Quantitative Data Report: Examining Standardized Test Performance in English Language Arts among Students with Two Consecutive Years of Participation in the Globaloria Social Network for Learning Game Design

Laura Minnigerode

World Wide Workshop

I. Abstract

The following report summarizes changes in performance on critical thinking and analysis assessments in students engaged in the Globaloria social network for learning game-design program at the East Austin College Prep Academy (EACPA) in Texas. All students at EACPA engage in Globaloria as a daily activity within their school day, year after year. As such, the seventh grade students in this study have had two consecutive years of experience in the Globaloria program. Analysts compared pre and post-test scores from all seventh grade students on the state standardized assessment, the Texas Assessment of Knowledge and Skills (TAKS). For this analysis, they selected an objective that aligns with one of the tasks and competencies used in game design and game making, and specifically those used in researching a social issue related to science used as the content of the game. This objective is known as *Applying Critical Thinking* within the Texas Essential Knowledge and Skills *(TEKS),* and is evaluated by the TAKS assessment. The results of this analysis show that students showed very significant change in the Applying Critical Thinking objective, while their performance on other ELA objectives did not show significant change.

II. Main Body

What is Globaloria – update as per the 6th grade paper please

Globaloria (www.Globaloria.org), a program established by the World Wide Workshop in 2006, is an educational intervention for students to develop learning abilities by designing and building original webgames in a wiki-based networked environment. Globaloria is a yearlong academic curriculum comprised of programmable wikis, blogs, game design and programming tutorials, game-content resources, and a virtual support systems for educators and students. Students drive the design process, taking an original idea to final product. In a student-centered or 'workshop' classroom, students learn both technical and computational skills and in content knowledge in preparation for college-level studies, especially in STEM curricula of science, technology, engineering, and mathematics. (World Wide Workshop 2010).

Globaloria at EACPA, 2009-2011

The students attend a new charter middle school, opened in 2009, designed for and populated by students who are from the surrounding economically disadvantaged community. The students are 85% Hispanic, 15% African American and 60 % English Language Learners. During the first year of the program, 2009-10, the students in this sample were in sixth grade, and they took a Globaloria class that

was 90 minutes long, each day, and focused on math content. During the second year, all students again took a Globaloria class, which was 75 minutes daily, and focused their games on social issue topics related to science.

In the Globaloria class, educators use a student-centered approach of guiding students to find answers to questions about their game-topic, generally more student led with relatively smaller amounts of direct teaching on the topic. In a student-centered or 'workshop' classroom, students learn both technical and computational skills and gain content knowledge in preparation for college-level studies, especially in STEM curricula of science, technology, engineering, and mathematics. Educators engage in multi-year, blended (onsite and online), rigorous professional development that prepares them to manage and master this Constructionist learning environment (World Wide Workshop 2010).

In 2010-11, for a second year, these students used research skills to understand and document a social issue related to science. The students used the information from their research for the theme of their game. The approach where students learn by design is drawn from Constructionist theory, which states 'learning is most effective when part of an activity the learner experiences as constructing a meaningful product.' (Papert, 1987).

Students engaged in class activities in which they learned how to research a topic, collect information, form questions and analyze information they gathered. See

Figures 1 and 2 below for examples of one student's work. During the second year, the students received more structured support in this activity. All students spent time conducting research online with materials from the Globaloria curriculum and used the Globaloria wiki platform and blogs to present research findings. The Globaloria educator used resources from outside of the course, including newspaper articles, films and educational websites, to model the research process and access to virtual game design experts. Because of the amount of time the students spent reading and thinking about information related to their social and science-related issue, researchers identified the ELA TAKS objective that measures critical analysis of written material, *Applying Critical Thinking Skills*, as a measure of change in this area.

See examples of the English Language Arts and Social Studies learning competencies that are aligned with Applying Critical Thinking objective in Table 2 in Appendices.

Figure 1 Student research notes on blog

Monday, November 15, 2010

Valerie F. 13 2010

"Strange Days on Planet Earth"

Part 4

Some people don't care, aren't interested or don't know what they can do to help Global Warming end

70% of Earth's surface is ocean - The Pacific ocean accounts for half of that - (saltwater)

Krill are a type of Plankton (apparently there are like BILLIONS!)

Krill populations is somehow decreasing

If these tiny organisms where to die out then the whole food web in the ocean could be disrupted

The was a crash of populations in the 80 but in the 90 the populations came back

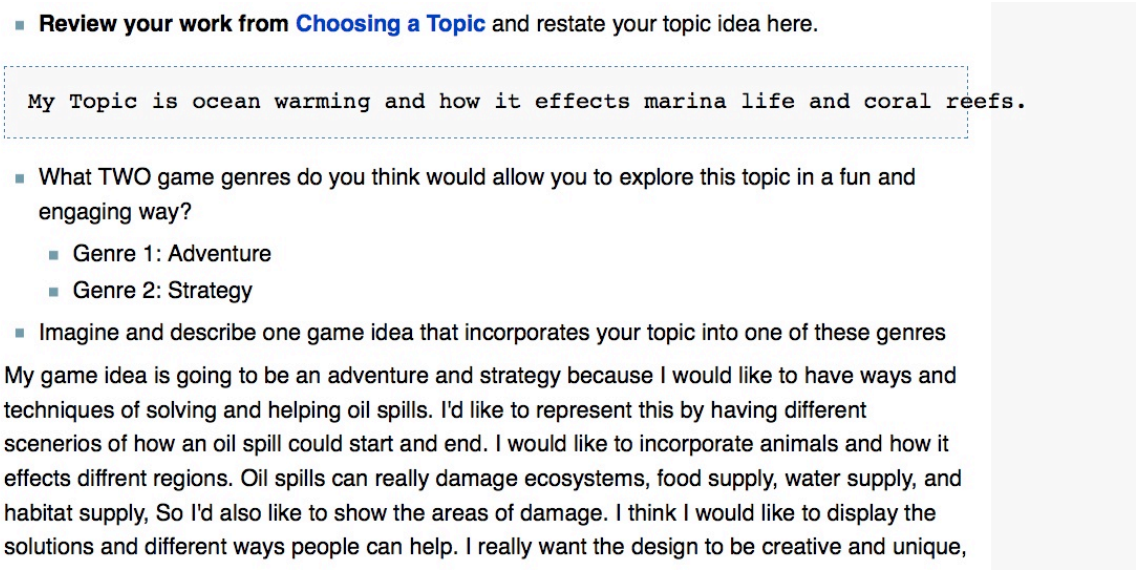
Scientist believe that the fall and increase in Krill Plankton was caused by temperature shifts in the ocean

There are sudden temperatures that the tides bring to the shore

Could some temperatures rise to the point where some organisms die?

Th Earth's climate is LINKED to every person.... So everything is linked!

Figure 2: Student research on wiki page



- **Review your work from Choosing a Topic** and restate your topic idea here.

```
My Topic is ocean warming and how it effects marina life and coral reefs.
```

- What TWO game genres do you think would allow you to explore this topic in a fun and engaging way?
  - Genre 1: Adventure
  - Genre 2: Strategy
- Imagine and describe one game idea that incorporates your topic into one of these genres

My game idea is going to be an adventure and strategy because I would like to have ways and techniques of solving and helping oil spills. I'd like to represent this by having different scenerios of how an oil spill could start and end. I would like to incorporate animals and how it effects diffrent regions. Oil spills can really damage ecosystems, food supply, water supply, and habitat supply, So I'd also like to show the areas of damage. I think I would like to display the solutions and different ways people can help. I really want the design to be creative and unique,

We analyzed scores from all students in seventh grade, using a Benchmark assessment as pre-test and TAKS administration as a post. Exclusions were special

education students who took a modified TAKS, students who left the school before taking the TAKS or students who joined the student body after the pre-test was administered in October. The first benchmark (or pretest) TAKS of the seventh grade was administered on October 10, 2010. The 2011 TAKS was administered in late April 2011, and the raw scores from the *Applying Critical Thinking* objective on that assessment are included in Figure 3 in the Appendix of this report.

IV. Results and Statistical Analysis

The seventh grade students' scores on the *Applying Critical Thinking* objective were significantly higher on the final administration of the TAKS test, on average. Some students improved as much as 100% between the pre and post tests on the objectives examined.

To examine the change in student performance on *Applying Critical Thinking*, researchers took raw scores of all seventh grade students. To measure the change, researchers compared the scores from the first benchmark and the final TAKS test on this one objective, as in the previous analysis. The results were analyzed using a two-tailed, Paired Sample T-Test. After performing this analysis, we again find that the change in the scores of the students is 'very statistically significant.' See Figure 3 below for further details about the statistical analysis.

Figure 3: Statistical analysis of Applying Critical Thinking TAKS (pre and post)

Paired t test results for Applying Critical

Thinking

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals -7.269

95% confidence interval of this difference: From -10.833 to -3.705

Intermediate values used in calculations:

t = 4.0598

df = 79

standard error of difference = 1.790

Group	Group One	Group Two
Mean	68.93	76.199
SD	19.761	15.536
SEM	2.209	1.737
N	80	80

Student Performance on Other Objectives within the ELA Subject Area

A comparison was made between pre and post scores on the objectives areas of the English Language Arts (ELA) assessment. The chart below depicts the content that each objective is meant to measure, followed by the mean score for the cohort on each one. Note that the differences from pre to post were significant in just two of

the four objectives, (Objective 1 and 4), both of which showed a statistically significant improvement.

Figure 4 ELA Objectives and Descriptions

Objective	1: Basic Understanding: Finding important details, recognizing accurate summaries	2: Applying Knowledge of Literary Elements: Understanding parts of a story, setting, characters, etc	3: Using Strategies to Analyze: Knowing purposes for reading, recognizing characteristics of types of selections, using graphic organizers like charts or pictures	4: Applying Critical Thinking Skills: Using critical thinking skills to develop understanding, drawing conclusions, developing ideas, and using text to support their ideas
Mean scores	Pre78.78 Post **84.33**	Pre 76.25 Post **75.18**	Pre 74.00 Post **73.18**	Pre 68.93 Post **76.19**

V. Limitations of Standardized Test Scores to Measure Student Achievement

For this research, researchers used Benchmark (pre-test) scores and TAKS score for the same objectives from the Texas Essential Knowledge and Skills. The Benchmark instrument is designed to examine the same objectives; however, it is designed by a different publisher. Therefore, the post-test was not an administration of an identical test, or one created by the same author. It is possible that a difference in level of difficulty between the instruments could influence scores. Test administrators report that the benchmarks examinations are administered in a serious 'testing' environment at EACPA, but regardless of this, there is a tendency for students to be less focused during a Benchmark than during the actual high stakes testing administration. This also introduces possibility of difference in

student attitudes about the importance of the assessment. Our use of standardized pre-tests and tests as a diagnostic tool is limited by these factors, and should be viewed as such.

VI. Findings

The results show substantial improvement of non-special education students from the seventh grade Globaloria class at East Austin College Prep Academy on the ELA objective linked to critical thinking. The average improvement of the students of these students in this objective is statistically significant from pre-to post test, while their improvement on other objectives was mixed, but not statistically significant.

Teacher interviews and observation support the idea that the Applying Critical Thinking objective is related to work that the students did in the Globaloria class. Two of the other English Language Arts objectives focus closely on literature and literary elements and so are less closely related to work in the game design research.

During the 2009-10 school year, researchers found that participation in Globaloria supported a student's achievement on the specific TAKS objective that was assigned to her or him as the math content for his or her team's game, as compared to the students' pre-test scores. In addition, findings from this study form the basis for a longitudinal study about these students, where we will follow their *Applying Critical Thinking* performance (ELA) across their Globaloria experience.

It is important to note that students made games about science this year, but did not take a standardized test on science, as that test is given in 8th grade in Texas.

VII. Conclusion

The findings above build upon results from a previous examination of test scores (Minnigerode, 2010), which also showed higher than expected improvement on assessment scores on [math] objectives that were assigned to students. Further, the current study begins to address the interdisciplinary and higher level thinking aspect of Globaloria's impact. These data suggest that participation in Globaloria as part of East Austin College Prep Academy's overall curriculum had a significant positive impact on students' achievement.

VII. References

Papert, Seymour. (1987) *Constructionism: A New Opportunity for Elementary Science Education*. National Science Foundation Abstract Award Abstract #8751190.

Harel Caperton, I., Oliver, A., Sullivan, S. (2010) World Wide Workshop Annual Report 2009-2010 (World Wide Workshop, NY).

Minnigerode, L. (2010) Using Quantitative Data To Assess Impact Of Globaloria On Student Performance in an at Risk Middle School Student Population (World Wide Workshop, NY). Retrieved from: Worldwideworkshop.org/reports

Appendices

Figure 5: Examples of Applying Critical Thinking objective

Examples of Learning Objectives Generally Aligned to the *Applying Critical Thinking* TAKS Objective	
Language Arts Competencies	
Student evaluates his/her own research and frame new questions for further investigation.	Student summarizes and organizes ideas gained from multiple sources in useful ways such as outlines, conceptual maps, learning logs and time lines.
Student produces research projects and reports in effective formats for various audiences.	Student presents information in various forms using available technology.
Student evaluates his/her own research and frame new questions for further investigation.	Student uses compiled information and knowledge to raise additional, unanswered questions.
Social Studies Competencies	
Student incorporates main and supporting ideas in verbal and written communication.	Student uses a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.
Student uses a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution and evaluate the effectiveness of a solution.	

Figure 6 Pre and post Applying Critical Thinking scores for all students

Seventh Grade Students' Scores in Applying Critical Thinking objective on TAKS

Student #	Pre	Post	Student #	Pre	Post
1	80.0%	50.0%	41	90.0%	90.0%
2	0.0%	70.0%	42	90.0%	80.0%
3	90.0%	80.0%	43	40.0%	80.0%
4	80.0%	90.0%	44	30.0%	40.0%
5	70.0%	70.0%	45	70.0%	100.0%
6	70.0%	50.0%	46	30.0%	70.0%
7	60.0%	40.0%	47	30.0%	40.0%
8	80%	70.0%	48	10.0%	20.0%
9	80.0%	90.0%	49	80.0%	90.0%
10	40.0%	60.0%	50	90.0%	60.0%
11	80.0%	80.0%	51	30.0%	90.0%
12	90.0%	60.0%	52	80.0%	80.0%
13	60.0%	70.0%	53	100.0%	100.0%
14	70.0%	40.0%	54	70.0%	80.0%
15	100.0%	70.0%	55	80.0%	100.0%
16	60.0%	40.0%	56	90.0%	100.0%
17	60.0%	80.0%	57	90.0%	90.0%
18	90.0%	50.0%	58	80.0%	90.0%
19	100.0%	100.0%	59	80.0%	90.0%
20	90.0%	50.0%	60	80.0%	40.0%
21	80.0%	70.0%	61	70.0%	90.0%
22	80.0%	80.0%	62	90.0%	80.0%
23	80.0%	90.0%	63	60.0%	40.0%
24	90.0%	60.0%	64	70.0%	60.0%
25	80.0%	80.0%	65	80.0%	90.0%
26	80.0%	90.0%	66	40.0%	40.0%
27	80.0%	80.0%	67	80.0%	100.0%
28	50.0%	80.0%	68	80.0%	90.0%
29	90.0%	80.0%	69	90.0%	70.0%
30	80.0%	60.0%	70	80.0%	70.0%
31	90.0%	90.0%	71	90.0%	90.0%
32	90.0%	80.0%	72	70.0%	80.0%
33	60.0%	60.0%	73	90.0%	100.0%
34	100.0%	80.0%	74	80.0%	90.0%
35	80.0%	70.0%	75	90.0%	70.0%
36	80.0%	90.0%	76	70.0%	30.0%
37	100.0%	50.0%	77	90.0%	80.0%
38	80.0%	80.0%	78	30.0%	30.0%
39	60.0%	40.0%	79	90.0%	80.0%
40	80.0%	90.0%	80	80.0%	80.0%
			81	80.0%	80.0%