

Improving Student Science and English Language Skills:

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# A Study of the Effectiveness of BrainPOP

2009

Executive Summary



*This study was conducted by SEG Research, an independent educational research firm located in New Hope, Pennsylvania. SEG Research provides research, evaluation, and assessment services to educational publishers, educational technology providers, assessment service providers and government agencies. SEG has been meeting the research and assessment needs of organizations since 1979. This research was supported by a grant from BrainPOP.*

## **Executive Summary**

### **Background and Purpose**

During the 2008-2009 school year, SEG Research conducted a multi-site study of students in grades 3, 5 and 8 to evaluate the effectiveness of BrainPOP, a web-based animated instructional tool designed to support educators and engage students. BrainPOP is intended for use in both group and one-on-one settings and can be used in numerous ways, from introducing a new lesson or topic to illustrating complex subject matter to reviewing before a test. Content is aligned to state standards and searchable.

The goal of this study was to evaluate the effectiveness of BrainPOP. The findings indicate that students in classes using BrainPOP made significant improvement in Science, Reading Comprehension, Language, and Vocabulary skills during one school semester (January through June) as compared to students in classes that did not use BrainPOP.

### **Study Design**

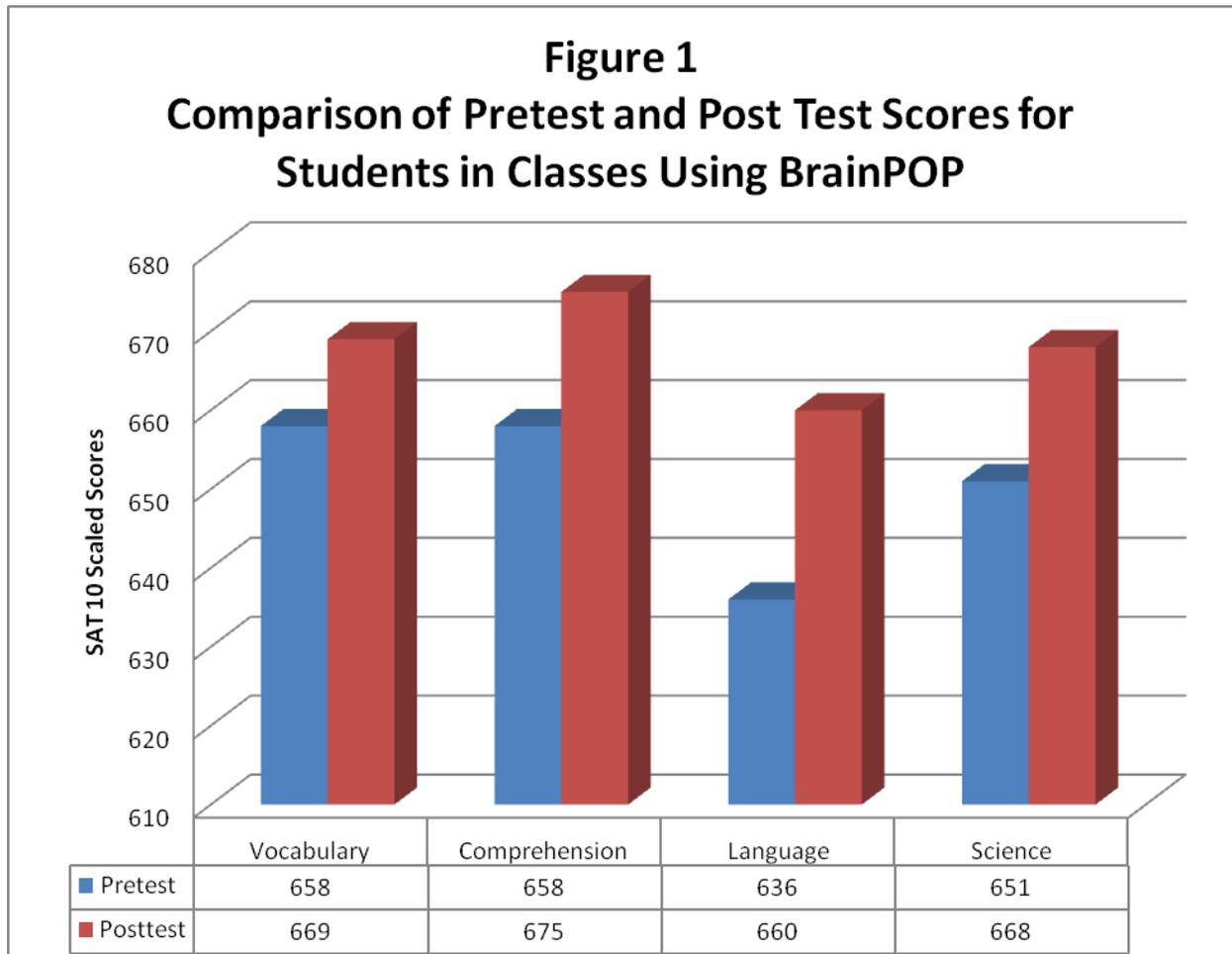
Between January 2009 and June 2009, approximately 1,100 students in 46 classrooms in Palm Beach County, Florida and New York City, New York participated in a controlled study of BrainPOP effectiveness. Using a quasi-experimental, pre-post design, this study compared the growth in Science, Reading Comprehension, Language and Vocabulary skills between students in classes using BrainPOP (Treatment Group) and a comparable group of students in classes that did not use BrainPOP (Control Group). Growth in Reading Comprehension, Vocabulary, Language and Science was measured by comparing scores on the Stanford 10 Achievement Test™ Abbreviated Battery (SAT 10) at the beginning of the second semester of the school year and at the end of the school year. Students in both the Treatment (BrainPOP Users) and Control Groups took a pretest (SAT 10) at the beginning of the second semester of the school year to obtain a baseline measure of student Science, Reading Comprehension, Language and Vocabulary skills. Students in the Treatment Group then received instruction that typically included two to three hours of BrainPOP weekly, while those in the Control Group received instruction without the benefit of BrainPOP. At

the end of the school year, students in both the BrainPOP Users Group and Control Groups took a posttest (SAT 10). The results from the pretest and posttest were compared statistically to determine the level of growth in Science, Language, Reading Comprehension, and Vocabulary skills. Students in the BrainPOP Users and the Control Group were well-matched in ability and demographically. Any initial differences in the Science, Reading Comprehension, Language and Vocabulary skills of students in the Treatment and Control Groups were statistically controlled during analysis.

### **Pre- Post Results for BrainPOP Users**

Students who were in classes that used BrainPOP showed substantial growth in Science, Language, and Reading Comprehension and more moderate gains in Vocabulary, during the course of the study. Students in classes using BrainPOP increased their SAT 10 Language scale-scores by 24 points, their Reading Comprehension scores by 17 points, their Science Scores by 17 points, and their Vocabulary scores by 11 points (see Figure 1). Students received approximately 16-20 weeks of instruction using BrainPOP, yet the amount of growth achieved is equivalent to between one and two grade levels of growth when compared to the national sample of students included in the Stanford 10 norm group (Harcourt Assessment, 2002).

To better understand the magnitude of growth for students in BrainPOP classrooms, we looked at the “effect size”, a common metric that can be used to evaluate the amount of growth across studies, even when different measures are used. We found effect sizes of +.47 for Language, +.37 for Reading, +.36 for Science, and +.19 for Vocabulary (unadjusted for Control Group differences). This indicates that students in classes that used BrainPOP showed substantial growth in Reading, Language, and Science and moderate growth in Vocabulary from the beginning to the end of the study.



While the growth achieved by students using BrainPOP is an important indicator of the effectiveness of BrainPOP, a more complete way to assess growth is to compare the growth achieved by students in classes using BrainPOP (Treatment) to students in classes that did not use BrainPOP (Control).

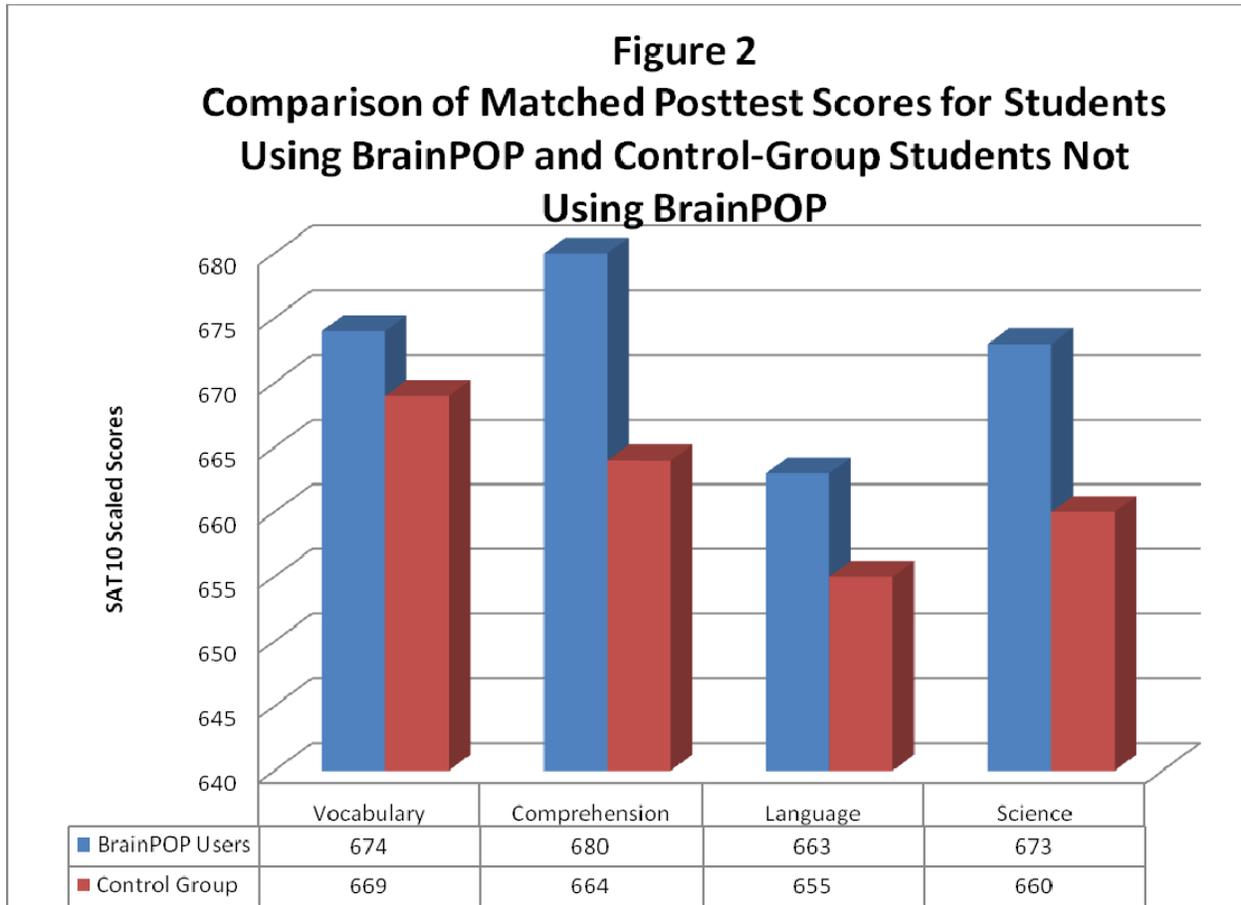
### Comparison of BrainPOP Users to the Control Group

We compared the gains made by students in classes using BrainPOP to those of a Control group of students in classes that did not use BrainPOP, controlling for any initial differences in the Science, Reading Comprehension, Language and Vocabulary skills of students in the two groups. We used a

statistical procedure known as analysis of covariance (ANCOVA), to provide a more accurate comparison of growth between groups. This analysis compares differences as if the two groups (BrainPOP Users and Control) were identically matched in initial Science, Reading Comprehension, Language and Vocabulary skills. The students using BrainPOP showed statistically greater gains in Science, Language, Vocabulary, and Reading Comprehension than those students in the Control Group who were not using BrainPOP. Gains by the BrainPOP users were statistically significant at the  $p < .05$  level.

BrainPOP users showed substantially greater gains in Reading Comprehension, Science and Language and moderately greater gains in Vocabulary than students in classes that did not use BrainPOP. When controlling for students' initial ability, BrainPOP users finished the year with scores that were 16 scale-score points higher in Reading Comprehension, 13 scale-score points higher in Science, 8 scale-score points higher in Language, and 5 points higher in Vocabulary than the Control Group on the SAT 10 assessments (see Figure 2).

To better understand the magnitude of the difference between students in BrainPOP classes and those in classes that did not use BrainPOP, we again looked at the “effect size.” We compared the average (mean) score for the BrainPOP users Group to the average (mean) score for the Control Group (adjusted for any initial differences in student ability).



We found effect sizes of  $+0.34$  for Reading Comprehension,  $+0.29$  for Science,  $+0.17$  for Language, and  $+0.09$  for Vocabulary. The effects for Reading Comprehension, Science and Language are quite substantial, indicating that the students in classes that used BrainPOP performed well above the students in classes that did not use BrainPOP in these skill areas. For comparison, the effect sizes for Reading Comprehension and Science are above the typical effect sizes seen in other studies of instructional programs. Language and Vocabulary were more typical of the comparative gains seen in other studies of instructional programs. (For example, Slavin (2008) in his comprehensive synthesis of middle and high school Reading program research studies reports a mean effect size for instructional-process Reading programs of  $+0.21$ .)

The results by grade level indicated that BrainPOP produced significantly greater increases in a composite of Reading, Language, Vocabulary and Science. The effects were most pronounced at the 5th grade level, where the greatest gains were seen.

BrainPOP was found to be equally effective for boys and girls; for students of different ethnicities; and for both students receiving free or reduced lunch services and those not receiving this service. The interaction between BrainPOP use and gender, ethnicity and free or reduced lunch status was not statistically significant.

### **Teacher Perceptions of Effectiveness**

At the conclusion of the study, participating teachers were surveyed regarding their perceptions of BrainPOP. 90% felt that BrainPOP was good or excellent at improving students' attitudes toward school and learning. Similarly, 90% of teachers felt that BrainPOP was good or excellent at increasing students' cognitive/intellectual growth. All (100%) of the teachers indicated that they would definitely recommend BrainPOP to others.

### **Summary**

Students who were in classes that used BrainPOP showed substantial growth in Language, Reading Comprehension and Science and more moderate gains in Vocabulary during the course of the study. Students in classes using BrainPOP increased their SAT 10 scores between 11 and 24 points. Students received approximately 16-20 weeks of instruction using BrainPOP, yet the amount of growth achieved is equivalent to between one and two grade levels of growth when compared to the national norm group.

Students enrolled in classrooms using BrainPOP achieved substantially greater gains in Science, Language, and Reading comprehension than students enrolled in classes that did not use BrainPOP. More moderate gains were also seen for Vocabulary. When controlling for students' initial ability using analysis of covariance, BrainPOP users showed substantially greater gains in Reading Comprehension, Science and Language and moderately greater gains in Vocabulary than students in

classes that did not use BrainPOP. BrainPOP users finished the year with scores that were 16 scale-score points higher in Reading Comprehension, 13 scale-score points higher in Science, 8 scale-score points higher in Language, and 5 points higher in Vocabulary than the Control Group on the SAT 10 assessments.

To understand the magnitude of the difference in growth between BrainPOP users and those who did not use BrainPOP, we looked at effect size. We found effect sizes of  $+.34$  for Reading Comprehension,  $+.29$  for Science,  $+.17$  for Language, and  $+.09$  for Vocabulary. This is a large effect, particularly for Reading Comprehension, Science, and Language, indicating that the students in classes using BrainPOP performed well above the students in classes that did not use BrainPOP.

BrainPOP was found to be effective at all three grade levels included in the study (grades 3, 5 and 8). BrainPOP was found to be equally effective for boys and girls; students of different ethnicities; and both students receiving free or reduced lunch services and those not receiving this service.

The findings of this study demonstrate that students in classes using BrainPOP achieve substantially more growth in Science, Reading comprehension and Language skills than students in classes that do not have the benefit of BrainPOP in their classroom.