Potential Contributions to Meeting the Goals of the Michigan State Plan under ESSA

At BrainWare Learning Company, we help individuals of all ages develop their cognitive capacity to become the most effective learners, thinkers, and problem-solvers they can be. We incorporate sound neuroscience principles and the power of digital game-based technology into our products and services. We demonstrate the impact of our programs through ongoing research and support schools through best practices implementations of our programs.

Connection to the Michigan State Plan for the Every Student Succeeds Act (ESSA) and Top 10 in 10 Years goals and principles:

- Reducing the impact of high-risk factors such as poverty, learning disabilities and lower English Proficiency. We have helped significantly narrow the achievement gap within a single school year for economically disadvantaged students, students in special education and English Learners, with accelerated growth in academic performance.
- Supporting the efforts for data-informed decision-making by providing leading indicators of student learning capacity and implementation methodologies that emphasize fidelity of implementation and equity of access to quality instruction.
- Achieving the goal of college- and career-readiness for all students. Some of the most important skills for college- and career-readiness are executive functions and related "soft skills." We develop the cognitive infrastructure for these skills in a sustainable manner that also transfers to STEM and other academic priorities.
- Operationalizing the principles of Universal Design for Learning (UDL) and learner personalization. UDL recognizes individual differences in aspects of cognitive processing, something we address directly through assessments that identify an individual's student's learning profile and direct training of cognitive processes.
- Integrating assessments and interventions for Multi-Tiered Systems (MTSS) across social/emotional and academic factors. As MTSS seeks to determine root causes for struggling or under-performing students, our tools enable teachers and administrators to identify non-academic (i.e., cognitive reasons) for a student's difficulties. This results in strategies and interventions based on actionable data, rather than guesswork, enabling teachers and administrators to unpack the learning process and be more strategic in the application of resources.

Approach:

Our approach is generally characterized as Neuroeducation, the practical integration and application of neuroscience, psychology and pedagogy as depicted in this image.

We differentiate our services to meet the unique needs of districts and schools by engaging in detailed discussions about the factors that affect implementation of our programs, including technology (computers and Internet), schedule, the capacity of instructional staff, the use of various assessment data that are already available to the district/school, and professional development needs. We provide support throughout the implementation process from initial planning through to the assessment of the impact of the program(s) on student outcomes.
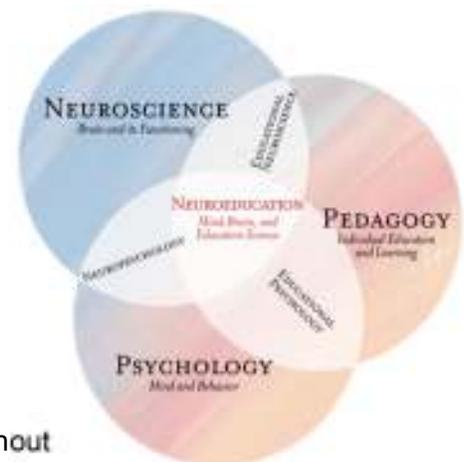
The ideal district/school partner is one that already has an interest in neuroscience-based solutions and/or is beginning to have an understanding of how the brain learns, the role of cognitive skills and executive functions in academic success and social and emotional competence. Good project planning and implementation processes are also desirable. Having said that, we are ready, willing and able to provide the training and professional development needed if those characteristics are not already in place.

Track Record of Student and School Outcomes:

Our programs have been studied extensively as to their ability to dramatically improve outcomes for a variety of students, including students in Special Education, economically disadvantaged students, English Language Learners, and general education.

Multiple studies have been completed on our programs, including peer-reviewed published research and field studies **at all Evidence Levels Defined by ESSA**. Below we provide brief descriptions of one study for each of the three subgroups of students targeted in the Connecticut plan. (Detailed reports of these and other studies can all be accessed at https://mybrainware.com/research-studies/.)

<u>Students in Special Education</u>

Educators who work with students with deficits in underlying cognitive processes that impede their ability to learn to read, write and do math typically use three categories of strategies to help students receiving special education services: Accommodation, Curriculum Modification and Compensatory Strategies. The purpose of these strategies is to bypass the cognitive processes that are weak in order to minimize the impact of processing deficits. Thus, for example, if a student has limited working memory capacity and can't remember a set of three instructions, the teacher would eliminate the need to hold three items of information in working memory, and, instead, give the instructions one at a time.

Training to overcome cognitive deficits has been known for decades as it is practiced by various therapeutic disciplines, such as vision therapy, speech/language pathology, neurology and psychology. Our approach uses multidisciplinary clinical therapy techniques in a digital game-based format to directly remediate underlying cognitive skills by providing comprehensive and integrated cognitive training, working on 41 skills in the areas of attention, memory, visual processing, auditory processing, sensory integration and logic/reasoning. Significant cognitive gains are consistently achieved for students in special education, with those gains translating into better academic performance and narrowing of the achievement gap.

"Effect of Neuroscience-Based Cognitive Skill Training on Growth of Cognitive Deficits Associated with Learning Disabilities in Children Grade 2-4." Sarah Abitbol Avtzon. Learning Disabilities: A Multidisciplinary Journal. Vol 18 (3), 2012: pp. 111-122.

Subjects	40 students in Grades 2, 3 and 4 in two schools, diagnosed as having a specific learning disability (SLD), randomly assigned to treatment and no-treatment groups. The no-treatment group received instruction as usual. All students continued to receive the standard reading and math interventions to which they were entitled because of their SLD diagnosis.

Treatment	The treatment group used a comprehensive, integrated, computer-based cognitive training program (BrainWare SAFARI) 3 to 5 sessions per week, 30-45 minutes per session for 12 weeks.
Assessment	Woodcock Johnson III Cognitive Battery and Tests of Achievement
Findings	Students in the treatment group who used the cognitive training program for 12 weeks improved their cognitive functioning by an average of 2.8 years, compared to 2 months for the no-treatment group. This improvement raised the students' overall cognitive proficiency level from 64% to 89% where 90% is the expected performance for a normally developing student. Students in the no-treatment group improved just one percentage point, from 63% to 64% proficiency, on the cognitive tests. Students in the treatment group improved their reading and math scores by 0.8 and 1.0 grade equivalent respectively over the 12 weeks.

Economically Disadvantaged Students

As the guiding principles in the Michigan plan express it, poverty matters. In recent years, poverty's impact on cognitive development has been more widely recognized in education, as has the critical importance of cognitive skills for academic success. The neuroscience evidence reveals the impact of poverty both on brain development and differences in cognitive skill performance related to socio-economic status (SES). Further, the longer children live in poverty, and the greater the degree of poverty, the more marked the effects. Cognitive development does not immediately catch up when children are exposed to good teaching and good curriculum. In fact, underdeveloped cognitive skills are important barriers to closing the achievement gap. The cognitive gap must be closed to support the impact of good teaching and good curriculum in closing the achievement gap.

Our approach, thus, is developing foundational learning capacity for each student. The cognitive training intervention provides a scalable way to significantly and measurably improve cognitive performance across multiple processes in a way that translates into better academic outcomes. The application of such techniques in a scalable way has become viable in the last decade and a variety of public, public charter and private schools in the U.S. and elsewhere have begun to implement specific neurocognitive development programs addressing the very processes that have been determined to be most deficient in low-SES students with noteworthy results.

"Improvement in California State Test Scores Following Cognitive Skills Training "(2013) retrieved from https://mybrainware.com/benefit-of-brainware-safari-in-a-predominantly-hispanic-school-district/

Subjects	257 students, all 3rd grade classes in all four district elementary schools, Low SES, predominantly Hispanic, significant proportion of ELL. One of the two 3rd grade classes in each school was assignment to the treatment condition and the other to the no-treatment condition. The no-treatment group received instruction as usual.

Treatment	The treatment group used a comprehensive, integrated, computer-based cognitive training program (BrainWare SAFARI) 3 to 5 sessions per week, 30-45 minutes per session for 12 weeks
Assessment	California State Test (ELA and Math)
Findings	The students who followed the cognitive training regimen performed better than the no-treatment group of students, looking at the difference in test scores from second grade in 2012 to third grade in 2013, for the same students. The change in English Language Arts was 17 scaled score units better for the BrainWare students, who also narrowed the gap between their scores and the median state score. Similar improvements were found for English Language Learners as for English-speaking students. In Math, the improvement for the treatment group students (19 scaled score units) also exceeded the state-wide growth in median score, while the np-treatment group's scores declined. While the trend was consistent for ELL and English-speaking students in Math, the difference for the English Language Learners was highly significant. The significant results for special education students was reported separately, with many students dramatically improving their performance on the state tests.

English Language Learners

Acquiring a second (or other) language is frequently a different process than learning a first language and may be helped or hindered in by an individual's underlying cognitive skills. ELL students rely to a greater degree on executive functions such as working memory (e.g., holding information in mind while translating before the target language becomes automatic) and inhibitory control (e.g., suppressing first-language vocabulary options). Other skills, such as auditory processing, visualization and cognitive flexibility (particularly when the target language's structure and syntax are different from the first language) are also important.

"The Impact of Cognitive Skills Training on Reading Scores in a Bilingual Program" (2010) retrieved from www.mybrainware.com/the-impact-of-cognitive-skills-training-on-reading-scores-in-a-bilingual-program/.

Subjects	39 Limited English Proficiency students in 6th through 9th grades in an all-day program.
Treatment	The treatment group used a comprehensive, integrated, computer-based cognitive training program (BrainWare SAFARI) 5 sessions per week, 30-45 minutes per session for 8 weeks.
Assessment	Scholastic Reading Inventory (SRI) Teacher surveys
Findings	All of the teachers noted improvement for their classes on the 14 behavioral survey measures in the survey, with the strongest areas of improvement being "Attention span and focus," "Ability to visualize," "Desire to perform and put in

effort," and "Following directions," which the teachers connected to improved language skills and English reading skills.

During the trimester in which the students used the cognitive training program, 66% increased their scores on the SRI, compared to the previous trimester where only 41% improved their scores. The 8th and 9th grade students scored Below Basic during the first two trimesters on average, but finished the year above the Basic rating following their use of BrainWare SAFARI.

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