Final Report

An Efficacy Study of *Comprehension Upgrade* at

Valencia Park Elementary School
&
Casa De Oro Elementary School

Prepared by

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Summary
This investigation evaluated the effectiveness of *Comprehension Upgrade*, a web-based intervention course, on the reading comprehension skills of elementary school children identified as struggling readers. In an after school setting, fifth grade students were randomly selected and then assigned to participate in one of two computer-based reading activities (*Comprehension Upgrade* or another computer-based activity). Specifically this study examined students' reading comprehension performance before and after the computer-based intervention. Finally, the relationship between all students' engagement levels and reading performance were assessed. Results showed significant gains in reading comprehension and other related skills for students who received the *Comprehension Upgrade* intervention. These findings further contribute to the development of successfully designed computer-based learning environments for struggling readers.

The Web-Based Reading Intervention: *Comprehension Upgrade*
Comprehension Upgrade (www.readingupgrade.com) is based on several research driven findings (Chall, 1983; Goodman & Goodman, 1990; Snow, Burns & Griffin, 1998). This program presents a new and meaningful approach to teaching vocabulary development, narrative and expository comprehension, as well as other related cognitive strategies necessary for comprehension that draws upon the widely valued medium of hip-hop music and multi-ethnic graphic representations of characters. This model combines the following elements:
- Internet-connected computer
- 50 lessons consisting of an instructional portion with songs and digitalized videos
- Practice activity consisting of an interactive game
- Students typically engaged for 30-60 minutes per session
- Students typically complete 2-5 lessons per session
- A certificate is received when all 50 lessons are complete.

Table 1 displays the specific topics covered in *Comprehension Upgrade*. In these lessons students must actively read and demonstrate mastery of comprehension. A variety of texts are presented including expository (informational) text such as science and social studies, narrative text such as stories and poems, and media such as advertising, newspaper articles and email. Students must master comprehension techniques such as K-W-L (know, want to learn, learn), QAR (Question Answer Relationships), Story Maps, and Expository Organizers. In addition, a variety of vocabulary building exercises emphasize fundamentals such as word origins and the application of vocabulary to comprehension.

As an example, Level 10 "K-W-L" teaches the student the technique of using a "What I Know, What I Want To Know, What I Have Learned" chart. In a song, a teacher and a student move back and forth to fill in a K-W-L chart about the subject "Mount Fuji". This lesson includes work before and after reading the passage. Next, the student plays a game where they actively fill in K-W-L charts involving a number of different passages.

The lesson teaches a student to think before reading and demonstrates to the student that he or she is capable of learning through reading.

Table 1: Content in *Comprehension Upgrade*:	
Vocabulary Synonyms Antonyms Homonyms Root Words Word Origins Idioms Common Word Lists **Subject Reading** History, Geography Biology, Science, Math Poetry, Art, Music Email, Web Pages	Comprehension Author's Purpose & Tone Metaphor and Simile Types of Text, Formats Generalization, Summary Strategy: K – W – L QAR: Question-Answer Relationships Story Maps, Concept Imagery Main Idea, Theme Charts and Graphs Narrative Organizers Reference Books Critical Thinking Context Clues

Methodology

Participants
Teachers randomly selected a sample of 40 students in fifth grade to participate in the trial. The students ranged in age from 10-12 years old (M=10.8). The sample demographically represented the majority of struggling readers throughout their school district and consisted of 12 African American, 14 Latino, 10 Caucasian, and 4 Filipino students. Approximately 35% spoke a language other than English as their native language. Selected students' reading ability ranged from proficient to below grade level with minimum fluency. Students enrolled in Special Education Programming were not included in this study. All participants and their parents returned a signed informed consent form.

Site Selection
The research activity occurred at Valencia Park elementary school located in southeast community of San Diego and Casa De Oro elementary school located in La Mesa/Spring Valley area. These schools were selected because of the interest and support of the teachers and principal. The instruction and evaluation was conducted during after school hours in a classroom and computer lab. Table 2 displays a demographic profile for the participating schools.

Table 2: School Demographics

Casa De Oro Elementary- La Mesa-Spring Valley Unified School District	
School Type:	Elementary
Grade Level:	K–5
Total Enrollment:	529
African American:	26%
Asian:	1%
Filipino:	1%
Hispanic:	34%
Pacific Islander:	2%
White:	28%
No Response:	6%
Free/Reduced Lunch:	75%
Title I Funding:	Yes

Valencia Park Elementary – San Diego Unified School District	
School Type:	Elementary
Grade Level:	K–5
Total Enrollment:	729
African American:	49%
Filipino:	8.6%
Hispanic:	28.8%
Indochin.	8.9%
White:	3.5%
No Response:	2.0%
Free/Reduced Lunch:	82%
Title I Funding:	Yes

Measures

Several measures were used to assess students' reading comprehension performance and engagement level.

The Gray Oral Reading Test - Fourth Edition (Wiederholt & Bryant, 2001) was administered to provide reading assessment before and after the intervention. The GORT-4 is comprised of two parallel forms, each containing 14 developmentally sequenced passages with five comprehension questions. Each correct response is worth 1-point.

Reading Performance Instrument (Cole, 2000): this instrument explicitly addresses the reading comprehension strategies such as: author purpose, text-recall, main idea, and inference. The questions are in multiple-choice format and phrased to elicit only one correct answer. There are 25-items and each correct response is worth 1- point.

California Achievement Test (Reading Subscale): scores from this standardized test administered by the school are used to correlate with other reading performance instruments in this study if parental permission is granted.

Engagement Questionnaire (McNair, Lorr, & Doppleman, 1992): This adapted measure contains 12-adjective items that describe various levels of attention and clarity. Each of the 12-itmes is rated on a 4-point Likert-scale, with 0 being the lowest and 3 the highest. The sum of the items is calculated to obtain a score for engagement level.

Procedures
In the spring of 2004, students were pre-tested on all measures except the CAT-6. The school administered the CAT-6 to the students after the study was complete. Participants' CAT-6 scores were obtained at the end of the study if granted parental consent. Next, students were randomly assigned to the *Comprehension Upgrade* intervention or control group. The control group played generic computer-based reading games activities with no instruction. There were a total of 20 students in each group. Students met for 2 hours twice a week for approximately 10 weeks to complete the intervention. Research assistants monitored attendance for the duration of the study. Finally, students were post-tested at the end of the10-week session, regardless of level obtained in the *Comprehension Upgrade* intervention course.

Results

Table 3 presents attendance data across the various demographic variables. Total number of days possible was 24. The overall average number of days attended by the students was 18. The variability across treatment and control groups was extremely large, indicating that students in the *Comprehension Upgrade* group attended more than 90% of the days available.

Table 4 displays pre-post test mean scores for reading performance in the treatment and control groups categorized by demographic variables. An independent t-test revealed a significant difference in performance across all measures such that students in the *Comprehension Upgrade* group made more gains in reading comprehension than the control group (t_{18}=7.53, p <.01). The difference in CAT-6 scores between the two groups were found to be statistically significant using a t-test (t_{18} = 52.3, p<01), such that the *Comprehension Upgrade* group were more proficient in reading comprehension than the control group. There were no statistically significant differences between groups on the engagement questionnaire, however attendance and observation data presented in Table 3 suggest that students in the *Comprehension Upgrade* group were more motivated to attend and engaged in the activity. The mean scores across ethnicity and gender did not vary greatly between or within the treatment and control groups.

Table 5 shows the mean subject performance scores for *Comprehension Upgrade* subject areas and average level completed. Students' performed significantly higher in the subject areas of Graphic Organizers and Concept Imagery (96%); Narrative/Literature comprehension (81%); and Information/Expository comprehension (83%). More than half of the students (n=11) reached Level 30 or higher. Figure 1 illustrates individual students performance in each subject area.

TABLE 3. Demographic Variables and Attendance

Comprehension Upgrade	Days Attended (20)	
Ethnicity	N	Mean
African American	6	20
Hispanic	7	18
Filipino	2	20
White	5	20
total	20	19.5
Gender		
Female	11	20
Male	9	19
total	20	19,5
		(95%)
Control Group		
Ethnicity	N	Mean
African American	6	15
Hispanic	7	17
Filipino	2	16
White	5	18
total	20	16.5
Gender		
Female	9	17
Male	11	16
total	20	16.5
		(82%)
TOTAL	**40**	**18**

TABLE 4. Reading Performance By Demographic Variables

Assessments	Comprehension Upgrade (n=20)					Control Group (n=20)				
	Pre	Pre Grade Equiv.	Post	Post Grade Equiv.	Gain	Pre	Pre Grade Equiv.	Post	Post Grade Equiv.	Gain
GORT-4 Ethnicity	17	4.1	27	5.3	1.2	19	4.2	23	4.9	0.7
African American	14	3.9	24	5.0	1.1	14	3.9	18	4.1	0.2
Hispanic	13	3.9	22	4.9	1.0	15	4.0	18	4.1	0.1
Filipino	17	4.1	25	5.2	1.1	19	4.2	23	4.9	0.7
White	18	4.1	26	5.2	1.1	20	4.3	23	4.9	0.6
Gender										
Female	16	4.0	27	5.3	1.3	18	4.1	22	4.9	0.8
Male	17	4.0	25	5.2	1.2	19	4.3	23	4.9	0.6
Reading Performance Test Ethnicity	13	------	22	-------	9	14	-----	18	------	4
African American	14	-------	21	-------	7	15	-----	19	------	4
Hispanic	11	-------	20	------	9	12	-----	14	-------	2
Filipino	13	-------	22	------	9	14	-----	18	------	4
White	15	------	24	------	9	16	-----	20	-----	4
Gender										
Female	11	------	20	-------	9	16	----	19	-----	3
Male	13	------	22	-------	9	14	----	18	-----	4
Engagement	6	-----	9.3	-----	3.3	4.5	------	7	------	2.5
2003 CAT-6	56% Proficient					49% Proficient				

Table 5. Performance Scores for *Comprehension Upgrade* Subject Areas

Comprehension Upgrade Computer Log Report

Subject Area Scores	% Correct
Vocabulary Development	76.6
Narrative/Literature Comprehension	81.5
Information/Expository Comprehension	83.2
Graphic Organizers, Concept Imagery	96.9
Functional, Directions, Research	63

Level Completed	Number of Students (n=20)
50	6
40-49	2
30-39	3
20-29	3
10-19	6
1-9	0

Figure 1. Individual Performance Scores by Subject Area

Comprehension Upgrade Computer Log Report
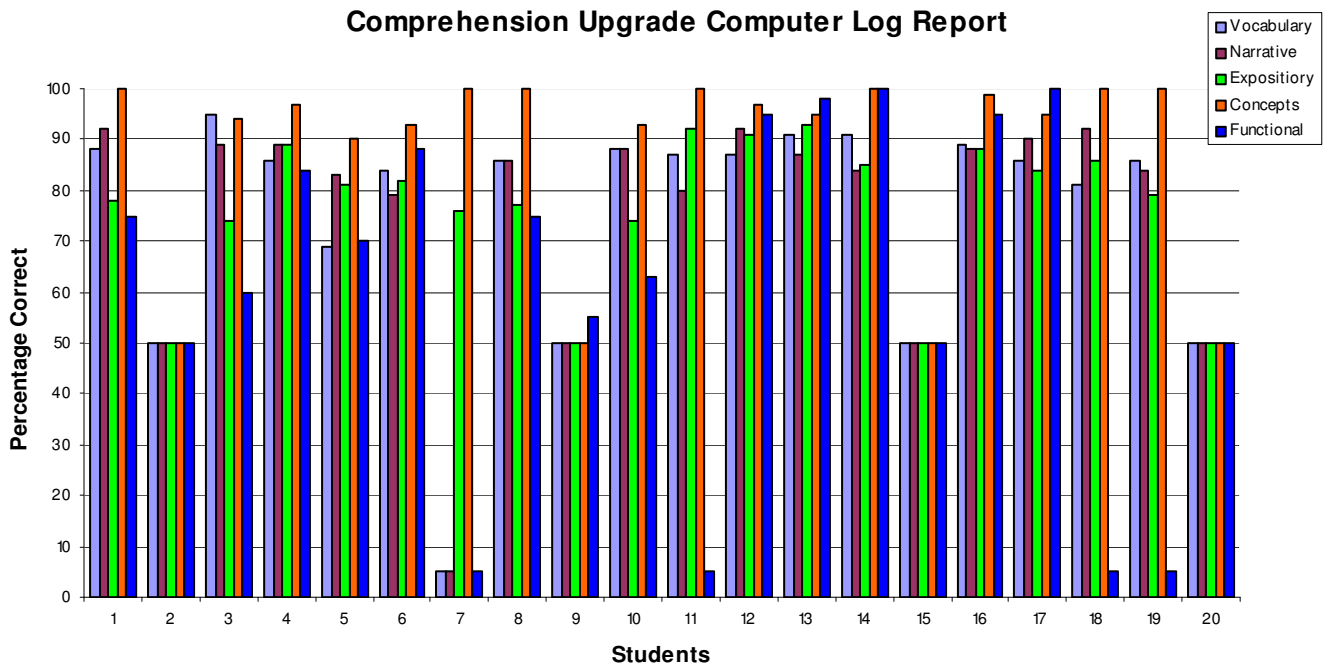
Conclusion

Comprehension Upgrade is a reading intervention that demonstrates quantifiable improvement in reading achievement for struggling readers. The course is designed for those students reading below grade level.

During the Spring 2004, *Comprehension Upgrade* was implemented as an after school activity in two schools in San Diego County. Baseline data and pretests provided in this current descriptive report indicated the majority of these students are at risk or struggling readers by California's academic performance standards.

Observations during the study indicate the *Comprehension Upgrade students* are in an enjoyable environment where learning occurs. Students were able to access and operate the website without major difficulties. The observations further indicated that the program is highly motivational due to the built-in incentives (e.g., points, level advancements, and certificate) and students are comfortable with the program.

Results of the data analyses indicate that *Comprehension Upgrade* participants made gains in reading comprehension and other related reading skills in ten weeks and were significantly higher than an equivalent control group of students who did not participate in the course but played computer-based reading games without instruction. Although caution is warranted in generalizing these findings due to the small number of participants, the results are nonetheless very compelling. Future investigations should consider using the *Reading Upgrade i*ntervention program and the *Comprehension Upgrade* program jointly in order to obtain maximum impact on student reading achievement. Additionally, future studies must consider a larger sample size, other reading comprehension assessments, and more rigorous statistical analyses to account for predicting and mediating variables. Finally, it is clear that *Comprehension Upgrade* is effective in both engaging students and raising both reading comprehension scores.

About the Evaluator

Dr. Juanita Cole earned her Ph.D. in developmental psychology from Howard University in Washington, DC. Her primary research interest is the influence of culture on cognitive and social development, with a special interest on African American and Hispanic children. Other areas of interests include health disparities, resiliency, reading comprehension, academic motivation, and the design of culturally tailored basic and health literacy curriculum. During 2002- 2004, she served as the Principal Investigator for a research grant funded by the National Science Foundation, Culture Computers Literacy Active Play (Project CCLAP), that involves the design of computer and non-computer based reading instruction which builds upon the social and cultural assets students bring from their home and community experiences. Currently she is a Research Scientist in the Laboratory of Comparative Human Cognition and Lecturer in the Human Development Program at the University of California, San Diego.