Fostering a Relationship between Computer Animation and Middle School Math Students

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Abstract

This paper documents an outreach program from a university-level computer animation program to students within a middle school math class. Students were introduced to the concept of 2D and 3D space during the first class meeting using a variety of inexpensive props and appropriate brainteasers. The second meeting consisted of the students using basic geometric shapes to create computer-animated characters that were later brought to life by the instructors via a 3D modeling package. The purpose of the meetings were to 1) expose middle school students to the field of computer animation, 2) demonstrate the relation between math and computer animation, 3) foster interest in real world applications of math.

Introduction

As technology advances everyday, generations are exposed to new realms of possibilities at a much earlier age. Schools are constantly implementing new programs that expose children to emerging technologies and integrate new curricula to make the young more techno-savvy as the world advances with them. However, many elementary school students are still unaware of the consequences these technologies have on their lifestyle and the advantages associated with them. The workshops, detailed in the following paper, explain one attempt at educating middle school students on the involvement of technology in their school studies and everyday life. The goal was to engage students in their usual day-to-day school subjects (i.e. math) by integrating technologies used everyday around the world. Students were encouraged to explore the field of computer animation and how technology has made the industry possible, yet can be related back to middle school subjects for its basis.

Learning Styles of Middle School Math Students

Presentations on computer animation and its relationship to mathematics were delivered at an inner-city middle school in Orlando, Florida. Lee Middle School is part of the Orange County Public School system. The enrollment summary for Lee Middle School is as follows:

School	White	Black	Hisp.	Other	Enr. Total
Lee	35.43	51.61	10.45	2.51	1,205

The learning experience was designed to be fun and exciting, yet also educational. Different students can perceive learning experiences different ways, which is a direct correlation as to how

the material is delivered. Math is a core subject that can either interest students who view it as exciting and exhilarating, or others may find the subject tedious and frustrating. Teaching strategies that encompass a variety of learning styles have proven to encourage student learning through their own exploration. A variety of teaching strategies can also encourage students to explore other learning styles that are not familiar with, thereby deepening their learning experience[1]. Students also desire classroom work that awakens their natural curiosity and will stimulate their thinking[2]. Expanding curricula that allows students to express their originality and enables them to discover who they are and what talents they possess encourages motivation in the classroom. Students were motivated in this study by using current skill sets in math to create work that was unique and imaginative.

Student Preparation

In order to introduce the math students to the concept of computer animation and three-dimensional cyberspace, the students were given a brainteaser. The brainteaser was given the day before the presentation, and students were asked the solution to the brainteaser. The brainteaser involved using six toothpicks (all of the same length) to create four equilateral triangles. The toothpicks could not overlap in any way, nor could they be broken or altered in any way. (Fig. 1.1) The idea behind the brainteaser was to encourage students to "think outside the box" and employ solutions that may not be immediately obvious. A typical respondent would attempt to arrange the toothpicks on a flat surface in a fashion that might yield four triangles. However, the solution would require the toothpicks to overlap and would be incorrect. (Fig. 1.2) The correct solution to the brainteaser was to think in three-dimensional terms, raise the toothpicks out of the flat plane, and introduce depth to the figure. (Fig. 1.3) Out of the one hundred and twenty students participating, only three were able to solve the brainteaser correctly. Once informed of the correct solution, many students responded excitedly, laughing at how obvious the solution now seemed. They were engaged in the problem, and intrigued at the mathematical solution that stumped the majority of them. Interest was high for the next day's presentation on three-dimensional computer animation.

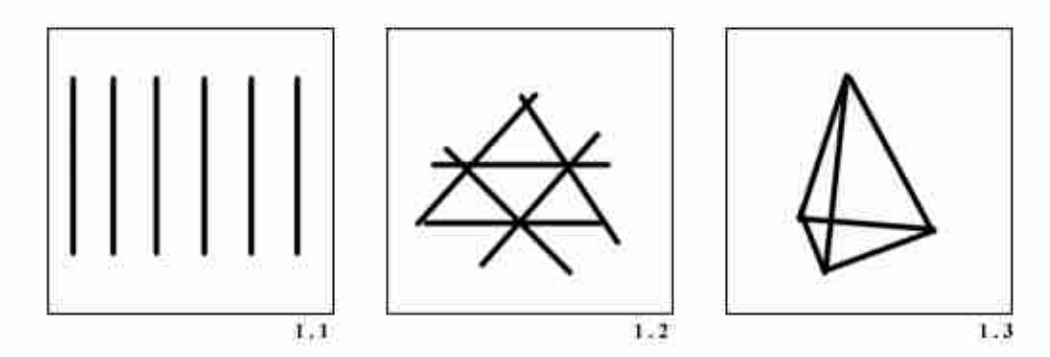

Figure 1 – Toothpick Brainteaser

Procedures for Classroom Presentations

The procedures for the two classroom meetings varied, yet attempted to engage the students with different principles each time, building on the foundations and principles of the previous lessons.

The first classroom meeting introduced the author to the students and her role as a computer animation professor at the university level. Students were asked what the term "animation" meant to them, followed by the term "computer animation". General responses

included naming cartoons, animated movies, and video games. However, students were unable to identify the role of mathematics in such movies and games.

Basic two-dimensional shapes were then presented to the students and they identified them as squares, circles, and triangles. The two dimensions of the shapes were identified as width and height. The third dimension, depth, was then added to the presentation. Students were asked to draw and name the three-dimensional equivalent to the two dimensional shapes. A square was a cube, a rectangle was a box, a circle could be a cylinder or sphere, a triangle could be a cone, prism, or pyramid.

The concept of geometric shapes was then presented to the classroom using pictures of characters from well-known movies. With guidance in the first picture, students were asked to name as many basic shapes in the pictures as they could identify. Using the second picture, students were asked to write down as many shapes as they could see in a restricted time frame of two minutes. Answers were then discussed and the presenter redrew the characters using just the aforementioned shapes listed.

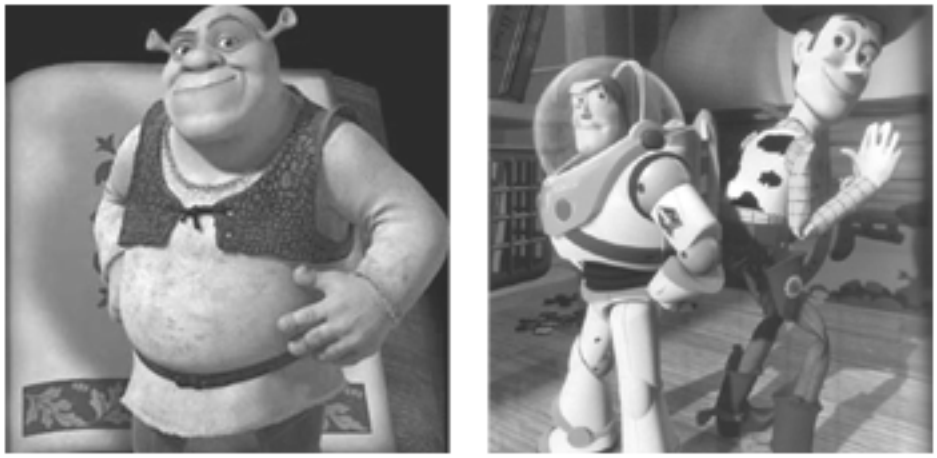

Figure 2 – Character Pictures for Identifying Primitive Shapes

Students were instructed to design their own characters using just three-dimensional shapes and draw them on paper, listing the total number of shapes next to the figure. Following the meeting, the author distributed the drawings to her college students and asked them to convert the characters to 3D using any software package of their choice. The original sketches and 3D characters were then redistributed to the middle school students at the next classroom presentation. Students were able to see their own thoughts and character sketches come to life via a 3D modeling package. (Figure 3)

During the second classroom meeting, the students were walked through the process of creating a 3D character similar to their own via discreet's 3D StudioMax animation software. Basic primitives shapes were identified and created on screen for the students to visualize. Dimensions of each shape were discussed (width, height, depth).

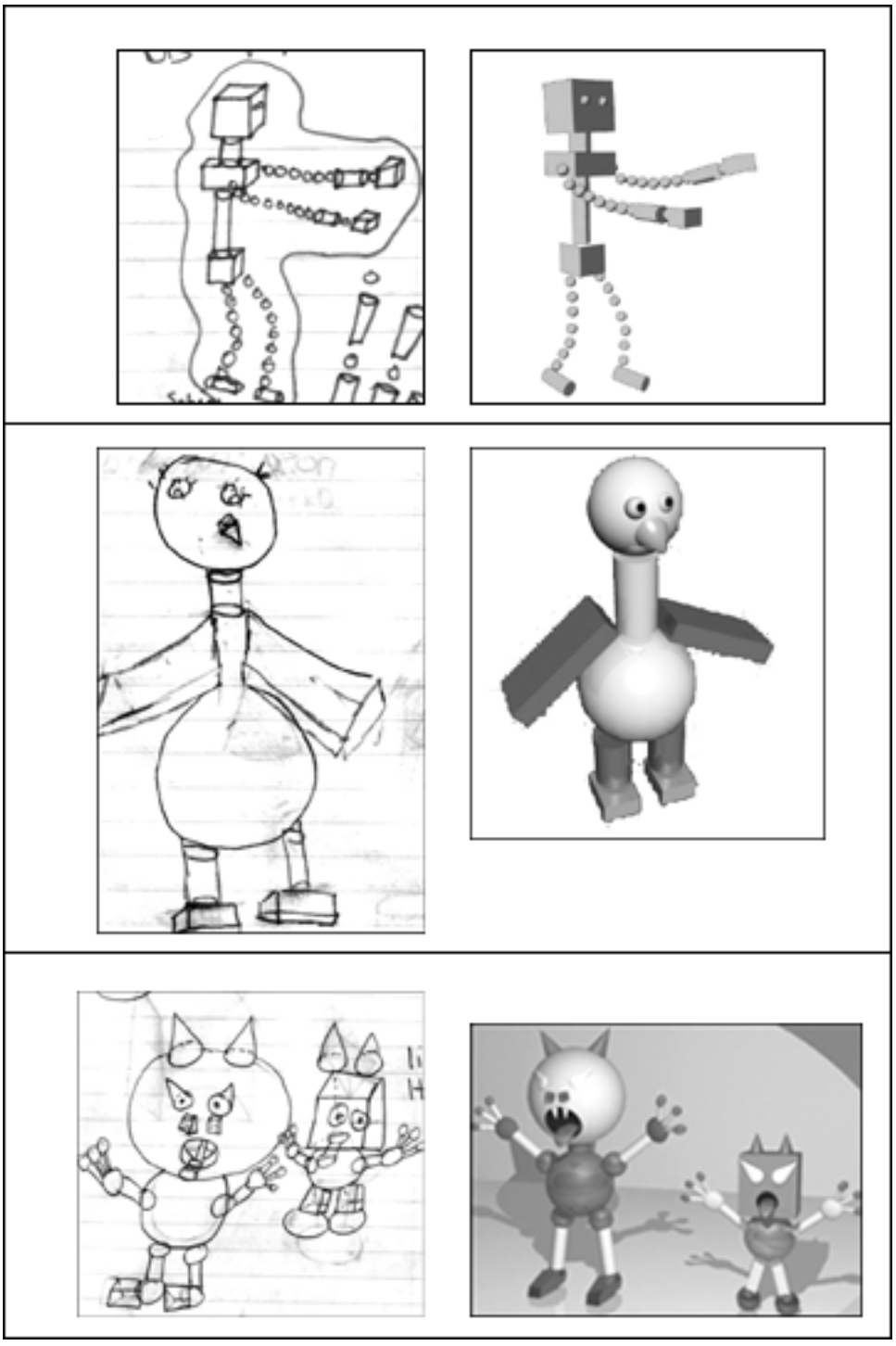

Figure 3 – Character Pictures for Identifying Primitive Shapes

Summary

The classroom meetings were able to engage students in the subject of math who were not previously engaged before. Learner participation was exceptionally strong, as reported by the school teachers, based on their past evaluations of classroom behavior. The role of educators

should be to teach new information, but additionally to engage all students with various learning styles by pushing them to learn, explore, and apply their new information. These learning experiences will enhance the student's experience and knowledge base as subjects become more exciting and challenging[1]. The exposure of real-world applications of mathematical subjects interested and amazed the students, as it related a school application to the entertainment field that students partake in everyday.

Bibliographical References

1 NUSSBAUMER, L. (2001). Theoretical Framework for Instruction That Accommodates All Learning Styles. *Journal of Interior Design*, 27(2) 35-45.

2 STRONG, R. (1995). What Do Students Want (and What Really Motivates Them)?. *Educational Leadership*.