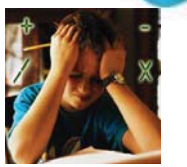
Science Fair Extravaganza

IPRO 330

Problem

- Many american students in middle and high schools regularly score **worse** than any other nations on math and science standardized tests.
- Factors that contribute to this are the lack of available math and science resources that could help students, parents and teachers.
- As a concequence of this, Chicago Public Schools (CPS) students regularly struggle to complete science fair projects successfully.



Objectives

- Combat mathematical and scientific illiteracy among CPS students
- Provide students with the ideas and analytical tools necessary to succeed in their science fair projects and outside science curricula as well
- Motivate students to learn math and science though intriguing science fair projects

Approaching the Problem

- Divide into three subteams focused on creating projects and guides, improving communication among current CPS contacts, and improving science fair extravaganza website
- Intensify efforts towards obtaining feedback from current CPS teachers involved in High School Transformation Project as well as other CPS teachers and science fair coordinators

About Us

- Our group is composed of students from different diciplines.
- We are committed to make a difference in how high school students perceive math and science through science fair projects.

PROJECT/GUIDES TEAM
Leah Baldwin, 3rd Year BME
Joshua Tate, 3rd Year AMATH
Aimee Totleben, 3rd Year AMATH
Yewon Gim, 4th Year Physics
Patrick Ten Eyck, 2nd Year AMATH

COMMUNICATIONS TEAM
Rocio Diaz, 3rd Year CHEM
Angela Pak, 3rd Year MBB

INFRASTRUCTURE TEAM
Keith Campbell, 4th Year ECE
Anthony Parrillo, 4th Year AMATH
Shane Steward, 4th Year CS

FACULTY ADVISORS
Prof. Gregory Fasshauer AMATH
Prof. Michael Pelsmajer AMATH

http://sciencefair.math.iit.edu

Everything You Need to Know About Science Fairs!

PROJECTS
GUIDES
DATA ANALYSIS
PRESENTATION
COMMUNICATION
COLLABORATION

PROJECT/GUIDES TEAM
creating a science fair bank

GOAL
Update current science fair project bank and create data analysis and safety guides

Accomplishments

- Created a student friendly Safety Hazards Guide
- Renovated data analysis guides to be more comprehensible by CPS teachers, students, and parents
- Designed a quiz to help students choose a science fair topic
- Added **10+ projects** to our current science fair project bank, which ranged from easy to challenging

COMMUNICATION TEAM
contacting CPS and University of Chicago

GOAL
Create more contacts with different people who can help develop IPRO 330

Accomplishments

- Developed communication with current Chicago Public School and other contacts
- Distributed IPRO 330 brochures and information to CPS city-wide science fair
- Designed promotional items, such as brochures for students and teachers, as well as a new logo
- Helped with design and layout of the website
- Visited Chicago Public School Schools to raise awareness of our website
- Univesity of Chicago collaboration for future goals

INFRAESTRUCTURE TEAM
making it available to everyone, everywhere

GOAL
Revamp the website so that it would be more appealing to students, and easier to use for future groups

Accomplishments

- Separated the coding into two components: design and content
- Changed the design of the website and made the usability easier by adding more internal links
- Converted all code for website to standard xhtml format
- Created tutorials for future IPRO groups to see the work done this semester and be able to keep building the website easily

Team Achievements!

- Restructured and reformatted Science Fair Website
- Renovated data analysis guides to be more comprehensible by CPS teachers, students, and parents
- Visited high schools and presented our website and quiz to students and teachers.
- Our IPRO was able to present our project to **50+ teachers** involved in IIT High School Transformation Project and was very successful at obtaining more contacts for the coming semester.

Future goals

- Maintain and increase communication with CPS science teachers and science coordinators with the aim to provide our support for CPS science
- Add more interactive guides so that students learn through practice
- Future members of IPRO 330 will expand and improve on already posted projects and presentation guides, as well as add projects of their own.
- The website will also need to be expanded and improved upon with increased content, and more interactive programs, based on further research and feedback from current Chicago Public Schools.

IPRO 330

Contemporary Science Fair Projects

for every child in every school

Measuring Characteristics of Planets

OBJECTIVE - Figure out characteristics of planets without measuring anything!

CONCEPT - While we have great telescopes to observe neighboring planets to distant galaxies, we do not have any direct way to measure how big the sun or the moon is. Even astrophysicists obtain data they can, and look for clues that can tell us about the vast universe. There is no scale big enough to weigh a planet, (or that would properly function as a matter of fact). Have no fear! By observing how they interact with each other this information can be indirectly measured.

PERSONALIZE YOUR PROJECT - Ask yourself some questions! What do you want to measure? Density? Mass? Distance? There are measurements known already with great accuracy. How does your measurement correspond to these values? Where would the error come from?

REMEMBER - Make sure you cite your sources properly!

DIFFICULTY ★★★★★

RELATED FIELD - Physics

Are You Really Random?

OBJECTIVE - Find the best way to generate random numbers!

CONCEPT - A lot of things in nature are random - Radioactive decay of atoms, quantum tunneling, and even rain drops! So it's really important that we know what true randomness is, It's hard to generate random numbers. Once we generate these numbers, inherently it is no longer random but generated. It is oxymoron. So we try our best. What is the best way to generate random numbers then?

PERSONALIZE YOUR PROJECT - Ask yourself some questions! What is the most effective algorithm for generating random numbers? Random numbers out of a phone book? Asking people? Or is there a perfect equation for it? How does your ipod generate shuffle?

REMEMBER - This is a thought experiment. There are very few dangers.

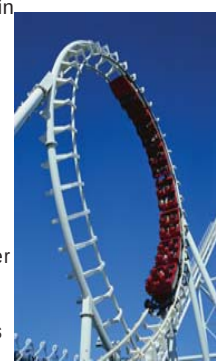
DIFFICULTY ★☆☆☆☆

RELATED FIELD - Math

Playing with Forces

OBJECTIVE - There are so many forces around us! So why don't we get to know them and play with them.

CONCEPT - We live in a world where balance among forces plays an important role, figuratively and literally. The balance of this force is what enables us to be on a rollercoaster without falling down. One of the most famous equations, and important legacy of Newton is F=ma. The equation states that mass and acceleration is directly proportional to force. So how do forces relate? How do we balance forces?



PERSONALIZE YOUR PROJECT - Ask yourself some questions! Can you build a series of devices that will push buttons and do things for you? (Like that Honda commercial!)

REMEMBER - Some stored energy can be dangerous. Make sure the forces are controlled and you cannot be harmed. If needed equip yourself with proper safety equipment.

DIFFICULTY ★★★☆☆

RELATED FIELD - Physics

Play to Win

OBJECTIVE - Develop a winning strategy for this game!

CONCEPT - Game: Two players count up to 21 in increments of 1 or 2. The player to say 21 loses. What is the best way of playing this game so you can win?

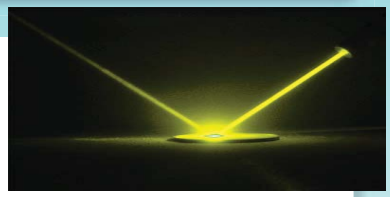
PROCEDURE - Find a friend and play the game. Record what happens at each turn. Based on the outcomes, develop a strategy. Play the game again to test your strategy! Repeat steps 1-4 if necessary

ANALYSIS - Try creating a strategy what that will win not only a game that ends with 21 but 22, 23, etc!

DIFFICULTY ★☆☆☆☆

RELATED FIELD - Math

Bending the Light



OBJECTIVE - How does light behave under different conditions?

CONCEPT - Even though we interact with light every day, it has mysterious characteristics. One of them is how light interacts with other materials in the world. Thanks to commercially available lasers, you can observe the behavior of light easily!

PERSONALIZE YOUR PROJECT - Ask yourself some questions! How does different color of light interact differently? What other effect does material have on the light? Does it change its speed? Color? How does light bend if there is current flow in the water? Does it change as the direction of current changes?

REMEMBER - Do not point the laser directly on your eyes!

DIFFICULTY ★★★☆☆

RELATED FIELD - Physics

MATH

PHYSICS

CHEMISTRY

BIOLOGY

AND MORE!