Globaloria Student Outcomes: An Overview of What We Have Learned About Urban Charter Middle School Students Who Design Games

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Abstract: Game design programs are becoming more common in middle and high schools. The Globaloria program, which combines research and media literacy with computer programming and game design, in a networked setting, is used by thousands of students in several states. This paper presents survey and student achievement data from students at one middle and high school where all students participate in the program daily, and will do so from 6th -12th grade. While this information represents the early stages of a seven-year longitudinal study, some promising changes in student self-efficacy, STEM career goals and achievement measures are reported. This research will continue across seven years, following students from grade 6-12.

What is Globaloria?

Globaloria (www.Globaloria.org), a program launched by the World Wide Workshop (www.WorldWideWorkshop.org) in 2006, is an educational intervention for students to develop digital literacies, STEM knowledge and global citizenship by designing and building original webgames in a wiki-based collaborative and 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 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).
All students at East Austin College Prep Academy (EACPA) participate daily in Globaloria for 75-minutes, and will do so each year from 6th through 12th grade. The school is 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 80% Latino and 20% African American. Approximately 40% of students are English Language Learners.

In the Globaloria class, educators use a student-centered approach of guiding students to find answers for their questions about their game-topic among their peers and using available virtual resources, including live and asynchronous expert helpdesk and tutorials, rather than direct teaching, thereby enhancing research and problem solving skills. Educators receive just-in-time in-person and virtual training and support to refine their use of this approach. They also create lessons and adapt Globaloria tools to fit the needs of the students in this population, making the game design process accessible and relevant.

This paper summarizes the research conducted during 2010-11, which represents part of an opportunity for longitudinal study of digital learning.

Globaloria Students' Technology Learning Self Efficacy

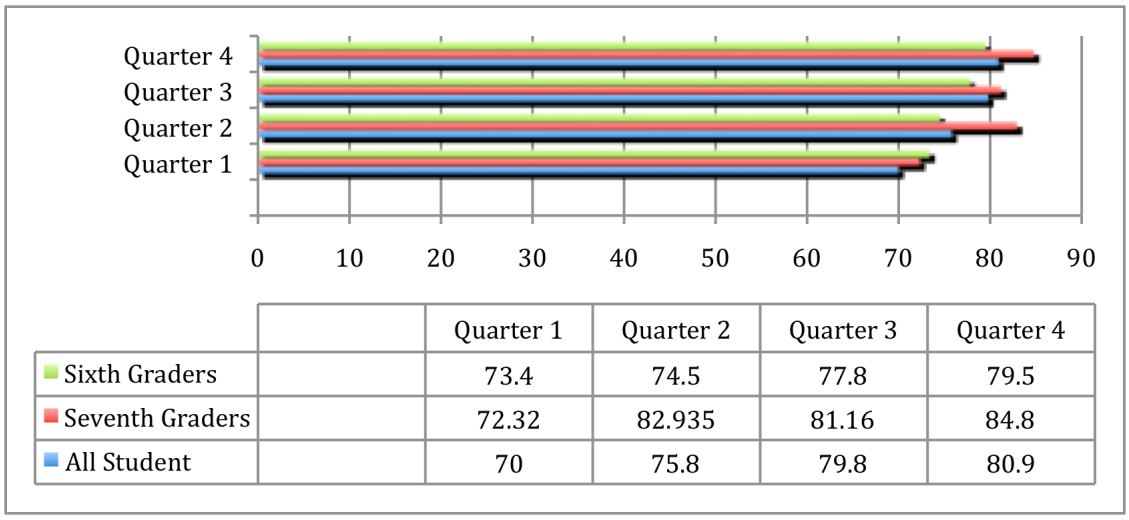
During the Pilot Year 2 (PY2) of the program, there were two student groups: students in grade 6, who were new to Globaloria and students in grade 7, who were for the most part engaging in a second year of the program. During PY2, the researcher collected data from students about their perception of self-efficacy with regards to technology, using an instrument derived from *Guide for Constructing Self efficacy Scales* (Bandura, 2006), but tailored to measure self efficacy related to the specific skills and competencies of 21st century learning.

The students responded to a survey by rating their confidence in their abilities in ten skill areas related to the 21st century learning tasks in Globaloria.

Three of the eleven survey questions have been analyzed. These items were analyzed first because of alignment to 21st century skills important to the program:

How confident are you that you can help other students who are stuck on something in Globaloria?
How confident are you that you can put your thoughts and ideas into words that are easy for people to understand on your blog?
How confident are you that you can figure out what to do when you get stuck on something doing Flash in Globaloria?

Analysis of the full year's data shows that participating in Globaloria for multiple years is a factor in students becoming more confident in their technology abilities. Note that while the scores for 7th grade girls were somewhat higher, the ultimate change difference between boys and girls overall was not statistically significant. Further analysis will compare subgroups for statistical differences. The table below depicts change in student responses across four quarters of the year to the question: *How confident are you that you can figure out what to do when you get stuck on something doing Flash in Globaloria*?



		Quarter 1	Quarter 2	Quarter 3	Quarter 4
Sixth Graders		73.4	74.5	77.8	79.5
Seventh Graders		72.32	82.935	81.16	84.8
All Student		70	75.8	79.8	80.9

Table 1: Changes in student responses to a self-efficacy question on problem solving in engineering, across a school year

For a more complete discussion of this Globaloria and Self-efficacy study, please see the upcoming full report: **STEM Skill Self-Efficacy in At Risk Language Learner Middle School Students in Globaloria,** available at **worldwideworkshop.org/reports**

Globaloria Student Performance on Standardized Assessments

Like all students in public education, Globaloria students are evaluated with an annual standardized test. Students in this particular population take the Texas Assessment of Knowledge and Skills, or TAKS, each April. Students in 6th grade made games focused on one math objective as the content for their games. Since part of the game design process was using math concepts to create activities in which players of the game will engage, the students interacted with the assigned content more than with any other math objective. For this reason, for 6th grade students, research also focused on the students' performance on the *Numbers, Operations and Quantitative Reasoning (NOQR)* objective tested on the TAKS.

For both 6th and 7th grades, observation and teacher progress reports documented that learning and modeling research skills was a major focus of the class. Observation and teacher interviews support the connection between the *Applying Critical Thinking* (*ACT*) objective and the work that the students performed in the Globaloria classroom. As part of the Globaloria curriculum, 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 educators used resources from outside of the course, including newspaper articles, films and educational

websites, to model the research process. Because of the amount of time the students spent reading and thinking about information related to their social and science-related issue, researchers looked at the student scores on *ACT,* which focuses on analysis of written material, as a measure of program impact.

The first benchmark for the TAKS test was administered in Fall 2010 and the results from that administration are used as pre-test scores here. The statewide TAKS test was administered in late April 2011. Scores for 6th and 7th grade students were analyzed with a paired T-test to determine improvement.

The results of these analyses show substantial improvement of students from 6th and 7th grade Globaloria classes on the ELA objective designed to measure critical thinking. The average improvement of the students' scores on this objective from pre-to posttest was 'very statistically significant', while their improvement on other ELA objectives included some improvement, but not statistically significant change. Further analysis is taking place to determine qualities of student participation among those who have shown the greatest improvement in this and other areas, and to look for patterns or correlations that could inform the field and lead to stronger STEM performance through game design. See Table 2 below for a summary of the pre and post test scores for the *Applying Critical Thinking* objective, for the cohort of grade 6 students who are in their first year of Globaloria study, and cohort of grade 7 students who are in their second year of Globaloria.

Grade 6 Applying Critical Thinking TAKS objective			**Grade 7 Applying Critical Thinking TAKS Objective**		
Group	Pre	Post	**Group**	Pre	Post
Mean	57.44	79.71	**Mean**	68.93	76.199
SD	17.9	18.61	**SD**	19.761	15.536
SEM	1.98	2.06	**SEM**	2.209	1.737
N	82	82	**N**	80	80

Table 2: Pre and post scores of Globaloria students on Applying Critical Thinking English-Language Arts TAKS objective

In order to determine whether the change in raw student scores on the Math Objective NOQR was statistically significant, we took Benchmark/pre-test scores and post-test scores from each student in the focus group. Performing this analysis, we found that the change in the pre to post scores was 'very statistically significant'. See Table 3 below for an analysis of pre and post test scores for Grade 6 students in *NOQR*.

Grade 6 Numbers, Operations, and Quantitative Reasoning Objective		
Group	Pre	Post
Mean	51.37	66.3
SD	24.44	23.53
SEM	2.72	2.61
N	81	81

Table 3: Pre-and post-test scores for Globaloria 6th grade students on *NOQR* Math Objective

Student Motivation: Responses on Pre and post Globaloria program surveys

As part of a longitudinal study which involves the students in East Austin across all years of Globaloria participation, we are examining students' reactions to, before beginning the Globaloria course, all students in the 1000+ user network of Globaloria, including those in East Austin, respond to a pre-program survey that is designed to collect demographic and background information about students' experience with and attitudes about technology use. Students then also respond to an almost identical post-program survey at the close of the year.

Students take a survey that includes questions about their motivation for learning new technology and game design skills. This survey is given to all Globaloria students, nationally, but is especially interesting for the East Austin student population since they are required to take the class. It is therefore possible that students who are continuing may not be motivated or interested. The survey question is a statement with a variety of response options, as illustrated below;

I want to learn technology and game design skills:

Because I would feel proud if I continued to improve at technology and game design.
Because it is interesting
Because it's exciting to try new ways to use technology for game design.

For each of the above response options, students selected one of the following responses:

Not at all true
Not usually true
Sometimes true
Usually true
Very true

Responses to this question were analyzed as a source of information about gender differences and motivation. The breakdown of student responses is depicted in the chart below. There is no significant difference in gender groups. This information forms the beginning of a longitudinal study where we will track responses to this question across seven years of participation, along with examining other factors related to the programs impact.

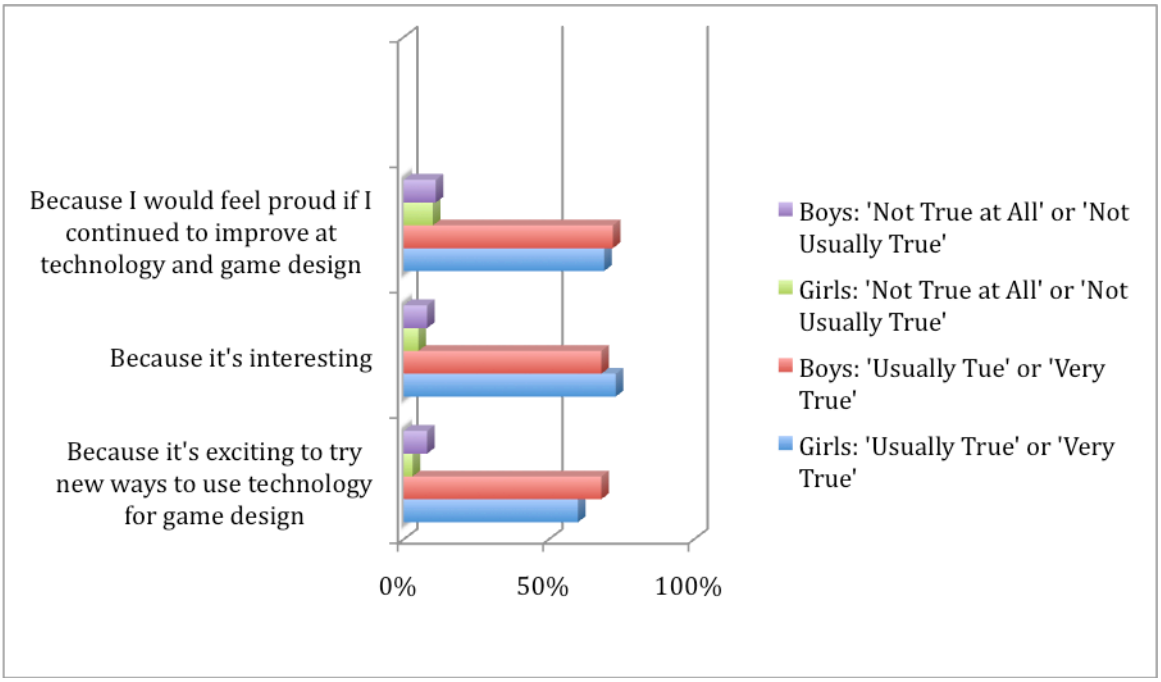


Table 4 Chart depicting student survey responses indicating motivation for learning game design skills

	Girls: 'Usually True' or 'Very True'	**Boys: 'Usually Tue' or 'Very True'**	**Girls: 'Not True at All' or 'Not Usually True'**	**Boys: 'Not True at All' or 'Not Usually True'**
Because it's exciting to try new ways to use technology for game design	60%	68%	3%	8%
Because it's interesting	73%	68%	5%	8%
Because I would feel proud if I continued to improve at technology and game design	69%	72%	10%	11%

Table 5 Percentage breakdown of student responses from Table 4

Changes in Students' Career Goals

Opening doors to STEM careers is a key long-term goal of the Globaloria program in East Austin, a community plagued by very low educational attainments rates and high unemployment. (East Austin Children's Promise 2011). Researchers are tracking changes in student goals, using information that students supply in pre and post program surveys. The students are asked about their goals with an open-ended question and enter their career goal in a text box. The goals are coded as STEM related or non-STEM related, and then tabulated. According to pre-program surveys, 36% of the students in the 7th grade cohort group, with some leaving and new students being added, entered the program with STEM career goals. These students have participated in the Globaloria program for 2 years (6th and 7th grades), and at the end of the second year, 52% have a career goal in the STEM field. Among students who entered the program in Pilot year 2, and who have participated in the Globaloria program for 1 year (6th grade) 48% have a career goal in the STEM field. According to pre-program surveys, this group started out at 19% with STEM career goals. The chart below illustrates the changes among the two groups across their Globaloria experience.

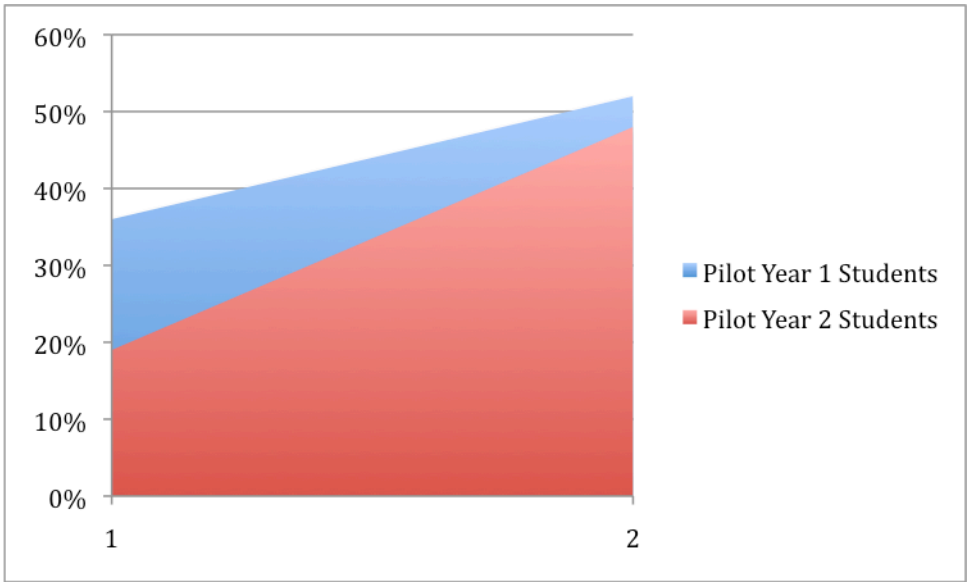


Figure 6 Number of students with career goals in a STEM field

The STEM career goals reported by students are split among medicine, engineering and tech/math fields such as architecture and computer programming. In the pre-surveys, there is a high occurrence of veterinarian as a goal, while this is much less commonly mentioned in the post-Globaloria surveys.

Statistical research is underway to further illuminate the characteristics of the students who have been impacted, tracking students' changing career goals, and correlation with other factors, to better understand how the program is working. The mechanisms behind changing aspirations and the reasons for changes in career goals are complex, but following this metric and looking for correlation within our other program data longitudinally will help to illuminate directions in this field.

Conclusion

In conclusion, this overview provides a summary of some of the qualitative and quantitative information we have about the Globaloria (game design and media exploration) program in a charter middle school in east Austin, Texas. Some of the early findings indicate that students who participate in this game design and critical thinking program show positive change in their self-perception and better than expected results on quantitative assessments. This represents the beginning of a longitudinal study, which will be the first to follow a program of this

kind over a seven-year period. Please visit worldwideworkshop.org/reports for more research information and detailed reports on the implementation of Globaloria in a variety of settings.

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