The Science and Engineering Division and National Association of Blind Students Joint STEM Zoom Conference Minutes for February 26, 2023

The National Federation of the Blind's Science and Engineering Division (SED) and the National Federation of the Blind's National Association of Blind Students (NABS) held a joint Zoom conference on Science Technology Engineering and Math (STEM) on Sunday, February 26, 2023, by Zoom.

A Recording of this meeting is available at

"[2023-02-26 SED - NABS STEM Seminar Audio Only.mp3](https://drive.google.com/file/d/1uBI-aI1vmiEyvgeEAFNfxZSUgc3bxmI4/view?usp=share_link)".

To see past Science and Engineering documents, minutes, and recordings, go to

"<https://tinyurl.com/NFB-Science-Engineering>".

The meeting was called to order by Trisha Kulkarni, president of NABS, at 8 PM Eastern Standard Time (EST).

# Introduction

President Kulkarni welcomed the audience to the annual joint conference between NABS and SED. She invited people to register for the NABS 2023 Midwest Student Seminar in Chicago (March 24 - 26, 2023) "https://www.nabslink.org/", The registration deadline is March 1, 2023. She also announced the Pacific seminar, which is from May19, to May 21, 2023.

She is currently studying at the Louisiana Center for the Blind. She will soon be starting graduate school at Stanford University.

She thanked the speakers for presenting this evening, and the SED for recruiting the speakers. She invited people to contact her if they had questions "nabs.president@gmail.com".

President Kulkarni then introduced John Miller, president of SED, who will be the moderator for the evening.

SED president, John Miller, thanked the speakers for presenting at this event, and for NABS who is hosting this seminar. He is an electrical engineer.

President Miller recommended that people learn Microsoft Teams. He further recommended that people who have STEM requirements take at least one computer programming course. People in STEM majors will probably take more computer science courses. He said that SED could help people with STEM requirements. He also said that talking to other students about their problems was a powerful tool.

He invited people to join the SED. Links for joining NABS and SED can be found under the "Wrap up" heading towards the end of this document.

The SED will have its annual division meeting during the NFB convention. The SED Division meeting will occur on Monday, July 3, 2023, between 6:30 and 10 PM.

He asked that any questions for the SED, recommendations for future presentations, or questions for the speakers, be sent through him at "Johnmillerphd@hotmail.com".

President Miller then introduced Gene Kim who discussed the NFB Science and Engineering Division Systemic Access Mentorship Program. Gene is a junior at Stanford, and the secretary of NABS. He said that the blind have many accessibility challenges in stem. To help with these challenges, He, Newton Nguyen, and Kennedy Stomberg, founded the Science and Engineering division's Systemic Access Mentorship Program. This group meets on the second Thursday of each month, by Zoom, at 8 PM EST. He invited people to sign up for the Mentorship Program:

"<https://docs.google.com/forms/d/1ZQocAcXQ_j2u-ytH3TROxaVcpeGslRAwXhzNc3rW-GI/viewform?edit_requested=true>.

# A summary of the presentations follows.

## **Speaker:** Ken Perry

**Title:** Producing Hardware as A Blind Engineer

**Speaker Introduction:** Ken Perry has been working in Access Technology for 31 years and has been doing electronics for longer. Ken began with electronics early in life by helping his dad with anything he was allowed to. By the time he was eight, he was the de facto tube tester for his fathers at home TV repair shop. When he was nine, he helped his father build their first Color TV a Zenith kit. Ken joined the Air Force right out of High school following his father's footsteps as an Air force Electronics tech, until fait redirected his steps into Disability retirement. With his newfound adjusted vision on life, Ken returned to college and after listening to the VA counselors he was told that he wouldn’t be able to do electronics. He took his electronics knowledge and used it to earn a bachelor’s in software engineering. In 2012 he began working with Orbit Research to Develop the Orion TI-84 Talking Graphing calculator. Then In 2013, His wife and family bought him a Robotics kit and Snap Circuits kit that with his help they created accessible instructions for which he passed on to APH to create the four accessible Snap Circuit kits. He has worked with Orbit research on designs like orbit Reader, Graphiti, and with Independent Science on designing the SALS probe. This year APH will be releasing another one of his projects which is the Accessible Arduino kit with tactile schematics and 16 starter projects.

**Talk Description:** APH released the Submersible Audio Light Sensor (SALS) at the end of last year, which is a Bluetooth light sensor probe for detecting opacity of Chemical liquids. SALS is the brainchild of the blind chemist Dr. Cary Supalo. Cary worked with a sighted engineer to create the original prototypes which were standalone boxes. From that point, Ken Perry, a Blind Senior Software and Hardware engineer, stepped in to re-imagine the SALS device as a Bluetooth probe connected to IOS and Android. This talk will walk the path from Snap circuits, bread board and Arduino, and finally to NRF bare metal chip, and programming and design of the hardware.

## **Speaker:** Annemiek van Leendert

**Title:** Support for reading mathematical expressions in Braille

**Speaker Introduction:** My name is Annemiek van Leendert. I am educated as a teacher of mathematics and physics. I have been working for more than 30 years at Koninklijke Visio, an organization in the Netherlands that provides care and education to people with a visual impairment. My expertise is mathematics for Braille readers. In 2021, I successfully defended my PhD dissertation. The title of my thesis is Improving Reading and Comprehending Mathematical Expressions in Braille.

**Talk Description:** I will give a presentation about my PhD research. The main question that guided this research was: How can Braille readers improve reading and understanding of mathematical expressions? I have studied this question from different angles. The emphasis was on research into tactile perception, the professionalization of mathematics teachers and the representation of mathematical expressions in Braille. In this presentation, I will focus on tactile perception. I will show how finger-tracking technology has helped me understand the finger movements of Braille readers while reading mathematical expressions.

**Talking Points**

In the Netherlands, 50% of the blind students are in special schools, and the other 50% are main streamed.

In the Netherlands secondary education, math is taught using Braille displays using eight-dot Braille.

The organization, Koninklijke Visio, serves as a math help desk for teachers. The organization operates in Europe and Africa.

Dr. Van Leendert just completed a term working in Uganda. They have few Braille slates—say five slates for forty students. They do not have Braille displays.

Dr. Van Leendert studies the way Braille readers move their hands across Braille displays. She recommends using the index fingers of both hands, and to have the left hand explore the left-hand side of the display, and the right hand explore the right side of the display.

Students do a lot of rereading in math.

The way they read an equation depends on the structure of the equation.

Dr. Van Leendert teaches students to consider the equation's structure as they read it.

A student's math reading speed can be increased by about 50% after around four hours of training.

In her experience, students make more Braille errors than Math errors.

Each European country seems to have its own Braille math code.

Dr. Van Leendert uses Excel a lot. Excel can help the blind math student communicate with the sighted.

Dr. Van Leendert likes the Nemeth code, although it is not used in the Netherlands.

She sees herself as learning from Braille readers.

## **Speaker:** Diego Vicioso

**Title:** Getting Through Stem Without Braille

**Speaker Introduction:** I come from a country, The Dominican Republic, where it is almost impossible to learn braille or the nemeth code. I will try to provide descriptions of what has worked for me, and what hasn’t.

**Talk Description:** LaTex and document conversion programs can be used to replace braille, but the learning curve is steep. Over the last two years, I have tried to collect my different experiences and bundle them into a format that’s easy to understand.

Talking Points

Mr. Vicioso is an exchange student from the Dominican Republic. He has been in the U.S. for eight months.

The school for the blind in the Dominican Republic has no Braille materials, and no Braille instructors.

He has learned the Spanish version of the Braille code.

He has no access to a Braille math code.

He did not have mathematics in high school. He is starting math, from scratch, in college.

He is turning to technology to make up for the lack of Braille.

He started with LaTeX. LaTeX has a lot of start-up boiler plate when you begin a file.

He uses Pandoc to convert LaTeX to HTML. This worked for him in a pre-algebra course. It did not work so well for Calculus.

He almost failed statistics because of the graphical content of the course. His college

did not have accessible graphics capabilities.

He used Desmos and the audio graphing calculator to get through graphics rich courses.

From National Association of Blind Students to Everyone: https://www.freedomscientific.com/training/teachers/desmos-online-graphing-calculator/

He converted LaTeX files into Microsoft Word and pdf files.

He started working with Markdown which needed less complicated input than LaTeX.

He found that Latex, Pandoc and Markdown allowed him to survive without Braille.

# Wrap up.

John Miller and Trisha Kulkarni thanked the individuals who produced the STEM meeting including Harry Staley and Gene Kim.

If you wish to learn more about NABS, including how to become a member, go to:

"https://www.nabslink.org/".

If you wish to join the SED, go to:

"<http://www.nfb.org/divisiondues>".

Dues for NABS and SED are $5 a year.

Starting in 2022, the NFB divisions' financial year started on January 1 and end on December 31 of the same year.

Individuals may join the NABS and SED e-mail discussion groups at "Nfbnet.org".

# Adjournment

The meeting ended at 9:10 PM EST.

About thirty people attended the meeting.

# Questions and Corrections

If there are any questions concerning the National Association of Blind Students, please contact Trisha Kulkarni (nabs.president@gmail.com).

If there are any questions concerning the Science and Engineering Division, please contact John Miller (Phone: 858-774-9286, Johnmillerphd@hotmail.com).

If there are any corrections for the minutes, please contact Louis Maher (713-444-7838, [ljmaher03@outlook.com](mailto:ljmaher03@outlook.com)).

Minutes submitted by Louis Maher.