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Dweezil's Dimensional Dream: A Computer-Based Multimedia Educational Game Pertaining to Area and Perimeter Developed and Implemented as an Alternative to Traditional Paper/Pencil Exercises for Students at the Secondary Level

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THE CARL AND WINIFRED LEE HONORS COLLEGE

CERTIFICATE OF ORAL EXAMINATION

Adam Sterenberg, having been admitted to the Carl and Winifred Lee Honors College in 1990, successfully presented the Lee Honors College Thesis on June 8, 1995.

The title of the paper is:

"Dweezil's Dimensional Dream: A Computer-Based Multimedia Educational Game Pertaining to Area and Perimeter Developed and Implemented as an Alternative to Traditional Paper/Pencil Exercises for Students at the Secondary Level"

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Kalamazoo Christian High School

THESIS PROJECT

Presented in Partial Fulfillment of the
Requirements for Graduation with Honors
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Western Michigan University

by

Adam James Sterenberg

July, 1995

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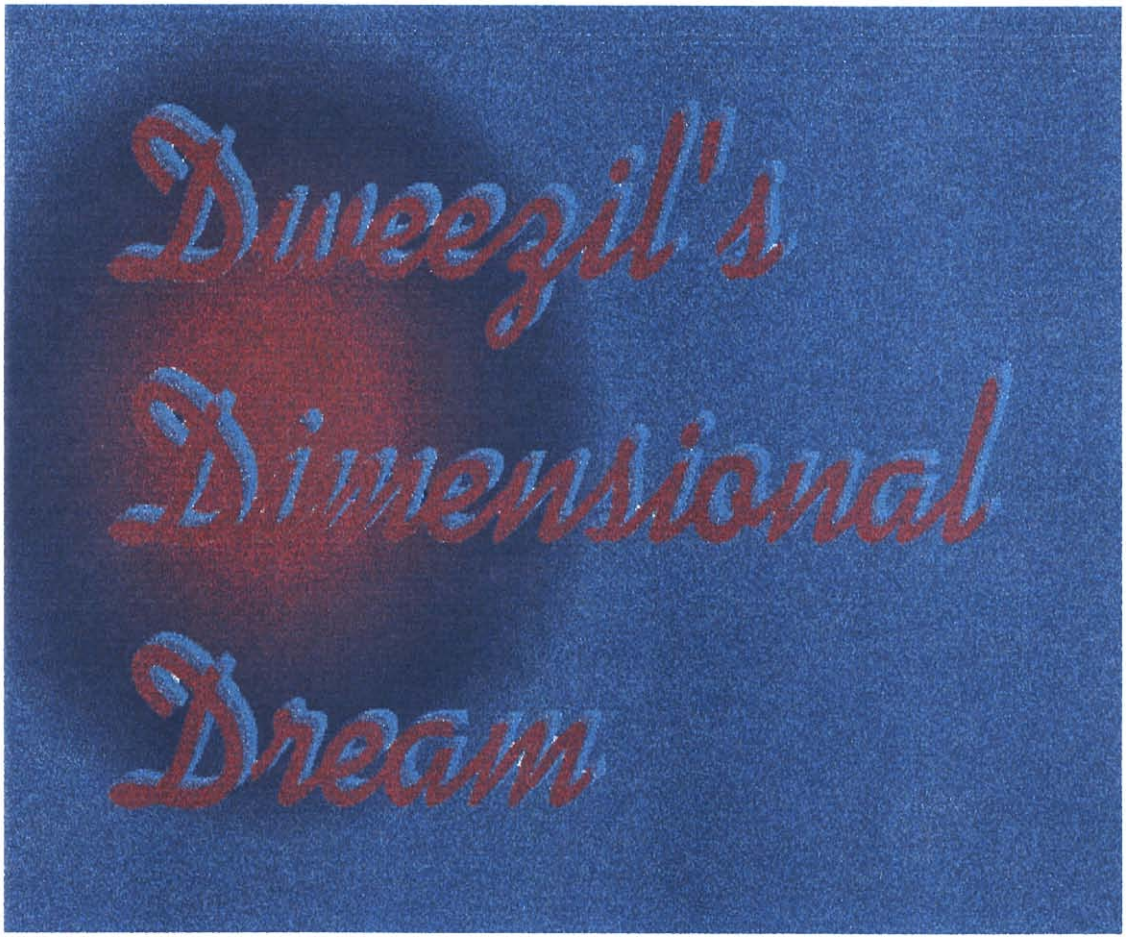

By
Adam
James
Sterenberg

Thesis Contents

Dweezil's Dimensional Dream
Introduction

After approximately five hundred hours of blood, sweat, and tears, Dweezil's Dimensional Dream: A Computer-Based Multimedia Educational Game Pertaining to Area and Perimeter Developed and Implemented as an Alternative to Traditional Paper/Pencil Exercises for Students at the Secondary Level is finished!

...for now.

Eleven months ago I decided to complete my Honor's College education by conducting a thesis project. Since a one hundred page paper was out of the question, I was forced to be creative. As a future math teacher I desired a type of application relevant to the classroom. Holding a minor in computer science made selecting a computer program for my thesis project an easy choice.

The following pages document the events that took place during the different phases of this project. In order to thwart theft and plagiarism, the actual program and source code have not been included. I sincerely apologize for any inconvenience. However, those interested in obtaining further information about the computer program Dweezil's Dimensional Dream should contact:

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Developing a Classroom Program

Four goals guided the development of this thesis project. First and foremost, the computer program was to be a highly usable tool. Therefore, it was designed to be used in a math classroom. Concepts centering on area and perimeter were chosen to coincide with a section of Mr. Randy Van Dyk's Consumer Math class at Kalamazoo Christian High School.

Next the theme Dweezil's Dimensional Dream was invented. The program required a theme because it was to be created in a game format. Games have a strong tendency to be more motivational than typical drill and practice programs.

Upon composing a theme, the problem types and levels were chosen. Problems were directed at students at the sophomore level in high school- specifically Consumer Math students at Kalamazoo Christian High School. However, these problems may be suitable for capable students at the Middle School level. Problem suitability was thoroughly discussed with Mr. Randy Van Dyk. Problems centered around situations that involved finding perimeter, finding area conceptually, and deducing surface areas. For example, one problem in the game requires the students to count the number of unit squares to find the area of an irregular shaped object.

Once a set of ten problems was agreed upon, the details of the theme for the game had to be developed. Creating a story line around the problems was difficult, but after many hours of deliberation the following storyline arose. The following text appears verbatim in the game.

Once upon a time...

Yeah, yeah, yeah.

Here's the scoop. Dweezil (we use this name to protect anonymity) was a student at Kalamazoo Christian who fell asleep during MATH class. Little did Dweezil know that the Math teachers at Christian High were given solutions for just an occasion! With the help of *The Book For Slackers* the teacher cast the student into a Dimensional Dream. In this world, Dweezil's only chance of getting back to Kalamazoo (yeah we're assuming he wants to come back to Kalamazoo!!) is to solve the many puzzles in the different places encountered and gather the pieces of the code to travel back through the porthole!!

Well, unfortunately Dweezil has been sleeping during class and you are Dweezil's only help!! By using this Link I have created in Cyberspace, you can see what Dweezil sees and be of assistance. Dweezil will know you're there and will talk to you...

SO PAY ATTENTION!

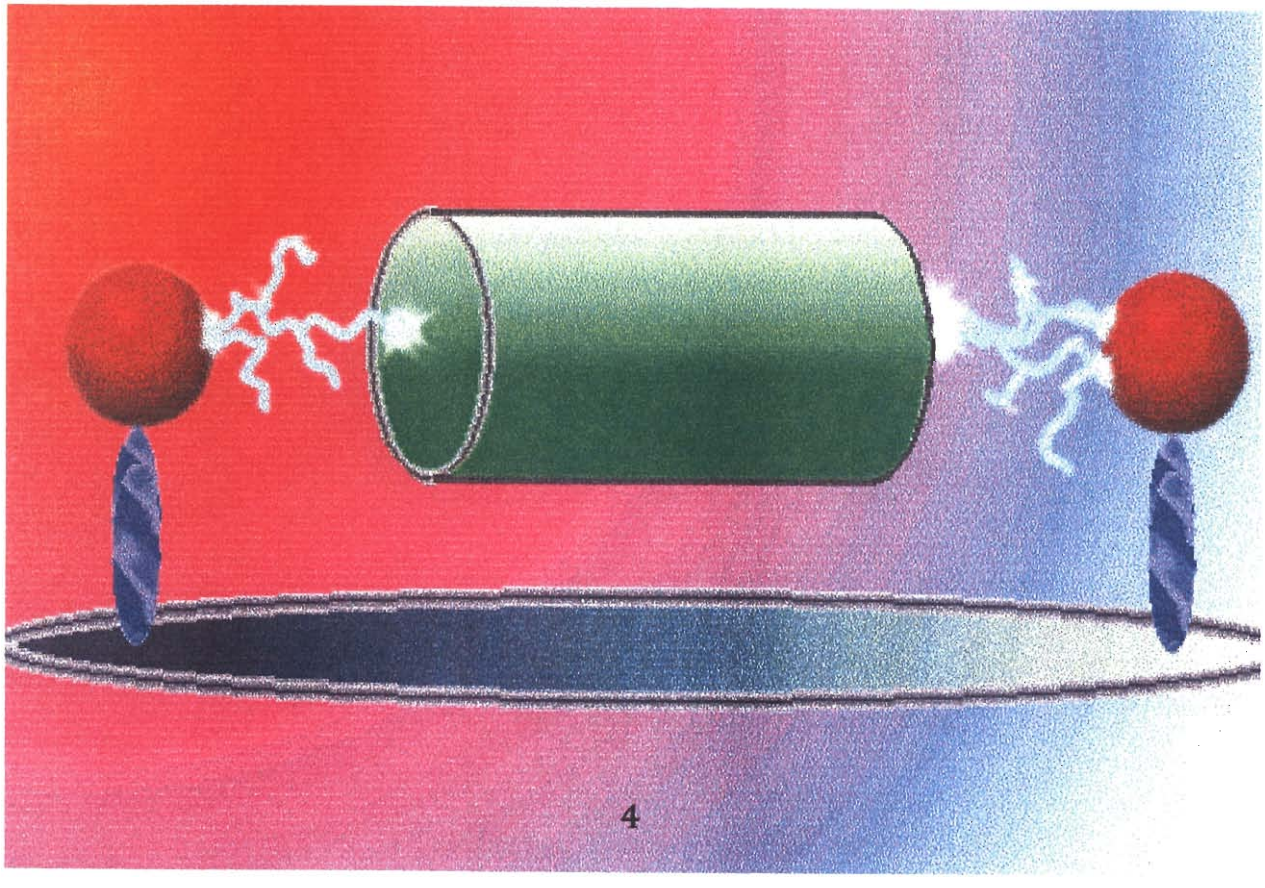
Good Luck!!

Implementing the Program

Once all concepts had been dreamt up, the implementation process was started. Hypercard 2.2 was chosen for its flexibility, high quality color graphics, multimedia capabilities, and user friendliness. Thus, the Macintosh platform was chosen because visual and audio effects are more readily integrated into one's program than on an IBM platform.

Programing proved very challenging because I had to learn *Hypertalk* from scratch. Fortunately, Macintosh manuals are relatively easy to understand. Coding was slow at first but picked up with time. Once the basic structure of the first few problems was implemented, the rest seemed to follow.

Adobe Photoshop™ Limited Edition 2.5.1 was used to create the graphics. This application was designed to enhance scanned photographs. Nevertheless, it proved to be quite worthwhile in the designing graphics for each of the problems. The figure below is an example of one of the many graphics created for Dweezil's Dimensional Dream.



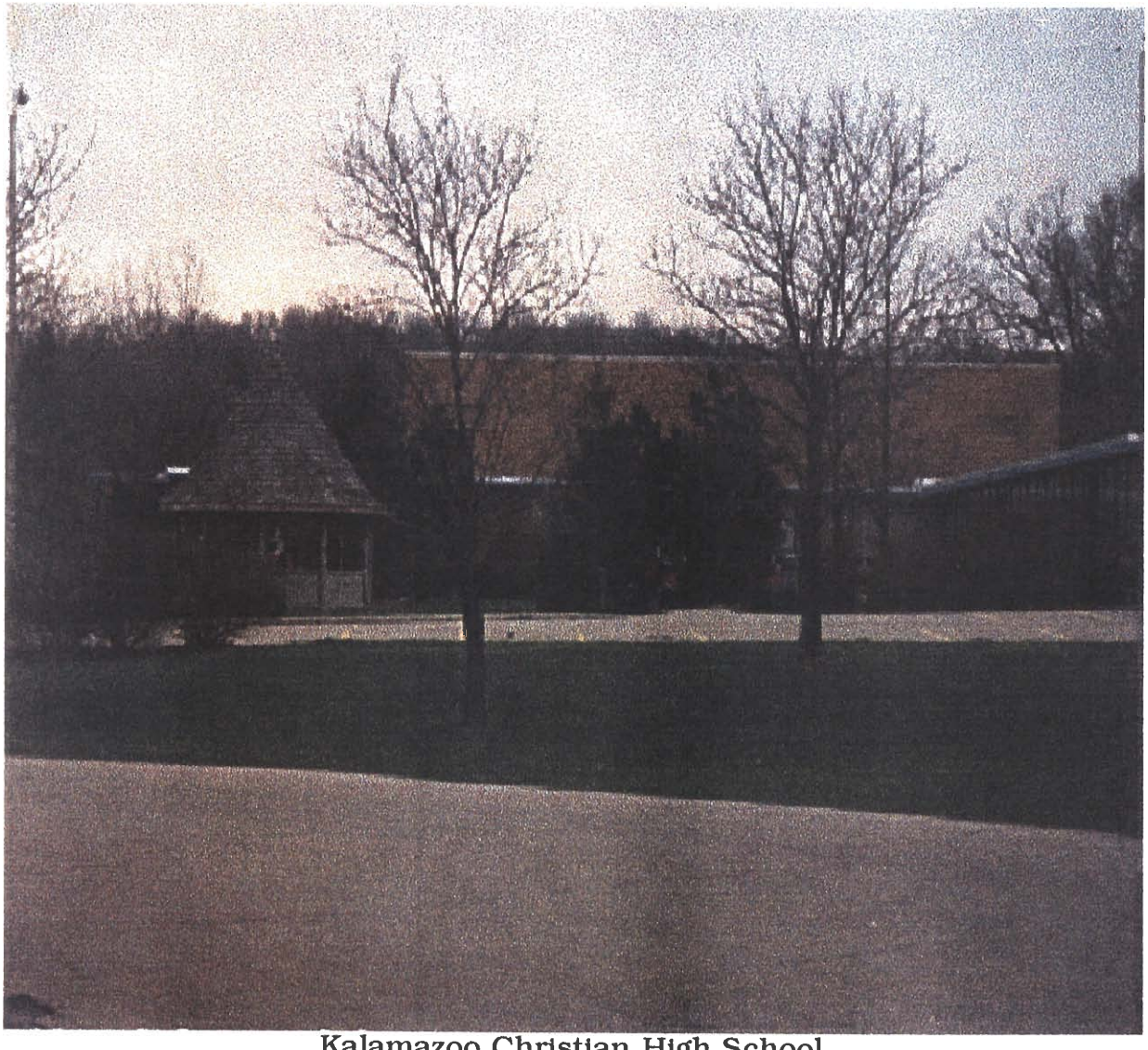
Kaboom!™ Factory 3.0 was used to design all of the sounds for the program. Sounds were used throughout the program to build excitement, to provide praise, and to suggest the need for correction. Many of the sounds are simply my voice run through different filters to create certain effects. Other sound samples were downloaded from America Online.

A movie clip was also used in the first problem. A mirror appears to talk to the students by using a Quicktime™ Video of Mr. Randy Van Dyk. This clip was created by using a standard video camera and then importing it into the computer.

The program was designed in a such a manner that additional problems beyond the initial ten can be incorporated with little modification to the main structure of the program. The top-down, modular approach used to create the program makes such modifications possible. Detailed commenting was used throughout the code as well to make it easier for a reader to understand and correctly interpret the code.

Testing and Surveying the Program

Once the program was finished, it was placed on KCHS's Macintosh LC III. Students were given special passes to play the game. All students were eligible to play. Students in the Consumer Math class were especially encouraged to play the game and were given extra credit for playing. After playing the game, students were urged to fill out a survey that I had created. The game was in use for approximately three weeks.



Kalamazoo Christian High School
Photo used in Dweezil's Dimensional Dream
Credit: Dan Michmerhuizen

The following help sheet was attached to the computer that the students at KCHS operated. This sheet included operational instructions as well as hints to solve the game problems. The pages following the help sheet are the actual survey pages filled out by those who played Dweezil's Dimensional Dream.

HELP SHEET FOR DWEEZIL'S GAME

Opening Game:

1. Turn computer on (Back right hand side)
2. Turn on the monitor.
3. Double Click the Dweezil's Dimensional Dream Icon. Please Wait (about a minute)

For the game you will need:

1. Paper
2. Pencil / Pen.
3. Calculator.

Once Started:

BE PATIENT!! THE GAME IS SLOW BECAUSE THE COMPUTER IS!!
I apologize! But it runs great on faster computers.

Read the instructions.

** If you have to quit early--

Simply get the answer wrong 3 times. This will at least save what you did. If you quit or shut it off, none of your work will be saved.

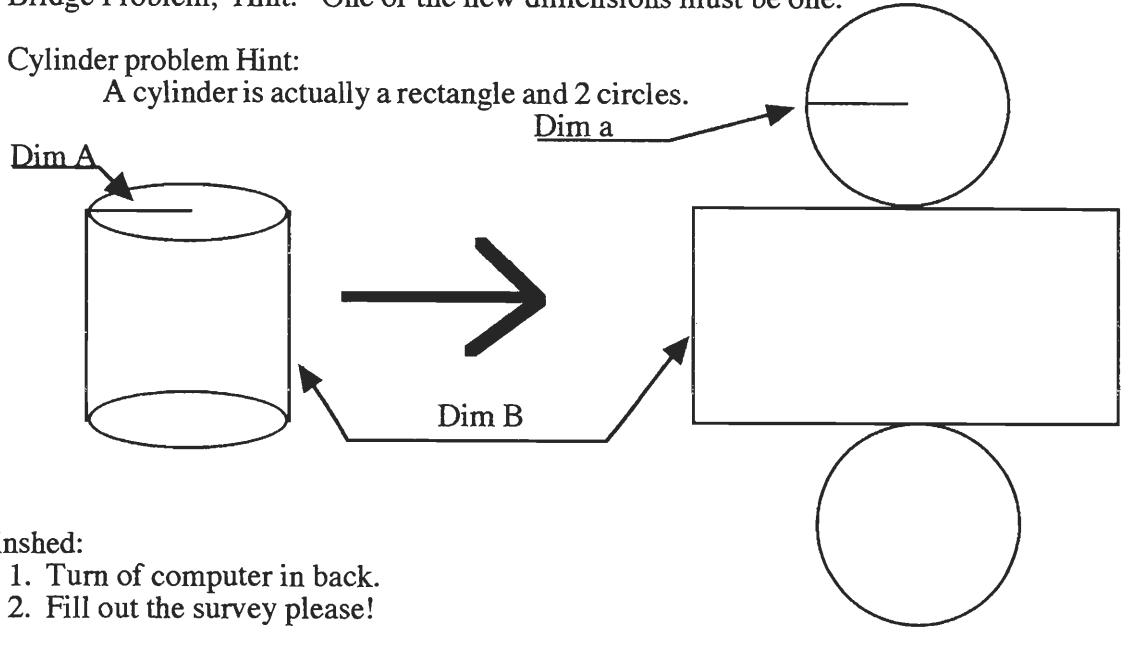
** The "I beam" or "cursor" must be in the Answer Box to type and hit RETURN

** Write down the pieces of the code!!

Bridge Problem, Hint: One of the new dimensions must be one.

Cylinder problem Hint:

A cylinder is actually a rectangle and 2 circles.



Once finshed:

1. Turn of computer in back.
2. Fill out the survey please!

Thanks for Playing!

Dweezil's Dimensional Dream

I really appreciate you taking the time to fill out this survey!! Please fill out with as much detail as possible and as honestly as you can- your responses will be documented in my thesis report. Write on the back if you need more room. THANKS!! Adam Sterenberg :)

Name:_____ Grade Level:_____ Age:_____ Sex: M F

Race:_____ Most recent math class:_____ College bound? Y / N

1. In general, what did you think of Dweezil's Dimensional Dream??

   Awesome! Pretty Cool. I'd prefer a kick in the head.

2. Would you rather play the game than do a paper/pencil activity. YES NO

3. Overall, how would you rate the program? (Worst) 1 2 3 4 5 (Best)

4. Did you play this game more than one time?? YES NO

   Would you?? YES NO

5. What did you think of the problems used in the game??

   Impossible Challenging So, So. Too Easy

6. What do you think would be an suitable grade level for this program??

   Elementary Middle School/Jr. High High School

7. Were the instructions clear?? YES NO

8. Did you enjoy the graphics and sound effects?? YES NO

9. Did you find it difficult to operate the game?? YES NO

OVER PLEASE!!

10. How often do you use computers??

A lot Sometimes Hardly at all

11. Did you find this computer hard to use?? YES NO

12. Do you think this program would benefit students in the appropriate grade level? YES NO

Why?

13. Would you be more motivated to do this than homework? YES NO
WHY???

14. What did you really like about the game??

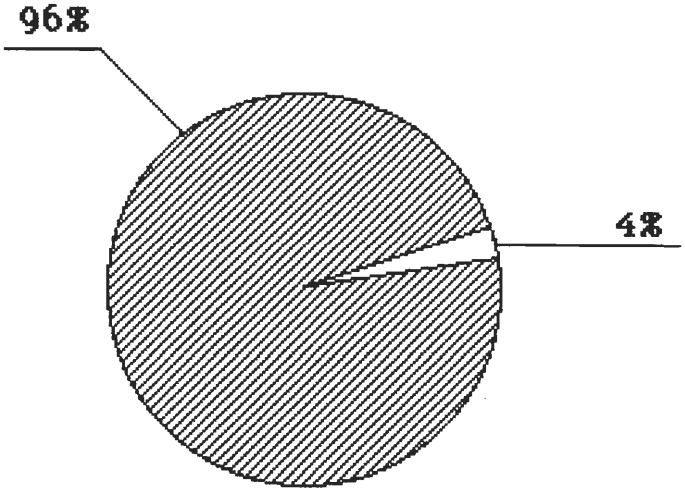
15. What did you really hate about the game??

16. What would you suggest for changes??

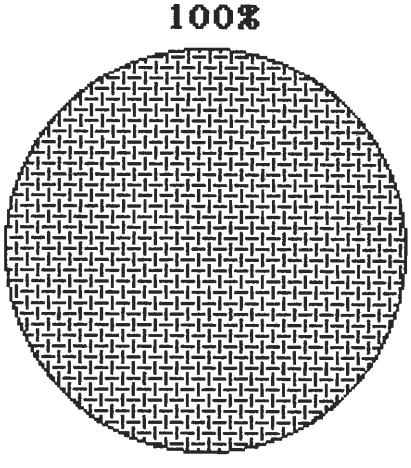
Thanks for taking the time to fill out this survey!!

Analyzing the Results

The results from the surveys were very encouraging! The majority of the students enjoyed the program's visual and audio effects. The program earned an overall rating of 4.25 on a scale of 1 to 5 (question 3 of the survey). Almost all students would rather play the game than do a paper/pencil activity and all students who responded to the survey would rather play the game than do homework (question 13 of the survey).



Game Vs. Paper/Pencil
Question 2



Game Vs. Homework
Question 13

Realizing that the creation of this took about five hundred hours, it seems that educational games like Dweezil's Dimensional Dream could prove their worth. Students took an average of 35 - 40 minutes to work through problems presented by the program. This is a typical amount of time spent on daily homework. But, if students are motivated to play this and the program has the same educational value as a paper/pencil activity, why not encourage them to play it?

The following two pages is the data collected from the surveys. The data was then compiled in a spreadsheet format. Columns B through G label the logistical data of each student. Columns H through U represent the answers to questions 1 through 13 of the survey. Below is a legend for the numerical values used in the spreadsheet.

Column D: 1 = Male 2 = Female

Column E: 1 = Caucasian 2 = Afro-American 3 = Other

Column F: 1 = Algebra 2 = Geometry 3 = FST 4 = Calculus
5 = Consumer Math 6 = Advanced Algebra
7 = Two Year Algebra

Column H: 1 = Awesome! 2 = Pretty Cool. 3 = I'd prefer a kick in the head.

Column M: 1 = Impossible 2 = Challenging 3 = So, so. 4 = Too Easy.

Column N: 1 = Elementary 2 = Middle School 3 = High School

Column R: 1 = A lot 2 = Sometimes 3 = Hardly at all.

Columns G, I, K, O - Q, S - U: 1 = Yes 1.5 = Maybe 2 = No

*An asterisk means that no information was given.

	A	B	C	D	E	F	G	H
1	First and Last Name	Grade Level	Age	Gender	Race	Math Level	College Bound	Q1
2	BILL	9	15	1	1	2	1	1
3	JEFF	9	15	1	1	1	1	1
4	BRIAN D.	12	18	1	1	6	1	2
5	RICH K.	9	14	1	1	1	1	1
6	ED H.	10	16	1	1	7	1.5	3
7	DAN H.	10	16	1	1	6	1	1
8	CURT M.	10	16	1	1	6	1	1
9	DEBBIE A.	12	18	2	1	6	1	2
10	MARK A.	11	17	1	1	6	1	2
11	KARL G.	11	17	1	1	6	1	2
12	DOUG W.	10	16	1	1	6	1	1
13	RYAN W.	10	16	1	1	6	1	2
14	MARK L.	10	17	1	1	5	*	1
15	JAMILA B.	11	17	2	2	5	1	2
16	BRIAN D.	10	16	1	1	2	*	2
17	CHUCKIE	10	15	1	1	*	2	2
18	GREG E.	9	15	1	1	2	1	1
19	ANDREW V. P.	10	15	1	1	4	1	2
20								
21	AVERAGES	10.17	16.06	1.11	1.06	4.53	1.09	1.61
22								
23	STANDARD DEVIATION	0.92	1.11	0.32	0.24	2.07	0.27	0.61
24								
25	VARIANCE	0.8529	1.2320	0.1046	0.0556	4.2647	0.0740	3e-1

	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Q2	Q3	Q4.1	Q4.2	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
2	1	5	1	1	2	2.5	1	1	2	1	2	1	1
3	1	5	1	1	2	2.5	1	1	2	1	2	1	1
4	1	5	1	1	3	*	1	1	2	2	2	1	1
5	1	5	2	1	1	3	1	1	2	3	2	1	1
6	1	2	2	1	1.5	3.5	2	1	1	2	2	1	1
7	1	4	1	1	3	3	1	1	2	1	2	1	1
8	1	4	1	1	3	3	1	1	2	2	2	1	1
9	1	4	1	1	2	3	1	1	2	2	2	1	1
10	1	4	2	1	3	2	1	1	2	2	2	1	1
11	1	4	2	1	3	2	1	1	2	2	2	1	1
12	1	5	1	1	4	3	1	1	2	1	2	1	1
13	1	4	2	1	2	3	2	1	1	2	2	1	1
14	2	5	1	1	2	3	1	1	2	2	2	1	1
15	1	4	2	1.5	3	2.5	1	1.5	2	1	2	1	1
16	1	4	2	2	2	3	1	1	2	1	2	1	1
17	1	4	2	1	2	2	2	1	1	1	1	1	1
18	1	5	2	1	1	3	1	1	1.5	1	1.5	1	1
19	1	3.5	1	1	3	2	1	1	2	1	2	1	1
20													
21	1.06	4.25	1.50	1.08	2.36	2.71	1.17	1.03	1.81	1.56	1.92	1.00	1.00
22													
23	0.24	0.77	0.51	0.26	0.80	0.47	0.38	0.12	0.39	0.62	0.26	0.00	0.00
24													
25	5e-2	5e-1	2e-1	6e-2	6e-1	2e-1	1e-1	1e-2	1e-1	3e-1	6e-2	0	0

Summary

Designing and implementing this thesis project proved to be a truly educational experience. Through this project I have developed a much deeper understanding of the process for creating educational software. Due to careful planning, the process went quite smoothly and most of my expectations were met.

In the future, I plan to further explore this venue of educational software development. As a mathematics middle school teacher, I can discover first-hand any topics in which students might feel an educational game to be appropriate.

I do plan to use Dweezil's Dimensional Dream in my classroom. It is highly possible that educational software development will someday become a business venture for myself.

Works Cited

Price, Robert V. Computer Aided Instruction - A Guide for Authors. Brook/Cole Publishers, 1991.

Winkler, Dan and Kamins, Scott. Hypertalk 2.0 The Book. Bantam Books, 1990.

Acknowledgements

Computer Application Programs Used in the Development Process

Adobe Photoshop™ Limited Edition 2.5.1
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America Online 2.5.1
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Hypercard 2.2
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Kaboom! ™ Factory 3.0
Nova Development Corporation.
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I owe you one! (maybe two?)

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Designed with HyperCard 2.2, Kaboom!, and Adobe Photoshop Lite.

Created, Designed, And Implemented by:

ADAM JAMES STERENBERG

Email: TrainusA@aol.com

Thanks Again!! GOD BLESS!!