

In the fall of 2005, Learning Enhancement Corporation (LEC) agreed to sponsor a study of the use of BrainWare Safari at the Edgar Evans Academy, one of the schools within the Indianapolis Public Schools (IPS). Dr. Eugene White, superintendent of IPS, and Dr. Li-Yen Johnson, assistant superintendent for elementary education, were instrumental in establishing the program. The study also benefited from the support of Stanley Law, the school's principal and two teachers –Natalie Cordell and Michelle Fisher-Jones. LEC donated software, training, and third-party testing services to enable the study.

Previous studies of BrainWare Safari had involved use of the program in a home or clinical setting. The purpose of this study was to demonstrate how BrainWare Safari (BWS) fits into the regular curriculum of an elementary school classroom and to see how effective it can be with even the most challenging users.

The Edgar Evans Academy School for Boys was created to provide a structured, disciplined environment for male children in grades four and five. Dr. White created this school after evaluating IPS data that showed that some students (particularly boys) begin to disengage from learning beginning in Grade 4. Instead of growing in social and academic skills, they become discipline problems. Evans Academy offered core curriculum within an environment that stressed building self-discipline and self-esteem. This school was chosen for the BrainWare study because of the significant difference it was felt the program could make with these students, Furthermore, demonstrating that BrainWare could help these students, would speak to the program's ability to help virtually any student.

Study Design

Principal Law selected two classrooms for the study – one fourth grade and one fifth grade, which together had 25 students. Test data are available for 24 of the students.¹ In January 2006, the students were pre-tested with a subset of the Woodcock-Johnson[®] III Cognitive Battery² by Patricia Chunn of Professional Communications Care, P.C. in Indianapolis. Ms. Chunn is a nationally certified speech pathologist. BWS was installed on the Apple iBook computers that were available at the school for student use and which connected to the Internet via a wireless connection.

The classroom teachers committed to using BWS for 2 to 3 hours a week during their regularly scheduled class day. In May 2006, after 11 weeks of using BWS, the students were post-tested with the same subset of the Woodcock-Johnson III Cognitive Battery by Ms. Chunn.

Measured Use of the Program

BWS is a software program designed to comprehensively develop the cognitive skills that are most important for learning, in a fun and entertaining video-game format. Set in a South American jungle, it consists of 20 exercises designed to develop various cognitive skills. Each exercise has a number of levels, progressively more difficult; each level must be passed before the user can progress to the next level. All but two of the exercises have seven levels; the two logic and reasoning exercises have 21 levels each, for a total of 168 progressively challenging levels in the program.

BWS requires an Internet connection. It is designed as a rich-client application to enhance the user's experience, but log-in and progress through the program are controlled by LEC's server. This enables LEC to monitor completion of levels as well as time spent using the program. It also enables the players to use any computer on which the program is installed, starting where they left off in their previous session.

¹ One student was unable to be post-tested due to scheduling difficulties.

² The tests used for this investigation included Visual Auditory Learning, Spatial Relations, Concept Formation, Numbers Reversed, Auditory Working Memory and Decision Speed.

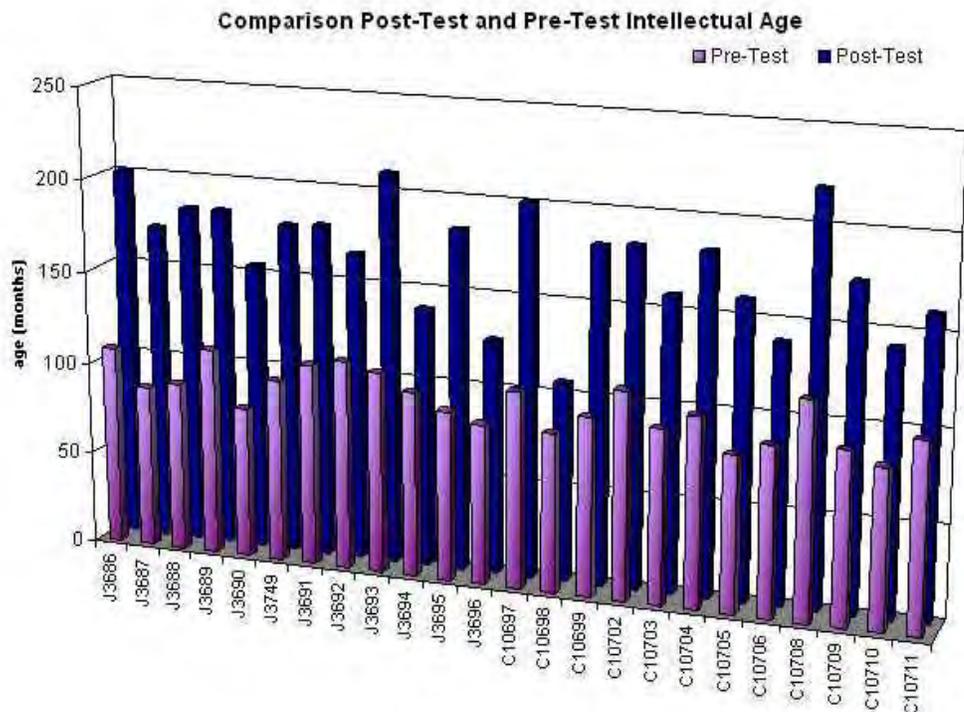
BrainWare SAFARI Benefits 4th & 5th Grade Boys At Risk

For the entire program, the average number of levels completed during this study was 103 of 168 possible with a minimum of 66 and a maximum of 142. For the logic exercises, with a maximum of 21 levels possible, the average levels completed by all the students was 20 with a minimum level of 6 and maximum level of 21.

Woodcock-Johnson III Results

The students in this study had an average chronological age of 11 years at the time of the pre-test. Their average intellectual age, at the time of the pre-test, was calculated to be 8 years 2 months. Thus, these students were, on average, 2 years 10 months below the norm for their age. Upon post-testing, the students had an average chronological age of 11 years 4 months. The average post-test intellectual age after 11 weeks of working with BWS was measured at 14 years 2 months, an improvement of 6 years. These results indicated that the students, following use of BWS, performed at an average of 2 years 10 months above the norm for their age.

The impact of building cognitive skills and the effect of BWS is best explored by looking at individual results. The figure is a graphical representation comparing each student's Pre-Test and Post-Test Cognitive Age. This clearly indicates that every student in this study showed growth, with many showing multiple-year growth. Some of the students are now able to perform



significantly above their chronological age; others are now closer to performing at age-appropriate levels. Because no player successfully completed all levels of the program, each student has additional levels of the program to work with and may continue use of the program if needed or desired. After these first 11 weeks, the students may use the BWS program less frequently, more as a maintenance program, until all levels have been completed. This would continue to develop the skills that have been built thus far.

We did not find a correlation between the number of exercise levels completed and Woodcock-Johnson III test results. This is due to the fact that each exercise builds multiple skills at the same time and each person brings a unique combination of skills to the experience. BWS is effective because it uses a person's strengths to build weaker cognitive skills, thereby automatically individualizing the experience for the needs of the player. Consequently, a player who completed a total of 66 levels could ultimately

achieve more growth than a player who completes 100 levels. Results with the program depend on each individual brain, working with its existing neural connections to make them stronger and making new connections, so that all cognitive skills become automatic. The automatic functioning of basic cognitive skills paves the way for more advanced intellectual activity and success in school, at home, at play or at work.

Classroom Implementation

The two teachers who used BWS in their classrooms were given the flexibility to schedule use of the program during the school day as they saw fit within the guideline of three times a week, 30 to 60 minutes each time. Scheduling had to account for the fact that the i-book computers on which the program was installed were shared. One classroom teacher took time from both English and Math while the other took time primarily from English. Both teachers, although initially apprehensive about the material the students might miss, found that the time spent doing BWS was having an impact on their class in such a positive way that it was time well spent. One teacher reported including some journaling with BWS. In her class, students recorded which exercises they had tried, which levels they completed and their thoughts about their progress at the end of each BWS session. Journaling allowed her to not only track student progress but to incorporate some of the English skills they were learning.

Both teachers report that BWS was an activity the students looked forward to. They had fun using BWS, and it turned out to be a time when the class helped each other more than they ever had with anything else. Each student quickly knew whom to ask for help with an exercise, and it was rarely the teacher. Both teachers and the principal of the school are looking at ways to incorporate BWS into additional classroom settings and are excited about the opportunity to implement across the district.

Anecdotal Observations

In previous studies, improved self-esteem, improved attention to detail, improved memory and improved ability to follow directions have been among the observed changes. Similar observations were expressed by the teachers, the principal, and the test administrator involved in this study.

- Ms. Cordell, one of the teachers involved in the study, sent this comment 7 weeks into the study: "I love BrainWare SAFARI and so do the students. The program is indeed a great way for the students to learn while having fun. Many of them have shown more willingness to work independently. The program definitely has boosted their self-esteem as they have graduated many levels. It is rewarding to watch them problem solve and reach success."
- Ms. Jones also sent a message of appreciation for BrainWare Safari after 7 weeks of using the program. "This is an update to let you know that we are doing well with BrainWare. The students are very anxious on the days that we participate. I have seen progress with the students' problem solving skills, retention and perseverance. All of the students say that it is fun, challenging, and educational for them. (Honest-these are their words)."
- Principal Stanley Law had several comments to add about the program.
 - "I am ecstatic about the results of BrainWare and the amount of growth our students showed! It affects the underlying skills of our students; the very thing that effects everything else. . The skills that our kids need. The effects are far reaching "

- When questioned about how schools could find the time to use BrainWare during the school day, Principal Law said "There is time to do a program like this if you really look at it."
- Ms. Chunn commented that she was not at all surprised by the results when they were tabulated. She could see the difference in the students' attitudes when they came into the test room. During the pre-test, she had to encourage them to talk with her and to continue with the testing when it was hard for them. She commented that it was like she was seeing different students when they came for the post-test. They were excited to show how much further they could go in each of the tests, they were talkative, and they were very proud of the progress they knew they had made.

Comments from the students were captured during interviews conducted at the beginning of the new school year. Comments were universally positive, such as the following:

- BrainWare Safari is a fun thing to do. It is helping me to do things I have never done before, challenging me the further I go. It has helped me with my Math, thinking, and working hard.
- The animals grow as we learn more and more because we are growing more and more.
- School work is kind of easier. Hard work is easier to do. I was pushed to do higher and higher levels and succeed.
- At the beginning I wasn't really trying but then it got harder and I had to put more effort into it. I wanted to see how far I could get. I wanted to see what I could do.
- I didn't want to pay attention to it but it was fun so I wanted to do it.

Additionally, when LEC returned to the school to interview some of the boys we discovered that several of had begun to think about what they wanted to do when they grew up. The skills they gained as a result of BrainWare Safari helped them to key into what it was they needed to do to accomplish these goals.

When asked about future plans, the students responded with answers such as the following:

- I am one of the better students when I am thinking. I decide to pay attention because I want to go to college.
- I want to do good in school, get A's and B's. I want to go to college, get a good job to help out my family.
- I want to be an engineer, because you get to do hands-on things, put stuff together, learn about how things work, what they need to work. I really want to engineer roller coasters, because .you need to get it all right or the whole thing could be wrong. You have to use what you learned in school to make sure you don't mess it up.
- I want to be a famous person, a firefighter or an animal control officer.

Further Academic Assessments

The evidence so far is compelling. Because BWS is a cognitive development program, immediate improvement can be seen in performance on cognitive tests. It is expected that improved cognitive performance will provide the foundation for improved academic performance. There are some studies that have demonstrated the effect of visual perception on reading. However, further work needs to be completed in this area. Additional tracking for this study, including behavioral changes, grades, and other assessments is being gathered to add to the total picture of the effect of BWS used in a classroom setting.