The Science and Engineering Division and National Association of Blind Students Joint Science Technology Engineering and Math Phone Conference Minutes for February 24, 2019

The National Federation of the Blind's Science and Engineering Division (SED) and the National Association of Blind Students (nabs) held a joint phone conference on Science Technology Engineering and Math (STEM) on Sunday, February 24, 2019.

The meeting was called to order by the NABS outreach committee chair, Janae Burgmeier, at 8 p.m. Eastern Standard Time (EST).

Janae thanked the attendees and speakers for attending. SED president, John Miller, invited the listeners to join the SED, and subscribe to the SED e-mail list at "Nfbnet.org". He reminded the attendees that the SED would have its division meeting during the NFB convention. The SED Division meeting will likely occur the evening of July 9, 2019. Watch the NFB website for the convention meeting time. He asked that any questions to the speakers be sent through him at "Johnmillerphd@hotmail.com".

A summary of the presentations follows.

**Liliya Asadullina (lily2011a@gmail.com) Biology**

Liliya discussed: "Scoping Out A Blind Student’s Experience with Biological Sciences".

Liliya has a BS in integrative health care from the Metropolitan State University of Denver. This university has other blind students and was supportive of Liliya's education efforts. Liliya is currently a student at the academy of massage therapy and Bodyworks, and is working on her license in massage therapy. She says "I would like to be a medical massage therapist and work with cancer patients. After I graduate, I’d like to work either in a hospital or rehabilitation center. I am also currently a mentor for the college success program for Learning Ally."

Liliya said that she had a paid graduate student help her in labs.

She always familiarized herself with the lab before starting her experiments. She obtained the experiment's documents before the lab. She had a tray for each experiment to contain her work. She had access to tactile images and 3-D models. She had to remind her instructors to not use such words as "this" and "that" in their lectures so that she could know what object they were discussing.

Initially her lab partners tried to do the entire experiment themselves. She was able to show them that she could perform the experiments and would be an equal lab team member.

Her lab partners gave her detailed instructions when they were using dangerous chemicals. There were too many chemicals to put Braille labels on them. She often used gloves in lab.

In addition to her biology lab course, Liliya also completed two anatomy courses.

Liliya says: "My suggestions for other students is to be sure to be proactive prior to taking classes especially science ones that include labs. It’s important to be

prepared as well as advocate and communicate effectively with  instructors.  I would be happy to help any students that need any tips or help advocating in a laboratory situation."

**Aaron Cannon <cannona@fireantproductions.com>**

**Computer Careers**

Aaron discussed: "Self-Teaching and Alternatives to The Standard College Path".

Aaron studied computer science and mathematics at the University of Iowa. He is now a software engineer and the chief accessibility officer for "Accessible360" which is a startup specializing in "Digital Accessibility for Websites and Apps"

(<https://accessible360.com/>). This company was started less than three years ago, and now has several dozen employees, and growing. Accessible360 will not ask potential candidates if they have a college degree because they believe that degrees are not predictive of future success with the company.  They will instead ask about what you have done, and what you can do.

Aaron Does suggest that students go to college, for large companies still require degrees, and a degree will probably be very helpful in getting your first job. However, getting your second job will almost certainly be much more dependent on your first job.

Aaron says that degrees are not as useful as they used to be.  He says that there are other ways into the field of software development besides a computer

science degree. Coding boot camps and even self study have worked for many.  Before choosing a program of study, whether through a university, or a boot camp, He suggests that you check their placement rate of their graduates before you sign up.

Aaron says that Going to college and getting an education are not the same.  He suggests that colleges do not necessarily prepare you for a career. He

feels that colleges spend too much time teaching you coding, and not enough time teaching you about all the other activities software engineers have to engage in.

In software development, Aaron says that relatively little of your time is spent actually coding, and that most of your time is spent debugging, figuring

out how to test your code, understanding requirements, deciding on the best algorithm and code organization, etc.

Aaron says that the one skill you must possess, no matter your path, is the ability to teach yourself. He also mentioned that while it's a good idea to

try to find other blind people who have done what you want to do, like take a course, worked in a particular field, etc., you also shouldn't let it stop

you if you don't find anyone, or if they say it is not possible. If you really want to do something, you should not be afraid to be the first. After all,

someone has to be the pioneer.

You will need a subscription to bookshare.org for technical books. He says you should not wait for an invitation, or a course before you start learning

something you want to be able to do. You should become a prolific reader on your chosen subject. Just dive right in. Don't be afraid to get your hands

dirty and break things.

Aaron has hired readers for visual images, diagrams, and technical books which would not OCR well.  He used combination reader/tutors in math. Aaron has

had good luck in hiring readers from the Philippines.

Aaron scans his material and sends the scans to his reader.  Reader prices are lower in the Philippines than in the U.S, and it is not difficult to find

people who are well educated, and who have very good English.

Aaron urges students to find a mentor in their chosen field.

You will need good communication skills (speaking and writing). He believes that even if you have great ideas, you will struggle to be successful if you

can't communicate them well.

He suggests that you should avoid dictation on your smart phone for business communications because dictation inevitably leads to embarrassing and unprofessional errors. Using braille screen input on IOS has worked best for him, because it is fast and accurate.

**Kaden Colton Earth and Geoscience**

Kaden discussed "Studying Earth and Geoscience in A University".

Kaden received degrees in environment and analytics from the university of Utah.

He placed Braille labels on his large meteorological maps. He had an internship with the National Center for Atmospheric Research (NCAR). He studied weather patterns for New Zealand's South Island.

He uses Braille displays. He uses Microsoft's Excel for his data analysis. He has used a Braille printer to turn LaTeX image files into tactile images. His colleagues helped him process some images and provided alt text labels for other images.

He was the first Blind student at his university. He did have some problems with the Disabled Student Services office (DSS). Often, he found it easier to work directly with his professors on accessibility issues than to work through the DSS office.

He is now working on health care costs statistics for an insurance company. He also tutors in mathematics.

He wishes to become a Geophysics professor.

**Accessible STEM Documents Discussion**

Here are some suggestions as how to read STEM documents.

John Miller suggests that using a reader should be in your toolbox. The reader could digitally record the mathematics, and you could Braille out the equations in order to learn them.

John also suggests looking at the InftyProject

(<http://www.inftyproject.org/en/>). This project has developed several programs for reading and writing mathematics for the blind. This project has produced software that can read a mathematical document, scanned into a PDF image file, and convert it into blind-accessible formats such as LaTeX.

Louis Maher has these suggestions.

Here is the address of a web page, developed by John Gardner, on accessible STEM materials and methods

(http://access2science.com/indexAccessibility.html).

Remember, for STEM courses, to have the best chance of getting accessible material:

1. Start working on getting accessible STEM material for courses at least nine months before starting the course.

2. Use Braille as much as possible.

3. Get your course material in electronic format.  If necessary, write to the author of textbooks for his original book files. Often the author’s original

material is far more accessible then the material prepared by the publisher.

4. Use readers if that is the best solution.

5. NVDA seems to be the best screen reader for working with mathematics.  Also get the MathType and MathPlayer programs.

Finally, Louis suggests using a Sensational Blackboard, from Sensational Books. This 8.5 X 11 inch soft-sided clipboard allows a user to draw with a ball-point pen. This drawing can be seen by a sighted person and can be felt by the blind. Your instructor or classmate can make drawings to explain class lectures and other scientific concepts that are best taught with drawings. (<http://sensationalbooks.com/>).

**Conclusions**

Studying STEM is fun, exciting, and profitable.

Organization, advanced preparation, and hard work are the keys to success.

**Adjournment**

The conference ended at 9:05 PM EST.

**Questions and Corrections**

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).

Minutes submitted by Louis Maher