Open Source Software Development

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Research

The United States is in need of a way to engage students in science and increase performance. According to a study conducted by The Organisation for Economic Co-operation and Development (OECD), the United States is ranked as the 24th best country for science and scored below the average of the 65 countries included in the survey. Widspread apathy leads to teahcer’s inability to engage students; parents and students generally aren’t as passionate about learning as in other nations. (Roth). The United State’s ranking in science and ubiquitous apathy among students and teachers demonstrate the need to improve the quality of science education in the United States.

The apathy common in schools among students, teachers and parents is anathema to quality science education in the United States. This widespread apathy effectively decimates the ability of teachers to provide information that will be remembered to students, setting us behind the rest of the world (Crogham). Teachers are unable to engage students in their work, contributing to students’ apathy (Bishop). To begin to increase the quality of education in the United States, teachers must be able to engage students.

To engage students and combat apathy, teachers can use simulations and demonstrations that relate the material to students. Demonstrations in science have a proven affect on the ability of students to learn, increasing their retention of information drastically (Mile). Because of the noticeable affects of using demonstrations, teachers can implement them to increase the quality of education in their classes. (Shakhashiri). By using more demonstrations, teachers can combat apathy and improve education in the United States.

The Problem and Our Solution

*Catalyzing genuine interest in the age of apathy*

The cause for the United State’s subpar performance in science is caused by acute cultural differences between the United States and the countries that scored exceptionally (Steiner). Small, legislative changes could help; however, a partisan national government has caused the last Congress to be the second least productive in modern history, decimating the chance of legislative reform to the educational system (Murray). Since national changes are unlikely, the United States needs a grassroots movement to increase the quality of education.

With application in numerous other fields of science and in the creation of modern technology, physics is one of the most fundamental branches of science (https://phystec.physics.cornell.edu/content/why-study-physics). Studying physics is shown to increase performance on standardized tests and help students learn to study other areas of science (*Why Physics?)* By learning to teach physics more effectively and increasing the quality of physics education, teachers can improve the condition of science in the United States.

One of the primary obstacles teachers face in increasing the quality of science education is ubiquitous apathy among students. In the United States, disengagement among high school students is an epidemic: 40% of high school students report being disengaged in school (Crotty). This problem is exacerbated by traditional methods used to teach physics, which are characterized by a passive student listening to a teacher lecture. These methods are ineffective in engaging students and, therefore, are ineffective in teaching physics. (Dufresne). To increase the quality of science education in the United Sates, teachers must address the problem of disengagement caused by conventional methods used to teach physics by working to engage students.

Our project empowers teachers to separate themselves from traditional teaching methods and engage their students. Our project utilizes interactive learning modules that relate content to students by providing them with interactive, visual examples of content. Rather than propagating antiquated lecture intensive teaching techniques, instructors will be able to provide an overview of content and allow their students to use the simulations contained in our project to further investigate principles of physics. By enabling teachers to engage students with interactive, graphical examples, our project will decrease apathy among students, increasing the quality of science education in the United States.

Plan of Work Log

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Task | Time involved | Team Member(s) Responsible | Comments |
| 1/6/15 | Made outline for project | 2 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | We were successful in making the outline of the project. We will meet again on the weekend to review the tools we will be using. |
| 1/10/15 | Reviewed JavaScript | 1.5 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | We reviewed JavaScript and talked about how we will use it in the project. Next meeting has been scheduled for next week. |
| 1/13/15 | Came to a conclusion on the proper way to do the project. | 3 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | At the advice from the seniors, we redid the outline for the project, deciding to take it in another direction. We will now use Java and make an applet. |
| 1/20/15 | Discussed project, found a problem. | 45 minutes | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | Today, we started narrowing down the problem we will solve. We decided to teach something. Still deciding what to teach. |
| 1/27/15 | Found what problem to solve | 1.5 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | We decided to make a physics simulator to solve the problem of lack of engagement in physics classes. Still narrowing down what in physics to teach. |
| 2/2/15 | Decided what topics to teach | 30 minutes | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | We decided to teach Kinematics, Forces and collisions in the physics simulator. Andrew will research a way to do this for next meeting. |
| 2/7/15 | Researched Physics Simulator | 1 hour | Andrew Spencer | Spent time looking for a good framework with which to build our project. Found something that looks promising. |
| 2/8/15 | Downloaded Physics Simulator, got working | 3 hours | Andrew Spencer | Downloaded the simulator and spent time figuring out how to properly implement it. |
| 2/9/15 | Wrote documentation on Simulator | 1 hour | Andrew Spencer | Wrote example code on how the simulator will work and wrote documentation on how to use it. |
| 2/10/15 | Discussed simulator | 1.5 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | We talked about the simulator and how it will work, reviewed example code, and planned how graphics are going to work. Vinit will implement graphics for next meeting. |
| 2/13/15 | Worked on implementing graphics | 30 minutes | Vinit Ranjan | Wrote a graphics window for the graphics to take place in. Started on making graphics working. |
| 2/15/15 | Worked more on implementing graphics | 3 hours | Vinit Ranjan | Started working more on how graphics will work. Only have one bug to fix before graphics are finished. |
| 2/16/15 | Fixed bug | 45 minutes | Vinit Ranjan | Fixed the bug. The simulator now shows a box falling from the sky. Should be a good demonstration on how graphics work. |
| 2/17/15 | Vinit presented graphics, assigned tasks and due dates. | 1 hour | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat. | Vinit showed how graphics are going to work. We established that progress needs to be made on everyone’s part by the end of tri break. |
| 2/21/15 | Finished writing documentation | 1.5 hours | Andrew Spencer | Wrote more documentation on how the project is going to work. |
| 2/21/15 | Started outlining simulation | 2 hours | Sunwoo yim | Started planning how my simulation is going to work .Spent time reading the documentation. |
| 2/22/15 | Read documentation, understood simulation | 1 hour | Vikram Aikat | Read the documentation and started to understand how graphics is going to work. |
| 2/23/15 | Outlined simulation | 3 hours | Vikram Aikat | Outlined how my part of the simulation is going to work. |
| 2/23/15 | Started coding simulation | 2 hours | Vinit Ranjan | Started working on the coding of the simulation. Expanded the graphics currently in the simulation. |
| 2/24/15 | Started writing research | 1.5 hours | Andrew Spencer | Started writing up research for the project. |
| 2/25/15 | Started on kinematics | 4 hours | Sunwoo Yim | Found how DVAT Equations will be taught, made an environment in which the simulation will run. |
| 2/26/15 | Vikram Aikat | 3.5 hours | Vikram Aikat | Make environment for forces. Made different bodies to be acted on by the forces. |
| 2/26/15 | Worked on kinematics | 2 hours | Sunwoo Yim | Worked on filling the content on the kinematics simulation. |
| 2/28/15 | Started working on content of simulation | 2.5 hours | Vinit Ranjan | Worked on filling in the content for my part of the simulation. |
| 3/1/15 | Kept researching | 3 hours | Andrew Spencer | Finished writing the research for the project. Started on writing the design. |
| 3/1/15 | Finishing up simulation | 4 hours | Sunwoo Yim | Finishing the content for the simulation. Working on a lot of bugs. |
| 3/2/15 | Expanding graphics | 2 hours | Vikran Aikat | Made the graphics in my part of the simulation better. Worked on ensuring that the simulation teaches others. |
| 3/3/15 | Presented progress | 1.5 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat | Presented our progress on our parts of the simulation. Decided that we will have a draft of all of our parts of the simulation by next meeting. |
| 3/6/15 | Drafted simulation | 4 hours | Sunwoo Yim | Finished up the draft of the simulation (finally), will present |
| 3/6/15 | Worked on content | 2 hours | Vikran Aikat | Worked on the content of the simulation. Made the bodies the forces act on more responsive. |
| 3/7/15 | High-level design and project requirements. | 3 hours | Andrew Spencer | Finished up these two sections of the report. |
| 3/8/15 | Drafted simulation | 5 hours | Vinit Ranjan | Finished Drafting my part of the simulation. Will take bugs to the next meeting. |
| 3/8/15 | Finished up simulation | 3 hours | Vikram Aikat | Finished doing my part of the simulation. No bugs that I noticed. |
| 3/9/15 | User documentation | 2 hours | Andrew Spencer | Talked to other members of the team, started working on the user documentation. |
| 3/10/15 | Worked on bugs | 4 hours | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat | Spent time going through the bugs in everyone’s program. Parts of the simulation seem to be working. |
| 3/13/15 | Worked on main page | 2 hours | Andrew Spencer | Spent time working on the main page for the simulation. |
| 3/14/15 | Finished main page | 4 hours | Andrew Spencer | Finished the main page for the simulation. Got all the parts working together. |
| 3/15/15 | Wrote reflection | 45 minutes | Vinit Ranjan | Wrote the reflection on my part of the project and how I did. |
| 3/15/15 | Did reflection | 1 hour | Sunwoo Yim | Wrote my reflection. |
| 3/15/15 | Reflection | 30 minutes | Vikram Aikat | Did the reflection for how my part of the simulation went. |
| 3/17/15 | Meeting | 30 minutes | Andrew Spencer, Sunwoo Yim, Vinit Ranjan, Vikram Aikat | Talked about how project went. |

Advisor’s signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project Requirements

High-Level Software Design

Testing

User Documentation

Team Evaluation

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