



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

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Project Title Low Cost Animated Teaching Tool for Study of Elements of the Periodic Table with an Interface for the Visually Impaired	
<div style="display: flex; justify-content: space-between;"> <div data-bbox="87 634 324 667"> Objectives/Goals </div> <div data-bbox="712 613 836 642"> Abstract </div> </div> <p>Understanding elements and their atomic structure is a very interesting and important study. But, the logic involved is not straightforward. My goal is to come up with a solution that can help in teaching these complex concepts with visual effects that are easy to absorb. My goal is also to help visually impaired by adding sound. Finally I want my solution to be portable, extensible and low-cost and accessible to students with limited access to expensive resources or the Internet.</p> <div data-bbox="87 827 350 856"> Methods/Materials </div> <p>Materials: Raspberry Pi/Arduino, 2 Breadboards, 6V DC Motor, 8 LEDs, 8 resistors, Braille stickers. Programming: Elements, Exception Elements, Electron Configuration, Speech, Drawing the atom, Lighting up LEDs and beeping for valence electrons, Turning spinner/beeping for radioactive elements. Lewis Dot Notation: LEDs arranged in Lewis Dot Notation circuit on breadboard. Geiger Counter Simulation: Motor Circuit to simulate radioactivity level.</p> <div data-bbox="87 1016 191 1045"> Results </div> <p>The filling order of electrons is 1s² 2s² 2p⁶.. * Example: Oxygen: Atomic Number 8. Electron config: 1s² 2s² 2p⁴ with 6 electrons in valence shell. Lewis Dot Notation circuit: 6 LEDs light up (s1, s2, p1-1, p2-1, p3-1, p1-2) with 6 beeps. Exception Elements (20 in all): * The tool mentions #Exception#, so the student is aware * Example: Copper: Atomic Number 29. Based on the filling order, the configuration should be: 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 3d⁹. But in reality, an electron is transferred from 4s to the inner 3d, resulting in: 1s² 2s² 2p⁶ 3s² 3p⁶ 4s¹ 3d¹⁰. Lewis Dot Notation: The max of 8 valence electrons: s - 1st (s1), s - 2nd (s2), p1 - 3rd (p1-1), p2 - 4th (p2-1), p3 - 5th (p3-1), p1 - 6th (p1-2), p2 - 7th (p2-2), p3 - 8th (p2-3). Radioactive Elements: The Geiger counter is simulated</p> <div data-bbox="87 1369 409 1398"> Conclusions/Discussion </div> <p>My tool best serves the goal as: 1. It has both visual/audio capabilities, making learning fun and effective. 2. It is low cost, compact and portable as it uses Raspberry Pi, and a few simple components, and addresses those who do not have access to expensive resources or Internet. 3. It helps the visually impaired by SHOWING them with words and sounds. Also as it is a programming project: 1. It shows it is much easier than a non-programming model to teach complicated concepts. 2. It, but for the breadboards part, can be put in a website and accessed from anywhere and free of cost, if Internet is available.</p>	
Summary Statement Low-cost Animated Teaching Tool for Study of Elements of the Periodic Table with an Interface for the Visually Impaired	
Help Received Perkins.org and Kentucky school of the blind for feedback. My grandfather, Professor P S Sarma for teaching electronic circuits. School Science teacher, Mr Scharmen. Donumvisi.org for teaching me to help the blind. My weekly science and programming classes. Rishabh Bhasin for teaching Arduino.	