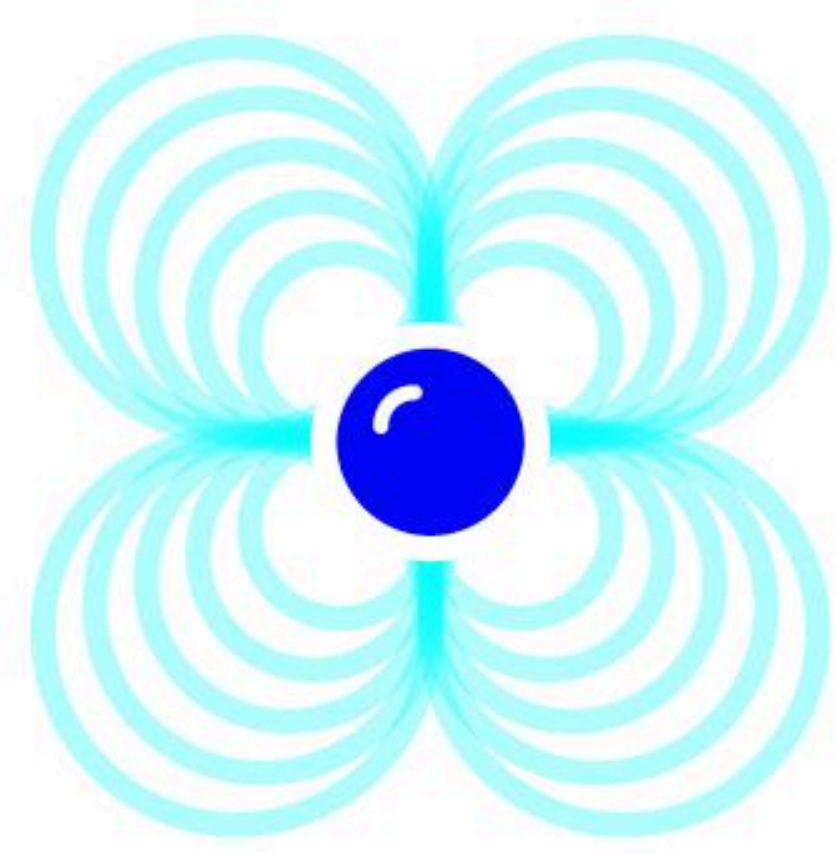
Chapter 2
Student Perceptions of LENR



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Introduction

The future belongs to the youth. Those who were born after 1981 (Gen Z and Millenials) are more actively engaged on issues related to climate change than older generations. In a 2021 survey carried out by Pew,[1] the youth do not see the world's leaders taking sufficient actions. College and high school students are not only talking about climate change on- and off-line, they are willing to be politically engaged in the topic (Figure 1).

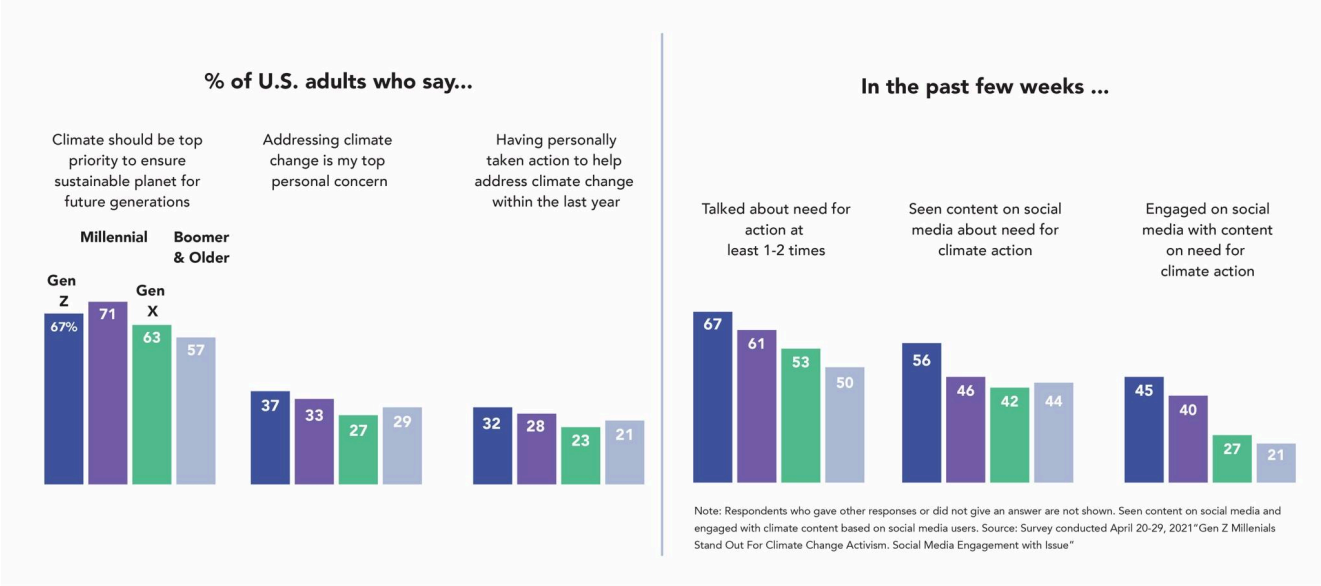

Fig 1. Gen Z, Millennials more active than older generations addressing climate change on- and off-line. (Source: Pew)

Closely tied to concerns about climate issues is student interest in developing clean energy technologies that will achieve the goals of a zero carbon economy.[2] One of the factors that will determine how quickly the LENR industry can grow is the availability of a well trained workforce. This means a corp of science, technology, engineering, and mathematics (STEM) students that can work together in building a clean energy future based on LENR. As a multidisciplinary field, STEM students with backgrounds in nuclear engineering, quantum chemistry and physics, material science, among others have the knowledge to both engage in basic science research and commercialization of LENR.

Among students who have enrolled in nuclear engineering programs in the past two decades, many are motivated by a desire to solve the climate emergency. They view both nuclear fission and fusion as technologies that can bring down greenhouse gas emissions to safe levels. Overall enrollment in nuclear engineering programs have tripled since 2001 accompanied by a steady rise in graduates from these programs (Figure 2).

[1] Pew (2021) Gen Z, Millennials Stand Out for Climate Change Activism, Social Media Engagement With Issue
[2] NPR (2018) As Nuclear Struggles, A New Generation Of Engineers Is Motivated By Climate Change

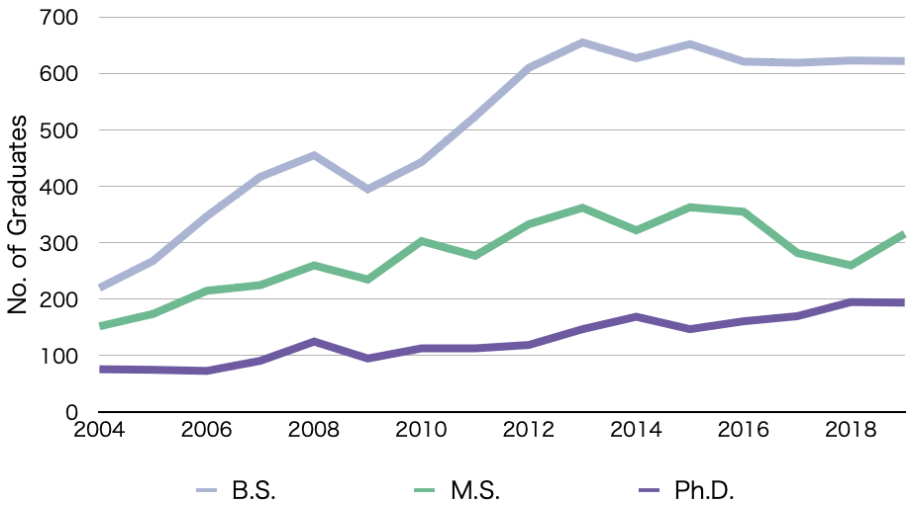

Fig 2. Nuclear engineering graduates in the US. (Source: Oak Ridge Institute for Science and Education)

In parallel to increasing student interest in nuclear engineering, the US public, regardless of political persuasion, has become more receptive to nuclear technologies with nearly 3 in 5 Americans now supporting next generation energy sources that are safer, cheaper, and more reliable than existing technologies (Figure 3).[3] In a survey carried out by EcoAmerica with 1100 participants, it was shown that support for nuclear R&D increased from 49% to 59% between 2018 and 2021.

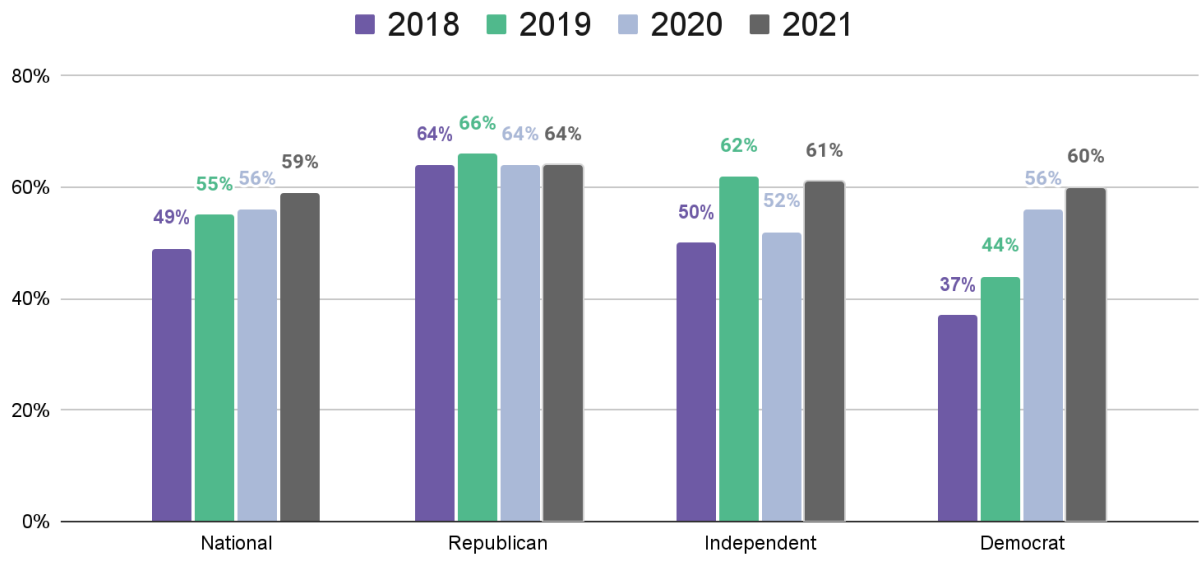

Fig 3. US support for R&D in next generation nuclear technologies. Survey question: America's traditional nuclear power plants produce around 20% of our electricity. Which is closest to your opinion? "Strongly support nuclear power", and "Somewhat supports nuclear power". Source (EcoAmerica)

[3] EcoAmerica (2021) American Climate Perspectives Vol. 5: Energy Attitudes: Americans Support Clean Energy

Survey

In the context of young scientists and engineers who increasingly see the climate emergency as the defining priority of their generation, we gauged students' level of interest in exploring LENR and their motivations. See Appendix A for methods and breakdown of the students surveyed.

In the context of several nuclear technologies, which include innovative fission and plasma fusion reactors, it was found that 51% of participants were aware of LENR (Figure 4) which was the second highest level of awareness.

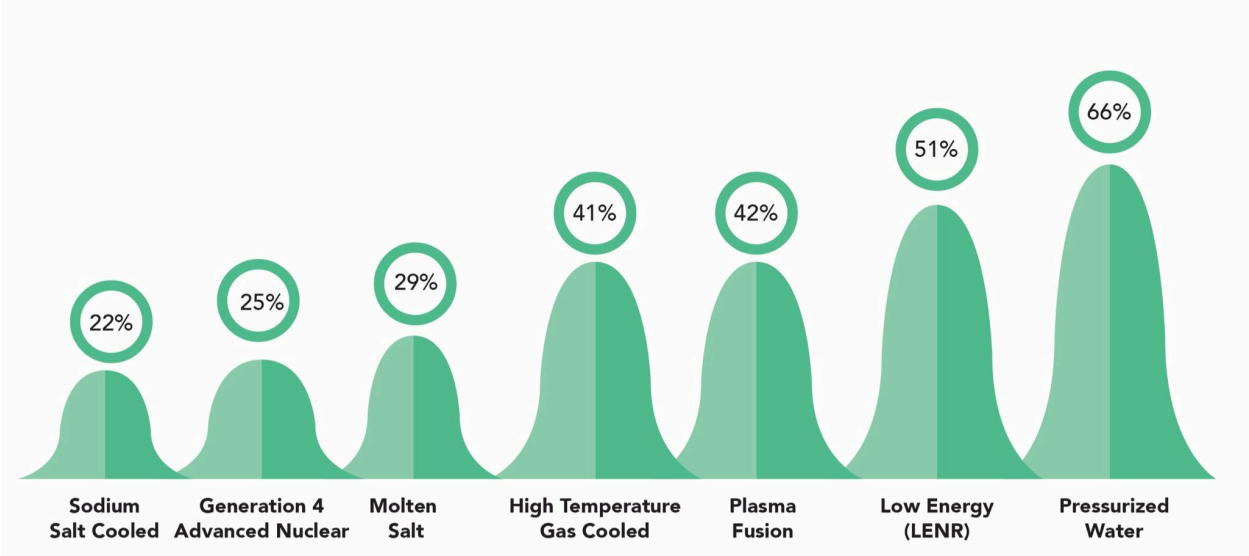

Fig 4. Awareness of nuclear technologies. (Source: CapstreamX)

The findings also show that 71 percent of students surveyed thought substantial resources should be allocated to support exploring the potential of LENR to generate clean energy (Figure 5). Furthermore, 75% indicated that they do not believe nuclear and quantum physics is sufficiently advanced to reliably exclude the possibility of LENR.

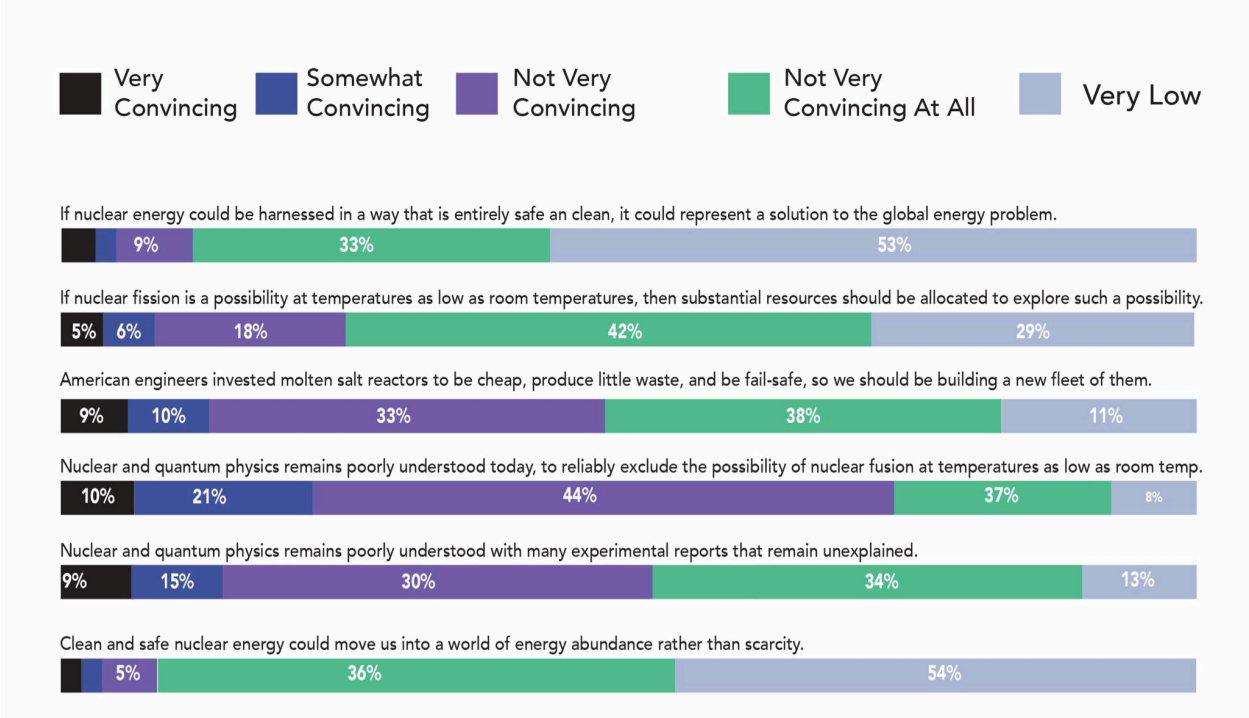

Fig 5. Survey of study support for basic science research in LENR in the context of nuclear and quantum science. (Source: CapstreamX)

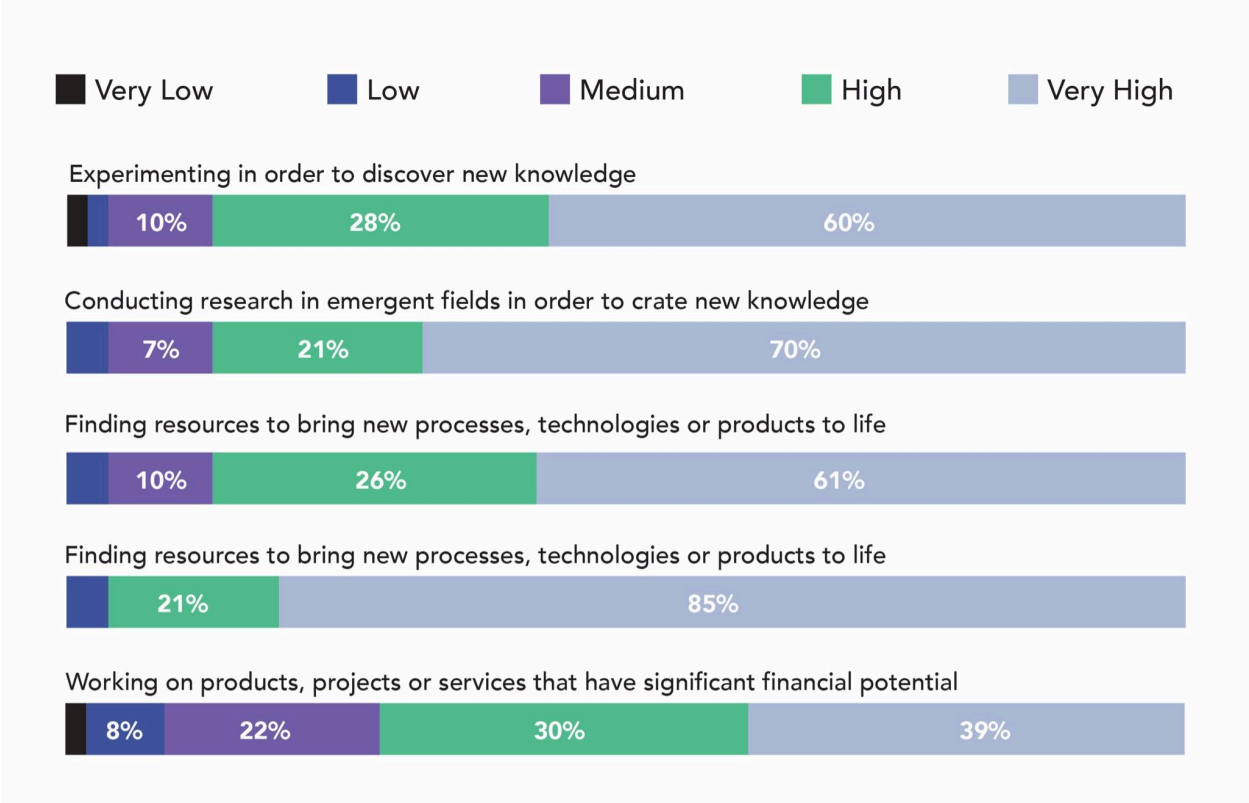

Fig 6. Students were asked how they are being motivated to study nuclear science and engineering. (Source: CapstreamX)

While profit is a strong motivator for capitalistic enterprises, the students in this survey indicated a strong motivation for creating knowledge and enabling technologies that have an impact on society (Figure 6).

The students were also assessed on their perception of the potential for development in fields that are related or dovetail with LENR (Figure 7). At least 73% of the participants were optimistic in quantum technologies and nano-materials, specialties that are thought to be most relevant in enabling LENR technologies. In contrast, the least optimistic fields were in conventional nuclear fission and fusion technologies. However, the greatest optimism was found in the established fields of solar photovoltaics, batteries, hydrogen, and energy storage technologies.

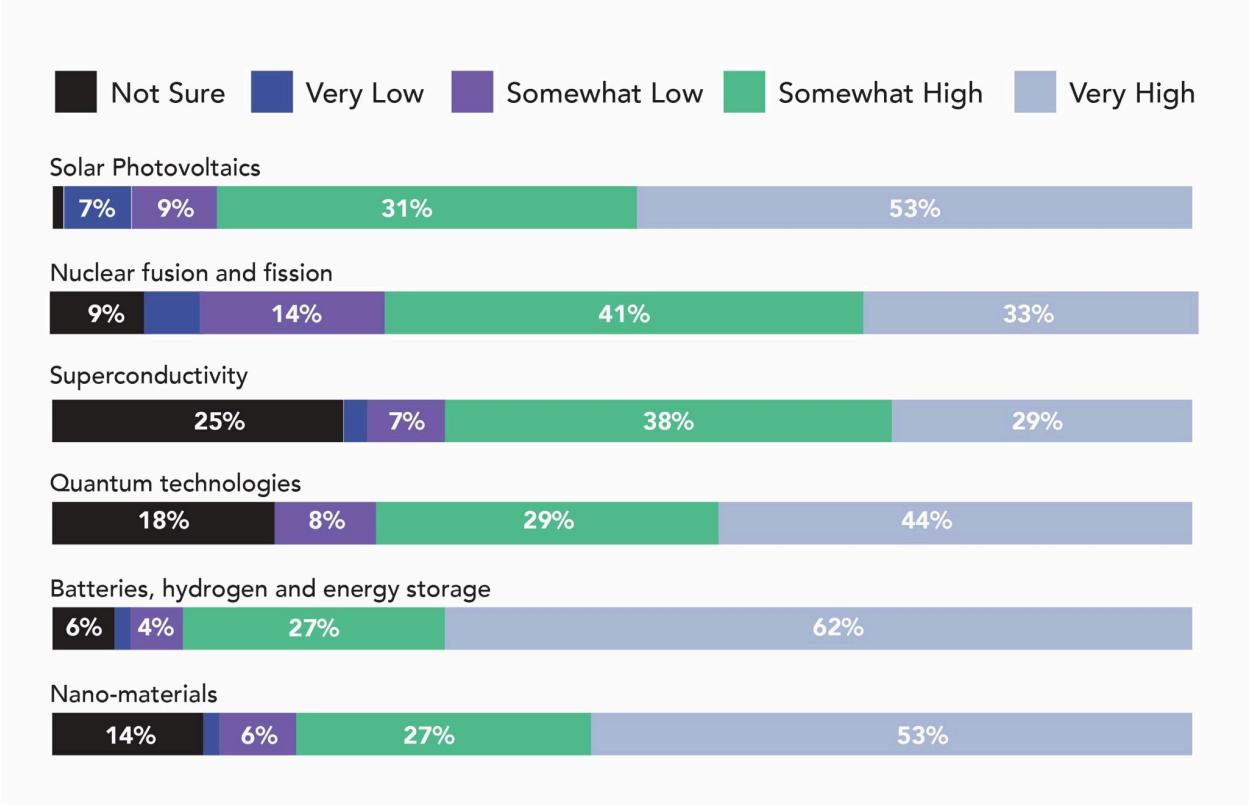

Fig 7. Assessment of student perception on the potential for future development in technologies associated or dovetailing with LENR (Source: CapstreamX)

Key Takeaways

The survey results show key trends that can enable a future LENR industry. Growing demand, especially from Millenials and Gen Z, for clean energy solutions to solve the climate crisis is driving public support for innovative nuclear technologies that can include LENR. Moreover, the current crop of STEM students are open to studying LENR as a field of study. They can provide engineering expertise needed to build the industry.

Acknowledgements

LENR Discovery would like to thank Mr. Grant Draper, founder of CapstreamX, for his leadership in designing and carrying out the survey of STEM students.

Appendix A

CapstreamX designed and administered this survey, which was conducted online April 12th through May 2nd, 2020 using Survey Monkey. The survey yielded a total of 201 U.S. STEM student responses, representing over 40 accredited higher educational institutions including University of California Berkeley, University of Illinois at Urbana-Champaign, University of Virginia, Stanford University, San Jose State University, University of Pennsylvania, University of California, Irvine, George Washington University, Johns Hopkins University, Rice University, Tufts University, American University, California Institute of Technology – Caltech, University of San Francisco, Virginia Tech, Grinnell College, Trinity College, University of Colorado Boulder and Michigan State University.

The breakdown of the students by gender, discipline, and age are: