

STEM Activity at Keene's John H Fuller Elementary School Three 3rd Grade Classes.

By Don Sherwood

I've used a modified version of IEEE's Pre-University Morse Code lesson plan as a hands-on STEM activity for 5th grade elementary students on a number of occasions. The addition of a variable audio signal provides an extra dimension to the original LED circuit that the students seem to enjoy. The project uses leaded components that are inserted into a solderless breadboard. The assembly is a bit time consuming, mainly due to the number of components and peripheral attachments. Experience with this activity at several schools show that 5th grade students can successfully complete the project from scratch in a two-hour session.

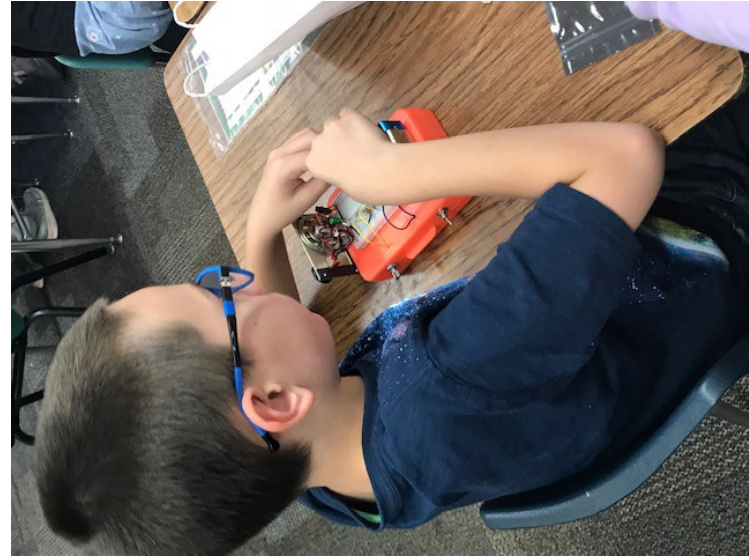
Several teachers at Keene's John H Fuller Elementary School expressed interest in having their 3rd grade students tackle the Code Practice Oscillator activity. Unfortunately, scheduling restraints would not allow an extension to the standard one-hour class time. To accommodate for the shortened time frame required reducing the number of components in each kit given to the students. This was accomplished by pre-assembling the congested oscillator portion of the circuit. The pre-assembly also helped to reduce the number of circuits that required trouble shooting to identify and correct occasional wiring errors. The students still had to assemble the peripheral components and attachments. It was very helpful that most of the 3rd grade students had familiarity the board game, "Battle Ship". This game uses grid coordinate labeling that is identical to that used with the solderless breadboard. The students had no problems at all following instruction for where to insert component on the solderless breadboard.



Class room desks arranged in a cluster format helped to foster student collaboration

There are two aspect to this project, both require approximately equal time duration to complete. The first is an ambitious hardware task to assemble the circuit, trouble shoot any problems and become familiar with several operating modes. Most students followed the sequence of instruction slides that were projected to locate the position and attachment point for each component. As with other schools, there are always a few students that quickly catch on and decide to independently follow the written assemble sheet included with each kit. Each of the three classes had their share of students that were able to complete their assembly ahead or others. It was very rewarding and encouraging to see how eager these students were to voluntarily assist their classmates that were having some difficulty in getting their circuits up and running. This portion of the project is considered complete when all students were able to generate a pleasant tone, generally considered restful between 300 t0 600 Hz and crisper between 500 and 1,200 Hz, and to select a transmit mode using audio, visual or both types of signal.

The second aspect involves a first-time exposure at learning the rudimentary rules of Morse Code to a degree needed to successfully transmit and receive a simple message. The students worked independently to practice the rules and in pairs to try communicating in Morse Code. To keep this as simple as possible, the message consisted of the two-letter abbreviation for a state other than NH. It takes a fair amount of practice to coordinate the duration and timing needed to send and receive message. All the students were able to at least pair up and spend a short amount of time using Morse Code to communicate between each other.



3rd grades students demonstrate a degree of dexterity and concentration needed to successfully complete complex tasks

The basic goal of this activity was to introduce the students to a few aspects of STEM involving electrical circuits, gain experience and confidence in their ability to complete a complex hardware task, challenge their comfort zone with learning a different method to communicate, and most importantly, have fun. I received much positive feedback from the students. Their thank you letters included a fair number of interesting comments, ranging from “I used the circuit to annoy my parents” to “I continued practicing Morse Code at home”. All in all, it looks like the students successfully achieved the goals.

I would like to thank my daughter, Mary Beth Fleury, for her ground work in arranging this activity and her assistance with some of the classroom activities. A very special thanks goes to the three 3rd grade teachers, Julie Shaffer, Jamie Nowak and Anne Pinard. They enthusiastically promoted the activity, were instrumental in preparing their students and instilled a positive attitude. The project would not have been successful without their involvement in providing assistance to the students. And finally, many kudos to the students for their enthusiastic participation. It was a pleasure to meet and work with them on this project.

One final comment. This activity took place late last October, several months before schools were shut down due to the coronavirus situation. Since then, teachers have been required to implement on-line distant learning procedures for the remaining school year. The Department of Education and local school boards face a daunting task of how best to safely reopen schools in the fall. Many STEM activities similar to this require student interaction. I hope this is allowed to continue in some manner.