IPRO-330
Project Plan
2/14/07

Objectives

The focus of IPRO-330 is to help Chicago Public Schools facilitate the district wide science fair project. Each semester each of the 23 public high schools in our district hold science fairs within their school. The best projects are selected from these and are chosen to compete at the district science fair; this competition was held at IIT this year.

Over the past few years there has been a sense of repetition in the projects presented, compounded by a lack of interest among some of the students who participate. This IPRO seeks to consider a solution to this problem by generating project ideas and a resource archive through which students can be inspired by science and also learn the appropriate techniques of presentation.

Our main objective is to create a bank of projects (between 10-20) which will provide students a variety of concepts when choosing an experiment. These projects will be incorporated into a website along with detailed descriptions of quality projects and methods of presenting at the fair. Another key focus of our IPRO, given that it is headed by the math department, is that the website will also encourage students to use mathematical tools to help them analyze their data. There will be a section which describes methods to help ensure quality results and more appropriate graphical representations.

Fundamentally, the objective of this IPRO is to learn to love science. Teaching students proper ways of conducting experiments and then analyzing and presenting the data is vital if these students are expected to appreciate science and potentially consider it as a career. It is equally as important that students learn the connection between science and math, as often science at early levels of education is taught with as little math as possible. By providing students with this science fair archive, we hope they will learn to love science and not consider it and math as inconveniences.

Background

This is the first semester for this IPRO, and as far as I know, the first time that an IPRO has worked with Chicago Public Schools (CPS). There is no financial sponsor involved with this project as CPS has no fiscal investment; however, they will be considered our sponsor for the purposes of this project plan. There are really only three people we work with in CPS: Chris Dignam, the science fair coordinator; Eric Williams, the post-secondary science coordinator; and Tammy Butler, the science chair coordinator.

The problems faced by CPS in the science fair are complicated by the problems they face in the classroom. I won't go into these as this is not meant to be a social commentary – superficially, the problems we are trying to solve deal with the lack of quality projects and poor presentation skills displayed by the majority of science fair participants. There may have been attempts to change this in the past, but no one we have contacted is aware of any. Part of the difficulty with implementing change is the high turnover rate for administrators and teachers in the science and math departments. Communication is also a problem for the teachers of the 23 schools in this district, but that is not a problem we are attempting to address.

Ethics is a problem which our team will have to consider, not because we plan on acting unethically, but simply because of the nature of the science fair. It is certainly tempting for a student who has no vested interest in the scientific method to steal someone's experiment and present it as his own. Because of this, we must remind the students of the importance of ethical practices, and also not

provide them too much scientific information for fear that they simply copy our results. While I personally think this is nonsense, some people believe that there are certain cultural backgrounds with a predilection towards math and science. It may be culturally sensitive to some of the students in the science fair project who are often told that they will not succeed at science and there is no career available using math. This is an unfortunate topic which arises far too often in society, however I will refrain from social commentary.

It is impractical to consider the business costs of this problem (apathy towards science/math in the youth of America) but the societal costs are immeasurable. Imagine an entire generation led by foreign scientists and mathematicians: there would no longer be any pride in America for our scientific advances because none of it would be achieved by Americans. Of course, as simple as it is to blame this all on the school system, I actually believe that the problem lies much deeper than that.

First of all, there is often little or no drive in the community (aka Mom and Dad) to learn or even care about math. A parent would be remiss to tell friends that their child couldn't read, but the fact that their child is incompetent in mathematics is hardly a problem – after all, Mom can't balance her checkbook and Dad can't read a graph. But the apathy among parents is only one of the symptoms of a much more frightening problem, which is to say that Americans have become lazy.

Laziness permeates the society at all levels, and I refer not only to mental laziness where a student becomes careless with his homework because it is too difficult; I refer also to the laziness of the American spirit. People no longer strive for greatness and persevere through mental challenges to reach their goals. Instead the goal of an American today is to be on television, or the internet. And why not, it's certainly much easier to find yourself a media spectacle today than it is to be a mathematician: CNN, Yahoo, YouTube, MTV and the like have paved the way for anyone to be "famous" or infamous as the case may be. There is no longer a need to be great or excel in a profession when one can simply become a member of a reality television program and emerge victorious with no more skills than the ability to exist.

This is a bit off the topic of the societal costs of failing to produce quality science fair projects, but none the less the cause and effect seems undeniable. If we solely restrict ourselves to curing the symptoms of a scientifically inept America we would be remiss for failing to consider the cause. It is only by treating the cause that we can hope to solve the problem, which is why this project seeks to inspire students as well as provide them the tools to complete a quality science fair project.

Methodology

I think the problem was rather broadly defined in the previous section, so here we will restrict our focus to solely the lack of quality projects and the need for a science fair archive with ideas, methods of implementation and proper techniques of analysis and presentation. The first step to solving this problem is to actually see for ourselves the state of science and math education in CPS and try to understand why students generally design mediocre projects. We will accomplish this by talking with CPS science and math teachers and also by working with students on their projects to try understand the strengths and weaknesses of the science fair scheme. If possible we will also help judge a science fair in which these students participate.

After we have contacted members of CPS we will try and put together some initial projects which are similar to the projects at the science fair. These projects will be well developed and have strong math association so that we can determine how easy it will be to incorporate math into the science fair projects. Once we have 15 quality projects, projected to take about 4 weeks, we will break into three subteams

The website team will design the website and perform the necessary coding to allow all the team members to upload material as needed. One team will carry out and document the experiments

that we suggest and modify/enhance them as needed; the results of these experiments will be edited and posted on the website to show students the expected outcome. Because presentation of the results is also important to a successful project, one subteam will have the job of designing appropriate material and organizing it in an aesthetic manner on the website. The final product will be used by CPS students to assist them in their future science fair projects, and hopefully this IPRO can continue to monitor and improve the archive to meet with the changing needs of the secondary education community.

One important consideration is the interdisciplinary nature of our IPRO team. This will allow us to approach science fair projects from a variety of angles, and make sure that no one project is overly complicated or lacking in depth. The projects chosen from the archives will be chosen by the whole team, and our success will be in determining whether the projects we design will help CPS students produce better projects. Simply providing them ideas is inadequate because as college students we obviously understand the scientific method more completely. Our results will be analyzed based on future data, because there is no basis for comparison to a current archive.

The IPRO deliverables are as follows:

Deliverables:	Generated by:
Website	website programming team
Bank of project ideas	project team
Presentation ideas	layout team
Scientific method ideas	layout team

Expected Results

This project has a number of final products that will be completed when the project is finished. These include a database of new and interesting high school science fair project ideas, with a special focus on the mathematical aspects of the projects. A guide to successfully completing a quality science fair project will also be compiled, to guide the students in their experimental endeavors. This will all be housed on a website accessible to the students and faculty of the Chicago Public Schools, from whom this is sponsored.

The list of novel science fair ideas is the primary product that this IPRO project will be producing. The list will include details of the projects, including descriptions of the procedures, and a discussion of what should be expected of the student completing the project. The project ideas will not be simply the "run of the mill" projects seen at every science fair, but the ideas will be novel. A special emphasis will be given to the mathematical aspects of the projects, and some projects will be primarily math based projects.

Another aspect of this project is to compile a general discussion of what makes a successful science fair project. This will contain a discussion of how to properly analyze data from an experiment, a description of how to present the project to judges, and a number of guidelines on making a successful display board.

All of this will be contained on a website produced by this IPRO team. This will require the website development team to make an interface accessible to middle and high school students, as well as templates for other team members to develop the content in, say, the list of project ideas. This website will be the ultimate product of this IPRO, serving as a project database for the Chicago Public Schools, as a resource for students interested in participating in the science fair.

This will all be achieved through discussions with officials from the Chicago Public Schools, as well as experience with the scientific method, and participation in science fair judging. Examining successful science fair projects that have been completed previously by students will be an important guide for the project to successfully achieve its goals.

Proposed Budget

There is little or no spending required for this project. Thus far there have been no expenses, but there are some possible costs:
Projected:
- Transportation to CPS - $100
- Website Development (copyright purchases) - $100
- Mock Experimentation Equipment - $100

Schedule of Tasks

Please see the attached MS Project file 330s07.mpp for the required data.

Individual Team Member Assignments

The IPRO 330 team consists of 11 members and 2 faculty advisors. For a list of team members, see the table below:

Name	Major	Strengths/Assets
Beagley, Jonathan	Math	Web design background
Dunne, Brian	Comp. Engineering	Free time, non-science perspective
Hill, Shayne	Math	Good understanding of science fairs
Holt, Thomas	Arch. Engineering	Free time, non-science perspective
Ji, Chaonan	Math	Creative solutions, female
McCourt, Michael	Physics	Free time, leadership
Meyer, Chad	Physics	
Parillo, Anthony	Math Education	Good at administrative stuff
Shenoy, Pradeep	Elec. Engineering	Non-science perspective
Sikoeski, Kajetan	Math	
Yokley, Kevin	Math	Knowledge of CPS, contacts

The team will be led by Michael McCourt and Tony Parillo, with input and assistance from our faculty advisors Dr. Greg Fasshauer and Dr. Michael Pelsmajer. The tables below show the distribution of members between teams.

Subteam 1	Subteam 2	Subteam 3
Jonathan Beagley	Brian Dunne	Michael McCourt
Kevin Yokley	Tom Holt	Pradeep Shenoy
Shayne Hill	Chaonan Ji	Kajetan Sikoeski
Tony Parillo	Chad Meyer	

For the first stage of the project, all subteams will be working on brainstorming. Thus, subteams will not have assigned leaders until the second formation of subteams. Each subteam will be accountable to the group as a whole, and the ideas they return will be discussed and refined.

Once we have collected what we feel to be an appropriate number of science fair project ideas, phase two of the project will begin. Subteams will be redivided on a per-task basis to handle the 3 remaining

primary tasks: constructing the website, developing a guide or series of guides to good presentation, and further development of project ideas. These subteams will each be assigned a leader, as they will be requiring more coordination than the subteams in phase 1.

Designation of Roles

As most of us entering this IPRO already knew each other, we have taken a more laid back approach to assigning roles and dividing up tasks. That is not to say that things are not getting done, but rather that we are accomplishing things without having to feel like we were forced into it. For example, no one wanted to be the assigned minutes taker, so we came up with a fair compromise: everyone will take turns taking the minutes. This may lead to inconsistency in style or quality of the minutes, but it also makes everyone happier that they only have to do it once or twice.

Mike McCourt, being the creator of the idea for this IPRO, has been the guy making up agendas for each meeting, with some help from Tony Parrillo. These two have taken charge in both meeting management and task division among our subteams, with Jonathon Beagley leading the third subgroup. As one might expect, this means they also set the agenda for subteam meetings, although those are more informal than our main meetings.

McCourt and Parrillo also act as timekeepers in our main meetings, although we have not really had any issues with sticking with the agenda thus far anyway. This is mainly because the planned agenda times have been both accurate and realistic for the amount of discussion and questioning required for each topic, but also because of the aforementioned familiarity between most of the members. Because we all know each other to some extent, we already have a head start in working together, an advantage that has led to early productivity as facilitated by the agendas developed by McCourt and Parrillo.

Weekly Timesheet Collector/Summarizer:

Since we divided into small groups, each group has its own timesheet collector and summarizer. The leaders of our small groups are Anthony Parillo, Brian Dunne, and Pradeep Shenoy. These members are responsible for collecting timesheets from each of their group members. These timesheets allow progress to be tracked throughout the course of the project as well as give the ability to quickly summarize what has been going on in each small group.

Master Schedule Maker:

The master schedule has allowed us to view what times various team members would be available. We also included our email addresses and phone numbers to further facilitate intra-group communications. Michael McCourt is in charge of these tasks should any information need to be changed. Having a master schedule has allowed us to choose more efficient small groups by putting members together that will be able to contact each other more easily.