Introducing Computing in Daily Life to High School Students

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With the declining number of students taking up Computer Science as a major in college, it is important to introduce the concept of computer science and its integration in daily life to students at a lower level. The students in the Poudre High School already use computer-based interactive worksheets to learn concepts of chemistry. These worksheets are developed using Molecular Workbench. The Molecular Workbench is a platform to develop "iterative, visual simulations and activities"[1] helping science teachers and students alike, since it is implemented in Java and therefore is portable.

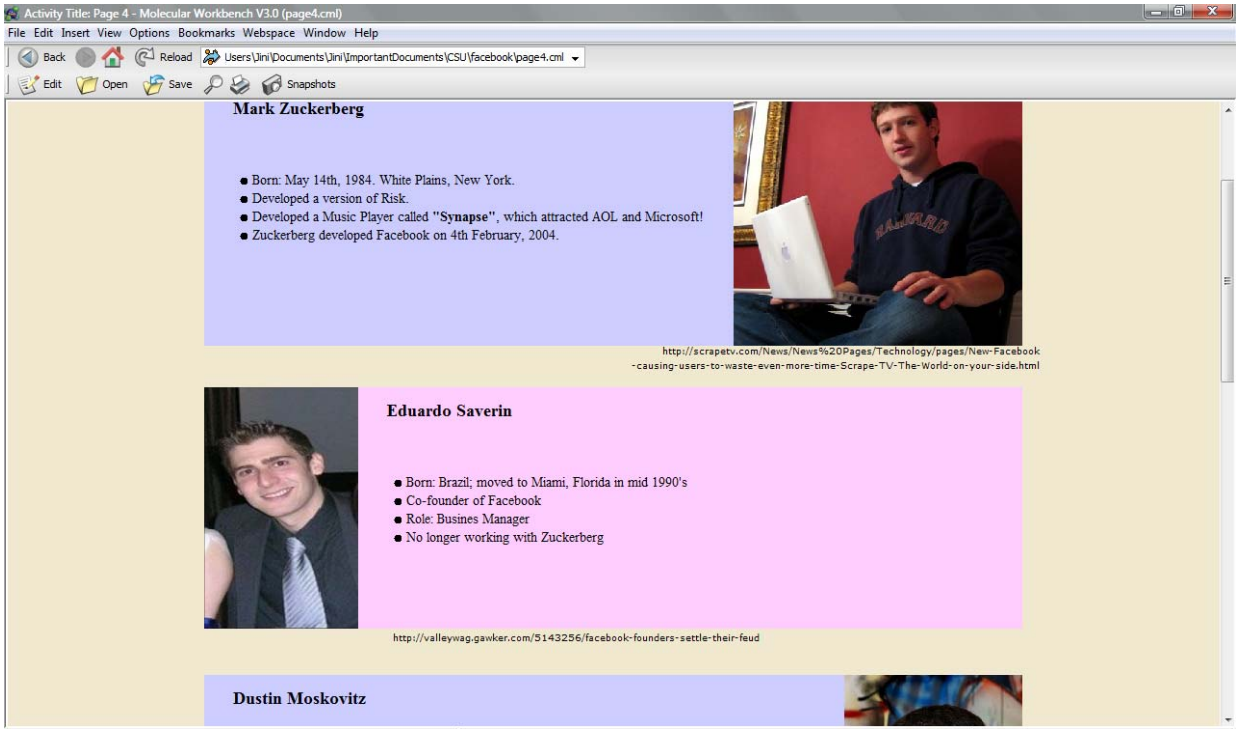
Worksheets are groups of interactive electronic pages developed to focus on a certain topic and activities related to it. A worksheet typically has an introductory page with some basic descriptions and questions. It leads into deeper concepts and more thoughtful questions and concludes with an overall questionnaire about everything mentioned and explained in the worksheet. Since the worksheets usually deal with concepts of chemistry, they include simulations explaining chemical activities and reactions and videos on various topics.

Using the Molecular Workbench to implement a Computer Science based worksheet is an effective way to address the issue of lack of interest of students in the field. Since the students have already been using Molecular Workbench to work on concepts of chemistry in the classrooms, introducing a new concept in familiar surroundings will prompt the students' confidence and urge to know more about it.

To address this problem of lack of interest in the computer science field, this summer I worked with my mentor from Colorado State University, Prof. Michelle Strout and two Poudre High School teachers, Kelly Suto and Tim Lenczycki on developing four new worksheets which, include not only chemistry but computer science concepts as well. We developed the worksheets on the following four topics: Elements and Electronics, The Oil Spill, Online Social Networking: Facebook and The Entertainment Industry.

The reason these four topics were chosen is to incorporate the daily lives of students and emphasize on the importance of computer science today. Following is a brief description of each of the worksheets. My responsibility was to create the Facebook worksheet, that is, the worksheet dedicated to introducing computer science concepts to high school students.

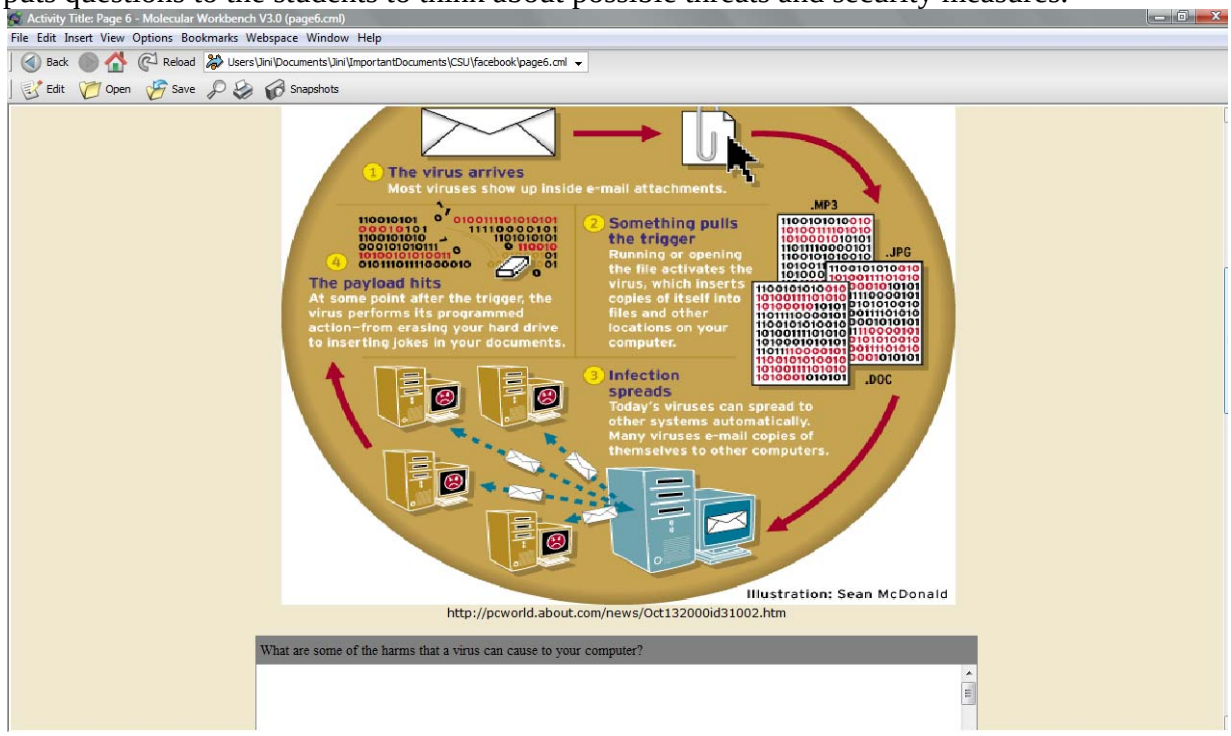
Out of the four, the worksheet on Facebook focuses solely on computer science concepts. The layout aims at introducing the concept of social networking to students and relates some fun facts about the usage and growth of Facebook. It follows with questions on the amount of time spent on Social Networking by students and some survey questions to measure their attitudes towards computer science. The worksheet then explains in details the history of the founders of Facebook and the site's origin and development. Then come some explanations of security threats and identity theft cases on Facebook. The intent is to introduce all aspects of the website to the students and bring to light the role computer science plays. To do so, we give details of the two most important computing concepts used by a popular site like Facebook – multiple servers and encryption. While the servers incline towards a more hardware aspect, the encryption talks about programming and its actual use in day-to-day transactions online. To conclude, the worksheet has some more survey questions to measure the change in attitude of the students after understanding these concepts. It also lists various jobs available to a computer science major right after college and reasons as to why a major in this subject may be beneficial.



A page with details about the founders of Facebook.com

Above is a page that provides information about the four founders of Facebook and is followed by questions about them to encourage the students to think about possible similarities and dissimilarities amongst the four. This is aimed to depict that interest in computer science is not based on only a certain set of choices, values or ideas, Computer science is a field of study open

to everyone. The background of Facebook eventually leads into more significant computer science topics, such as security and viruses. Following is a page that talks about viruses and puts questions to the students to think about possible threats and security measures.



The chain of a virus infection and following question on the topic

The Entertainment Industry worksheet, also incorporates similar computing details. This worksheet is still in its developmental stage and includes videos and reflective questions on advanced technology depicted in television shows and their actual applications and uses. This worksheet is also going to include many concepts of chemistry as the development proceeds.

The Elements and Electronics worksheet and The Oil Spill worksheet are primarily chemistry worksheets with computer science concepts involved in them. The former talks about the elements and narrows down to use of elements, namely semiconducting elements like - Silicon in electronics such as – cell phones, computers etc. It also includes the multitasking abilities of Androids and the concepts behind it.

The Oil Spill worksheet emphasizes on the role on computers today in creating simulations and predicting the future of oil spills and how it is helpful in taking preventive measures to curb the spills.

All four worksheets have interactive activities and questions throughout them to impart correct understanding of the concepts explained. All the questions are submitted to the teachers in charge and the inputs are subject to submission and grading.

The questions incorporated in the worksheet are used as double purpose questions. They not only introduce computing concepts to students, but also serve as a survey to the developers. The

survey questions are to be tested out on a sample population of high school students before being incorporated into the worksheets.

These questions are to be chosen from two papers published by the Colorado School of Mines(CSM) on measuring student attitudes towards Computing. CSM tested the questions out via statistical tests like the Cronbach's Alpha and Factor Analysis. The current questions will be tested out by the same methods after being subjected to the sample population.

All four worksheets will have questions at the beginning and end of the worksheets and will help in evaluating student attitudes towards computer science. With these worksheets explaining computing concepts to high school students, we aim at introducing the prospect of a Computer Science major in college for them. Molecular Workbench has been in use for two years already in Poudre High School, we will use the same medium to launch newer concepts into the curriculum.

References:

[1] http://workbench.concord.org/database/

[2] Andrew Hoegh and Barbara Moskal, “Examining Science and Engineering Students’ Attitudes Towards Computer Science”, http://portal.acm.org/citation.cfm?id=1733967, 2009

[3]Daniel Heersink and Barbara Moskal, “Measuring High School Students’ Attitudes Toward Computing”, http://portal.acm.org/citation.cfm?id=1734263.1734413, 2010