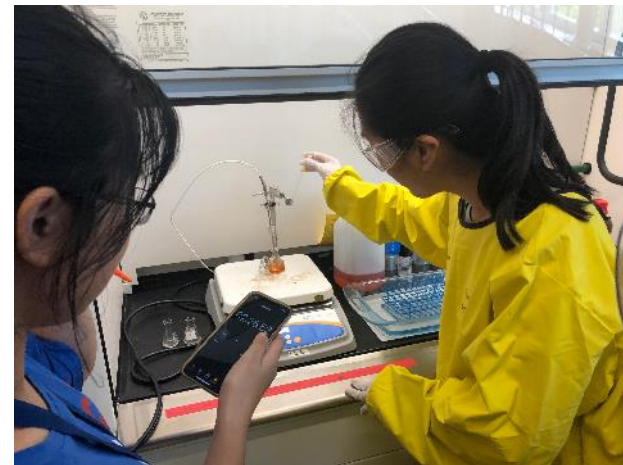
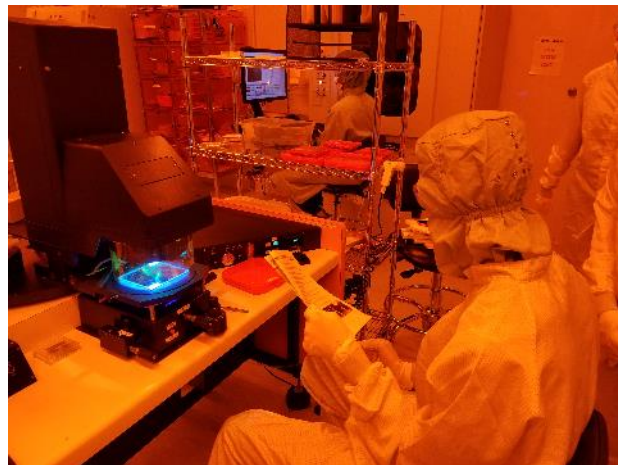


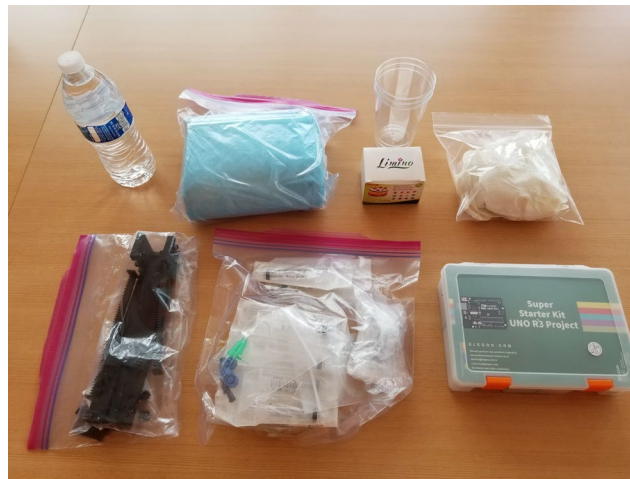
# MANTH: ESAP Nanotechnology in 2019

- MANTH has developed a program for high school students that provides these students with a hands-on opportunity to fabricate and characterize micro and nano-scale structures **using the tools in the MANTH cleanroom facility (in-person)**. There were **34 participants** (male: 17, female: 17).
- The lab modules include microletters patterning, quantum dot synthesis and characterization, microfluidic device fabrication and characterization, and 2-photon lithography to teach both conventional and non-conventional applications of nanotechnology
- Students handle wafers and operate tools on their own so that they may acquire real-world nanofabrication experience.
- In order to make the experience both educational and fun, letters that students write to parents or themselves were patterned at the micron scale on 300 nm  $\text{SiO}_2$  thin films on Si wafers. The  $\text{SiO}_2$  thin films were etched to different thicknesses in order to form a range of colors, illustrating the principles of light interference in thin films.



# MANTH: ESAP Nano in 2021 (Outline)

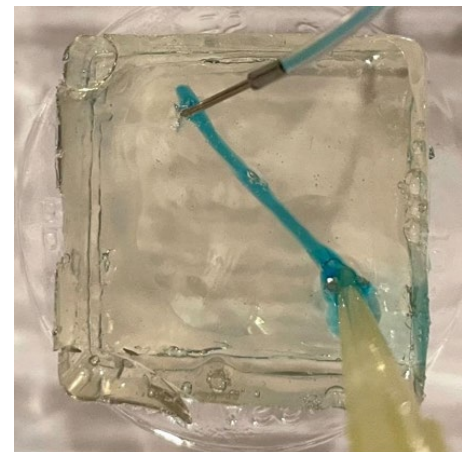
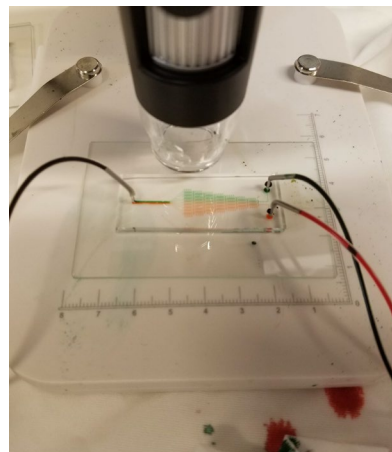
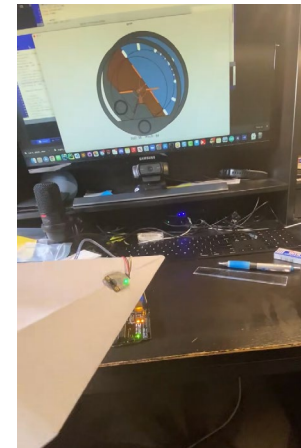
- MANTH has developed a program for high school students that provides these students with a hands-on opportunity to fabricate and characterize micro and nano-scale structures **using the kits for lab at home and demos at MANTH (full online)**. There were **27 participants** (male: 15, female: 12).
- A total of 12 hands-on processing lab @ home modules and 10 virtual demo lab modules were provided.
- The lab @ home modules include characteristics of light, nanofabrication with pre-sensitized PCB, gelatin microfluidics, syringe pump assembly and characterization of actual microfluidic devices, characterization of solar cell, LED and MEMS devices with Arduino, and coding. This covers both conventional and non-conventional applications of nanotechnology.
- 3 out of 12 lab @ home modules (magic sand, gelatin microfluidics and liquid crystal lab) were inspired by NNIN database (<https://www.nnin.org/education-training/k-12-teachers/nanotechnology-curriculum-materials/search?key>)
- Students received a package that contains many kits for lab modules ahead of course (70 items, \$400/package)





# MANTH: ESAP Nano in 2021 (Outcome)

- All lab modules were run in a fun and safe way. Students learned (some) theories and applications of nanotechnology
- Student groups that performed creative or systematic experiments obtained chances to publish Scholarly Commons





# MANTH: ESAP Nano in 2021 (Demo sessions)

