

The INNOVATOR

The Voice of the PSM

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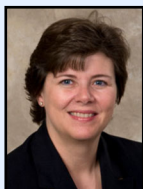
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Message from the Editor



Warm greetings as we welcome summer, the magical time of rest and relaxation (and planning for new students, fall classes, program reviews, and all of the other things on the list

that didn’t get done during the spring semester). One of those items may be how to help students identify their strengths and skills needed with an Individual Development Plan. Read the results from the NPSMA-CGS STEM Survey. Another item for your summer list is to make plans to join us in San Diego. President Kristen Kuter provided an article outlining last fall’s conference. A PSM student at Rice shares his innovation for COVID PPE. And, several colleagues shared their fond memories and tributes to the incomparable Sheila Tobias. Stay well, make time for much deserved R&R and enjoy!

The INNOVATOR is NPSMA’s peer-reviewed publication that shares best practices and other relevant information with the PSM community.

OPINION ARTICLE

Sheila Tobias – The “Godmother” of Professional Science Master’s Degrees

Elizabeth Friedman, Cynthia Bainton, Dagmar Beck, Linda Strausbaugh, and Bogdan Vernescu

THIS IS SHEILA.” “AND NOW SHEILA WILL PRESENT ...”. THIS IS HOW WE USED TO INTRODUCE her at meetings, as she never needed a formal introduction, for everyone knew her. Being recognized with just one name is an honor usually reserved for superstars such as Madonna or Cher or Common or Prince. In our world, Sheila was a superstar. We all met Sheila on different occasions, in different years at different venues. Here are a few anecdotes that we hope convey the love and gratitude we have for Sheila.

It was the weekend before Tax Day in 2000. As a colleague and I were writing a proposal for the Sloan Foundation, responding to a brand new solicitation to develop multidisciplinary master’s programs in the sciences, we got a call summoning us to bring our proposed draft to a local hotel that Friday evening. How unusual! There, waiting for us in the lobby, was a sophisticated, tall, well-dressed woman with small but inquisitive eyes. She, Sheila, just “happened” to be in town (ha ha). After short introductions we heard: “I hope you have a good proposal. We will meet again tomorrow at 8:00 am and I will give you my feedback.” Good to her word, the following morning our proposal was marked up in red with pertinent questions highlighted. “See you tonight at 7:00 pm,” she said as she departed. We agreed to her suggestions and spent the day revising the proposal, and in the evening got back even more suggestions. By the end of that Sunday, Tax Day, we had our proposal in shape, our taxes not so. Sadly, in December 2020, Sheila called to tell me she had fallen: “Do you know what happened to me? I fell on my brain.” “Of course Sheila,” I responded, thinking of how smart she was. “Naturally, it’s gravity, your center of mass is up there!” Bogdan Vernescu



In 2003, at the end of my first year at Rice as coordinator of their newly formed Professional Science Master's programs, I received a message from our provost announcing that Sheila Tobias, a friend of his, was planning a visit to Rice. I was thrilled to meet her as I had heard how influential and instrumental she had been in establishing these new degree programs. Twenty-four hours later I became a follower, a devotee. Sheila, extremely generous with her time, had spent a few hours telling me about herself and her activism, her goals and vision for women and science education, and she assured me that PSMs were as great as we thought they were. There was no more second-guessing. After meeting Sheila, I was confident that I was on to a good thing. Thereafter, I took advantage of every opportunity to meet up with Sheila, approaching her at every conference and meeting without trepidation, knowing she would always give me her undivided attention and counsel. Sheila became my mentor, someone I looked up to. She had a great sense of humor and was perhaps the most eloquent and articulate person I have ever met. She will not be forgotten. Dagmar Beck



Dagmar Beck (l), Sheila Tobias (c), and Peiru Wu (r) attending the NPSMA annual conference in Arlington, VA, November 10, 2016.

So much of what I remember of Sheila is visual. You would walk into a room, see a group of people and Sheila would be at the center of it. During a conference, she would make a point of speaking to everyone she knew and introduced herself to as many newcomers as possible. And she didn't change, didn't age. She was comfortable in her skin, a vortex of energy, eager to discuss what was cutting-edge, what was possible. She was so excited about life. That is what I remember most about her.

And how determined she was to help people succeed, especially women and young people. Cynthia Bainton

Sheila and I began what was to become a long and valued friendship in 1973 when she was a faculty member at Wesleyan University and I a new graduate student. As the only female student in the department, I was experiencing challenges navigating graduate school when I learned that there was

A "true-believer" in the best sense, Sheila expended boundless energy to create and promote the PSM, while at the same time bringing out the best in all of us.

a leading feminist on campus, Sheila Tobias. When I reached out, she was gracious enough to spend time with me. With her characteristic blunt yet somehow totally supportive advice, Sheila helped shape my approach to being a woman in a male-dominated profession. Lessons learned from her would be of benefit throughout my career. Many years later I received a call from one of our deans at the University of Connecticut who had just met an amazing woman who was pioneering a new type of master's degree, the PSM. Of course, it was Sheila. As she did with some of the other schools, she convinced UConn to submit an application to the Sloan Foundation for programmatic funding. Thus began a renewal of our friendship and working relationship. A "true-believer" in the best sense, Sheila expended boundless energy to create and promote the PSM, while at the same time bringing out the best in all of us. Innovator, educator, role model, author, entrepreneur, feminist, friend.....Sheila was all of these, and more. I am so fortunate to have known her. Linda Strausbaugh

When I think of Sheila I see her writing down her thoughts on a yellow legal pad. Not one for technology, she relied on her own ability to think through problems. No. Not exactly problems, but solutions. How to attain our goals? What actions

need to be taken? What data do we need to collect? Who do we need to speak to? This “we” was directed primarily at women. She was a pioneer feminist, our beacon. On the one hand pulling us toward her, on the other propelling us forward. We remember her with glass of red wine in hand, and honor the guidance and friendship she gave us all. Sheila encouraged us to speak up, to stand up, to move, to get things done. Always an activist, always a mentor, always our biggest supporter. We miss her dearly. Elizabeth Friedman

Sheila! What would she ask me to do? What would she expect me to do? What would she convince me to do? What would she give me the confidence to do? Whatever it was, we are all much better off having known her. Having Sheila’s presence in our lives has made us all much better representations of ourselves.

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Author Relationship to NPSMA

The authors are longtime members of the NPSMA. Bogdan Vernescu and Elizabeth Friedman are co-founders of the NPSMA and along with Dagmar Beck held the position of NPSMA President; Cynthia Bainton served two 3-year terms as an NPSMA Board Member; and Linda Strausbaugh served as the NPSMA Director for Strategic Initiatives and Vice President for Publications.

NPSMA 13th Annual National Conference & Workshop



NATIONAL PROFESSIONAL SCIENCE MASTER'S ASSOCIATION

[Register now](#) for the 13th annual NPSMA National Conference and Workshop! Meet your PSM colleagues from universities across the country. Discuss current and future collegial and employment issues. Learn about the range of PSM programs offered internationally and what makes them a success. And have some fun and enjoyment in San Diego at the same time.

With an overall theme of “The Past 25 Years and the Next 25,” the pre-conference workshop and the conference will be blended this year for two full days of content flanked by a mixer/welcome program event and a conference follow-up.



IN PRACTICE ARTICLE

Findings from the NPSMA-CGS STEM Master's IDP Survey

Christian P.L. West, Linda Strausbaugh, Deborah Silver, Elizabeth Friedman, and Hironao Okahana

INTRODUCTION

Individual Development Plans (IDPs) are tools used in education and industry to help students and employees, respectively, define and pursue their academic, career, and professional goals. Though prevalent in science PhD and postdoctoral programs, IDPs are not as common in master's degree programs. In 2020-2021, the National Professional Science Master's Association and the Council of Graduate Schools undertook a National Science Foundation-funded survey to collect data about the status of IDP use in STEM master's programs. Hironao Okahana and Christian West of CGS developed, in consultation with the workshop planning committee: Co-chairpersons: Professors Deborah Silver (Rutgers University) and Linda Strausbaugh (*Emerita*, University of Connecticut); members Robert Augustine (CGS), Rick Davis (Davis Development Group, LLC), Cynthia Fuhrman (University of Massachusetts Medical School), Michael Teitelbaum (Harvard Law School) and Sarah Egan Warren (North Carolina State University), a survey of STEM Master's program advising and individualized development plan practices. Contacts to participate in the survey either held membership with NPSMA or were identified as the director of a STEM Master's program. We received 151 responses, representing 80 unique institutions. Themes for the questions were: Mentoring and Advising Practices; Experiential Learning Opportunities; Transferable Skills; Template IDP Features; and Impact of COVID-19. In this article, we share results from the survey.

PARTICIPANT DEMOGRAPHICS

Survey participants represented a wide range of scientific fields and diverse types of universities. They have the following characteristics:

- 72% of participants oversee 1-2 professional science master's programs.
- Respondents primarily represent the following

academic fields (Note: Participants were permitted to mark all academic fields that apply.):

ACADEMIC FIELDS	% OF PARTICIPANTS
Biotechnology, Biomedical Sciences, Pharmaceutical Sciences	32%
Computer Sciences, Big Data, Analytics, UXD	30%
Environmental Sciences, Ocean Sciences Sustainability	19%
Engineering	18%
Other Fields	13%

- 80 unique institutions are represented in the dataset with the following Carnegie Classifications:

CARNEGIE CLASSIFICATIONS	% REPRESENTED
Doctoral Universities- Highest Research Activity	38.9%
Master's-focused Institutions	18.8%
Doctoral Universities- Higher Research Activity	14.1%
All other institutions	3.4%
Doctoral Universities- Moderate Research Activity	2.7%

msIDP TEMPLATE USE AND CONTENT

Seventy-three percent of program directors would implement a template msIDP if available. Nine percent of program directors use their own IDP for professional development. Respondents'

priorities on what should be included in an msIDP template were concordant with responses to other parts of the survey. More than six out of ten identified the following priorities:

RESPONDENTS' PRIORITIES	% OF RESPONDENTS
Skill Development Goals	67%
Skills Assessment	65%
Short-Term Career Goals	65%
Professional Networking Goals	63%
Long-Term Career Goals	63%
Professional Interest Assessment	61%

Just under one-half named values assessment (45%) and academic project goals (45%) as priorities.

MENTORING AND ADVISING PRACTICES

For 51% of programs, the program director serves as the faculty advisor for students; 71% of these faculty advisers are tenured or tenure-track eligible. For 47% of programs, advisees must meet with their respective advisor every semester or quarter. With respect to mentoring and advising practices, thirty percent of respondents use IDPs or IDP-like tools to help students define and pursue professional goals. When formal IDPs are adopted, they are from ones designed for undergraduates or doctoral/post-doctoral candidates. Some programs use other IDP-like tools such as GradMap and Port-folium.

Table 4 summarizes the required or recommended advising activities in programs. While most programs include reviews of the student's academic program and require attendance at professional development seminars, there is a sharp decline in program involvement in other activities such as identifying goals, resume review, and self-assessment. Assisting students in achieving these latter activities should be priorities for the msIDP template.

TABLE 4. ADVISING ACTIVITIES REQUIRED OR ENCOURAGED.

ACTIVITIES	% REQUIRED OR ENCOURAGED
Review Academic Program of Study	80.54%
Attend Professional Development Seminars	71.81%
Review Resume/CV	45.64%
Write Short-term Career and Professional Goals	30.20%
Write Long-term Career and Professional Goals	20.13%
Complete Self-assessment Inventories	16.78%

EXPERIENTIAL LEARNING

Seventy-eight percent of programs either require or encourage some type of work-based project or other research component. Experiential learning is delivered in several ways (*note: participants could mark all that apply*):

EXPERIENTIAL COMPONENT	% REQUIRED OR ENCOURAGED
Thesis or Final Report	43%
Capstone Project	43%
Independent Study or Research Project	43%
Work-Based Learning	31%
Some other way	7%

Eighty-one percent of programs require or encourage students to participate in experiential learning opportunities. These opportunities are delivered in the following ways (*note: participants could mark all that apply*):

EXPERIENTIAL COMPONENT	% REQUIRED OR ENCOURAGED
Internships	73%
Part-Time Professional Work	45%
Full-Time Professional Work	37%
Assistantships	35%
Some Other Choice	9%
Study Abroad	8%

It is encouraging that four out of five programs promote learning by doing. The importance of experiential learning as advantageous for employment still needs to be emphasized to students in msIDP, especially those students in the remaining 20% of programs that do not promote it.

TRANSFERABLE SKILLS	% OF PROGRAMS THAT TARGET
Written Communication	59%
Public Speaking	49%
Teamwork	45%
Project Management	44%
Professional Ethics / Integrity	44%
Quantitative Literacy / Data Analytics	40%
Leadership	39%
Communication with a Non-Technical Audience	33%
Networking	27%
Career Planning	24%
Digital Literacy	20%
Entrepreneurship	17%
Diversity / Multicultural Competency	14%
Managing Mentors	8%
Managing Wellness	8%

TRANSFERABLE SKILLS

Transferable skills are widely recognized by employers as one of the most important components of career preparation and workforce development. Yet only 65% of programs either require or encourage transferable professional development skills. Programs target the skills shown in the table in the previous column.

These transferable skills are developed by the academic programs in the following ways:

WAYS TRANSFERABLE SKILLS ARE DEVELOPED	% OF PROGRAMS
Incorporated into Required Coursework	58%
Incorporated into Elective Coursework	38%
Professional Development Seminars	28%
Stand-Alone Professional Development Course	24%
Online training modules	7%

Programs provide opportunities for students to engage with employers through the following:

OPPORTUNITIES	% OF PROGRAMS
Guest Lectures	51%
Information Sessions	38%
Mentorship	32%
Site Visits	29%
Job Shadowing	10%

From these responses, we note several things. First, all of the skills identified by the respondents are ones highly valued by employers. Second, in agreement with other surveys of PSM programs, communication skills remain at the top of the list of encouraged transferable skills. Third, that teamwork, entrepreneurship, and professional ethics, which are all essential for success in the workplace across a broad swath of scientific fields and jobs,

are the least encouraged skill sets identified by our respondents. That only 65% of programs require or encourage transferable skills further highlights how useful an msIDP would be to help students learn about transferable skills and be mindful of opportunities to acquire them.

COVID-19

The COVID-19 pandemic disrupted academic institutions in dramatic ways. We wanted to survey how master's programs were specifically impacted. Since the development of COVID-19, program directors assess students exhibiting more of the following:

STUDENT CONCERNS	% OF PROGRAMS
Concern About Finding Opportunities for Career Advancement	57%
Concerns About Job Security	53%
Ability to Complete Degree Program in a Timely Manner	43%
Ability to Balance Work, Life, and Course Obligations	38%
Relevance and Value of Their Degree Program	11%

Several of the student concerns lie squarely in the wheelhouse of an IDP.

MENTORING AND ADVISING PRACTICES	% OF PROGRAMS AFFECTED
Meetings with Advisors	71%
Review of Academic Program with Advisors	44%
Professional Development Seminars	43%
Review of Resume with Advisors	22%
Self-Assessment Inventories	8%

Program directors identify mentoring and advising practices impacted by COVID-19, as indicated in the preceding table.

Programs cope with these disruptions in a variety of ways:

PRACTICES	% OF PROGRAMS
Practices went Virtual	74%
In-Person Practices were Cancelled	25%
Practices Remained the Same	10%
Practices were Shortened	3%

Whether the advising is remote or in-person, an msIDP would be useful in keeping the student moving forward in a self-directed assessment of program progress, as a record of professional development, and as preparation for resume-writing. The kind of action items and mechanisms for tracking progress implicit in an IDP will allow students to have more control over their career paths and aid their advisor/mentor during program reviews. We suggest that having an msIDP template that includes more student ownership of educational and career decisions has the potential to promote positive action and reduce anxiety under all circumstances.

DOES AN IDP IMPROVE PROGRAM PERFORMANCE?

With the complexity of multiple responses and differences in the ways programs define components, it's always a challenge to compare programs. We can ask in general terms whether programs that currently use an IDP or IDP-like tool perform better than those that do not.

Across the full spectrum of mentoring/advising, experiential learning, and transferable skills, many categories are similar. In programs with IDPs, there is greater ($\geq 10\%$) encouragement or requirement of several subclasses of skills:

- Digital literacy (+14.8)
- Managing mentors (+13.9)
- Communication with a non-technical audience (+12.4)
- Career planning (+12)
- Academic project goals (+17.3)
- Professional networking/mentoring goals (+11.5)

Given both the higher percentages of inclusions for programs with IDPs, and the positive differences compared to programs without them, we conclude that use of an IDP or IDP-like program would benefit students across the spectrum of programs. The survey findings encourage us to further refine and explore topics in the planned workshop and to continue with the development of an msIDP template.

CONCLUDING THOUGHTS

The body of knowledge created by the survey is designed to inform on whether there exists a need for a STEM Master of Science IDP (msIDP). Of those programs that do not currently use any IDP-like tools, 84% say they would use an msIDP template if one were available. This metric alone provides compelling support for the development of the msIDP. The survey also identifies topics to be covered at a follow-up workshop, and insight into the development of the msIDP.

Note: The project “STEM Master’s IDP as an Essential Tool in Workforce Development” was funded by the NSF (Award Abstract #1940221 and #193934). After the survey, an msIDP workshop was held in Tampa, Florida, November 10, 2021, in conjunction with the NPSMA Annual Conference. A report on the msIDP workshop and an msIDP based on our findings are forthcoming.

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AUTHORS BRIEF BIO: Hironao Okahana (currently Assistant Vice President, Research and Analysis, American Council on Education) and Christian West (currently Senior Director of Admissions – Global Diversity, Equity and Inclusion, University of Virginia) were the Council of Graduate School Leads on the Master’s IDP Survey. Elizabeth Friedman, Deborah Silver and Linda Strausbaugh are National Professional Science Master’s Association members and current or former PSM program directors who contributed to the design of the survey and workshop discussions.



FEATURE ARTICLE

2021 National Conference “Developing a Roadmap for your PSM Program”

Kristin Kuter

DESPITE THE UNCERTAINTY CREATED BY THE PANDEMIC, NPSMA LEADERSHIP MADE THE DECISION TO PLAN

and hold an in-person meeting for the 2021 National Conference and Pre-Conference Workshop. A group of roughly 45 PSM Program Directors, NPSMA Board Members, and invited speakers gathered in Tampa, FL. To keep attendees safe, conference and workshop organizers took advantage of the wonderful Florida weather and arranged for all meals and breaks to be enjoyed

outside by the pool. Breakout sessions and small group discussions were encouraged to meet outside as well.



The theme of the conference was “Developing a Roadmap for your PSM Program”. Attendees were provided with valuable information on strategic planning for PSM programs, guidelines and best practices for developing transferrable skills in PSM students, and the current and future needs in science industry. For this author, there were four highlights to the conference: (1) the student presentations, (2) the reception and awards ceremony, (3) the PSM Program “success stories”, and (4) the Friday afternoon field trip to Busch Gardens.



Always a highlight of the annual conference, the student presenta-

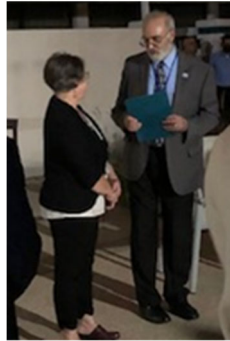
tions this year were no exception. Three students gave presentations on their practicum projects. There were two students from the University of Utah. The first, **Michael Bigelow**, graduated from the Computational and Data Science program in 2021 and presented on “Optimizing the Rate of Penetration of Natural Gas Drilling Rigs: A Shiny Web App Interface for Statistical Modeling Approaches”. The second student from Utah, **Katherine Maus**, graduated from the Environmental Science program in 2021 and presented on “Urban Pollinator Habitat Construction and Species Monitoring”. The third student presentation came from **Jackelyn Gutierrez**, a student in the Zoo, Aquarium and Animal Shelter Management Specialization at Colorado State University, who presented on “My PSM Experience and Capstone Research Project with the Cheyenne Mountain Zoo”. All three students made their institutions proud, demonstrating the value of combining technical education with the development of strong communication skills.



Another tradition of the annual conference is the Thursday evening reception and awards ceremony.

Each year, the NPSMA presents awards to outstanding members of the PSM community that have made a difference. The **President’s Award** is given to a member of the PSM community for outstanding contributions or service to the PSM Initiative. The 2021 President’s Award went to two Past Presidents of the NPSMA: **Scott Herness** (Montclair State University) and **Tim Born** (Grand Valley State University). The **Board of Directors Award** is given in recognition of outstanding contributions to a PSM Program, the NPSMA, or the PSM Initiative. For her exemplary service to and support of the NPS-

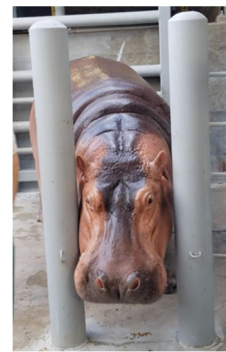
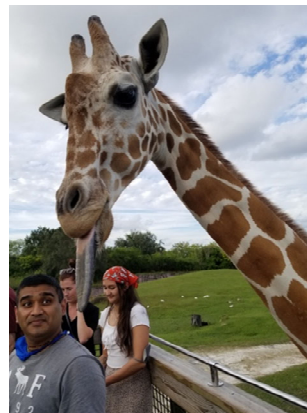
MA, the 2021 Board of Directors Award went to former NPSMA Coordinator of Operations, **Jeannie Houts**. In addition to these two standard awards, last year's President Gerald Grunwald (Thomas Jefferson University) took advantage of a unique opportunity to create a special award, the **Lifetime Achievement Award**, in order to recognize the outstanding service to the NPSMA of **Linda Strausbaugh**.



To close out the program this year, the conference ended with a session moderated by Tim Born featuring "success stories" from four PSM Programs. First up, **Stephanie Pierce** (Texas Woman's University) talked about launching a brand-new program in Biotechnology. Despite admitting the first class of PSM students in the midst of a pandemic, the program has been successful in attracting students. Stephanie and her colleagues also secured a \$1.5 million grant from the NSF to fund students in their program. **Dara Schniederjans** (University of Rhode Island) also discussed launching a new program during COVID. Despite starting their new program in Supply Chain and Applied Analytics in the fall of 2020, they attracted 18 students in their first class. Sixteen of these students completed the one-year program on time and enjoyed a job placement rate of 100%. **John Fegyveresi** (Northern Arizona University) discussed reinvigorating their PSM program in Climate Science and Solutions. After dropping below seven new students per year, John more than doubled enrollment while diversifying new cohorts through an increased social media presence, a public outreach campaign, and development of new industry partners. Finally, **Seema Freer** (Temple University) talked about the success of their nine-year old program, describing the outcomes of their students and focusing on their many successful alumni.

The final highlight of the conference was the field trip to Busch Gardens Friday afternoon. Through her professional network, **Jennie Willis** (Colorado State University) was able to arrange two special animal encounters free of charge for the group of 12 conference attendees that were able to visit the park following the conference. The first

event was a safari tour in which the group was loaded on to the back of a pick-up truck that drove around the vast safari exhibit and culminated in everyone getting to feed lettuce leaves to two very hungry and friendly giraffes. Following the safari tour, the group was then treated to a private, behind the scenes viewing of two of the park's hippos. After learning about how the keepers care for the animals, everyone was offered the opportunity to toss food into one of the hippo's mouths. This social event was such a treat that the conference planners for the 2022 National Conference in San Diego, CA are looking to again incorporate a field trip into the conference programming.



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IN PRACTICE ARTICLE

Covid-related Internship Project

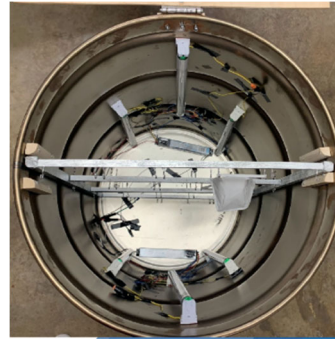
Andrew Abikhaled

DURING MY TIME AS AN UNDERGRADUATE AT RICE, I EARNED A MINOR IN GLOBAL HEALTH AND WORKED CLOSELY with the Rice 360 Institute for Global Health. Rice 360 is committed to research on health inequities, education of students, and the achievement of quality and equitable healthcare for all. They strive to see creative ideas become sustainable solutions. They do this through various research projects, degree programs, and internship opportunities.

I took advantage of the 5th year degree program offered to Rice undergrads and enrolled in Rice's M.S. in Bioscience and Health Policy, this allowed me to take courses towards my graduate degree during my senior year at Rice. Having established connections with Rice 360 already, I had the opportunity to take part in the Rice 360 Summer Internship program and worked as a team leader on redesigning a pre-existing system of disinfecting N95 masks with UVC light.



The project was focused on the disinfection of N95 masks using UVC light. Interestingly, it was the continuation of a project that I had personally worked on the previous summer. The student team were attempting to alleviate problems associated with PPE shortages in low-resource settings. We were tasked with creating a mobile unit capable of



effectively sterilizing N-95 masks so that they could be re-used. The team had the incredibly creative idea of using a 55-gallon oil drum as their mobile unit. This made it easy for designers in other countries to access the materials, reduced complexity by not making design-

ers build the mobile unit exterior, and ensured that every system was consistent in size. We built a mask rack with railings, installed 6 UVC bulbs, and created a rolling platform, a lid, and a lid stand for the oil drum. The final design sterilized masks effectively and efficiently, used accessible resources, was easy to use, and was within budget. It was an incredible project to work on and I could not be more proud of the team.

I relished the opportunity to guide a team through their design process, see their ingenuity express itself, and facilitate a fun and collaborative working environment for the students.



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The NPSMA thanks the following reviewers (asterisked names are also members of the Editorial Board for the curated issues of The INNOVATOR). The next peer-reviewed issue is in spring 2023. NPSMA members may submit manuscripts from June 1, 2022 through September 30, 2022.

Dagmar Beck (Rice University, Vice President for Publications)*

Natalie Bosecker (University of Illinois, INNOVATOR Editor)*

Kristin Kuter (Saint Mary's College, NPSMA President)*

Derek Payne (NPSMA, INNOVATOR Managing Editor)*