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NAS 401/501/601
CMST Institute—Final Challenge Project
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Abstract: Students of my 9th grade remedial general science class were presented with a challenging and fun activity. During our unit on forces as a part of our physics unit, the students were asked to create roller coaster rides that demonstrate physics principles such as: gravity, G-forces, Newtons, acceleration, velocity and force. Newton's laws were discussed in preparation for the rides. The students were divided into groups and asked to think about some main objectives for the ride. Examples included: Safety, acceleration, weightlessness (zero gravity), and drastic changes in force. They then created a "blueprint" of the ride with a ride name, length safety features and description of the ride. Then they created a PowerPoint presentation outlining the main points of the ride and the points made on the blueprint. Finally they built the ride in Interactive physics to test the forces on the ride, and to change angles, weight and other properties to make the ride more enjoyable.

II—The software used primarily was Interactive Physics (IP) and Microsoft PowerPoint. I chose these two software programs because IP allowed for the modeling of a real life simulation. This accounted for gravity, air resistance, the weight of the ride, the weight of the passengers and everything was to scale. This was the perfect use of a program like this, and although our application didn't use all the features that IP offers, it allowed for quick changes to the rides and immediate feedback on submitted changes.

I used PowerPoint because I wanted the students to get some experience on the program since many classes at the high school use it. I found some students to be very strong, and some to be reasonably weak on the program. I wanted to strengthen the students who were weak to prepare them for use in other classes. Plus PowerPoint allowed the students to organize their thoughts and create a meaningful and purposeful experience. Much of what these students suffer from is disorganization, and PowerPoint combated that by forcing them to make slides of related information.

Log Files for project—The class meets only 1 out of every four school days. This does limit our time together, but we started reasonably early. This project fell in the middle of the physics unit, so that had to be introduced first before modeling was done.

October 28th, 2005—Challenge project presented, groups formed, brainstorming session with class on major ideas, themes and challenges. Timeline outlined with students with anticipated due dates.
November 3rd, 2005— Proposals due/Consultation with teacher on ideas
November 9th, 2005— Powerpoint presentations created with help of teacher in computer lab.
November 15th, 2005— Finish and submit Powerpoint presentations with final corrections be guided by teacher.
November 21st, 2005— Instruction on how to use interactive Physics and beginning stages of making a "world" due by the end of class.
November 25th, 2005—Introduction of "track" and rides being created.
December 1st, 2005--- Force meters, colors, pictures and graphics added and rides finished
December 7th 2005—Final submission due with all required parts. Reflection paper due which looks at project as a whole, gives feedback to teacher and allows students to "grade" their partner.

Reflection Paper

As I struggled to think of an idea to run with using Interactive Physics, I came up with several ideas. None of them, however, really captured my imagination though. Then it hit me. Amusement parks! What a perfect blend of science and fun! I thought, since we do a Physics unit in class, why not have the students create an amusement park ride of their own. And so begins the tale…

To fully understand the project, I must introduce you to the students I had to convince that science is cool. Meet the remedial 9th grade class in General Science. These students are placed in this class due to poor results on the 8th grade achievement exam. This is a tough crowd. 9 students overall, one who is never there and 3-4 who are constantly out due to ISS or out of school suspension. Tough crowd.

I was a bit nervous about presenting my glorious idea to them about making science fun, and talking about physics in a non-nerdy way. I slowly told them the project that I was planning on the class doing. WOOO HOOOO!! They loved it! I told them about

Interactive Physics, how cool this program was, how powerful and realistic it was, and the only thing they asked me was "When can we use this stuff?" I was thrilled.

We began talking about the amusement park rides, and what aspects one has to take into consideration when designing these things. Here's a list of some things we came up with:

1. Safety –I was surprised this was mentioned first!
2. Fun
3. Ride length
4. Cost
5. Area available
6. How many people can it accommodate?

It was good to get the students thinking about where the rides come from and what people have to consider when building them.

From there, the next logical step was RESEARCH! I had the students come down to the computer lab, and they were instructed to research amusement park rides, and look for several key items: Capacity, ride length, and a general description of the ride. They were instructed to research 10 rides from all over the country. This exercise was designed to get the creative juices flowing.

The students were then instructed to talk with each other and create a ride of their own. They filled out "Challenge Project Proposal sheets", and then brought their ideas to me. I then discussed with them the feasibility of their rides, problems that were apparent and good ideas that needed to be expanded on. The biggest thing I noticed was people not being very creative. I encouraged them to think more outside the box, and even rejected one for simply being boring (he admitted it). Still, I was less than impressed with the final submissions, but I had to keep in mind my cliental. I knew that their level of performance wouldn't have been the same as my own had I been offered the project, and I needed them to reach *their* potential, not *my* potential.

From there, the students then went back to the computer lab to begin work on their PowerPoint presentations. The reasons why I chose this program were previously mentioned. They were given two classes in which to work with these presentations, and were instructed to have slides depicting what they had submitted using their "challenge Project Proposal" sheets. I was surprised though at the challenges that I ran across. I found the biggest problem with vocabulary and spelling. Words like "rate" and "angle" were questioned. I think it was here that I saw the potential of some of these students. I realized that what I was asking them to do was reaching close to the full potential of some kids.

From the PowerPoint, we moved on to the Interactive Physics. The students were thrilled to get on the program, but got in way over their heads. They needed careful guidance, which was easily given with the school's projector in the computer lab. Once the basics were established (which took MUCH longer than I anticipated), they were allowed to just

"play around". I was very surprised though at the lack of creativity that they possessed. They would only model what I showed them, or slight variations. I wanted to see them really delve into the program, but their creative skills, or lack thereof, limited them immensely.

We then had them start designing their own rides. Most of them made roller coasters, which I accepted. This was interesting, as they came up with many questions I didn't have immediate answers too. I was pleased to see most of them getting heavily involved. In fact, a few of my biggest behavior problems were a joy as they diligently worked along on their project. Fine tuning, resizing, and then starting over because they had a better idea. It was very good working time, and Interactive Physics, in all its complexity, still had the capability of providing the level of interaction that these kids needed. I have many students with ADD or ADHD, and the hands on nature of this project really focused their attention.

Now, for the challenges. I had originally expected something that was at or above the level I was capable of. This didn't happen, and for that I was disappointed. But as I thought about it more, it wasn't about what I was able to accomplish, it was what the students were able to do. For this I was pleased with them. Are the models earth-shatteringly complex? No. Are they the greatest in the world? No. Are they the best of what these kids can do? Yes. For that, I'm proud of them. Unfortunately, one of my better models is stuck on a computer hard drive, and unable to be accessed. The student who created it has a new password on his drive, and received out of school suspension just days before the project was due. Oh well, what can you do?

I learned a lot during this project. I learned how interactive and fun computer programs like Interactive Physics can be. It was a joy to use, and easy to teach with. Students learned to work together towards a common goal. They learned about their classmates, and shared ideas with them. It was a tremendous community builder. I'm proud of what they have done, and how far they've come. I doubt I'll win the award for the best animation or use of Interactive Physics this year, but I feel that the class was able to use technology to accomplish these goals. The visualization, the hands on, the immediate feedback were all so vital to these students who don't have very long attention spans. Technology was very important to show the students some new uses for the computer besides just word processing and game playing. Their creative abilities were challenged, and although I think there were areas of improvement, it was pretty good being that this is my first challenge project.

Here are some things I would plan on doing to make the project more successful next year:

1. Give more direction and more accountability to group members
2. Consider having one goal instead of multiple, and have groups work on different parts to that goal.
3. Continue to improve on giving students feedback throughout the process
4. Have expectations of the students work at a level to which they are capable. Not my level.

Overall, this has been a wonderful experience, and I'm already thinking of what to do next year, how to improve and where to grow. I thank you for the use of all the technology and I know it's sincerely made an improvement in the science education of my class.

Instructions on how to run software.

The software is run simply by opening the file in Interactive Physics and pushing play. Since multiple groups did work, there are multiple files.