Project 4: Educational and fun activity for groups of year-8 to year-10 children

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Background:
ECE is developing some activities suitable for Year 8 to Year 10 School children aimed at encouraging an interest in STEM (Science, Technology, Engineering and Mathematics) and engineering in particular.

We want to excite and encourage children who have not already developed such an interest to give engineering a chance. **We would like to have more engaging engineering activities based on fundamentals of physics, electricity, magnetism, light, etc. supported by appropriate inexpensive and physically robust hardware.** We are looking for electrical engineering equivalent of the "Mouse Trap Car".

While suitable designs can include the use of a microprocessor, such as an Arduino, the activity should not primarily be related to computer programming. The activity should be hands-on and suitable for a group of 4 children to work on together.

Technical specification

- The activity is designed to last approximately 90 minutes.
- There is one tutor (e.g. someone like a laboratory TA) per group.
- Each group has one set of equipment to work with. The cost per set should be as low as practical, but no more than NZ$500.
- There must be no voltages greater than 20 V (DC or RMS AC) in the equipment; a single standard DC or AC power adaptor can be used to power the equipment if required.
- If students need to insert or change components, this should be achieved reliably without them needing to solder. Screw/spring terminals are strongly favoured over a breadboard for this.
- Schematics must be supplied for any electronics involved in the design. Tina or Altium should be used to simulate any critical or non-standard aspects of the electronics. PCB designs are not required.
- Engineering CAD drawings must be supplied for the equipment, sufficient for it to be manufactured and sufficient for its function to be clear. A bill of materials and a costing must be provided.
- A user guide for the activity for tutors should be drafted as part of your report, explaining the set of items required for the activity, the aim for the activity, the steps involved (illustrated by appropriate diagrams) and indication of what outcomes are possible, both successful and unsuccessful.