



# A Chance To Grow

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## **EXECUTIVE SUMMARY: SMART-EARLY CHILDHOOD DEMONSTRATION PROJECT**

Over the past decade and a half, ACTG has worked with elementary school teachers to introduce the S.M.A.R.T. curriculum (*Stimulating Maturity through Accelerated Readiness Training*) into elementary school daily instruction. From 2005-2010, A Chance to Grow piloted the S.M.A.R.T – E.C. program. S.M.A.R.T. – E.C. is a program that uses brain stimulation exercises to help low-income children become ready for kindergarten.

## History

A Chance To Grow (ACTG) promotes the maximum development of the whole child through innovative, individualized and comprehensive brain-centered programs and services. These services are educational, therapeutic and rehabilitative in nature. Over the past decade and a half, ACTG has worked with elementary school teachers to introduce the S.M.A.R.T. curriculum (*Stimulating Maturity through Accelerated Readiness Training*) into elementary school daily instruction. The S.M.A.R.T. curriculum provides brain stimulation for improved learning readiness, literacy, and math skills. ACTG has trained over 4,000 teachers in twelve states.

In 2005, ACTG decided to apply its brain stimulation program to younger children. ACTG partnered with two Head Start programs (in Northwest Minnesota and in the Twin City metropolitan area) involving over 20 Head Start classrooms (exact number varied by year). S.M.A.R.T. – E.C. (*Stimulating Maturity through Accelerated Readiness Training – Early Childhood*) was a six year demonstration project to test the effectiveness of S.M.A.R.T. – E.C. with younger children in preschool settings. This project assumed that pre-school brain stimulation training should be even more effective because of greater brain plasticity in the earlier years.

## Importance of Early Childhood Education

S.M.A.R.T. – E.C. is a demonstration program that uses brain stimulation exercises to help low-income children become ready for kindergarten. Too many children are arriving at kindergarten and grade school unprepared to learn and lacking skills needed in order to learn to read, such as listening and vocabulary skills, visual perception, eye-hand coordination, social interaction patterns, attention to following directions, pencil-paper skills, gross and fine motor skills, and self-confidence in the face of challenges.

- In a groundbreaking study, Hart and Risley (1995) found that while some children enter kindergarten with a vocabulary of 4,000 words, children from deprived environments in the same class may only know 2,000 words.
- Roughly half of children entering Minnesota kindergartens were not proficient in language/literacy and mathematical thinking (Minnesota School Readiness Business Advisory Council, Ready for School, 2004).
- Another analysis found that children entering kindergarten from lower income families and with parents with less education were significantly more likely than children from higher incomes and with parents with more education to be rated not proficient in language/literacy and mathematical thinking (Minnesota School Readiness Study, 2004).

*“...chronic stress found in many poverty homes creates a cumulative effect on developing brains...”*

## Poverty and Brain Functioning

S.M.A.R.T. –E.C. is a demonstration project designed to improve brain functioning for low income children and to encourage educators to bring brain stimulation into the classroom. Recent research has demonstrated a direct relationship between poverty and brain functioning. Researchers at the University of California found that the brains of low-income children function differently than the brains of high-income children. Normal 9- and 10-year old children differing only in socioeconomic status have detectable differences as measured by EEGs in the responses of their prefrontal cortex – the part of the brain critical for problem-solving and creativity. Children from lower socioeconomic levels show brain physiology patterns similar to adults with damage in the frontal lobe (University of California Press Release, 12/2/08).

The cost of chronic stress found in many poverty homes creates a cumulative effect on developing brains. The prefrontal cortex and the hippocampus (crucial for learning, cognition, and working memory) are brain areas most affected by cortisol, the “stress hormone.” Experiments have demonstrated that exposure to chronic and acute stress shrinks neurons in the brain’s frontal lobes affecting making judgments, planning, and regulating impulsivity (Cook and Willman, 2004) and can modify or impair the hippocampus in ways that reduce learning capacity (Vythilingam, et. al., 2002).

## S.M.A.R.T. – E.C. Design

S.M.A.R.T. – E.C. has four basic components:

- ⇒ **S.M.A.R.T. – E.C. Curriculum:** The S.M.A.R.T. – E.C. curriculum is used in the classrooms by Head Start staff on a daily basis – 15-20 minutes per day. The curriculum involves the children in a series of exercises doing large motor exercises, small motor activities, and vision activities – designed to improve hand/eye coordination, focusing, gross and fine motor skills, sequencing, left/right awareness, and spatial relations.
- ⇒ **Staff Training Workshops:** Prior to the first year of implementation, Head Start teachers and assistants/aides attend a 2½-day workshop on S.M.A.R.T. – E.C., including suggestions on how to adapt it to normal classroom routines, shortened school days, and space limitations.
- ⇒ **Implementation in the Head Start Classrooms:** Teachers and assistants/aides integrate S.M.A.R.T. into their daily schedules.
- ⇒ **On-going Mentoring of Head Start Staff:** On a regular basis, ACTG mentors visit the Head Start Centers to provide monitoring of implementation, as well as on-going mentoring.

## S.M.A.R.T. - E.C. Implementation

Since its early beginnings in the 1980s, ACTG has developed new approaches to rehabilitation and learning readiness by first running demonstration projects and then by testing them for effectiveness. ACTG used this same approach with S.M.A.R.T. - E.C. in Head Start sites – first demonstrating, then testing, and then disseminating. Years One through Four were devoted to testing the effectiveness of S.M.A.R.T. – E.C. - comparing the literacy and learning readiness measures of Head Start children in S.M.A.R.T. – E.C. classrooms with Head Start children in classrooms that did not receive S.M.A.R.T. – E.C.

After the initial five years of testing, the evidence is clear that S.M.A.R.T. – E.C. has a positive effect on early cognitive development and prepares children for entry into kindergarten. Moreover, the evidence for a positive effect of S.M.A.R.T. – E.C. on early literacy skills and learning readiness got stronger from Years One through Four, reflecting the increased teacher skill and support for the intervention:

### *Year One: Implementation*

Year One was an implementation year in which details of integrating S.M.A.R.T. into a Head Start structure were worked out. The S.M.A.R.T. curriculum was modified to make appropriate for younger children. At both the Northwest Minnesota and metropolitan sites, the first year of implementation was difficult, as teachers had to learn a new technique, work out problems, and coordinate across centers. The first year experience underscored the importance of the mentoring of Head Start staff, as individual variability was greater than anticipated.

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## *Years Two to Four: Testing the S.M.A.R.T. Intervention at Head Start Centers*

Years Two through Four were demonstration years and involved the testing of the S.M.A.R.T. intervention using two standard tests of early literacy skills and school readiness – IGDI (Individual Growth and Development Indicators) and Brigance K & 1 Screen II (a test of various aspects of school readiness).

- *Year Two:* Test score analysis in Year Two were confined to Head Start centers in the Northwest Minnesota site, since the metropolitan site was still in its first year of implementation. In this site, Head Start students in S.M.A.R.T. – E.C. classrooms scored higher than students in comparison classrooms – picture naming (some inconsistency), rhyming, alliteration, and school readiness. Teacher acceptance of the new tool continued to increase.
- *Year Three:* The third year testing results were mixed and somewhat contradictory and unable to support the hypothesis of greater performance among S.M.A.R.T. – E.C. students. In probing for a deeper understanding, we examined performance gains for just students in full-day, full-year Head Start centers (assuming a longer and more intensive intervention). Over the course of the year, S.M.A.R.T. – E.C. students performed increasingly better in rhyming and alliteration and the same on picture naming (a less demanding test). However, teacher acceptance and evaluation of S.M.A.R.T. – E.C. continued to increase.
- *Year Four:* By the fourth year, a clear pattern had emerged – Head Start children who received S.M.A.R.T. – E.C. performed better on a variety of tests of early literacy and school readiness than Head Start children who did not receive S.M.A.R.T. – E.C. compared to Head Start children who did not receive the intervention. Head Start children who received S.M.A.R.T. – E.C. performed better on a majority of learning readiness and early literacy tests.
  - In six out of eight comparisons of classrooms at both sites, S.M.A.R.T.- E.C. end-of-the-year IGDI test scores were higher than those of comparison classrooms.
  - In 5 out of 6 comparisons of Fall to Spring improvement scores on IGDI, S.M.A.R.T. – E.C. children performed better than children in comparison classrooms.
  - S.M.A.R.T. – E.C. children’s scores for both IGDI and Brigance tests at both sites compared favorably to norms established for five-year olds (a measure of school readiness).

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Teacher acceptance and enthusiasm for S.M.A.R.T. – E.C. was strong. By the third and fourth years of the demonstration teachers were, by and large, quite enthusiastic about its value and contribution to learning readiness. In fact, teacher praise for S.M.A.R.T. – E.C. was very strong. According to teachers, students in S.M.A.R.T. – E.C. classrooms learned skills faster, focused and concentrated better, and learned letters and shapes faster. Teacher comfort with S.M.A.R.T. – E.C. did not become really strong until a long period of trial and error – usually by the end of the second year. By year six, Head Start

teachers at both sites continued to use S.M.A.R.T. - E.C, even though the initial financial support had expired. In addition, S.M.A.R.T. – E.C. has been introduced into other centers that originally served as comparison classrooms.

## Following Head Start/S.M.A.R.T. – E.C. Students into Elementary School

Years Five and Six were follow-up years. By Year Four of the demonstration project, we were ready to follow a subsample of Head Start graduates who had received S.M.A.R.T. – E.C. into elementary school to assess their readiness for school and their early academic skill development. Because of resource and tracking limitations, this follow-up study looked at a smaller sample (N=45) of Head Start/S.M.A.R.T. – E.C. students in elementary school. The follow-up study produced even more positive results:

### *Year Five: Tracking Head Start Students into Elementary School*

In Year Five (2009-2010) and Year Six (2010-2011), 45 children who received S.M.A.R.T.– E. C. were tracked as they entered elementary school to see how well they performed relative to their classmates and national norms. We now have Year Five results. Year Five results provide solid evidence that:

⇒ ***Head Start/S.M.A.R.T. – E.C. students were ready to learn upon entering Kindergarten.***

Tests of letter naming and sound fluency showed that Head Start/S.M.A.R.T. – E.C. students entered kindergarten scoring very close to the national norms for these tests. These results are encouraging in light of research in Minnesota showing that high percentages of children from low income families enter Kindergarten not proficient in language, literacy, and mathematical thinking and significantly higher than higher-income children to be rated not proficient.

⇒ ***Head Start/S.M.A.R.T. – E.C. students continued to learn at levels expected of all students in subsequent grades.***

We examined performance of Head Start/S.M.A.R.T. – E.C. students at the end of each of three elementary grades – Kindergarten, First Grade, and Second Grade – and compared them with national norms. At all three grade levels, the Head Start/S.M.A.R.T. – E.C. students met or exceeded normative expectations. These are impressive results for low-income students.

⇒ ***There was no evidence of the Head Start fade – performances at the normative level of Head Start/S.M.A.R.T. – E.C. continued through Grade Two.***

There is always a fear that performance gains in Head Start will fade over time in elementary school. There was no evidence of this in this study. We measured growth scores in reading and math in Grades One and Two and found that Head Start/S.M.A.R.T. – E.C. students improved at the same rate as other students in these grades and at the level of national norms.

## *Year Six: In Progress*

Year Six is the current academic year. The evaluation team will continue to work with elementary schools to track one more year of results.

## **Summary**

ACTG now has evaluation evidence from five years of a six-year demonstration program of S.M.A.R.T. – E.C. that supports its effectiveness as an early education intervention. Just about everybody with an interest in education deplors existing and persistent achievement gaps between students of varying income levels and racial backgrounds. Yet, little goes beyond describing and deploring the gap. The results of this study suggest that brain-related interventions, especially at an early age, might reduce these nagging inequalities – by elementary school, the Head Start students who received S.M.A.R.T. – E.C. were performing at a level equal to the other elementary school students.

“...evaluation evidence from five years of a six-year demonstration program of S.M.A.R.T. – E.C... supports its effectiveness as an early education intervention...”

## *Over the past five years, ACTG has been able to demonstrate that:*

- ⇒ The S.M.A.R.T. curriculum can be adapted to a preschool setting;
- ⇒ Teachers can learn, accept, and support this new tool;
- ⇒ Head Start children receiving S.M.A.R.T. – E.C. generally perform better on tests of early literacy skills and school readiness measures than those who do not receive it;
- ⇒ Head Start children who received S.M.A.R.T. – E.C. entered kindergarten ready to learn and at a level equal to national norms;
- ⇒ As Head Start/S.M.A.R.T. – E.C. students progressed through K-2 grades, they continued to learn at levels expected of all students;
- ⇒ There was no evidence of a “fade” in later grades – the Head Start/S.M.A.R.T. – E.C. students continued to perform at the normative level through Grade 2.




## Implications of Research

A number of implications of this research deserve mention:

- It is important to eradicate/reduce inequalities in the early years in order to prevent negative experiences and attitudes from interfering with later learning.
- Getting children ready for school involves more than rehearsing specific behaviors and skills – brain development and stimulation are important tools in getting children ready for school, and once in school, continuing to support learning. S.M.A.R.T. – E.C. addresses an underlying cause of learning deficits rather than addressing a specific learning deficit.
- This research is a reinforcement of the importance of brain-related learning and the need to integrate brain stimulation into the normal educational regimen. Educators shy away from brain issues, as they are not trained in its importance or functioning and many relegate brain development to the medical setting rather than to the classroom. These findings call into question this mindset.
- Even though there is heightened interest in early childhood development, most proposals seldom go beyond calling for more of the same or more funding. S.M.A.R.T. – E.C. provides a promising piece of the puzzle for improving educational outcomes.
- S.M.A.R.T. – E.C. is a relatively inexpensive early childhood intervention. Arthur Rolnick of the Federal Reserve Bank of Minneapolis has championed the advantages of quality early education for poor children and he and other economists have touted the high return on investment of quality early education programs. These return on investment base studies generally used a few Cadillac models, which require very high program investments – at levels seldom found in most early childhood programs, and especially not for programs serving the poor. S.M.A.R.T. – E.C., on the other hand, is relatively inexpensive- the up-front costs for teacher training and mentoring are only for 1-3 years and the downstream costs are quite inexpensive.
- The introduction of a brain stimulation program in these Head Start centers was continued beyond the period of direct funding and mentoring, as well as was introduced in the remaining centers. In this sense, S.M.A.R.T. – E.C. contributes to the infrastructure development of these preschool settings without any large and ongoing infusion of funding beyond the initial funding for training and mentoring.
- At its heart, S.M.A.R.T. – E.C. and its companion program for elementary school teachers is a teacher training program. Teachers reported how their training for S.M.A.R.T. – E.C., their experiences in using it in their classrooms, and the ongoing mentoring they received, got them to re-examine their teaching approaches, gave them a better perspective on the relationship between brain development and early childhood education, and alerted them to important changes in children’s learning, behaviors, and school readiness.
- This multi-year evaluation of S.M.A.R.T. – E.C. relied heavily on quantitative, standardized tests of learning readiness, literacy skills, and academic progress, namely IGDI and Brigance in the Head Start years and MAP and AIMSweb in the elementary school years. These were demanding tests of learning readiness and skill development. Still more demanding was the use of





comparison groups to assess the strength of S.M.A.R.T. – E.C. Even under these demanding conditions, students receiving S.M.A.R.T. – E.C. performed as or better than expected.

- Finally, the evaluation’s reliance on standardized testing should not over-shadow the importance of teacher assessments of the value of S.M.A.R.T. – E.C. and on-site observations of the evaluation staff. Even more importantly, we should acknowledge that this research was not able to document the effects of participation in S.M.A.R.T. – E.C. on children’s motivation, attitudes toward learning, self-confidence, and impulse control – all factors that we know are related to academic success.