RECRUITING AND RETAINING K9–16 STUDENTS THROUGH FIELD- AND LABORATORY– BASED GEOSCIENCE EXPERIENCES

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Abstract

Since 2004, we have been directly involved with the GSA to provide access and opportunities for K9-16 students, particularly those interested in the broader aspects of geoscience-related topics, to present their field-and- laboratory based research outcomes at professional conferences and to learn from each other. So far, well-over 550 students from the U. S. and abroad have taken advantage of this opportunity and participated our topical sessions through submitting 226 abstracts since 2004 (Summary Table, Figure 1-17). The overall trend of students participation demonstrated a significant number of undergraduate and K2 students as primary authors (Summary Table). On average, female to male students ratio in both undergraduate and K12 levels reached 1:1. It is quite gratifying to report that many of these students, as a result of their attendance at the GSA conference, felt a continuing need for exposure to high-level professional venues with effective knowledge-sharing and improving the level of understanding of the presented material. In addition, several presenters enthusiastically acknowledged their satisfaction with the significance of attendance at such high level meetings and potential to improve their chances of professional employment. Potential employers valued their experiential learning skills from both the educational and communications point of view and appreciated their endeavors and the preparation needed to attend and present at GSA conferences. Present-day extreme weather phenomena, environmental degradation, increased mega-flooding event, landslides, access to fresh drinking water, build-up or upgrading of aging infrastructures, etc., are closely tied to geological processes and anthropogenic practices. Students need to observe and connect geoscience concepts and understanding of the various phenomena, including representative case studies, to validate geoscience as a transformative discipline and its interdependence with other STEM disciplines such as physics, chemistry, and biology. We strongly believe that the future geoscience workforce needs to be trained from as early as the K9-12 grades via an integrated earth science curriculum that allows an open access to field-and research based content, creates inquiry-based knowledge, promotes group dynamics, and instills a sense of belonging. Given that over 70,000 K9-12 students took the Earth Science Regents examination last year in New York City alone, it will be worthwhile to work with the new cohort and provide them with a variety of learning tools to engage, inspire and attract them to the future geoscience-related workforce build-up.

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Summary Table Showing Undergraduates and K12 Students Presentation (2018-2004) at the GSA Annual Meeting

Year	Undergraduates		K12 STUDENTS		Total # Presenters	# of Abstracts
	Female	Male	Female	Male		
2004	15	10	4	3	32	18
2005	6	10	1	2	19	9
2006	11	14	2	4	31	18
2007	15	19	3	5	42	17
2008	15	11	3	4	33	15
2009	9	16	2	2	29	18
2010	11	8	2	3	24	10
2011	9	10	2	2	23	11
2012	12	8	3	5	26	12
2013	13	11	5	2	31	13
2014	16	14	3	6	39	16
2015	19	24	5	4	52	20
2016	10	16	4	6	36	15
2017	13	18	5	2	38	14
2018	48	40	3	4	95	20
Total	222	229	47	54	550	226

Figure 7. Visits to the New York-New Jersey Port Authority Geotechnical Laboratory bring geoengineering information to the geology students and reinforce the role of geology to successfully complete large-scale, capital construction projects in the city.

Figure 8. Just before initiating sediment size analysis, geology students are making sure that sieves are the right one and samples recorded in an excel sheet for conducting research.

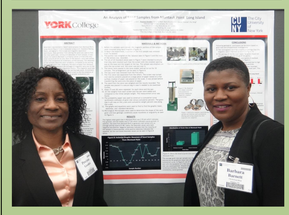

Figure 9. Outcome of independent geological research and student-led final presentation at the annual meeting of the Geological Society of America, Baltimore. 2015

Figure 11. Experiential learning opportunities made possible through USGS-supported York College Monitoring Wells installed inside the campus.

Figure 12. United States Geological Survey (USGS) assisting students to gather hydrogeological information.

Observation wells on the campus of York College of CUNY are less than a mile west of the West Side Chemical site. Water table elevations at these wells are reported by the USGS to be approximately 25 feet below LSD (Land Surface Datum). Ground water infiltration into sub-basement areas of buildings on the York College Campus is a significant problem at the present time. It was not a problem prior to the cessation of withdrawal of groundwater by The Jamaica Water Supply Company.

General appearance of the weathered Inwood marble (Isham Park, upper Manhattan).

Figure 14. Left to right: Mario Jo-Ramirez and Ryan McPherson (now Project Engineer at Creamer Environmental) collecting samples of purple colored, garnet-rich beach sand at Montauk Point, Long Island.

Figure 17. Rock Core showig garnet in pegmatite, New York City Water Tunnel#3

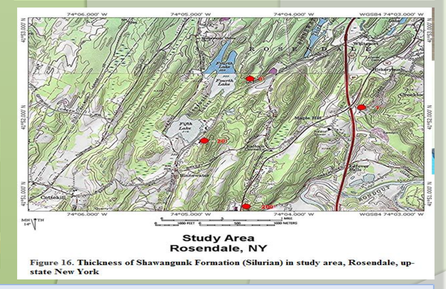

Figure 16. Thickness of Shawangunk Formation (Silurian) in study area, Rosendale, up-state New York

Geology students are out in the field, getting access to the city agency-supported geotechnical laboratory, drilling operation, and presenting independent field-based research in national geological conventions.

Figure 1. Geology students conducting field investigation and always collecting in-situ rock samples for initiating independent research and gaining in-depth knowledge about the way these formed and correlate with the surrounding geology. Kent Falls, CT

Figure 3. Sedimentation laboratory allows students preparing samples to run compositional test on beach sands. Hands-on activities augment classroom knowledge.

Figure 5. Mindy Rivera is learning about shallow drilling operation near Croton Reservoir as part of gaining applied geology background. Entry-level geology jobs often require knowledge of drilling operations and skills to characterize collected rock core and soil samples. Now works for the Hatch McDonald Engineering Company.

Figure 2. Exploring the Tory Cave, Kent, CT. Part of the spelunking activity. It brings a whole new way to observe underground geology and correlate with the surface outcrop.

Figure 4. Thakur Chaturgan using Brunton Compass to determine the attitude of the bed to understand the structural fabric of the outcrop, Wyoming. Such field-based knowledge allows students to think critically before recommending any measure for resource recovery to the exploration team. Now works for the Brown and Caldwell Geotechnical Company, NJ.

Figure 6. Inside the Howe Caverns, up-state New York, Charren Cabaroy, inspecting cave-rocks. Now works for the Environmental Protection Agency (EPA)

Figure 10. High School students-led presentations at York College (Summer Research Program) also prepare K12 students to attend GSA meeting and gather strategic knowledge about the geoscience discipline and be college ready.