentile in science, and the 7th percentile in reading (Figure 8). Marie's SGP was 4 percent in reading and 96 percent in math in seventh grade.

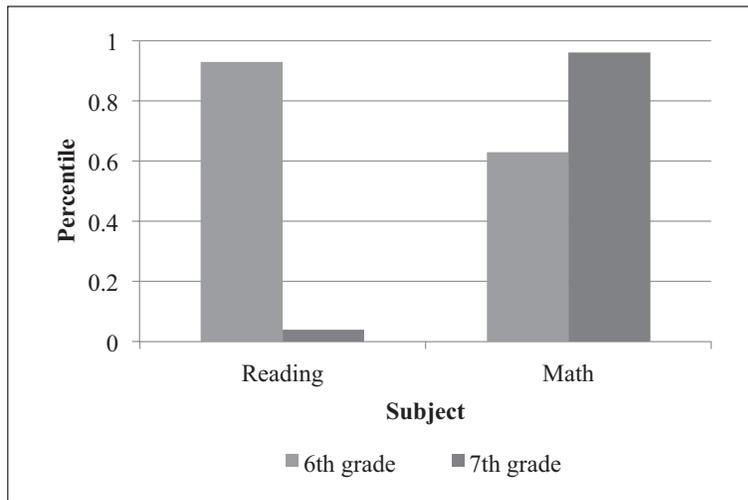


Figure 8. KPREP Student Growth Percentile

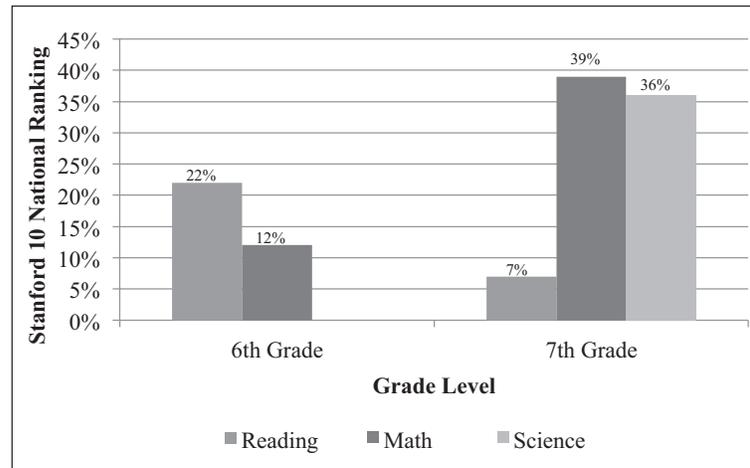


Figure 9. Marie's Stanford 10 Rankings

In conclusion, Marie's success may be attributed not only to supportive teachers, but undeniably to specific cognitive training exercises in EMCDC that are targeted to her areas of weakness. This past year, Marie has been working more on logic, reasoning, and abstract thinking, which is impacting her cognitive, social, and spiritual development. In the fall of 2015, Marie was baptized at her church after asking to meet with her pastor to discuss her relationship to Christ and desire to live for him.

Some typical children and certainly those with special needs must have someone to "teach" their brains how to think, how to process information, and how to store information in the same way that children with special needs may need physical therapy to teach them how to roll over as infants or how to put one foot in front of the other to walk. The specific cognitive exercises Marie performs with Equipping Minds does just that for her brain.

The other important thing to note is that the educational director is continually changing the exercises as they are mastered and adapting the program for Marie. It is this individualized targeting of cognitive areas that sets this program apart from other programs. Just think, if this program can help a child with Down syndrome learn at this rate, imagine how it could help other children with neurodevelopmental learning disorders. Cognitive developmental exercises could be incorporated into the teaching curriculum for every child and replace remedial tutoring.

The Equipping Minds Cognitive Development Curriculum (EMCDC) is based on the theory of structural cognitive modifiability (SCM) and the mediated learning experience (MLE). The Equipping Minds program employs a holistic approach to educational therapy through visual and auditory processing exercises, neurodevelopmental exercises, and cognitive developmental exercises. Students participated in interactive games and activities to strengthen working memory, processing speed, perceptual reasoning, and comprehension. The cognitive strengthening exercises use what the student already knows setting aside academic skills to target cognitive functions. EMCDC includes a teacher workbook, student workbook, and instructional DVDs for use in the regular or special education classroom, church, or home environment by teachers, therapists, and parents.

Implications for Christian Educators in Schools and the Church

The evidence for cognitive modifiability in learners with NDJ can no longer be denied. Christian educators' acceptance of development theories embraced by the American educational system that discount spirituality and have a naturalist worldview can be replaced with a theory of cognitive modifiability from a theist perspective. These developmental theories inform our academic and religious curricula, determine who may or may not attend Christian schools and participate in programs at church, define what is normal, and identify one's cognitive potential based on an intelligence quotient (IQ), a static assessment. The implications for the Christian school, the educator, and the church are substantial since intelligence can be developed when a mediator teaches and trains a student.

1. Christian school administrators, teachers, and parents should be educated on the theory of structural cognitive modifiability and how to be an effective mediator of the environment without over stimulating the child. The primary responsibility is ultimately on the parents and the church, and Christian schools should partner with them.
2. Christian educators need to be trained in mediated learning and cognitive developmental exercises. A combination of cognitive developmental exercises and curricular studies should result in significant advancement of both cognitive and domain-specific skills of special needs children. It is no longer sufficient to allow public schools to be the primary educators of students with developmental disabilities. Training is available through the Feuerstein Institute and Equipping Minds.

3. Lifetime learning is imperative. The brain continues to develop over an entire lifetime. It is important to continue to engage in stimulating learning activities during adulthood and old age.
4. Teachers should see each student with new eyes and as capable of learning. An optimistic attitude is essential. The former ideas of categorizing children into “bright” or “not so bright” must be changed. This will only happen when teachers begin to engage with children by mediating how to learn and how to think.
5. Stop focusing on a diagnosis or a “label” of Autism, Fetal Alcohol syndrome, learning disabled, Down syndrome, or intellectual disability. It simply does not make sense to follow a deterministic view of development in light of the findings in neuroplasticity.
6. Dynamic assessments should replace static assessments. All academic and intellectual testing should be done with care in administration and interpretation.
7. Research indicates the need for the training to understand the best way to include and teach individuals with disabilities, educating church leadership in disability theology and support, and congregations accepting that all people are created in the *imago dei*, valued, and can contribute to a faith community (Ault, Collins, & Carter, 2013).
8. Churches can bring in a guest speaker for training workshops on understanding Autism, intellectual disabilities, ADHD and other learning challenges for parents, children, teachers, and youth ministry; provide educational materials and resources for developing a special-needs ministry in the church; provide an after school or summer program for children and adults to integrate spiritual formation and cognitive formation; and hire an educational consult to observe the current disability programs, students, and teachers to determine any learning needs, teaching strategies, and adaptations needed.

Conclusions

Research suggests that it is possible to improve fluid intelligence in children with cognitive impairments significantly, using a comprehensive cognitive development program such as the Feuerstein Instrumental Enrichment, Bright Start, and Equipping Minds Cognitive Development Curriculum based on mediated learning experience. If the brain is constantly changing, it is possible to develop the thinking skills and increase the cognitive abili-

ties for all children. Advances in brain-imaging techniques allow us to understand and identify the cognitive neural systems to be strengthened. Neuroscience techniques provide valuable information for cognitive modifiability and hope for learners of all ages and etiologies (Tan & Seng, 2008).

Many Christian educators embrace the words of the great theologian and Father of Modern Education, John Amos Comenius who stressed the need to educate the intellectually and physically handicapped. According to Daniel Murphy, Comenius pleaded for educators to respond to those with special needs with extra sensitivity (Murphy, 1995). He believed that all humans are created in the image of God and have the capacity to learn:

It is evident that man is naturally capable of acquiring knowledge of all things since, in the first place, he is the image of God. So unlimited is the capacity of the mind that in the process of perception, it resembles an abyss ... for the mind, neither in heaven nor anywhere outside heaven, can a boundary be fixed. The means to wisdom are granted to all men, and he reaffirms the common character of learning potentiality in all of mankind. What one human being is or has or wishes or knows or is capable of doing, all others are or have or wish or know or are capable likewise. (pp. 87–89)

Let us join Feuerstein and Comenius by embracing a belief in modifiability and give our children the opportunity to reach all God created them to be.

Recommended Reading

- Alloway, T. & Alloway, R. (2014). *The working memory advantage: Train your brain to function stronger, smarter, faster*. New York, NY: Simon & Schuster.
- Feuerstein, R., Falik, L. H., & Feuerstein, R. S. (2015). *Changing minds & brains*. New York, NY: Teachers College Press.
- Feuerstein, R., & Lewin-Benham, A. (2012). *What learning looks like: Mediated learning in theory and practice, K-6*. New York, NY: Teachers College Press.
- Mentis, M., Dunn-Bernstein, M., Mentis, M., & Skuy, M. (2009). *Bridging learning: Unlocking cognitive potential in and out of the classroom*. Thousand Oaks, CA: Corwin.
- Tan, O. S., & Seng, S. H. A. (2008). *Cognitive modifiability in learning and assessment: International perspectives*. Singapore: Cengage Learning.

REFERENCES

- Alloway, T. (2011). *Improving working memory: Supporting students' learning*. London, England: Sage.
- Alloway, T., & Alloway, R. (2013). *The working memory advantage: Train your brain to function stronger, smarter, faster*. New York, NY: Simon & Schuster.
- Andreassen, R., & Braten, I. (2010). Examining the prediction of reading comprehension on different multiple choice tests. *Journal of Research in Reading, 33*(3), 263–283.
- Ault, M. J., Collins, B., & Carter, E. W. (2013). Congregational participation and supports for children and adults with disabilities: Parent perceptions. *Intellectual and Developmental Disabilities, 51*(1), 48–61.
- Bohács, K. (2014). *Clinical applications of the modifiability model: Feuerstein's mediated learning experience and the instrumental enrichment program* (Unpublished doctoral dissertation). Graduate School of Educational Sciences, University of Szeged, Hungary.
- Boleyn-Fitzgerald, M. (2010). *Pictures of the mind: What the new neuroscience tells us about who we are*. Upper Saddle River, NJ: Pearson Education.
- Boyd, B. (2007) Intelligence is not fixed. [Review of the work of Howard Gardner and Reuven Feuerstein]. *The Journey to Excellence*, Retrieved from <http://www.journeytoexcellence.org.uk/videos/expertspeakers/intelligenceisnotfixedbrianboyd.asp>
- Brainin, S. (1982). *The effects of Instrumental Enrichment on the reasoning abilities, reading achievement, and task orientation of 6th grade underachievers* (Unpublished doctoral dissertation). Columbia University, New York, NY.
- Brown, C. (2015). *Equipping minds cognitive development curriculum*. Publisher: Author.
- Camos, V. (2008). Low working memory capacity impedes both efficiency and learning of number transcoding in children. *Journal of Experimental Child Psychology, 99*, 37–57.
- Carretti, B., Borella, E., Cornoldi, C., & De-Beni, R. (2009). The role of working memory in explaining the performance of individuals with specific reading comprehension difficulties: A meta-analysis. *Learning and Individual Differences, 19*(2), 246–251.
- Doidge, N. (2015). *The brain's way of healing*. New York, NY: Viking.
- Feuerstein, R., Falik, L. H., & Feuerstein, R. S. (2015). *Changing minds & brains*. New York, NY: Teachers College Press.
- Feuerstein, R., Feuerstein, R. S., & Falik, L. H. (2010). *Beyond smarter: Mediated learning and the brain's capacity for change*. New York, NY: Teachers College Press.
- Feuerstein, R., Feuerstein, R. S., Falik, L. H., & Rand, Y. (2006). *The Feuerstein instrumental enrichment program*. Jerusalem, Israel: ICELP Publications.
- Feuerstein, R., & Lewin-Benham, A. (2012). *What learning looks like: Mediated learning in theory and practice, K-6*. New York, NY: Teachers College Press.
- Feuerstein, R., & Rand, Y. (1997). *Don't accept me as I am*. Arlington Heights, IL: Skylight.
- Feuerstein, S. (2002). *Biblical and Talmudic antecedents of mediated learning experience theory: Educational and didactic implication for inter-generational cultural transmission*. Jerusalem, Israel: ICELP Publication.
- Gross, S., & Stevens, T. (2005). Mediation and assessment of a young and low functioning child: An initial session. In O. Tan & A. Seng (Eds.), *Enhancing cognitive functions: Applications across contexts* (pp. 189–208). Singapore: McGraw Hill Education (Asia).

- Haywood, H. C. (2004). Thinking in, around, and about the curriculum: The role of cognitive education. *International Journal of Disability, Development, and Education*, 51(3), 231–252.
- Herrnstein, R., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York, NY: The Free Press.
- ICELP NEWS (2001). Paradigm assessment and treatment program for children with autistic features. Feuerstein Institute, Jerusalem, Israel, 1(1), 12. Retrieved from <http://ictaweb.org/51-2/>.
- Katims, D. S. (2000). The quest for literacy: Curriculum and instructional procedures for teaching reading and writing to students with mental retardation and developmental disabilities. Reston, VA: Council for Exceptional Children.
- Klauer, K. J. (2002). A new generation of cognitive training for children: A European perspective. In G.M. van der Aalsvoort, W. Resing, & A. Ruijsenaars (Eds.), *Learning potential assessment and cognitive training* (pp.147–174). New York, NY: Elsevier Science.
- Kozulin, A., Lebeer, J., Madella-Noja, A., Gonzalez, F., Jeffrey, I., Rosenthal, N., & Koslowsky, M. (2010). Cognitive modifiability of children with developmental disabilities: A multicenter study using Feuerstein's Instrumental Enrichment–Basic program. *Research in Developmental Disabilities*, 31(2), 551–559.
- Kreiger, S. and Kaplan, M. (1990). Improving inattention and reading in inattentive children through MLE: A pilot study. *International Journal of Cognitive Education and Learning*, 1(3), 185–192.
- Lane, J., & Kinnison, Q. (2014). *Welcoming children with special needs*. Bloomington, IN: West Bow Press.
- Mentis, M., Dunn-Bernstein, M., Mentis, M., & Skuy, M. (2009). *Bridging learning: Unlocking cognitive potential in and out of the classroom*. Thousand Oaks, CA: Corwin.
- Murphy, D. (1995). *Comenius: A critical reassessment of his life and work*. Portland, OR: Irish Academic Press.
- Nevin, A. (Ed.). (2000, Dec.) Lesson plans to teach self-determination across the K-12 curriculum for students with learning disabilities, students with mental retardation, students with emotional disabilities, and students with traumatic brain injury. Phoenix, AZ: Arizona State University West, College of Education. *Resources in Education*, ERIC Document # ED449615.
- Ormrod, J. (2010). *Educational psychology: Developing learners* (7th ed.). Upper Saddle River, NJ: Merrill Prentice-Hall.
- Paour, L. (1993). Induction of logic structures in the mentally retarded. In C. Haywood & D. Tzuriel (Eds.), *Interactive assessment* (pp. 119–166) New York, NY: Springer.
- Patel, V., Aronson, L., & Divan, G. (2013). *A school counsellor casebook*. Manipal, India: Byword Books.
- Piaget, J. (1952). *The origins of intelligence in children*. New York, NY: International Universities Press.
- Piaget, J. (1973). *The child and reality: Problems of genetic psychology*. New York, NY: Grossman.
- Raghubar, K., Barnes, M., & Hecht, S. (2010). Working memory and mathematics: A review of developmental, individual difference, and cognitive approaches. *Learning and Individual Differences*, 20, 110–122.
- Roth, M., & Szamoskozi, S. (2001). *Activating cognitive functions of children living in an impoverished environment: A Romanian perspective*. Hampshire, England: Project Inside.

Sanches, P. (1994). The study of Instrumental Enrichment as a tool for improving language proficiency. *Teaching Thinking and Problem Solving*, 13 (3): 9-16.

Sternberg, R. (1984). How can we teach intelligence? *Educational Leadership*, 42: 38-50.

Tan, O. S., & Seng, S. H. A. (2008). *Cognitive modifiability in learning and assessment: International perspectives*. Singapore: Cengage Learning.

AUTHOR

Carol T. Brown (Ed.D. student, The Southern Baptist Theological Seminary) serves as the executive director and educational specialist of Equipping Minds in Danville, KY. Email: cbrown@equippingminds.com