

Musing on STEM from an IEEE NH Perspective
By Don Sherwood

I enjoy collecting records, particularly those from the 50s and 60s. I still have the first 45 that I bought as a teenager, Sorry (I ran all the way home) by the Impalas, a great up-beat do-op song. So, my interest was peaked when I saw two articles on the internet reporting an interesting statistic that vinal record sales have surpassed CD sales for the first time since 1987. My first thought was the upsurge helps explain the recent increase in vinyl record prices for used and new releases. My second thought was that the reason for the increased prices could also be applicable to STEM projects. The two authors, Drenon [1] and Weatherbed [2] point out that the required dexterity and increased sensory feedback when using vinyl's analog technology provides a more pleasing listening experience than available from CD's digital technology. These results support a long-held contention that can be directly applied to STEM activities; the more sensory feedback, the greater opportunity to foster long lasting interest in STEM career choices. This forms the basis for a few reflections on the direction of the NH Section's STEM programs over a 15-year period from about the mid-2000s to covid's shutdown of most school activities starting in 2020.



The IEEE has long recognized the advantage that maximizing sensory feedback provides when incorporated into STEM activities. Under the TryEngineering

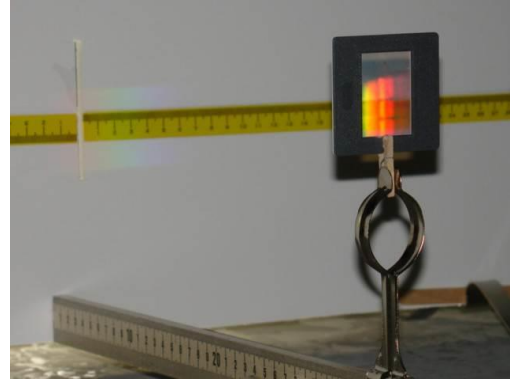
banner, the IEEE has developed a series of lesson plans that cover a wide variety of fields and categories [3]. Included in each lesson plan are explanation of theory, detailed instruction, assembly drawings, teacher and student work sheets and applicable national standards the lesson addresses. There are currently 134 accessible plans [3].

Along with the lesson plans, the IEEE also initiated a separate “Teacher in Service Program”, TISP. The goal was to have regional training sessions for section members to learn how to introduce teachers to the available lesson plans and how to use them in the classrooms. In 2006, the NH Section sent three members to a Region 1 TISP all-day workshop that was held in Boston. In theory, the plan sounded fine. In practice, however, the task of setting meetings up with the teachers turned out to be a daunting effort, most likely due to interfacing at the individual school level rather than at the broader SAU level. After a year of false starts, the TISP program was dropped.

However, while working the TISP issues, the section became very involved in supporting STEM activities in a variety of area, including in-classroom hands-on activities, individual mentoring, science fair demonstrations and judging, STEM Day talks and a section grant program. The key to success in these areas was matching members’ interest and availability to projects’ requirements and time constraints.

The in-classroom support came about somewhat as a result of the failure to get the TISP teacher meetings up and running. The work around had section members from around NH made contact with teacher acquaintances in their local school districts to develop specific activities that were related to the teacher’s class agenda and available class time. Many teachers expressed a hesitation to take on the learning curve associated with IEEE’s lesson plans and preferred to have the section member take over presenting the activity to the class, a win/win scenario.

A sampling of plans used in various situations and locations provides a glimpse into the set ups and interactions involved at the presenter and student level.



IEEE Spectroscope lesson plan is an ideal activity for a single, 1 hour, class period. The 6th grade students at Nashua's St. Christopher Elementary School were teamed up to tackle the project.

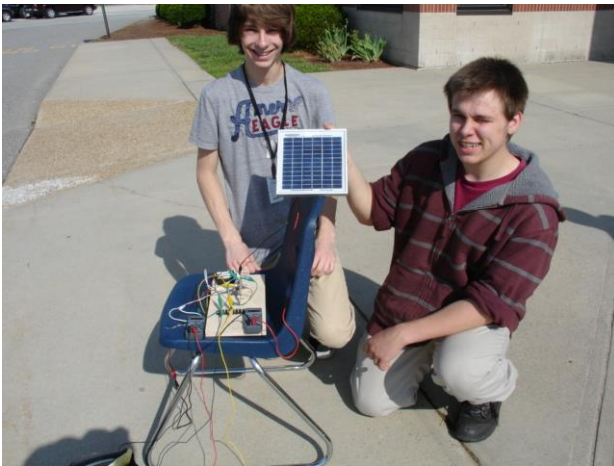


An activity on sound for 2nd grade students at Bow Elementary School used visual, hearing and touch sensory inputs to help demonstrate how sound waves travel



Hudson's 5th grade students were allowed two class sessions (2 hours) to complete IEEE's Light Communication Lesson Plan. The extended time allowed incorporating a simple 555 frequency generator to the circuit to add a tone, as well as light, to Morse Code signals.

Mentoring high school students to help with individual projects generally required a 6 week commitment from section members to meet with the high school student, or team, at least on a weekly basis and more often in exchanging email and text messages. Projects are usually cap-stone related and involve implementing a mix of engineering technologies to complete. Like real life projects, students often underestimate the time required to complete interim tasks and achieve specified goals. They often scramble to finish their projects by the scheduled deadline date. A valuable learning experience.



Milford NH High School's Applied Technology Center Capstone senior Projects
Left, fortunately, a sunny last day allows a student team to demonstrate meeting standard performance specifications for their solar powered USB charging station.
Right: Student practicing proper soldering techniques to ensure PC board integrity will withstand the harsh mechanical environment encountered in a guitar "fuzz" foot pedal.

NH Section members participated from the beginning in the annual Tech Fest STEM fairs that were held at Windom High School for many years. This was a well-organized program that consistently drew a large crowd from surrounding communities. Section members maned hands-on activity stations to coach students through a variety of activities, mostly based on IEEE's TryEngineering lesson plans that can be completed in a relatively short period of time.



L: Students at a Tech Fair work on IEEE's Spectroscope and Ohms Law activities. A multi colored beacon was used to stimulate interest and encourage student participation.

C: A young student with a very inquisitive mind

R: Members of Computer Society discuss several of their activities with student parents

Milford High School also organized annual career fairs for their students. Special emphasis was placed on fairs specifically geared to foster STEM career choices for female students. The NH Section support these fairs with table demonstrations on various topics.



Milford's Middle School 8th grade students gather around a section activity used to characterize electronically generated signals. The oscilloscope and speaker provided visual and auditory feedback

The popular NH section grant program was expanded in the mid-2000s to encourage teachers, and other interested individuals, to apply for funds covering expenses for special projects related to both STEM and non-engineering fields.

Takeaways

- The failure to implement IEEE's TISP program opened opportunities for members to directly address teachers needs and modify the Try Engineering Lesson plans to align STEM activities more closely with their teaching agenda
- Teachers are our best advocates. They carry a heavy load and expressed concern about taking on the additional extra time required in learning how to present activities which they have little familiarity with. They very much appreciated members willingness to take over the classroom presentation task.
- The students are well primed and eager to tackle new and different projects. A few always completed ahead of others and without prompting assisted fellow students in need of help, most gratifying to witness.
- IEEE's Try Engineering list of lesson plans is a treasure trove of STEM activities covering a wide range of disciplines and technologies. They are geared toward completion in a 1 class period, and can be used as a basis for shorter or longer activities.
- NH members that have volunteered their time and expertise have universally found it to be a satisfying experience
- The closing of covid restrictions opens opportunities to renew STEM initiatives. Bring your ideas to the ExCom and consider getting involved.

References

- 1) Brandon Drenon, "Vinyl records outsell CDs for first time in decades"
<https://www.bbc.com/news/64919126>
- 2) Less Weatherbed, "As interest in digital downloads wanes, vinyl record sales continue to grow for the 16th year running, says RIAA",
<https://www.theverge.com/2023/3/10/23633605/vinyl-records-surpasses-cd-music-sales-us-riaa>
- 3) IEEE, TRYEngineering, <https://tryengineering.org/teachers/lesson-plans/>
List of lesson plans:
<https://docs.google.com/spreadsheets/d/19CpGYf4itv0duEVejn3PeleEb3YffJ3dTAbVk5tXryQ/edit?pli=1#gid=0>