

## **Determining the Effectiveness of the 3D Alice Programming Workshop for At-risk High School Students**

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*This article provides the overview of AT & T-sponsored educational research project and the evaluation plan of the 3D visual programming use in the project. The primary focus of this project was to develop and evaluate 3D programming workshops designed to improve confidence, performance, and attitude toward school and learning of “at risk” high school students in the urban areas of Gotham County in an East Coastal area, where numbers of unsuccessful high school students has become serious concerns for educators.*

### **Introduction**

This article provides the overview of AT & T-sponsored educational research project and the evaluation plan of the 3D visual programming use in the project. The primary focus of this project was to develop and evaluate 3D programming called Alice, workshops designed to improve confidence, performance, and attitude toward school and learning of “at risk” high school students in the urban areas of Gotham County in an East Coastal area, where numbers of unsuccessful high school students has become serious concerns for educators.

Alice (<http://www.alice.org/>) is an easy-to-learn environment which allows users to build 3D visual worlds. Instead of creating traditional text-oriented programs which display meaningless messages such as “Hello World” to the screen, Alice allows the programmer to create and manipulate interesting objects (such as an ice skater). Those objects can be programmed to execute highly visual, exciting actions (such as skate and twirl). Users can create interesting environments in a short period of time, thereby increasing their satisfaction and motivation to continue. Alice was built by a group of researchers at Carnegie Mellon University under the direction of Randy Pausch (Pausch et al., 1995). The Alice application is freely available and maybe downloaded from the Website [www.alice.org](http://www.alice.org). The screen shot of the Alice environment is shown in Figure 1.



Figure 1 The screenshot of the Alice environment.

As can be seen, Alice provides a set of objects which have been pre-programmed with the basic methods for movement and interaction. Students use these as building blocks to create more complex actions, usually to tell a story or enact some type of scene. An infinite number of programs can be constructed, from simple interaction to elaborate, highly interactive scenes.

## **Need for the Project**

The area served in this project comprises the urban area of east coastal Georgia where approximately 5,600 families live in poverty. Nearly 4,000 of those families are headed by a single female. While the median household income in the county is \$42,091, the median income for families with children under 18, headed by single females is \$26,229. Gotham County Public Schools (GCPS) serves over 44,000 students, over 20% of whom live in poverty. Unlike many urban districts, the SCCPS population continues to grow; thus, the need for support of poverty-bound, at-risk youth is increasing.

According to the 2007 National Assessment of Educational Progress (NAEP), only 25% of Georgia's 8<sup>th</sup> graders reached the proficiency level or above in mathematics. More students (36%) scored below a basic level. In science, Georgia did not participate in the NAEP assessment in 2007; however, in 2005, 75% of Georgia's 8<sup>th</sup> graders scored at a basic or below level. Furthermore, in reading barely 26% of Georgia's 8<sup>th</sup> graders scored at a proficient or above level since 2002. And, in writing, Georgia students scored below the national average at every grade level. As reported by the Georgia Department of Education, Gotham County Schools did not meet AYP (Adequate Yearly Progress) in 2008, with more than 25% of the district's schools reported as not meeting standards. Of the district's seven high schools, only two passed AYP standards.

The high school completion rates in Gotham County are low, with fewer than 60% of students completing high school in four years, while the dropout rates are high. Moreover, the dropout rate for English Language Learners in the system is three times the state average, having grown more than 200% over the past three years. Finally, the dropout rate for economically disadvantaged students is higher than even that of students with disabilities.

This pilot program project will provide services to a group of students at-risk for becoming statistics in the growing numbers of unsuccessful high school students in the urban areas of Gotham County. This will be accomplished through the creation of a technology outreach program, in conjunction with Armstrong Atlantic State University's Educational Technology Center, housed in the AASU College of Education in partnership with Woodville-Tompkins Technical Career Institute, Gotham County Public School System.

The proposed project will involve the following:

- Intervention for at-risk students transitioning from 9<sup>th</sup> to 10<sup>th</sup> grade
- Three groups of 20 students per term (60 total) will be identified who meet at-risk characteristics such as:
  - Repeated grade
  - Promotion failure
  - Reading or math test scores below grade level
  - Attendance problems
  - Documented behavioral issues
- Two-year plan to teach students programming skills using Alice, an innovative 3D programming environment that makes it easy to create an animation for
  - telling a story,
  - creating an interactive game, or
  - creating a video to share on the web.

## **The Project Design**

“LET THE GAMES BEGIN” will involve students on a variety of levels. Each group will start with a four-day pre-program induction camp prior to the beginning of the school term (in summer and during Christmas break). Once the program begins, the students will attend classes twice a month on Saturday. In semester two of the program, students from semester one will become mentors to those new in the program. At the end of semester two, the original group is ready for an advanced camp, while those who finished the core program in semester two become mentors to yet another new group.

Students will receive a netbook for use during their entire program, making it possible for them to continue working on projects during the time when they are not meeting in class. Students will also receive a stipend at the end of each term, based upon accomplishment of their targeted goals and exemplary attendance. Finally, students will demonstrate their success at the end of each term with presentations to a wider audience.

## **Theoretical Framework**

Researchers found that the causes of school failure are largely attributed to the relationship between the social cultural conditions and cognitive conditions.

1. For at-risk students, especially minority group students, the gap between what learned in school and out of school is much wider than that of their peers (Banks, 1988).
2. At-risk students often fail to develop higher order cognitive skills because they are placed in classrooms that deemphasize the need for them (Levin, 1988).
3. At-risk students are seldom given tasks that require considerable student involvement and decision making which are the important forces to lead students to engage in learning (Salomon et. al., 1991; Levine, 1988; Oaks, 1985).

They found the positive role of educational technology in the three aspects of school failure mentioned above. Many researchers contended that the characteristics of the multimedia can help improve at-risk students' cognition capability and deprived social connections to learning. The use of interactive multimedia allows students to operate and see phenomena simultaneously in several different symbol systems (graphs, pictures, sounds). This can help the students leverage their mental representations to create knowledge structures which help deepen student understanding (Kozma & Croninger, 1992). Multimedia such as Alice 3D programming provide students with rich mental models of situations, mental models that they would otherwise need to construct on their own with text (Heneghan et al., 1992). The visual nature of the multimedia is more likely to activate the situation-based prior knowledge that students already have and connect their new learning to it (Heneghan et al., 1992). Task of learning 3D programming involves in rich, interactive simulation that require the need for the basic skills in higher order thinking. Instruction within such environments shifts the emphasis from information giving and receiving to an emphasis on finding relevant information and learning how to solve problems, ask questions, think critically, and communicate ideas (Cole & Griffin, 1987; LCHC, 1989).

## **Project Goals for Participant Learning**

Among our goals for participant learning are the following:

- Students reach targeted benchmarks (aligned with ISTE standards for students)
- Improved grades (raising grades in classes to a 2.00 average or higher)
- Reduced disciplinary problems in and out of school (fewer referrals among program group as compared with non-program peers)
- Improved regular school attendance (fewer unexcused absences in school attendance as compared with non-program peers)
- Graduation rate for completers higher than non-participant peer group
- Development of a support and mentoring group that includes university faculty, highly qualified in-service teachers, and others linked through personal interactions for the duration of the program.

## **Measurable objectives**

This program will accomplish the following:

1. Identify, through a systematic method, 20 participants for each of three "Let the Games Begin" groups, resulting in 60 participants over two and a half years.
2. Provide training in technology, specifically programming and development
3. Provide participants with requisite knowledge and skills that will positively impact success in school areas
4. Provide on-going support and program continuity following admission to the program.

## **Evaluation Plan**

The evaluation for the Armstrong "Let the Games Begin" Program will consist of both a formative and summative evaluation. The formative evaluation will be conducted semi-annually to ascertain progress towards meeting desired objectives and to identify possible areas of program improvement. A summative evaluation will be done at the conclusion of the program by a program evaluator to determine if program goals and objectives have ultimately been achieved. The program evaluator will review the data on student achievement, including improvements in student grades, school attendance, behavioral objectives, and project attainment, as measured by

ISTE standards for students and issue a summative report at the conclusion of the program to address student achievement as directly related to the intervention.

This study seeks answers to the following research questions:

- What impact does Alice 3D programming workshop have on the at-risk high school students' perceptions of self-confidence, attitude toward school and learning, and problem solving skill improvement?
- What impact does Alice 3D programming workshop have on academic gains, attendance and behavioral issues of at-risk high school students?
- What impact does Alice 3D programming workshop have on at-risk high school students' perceptions of gender difference in computing?

## Data Collection

Three groups of 20 at-risk high school students per term (60 total) will participate in this study. The subjects of this study are at-risk high school students in one of Gotham County Public High Schools. Subjects will be recruited with help of the high school principal and technology specialist. The school principal and technology specialist identify at-risk students based on the characteristics of at-risk students and encourage at-risk students to join the 3 D programming workshop. Upon attending the 3 D programming workshop, at-risk high school students will be invited to participate in this study. Each subject will participate in competing survey questionnaire two times. Each survey will take 15-20 minutes so they will contribute total of 30 to 40 minutes of their time to this study.

Our project also used a qualitative methodology to explore success or failure stories during workshops. This included the case study method (Yin, 2002), use of narrative telling (Connelly & Clandinin, 2006), and the appreciative inquiry method (Cooperrider & Sorenson, 2005).

The following questions will be asked in 5 Likert Scale.

1. I hope that my future career will require the use of 3D programming.
2. I like to use programming to solve problems.
3. I have a lot of self-confidence when it comes to computing courses.
4. I do not like using programming skills to solve problems.
5. I am confident that I can solve problems by using computer applications.
6. The challenge of solving problems using 3D programming appeals to me.
7. Developing computing skills will be important to my career goals.
8. I would voluntarily take additional computer programming courses if I were given the opportunity.
9. I think computer programming is interesting.
10. 3D programming improved my problem solving skills in my life.
11. I would like to learn more about careers related to computer programming.
12. I have become more interested in school since learning 3D programming.
13. 3D programming improved my self confidence.
14. 3D programming club improved my computer skills.

The additional 3 open-ended questions will be asked.

1. Describe, in detail, what programming means to you.
2. Please describe the characteristics of a person with a career in programming.
3. In your opinion, describe how programming can help you to solve problems in your lives?

## Data Collection

The subjects will be invited to complete a survey questionnaire right before the Alice 3 D programming workshop. This research is a pre-experimental and quantitative study of one group pre-test and post-test model. They will be participating in the pretest which will be administered right before the participation of the Alice 3 D programming workshop. After completion of the Alice 3 D programming workshop, they will participate in the post-test conducted. They will also be asked to participate in an interview. For the reliability test of the instrument, they will be asked to complete the same questionnaire three weeks after the first completion of the survey questionnaire. The semi-structured interview will be conducted to further investigate the research questions. The primary investigator will observe the workshop site to explore and reflect upon the progress of the project.

## Conclusion

The article outlined AT & T-sponsored educational research project and the evaluation plan of the 3D visual programming use in the project. Current evidence suggests that emerging technologies can facilitate learning, including the learning of student at risk of school failure. We are enthusiastic about these new technologies, but at the same time we are careful about the approaches to and infrastructure of technology projects. This research project will offer suggestions for educators who would like to integrate technology in improvement of at-risk students.

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