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Perspectives on Undergraduate Research & Mentoring

# Mentoring Students in Research and Communication Across the Ocean

Caryn L. Heldt, Ph.D., Michigan Technological University, U.S., heldt@mtu.edu
Erin Smith, Ph.D., Michigan Technological University, U.S.
Hannah Cunningham, Michigan Technological University, U.S.
Cameron Miller, Michigan Technological University, U.S.

## Introduction

Today's global health challenges will be met more effectively by researchers who can collaborate across disciplines and national borders, and who can communicate their research effectively, both within research communities and to the general public. The complexity of global health issues and their multifaceted dimensions have made interdisciplinary team-based research a well-established, if not essential, approach to addressing these problems (Stokols, Hall, Taylor, & Moser, 2008). It is also now commonplace within research communities and funding agencies to seek the diverse expertise of global research teams to meet what an international challenge is by definition (Stephen & Daibes, 2010). The need for strong communication is especially important to researchers who are sharing information across their respective fields and nationalities, and who recognize that public understanding of their science will play a vital role in the transmission of key concepts and in garnering support for research initiatives and public policy (Nisbet & Scheufele, 2009; Wu, 2017).

At Michigan Technological University, we have created a program that addresses all three of these areas, aimed at producing engineers and scientists who can work effectively as part of interdisciplinary and international research teams while at the same time helping the general public understand the process and significance of global health research initiatives. Funded through the National Science Foundation's (NSF's) International Research Experiences for Students (IRES) program, Dr. Caryn Heldt, the principal investigator (PI) for the grant, worked with a research collaborator at Aarhus University in Denmark to bring undergraduate research students to Denmark in the summer of 2017. Undergraduate research students were recruited from around the U.S. in the fields of biology, chemistry, biomedical engineering, and chemical engineering. For seven weeks, the students worked with the Danish PIs in Molecular Biology at Aarhus University to research new biosensors for malaria, tuberculosis, cancer, and many other global health threats.

A unique and significant addition to the IRES project was the integration of communication education and assignments, along with the addition of a student from a humanities-based student media team called CinOptic Enterprise[1], which often partners with researchers at Michigan Technological

[1] The Enterprise program at Michigan Tech provides students with the opportunity to participate in teams with various specialties that operate more like small businesses and whose work is most-often focused on real client projects. The Humanities department sponsors a media and communication Enterprise team, CinOptic Communication and Media (http://cinoptic.mtu.edu). These students generally major in Scientific and

University to help them create media materials. The CinOptic student became part of the cohort, joining them to document the experience in the first year. By adding a communication-focused student to the cohort and providing specific training and mentorship in the use of communication tools, this IRES project was designed to help all of the students synergistically learn the difficulties and importance of scientific communication, thus proactively addressing the growing need for scientists to communicate effectively among their peers and with the public in a variety of ways (Illingworth & Prokop, 2017; Nisbet & Scheufele, 2009; Yeo, 2015).

Mentoring was a guiding principle throughout the project. Mentors who provided a large breadth of experience were sought. The two key U.S. mentors were the PI of the project, Dr. Caryn Heldt, a professor of chemical engineering, and Dr. Erin Smith, a principal lecturer in digital media and film in Michigan Technological University's humanities department, which offers degrees in Scientific and Technical Communication (STC) and Communication, Culture, and Media (CCM). Dr. Heldt has been involved in multiple international and interdisciplinary collaborations. Her research lab focuses on the purification of biotherapeutics and the detection of pathogens, for example, a quick malaria sensor that could give you a result before you leave the doctor's office. Dr. Smith is an experienced media producer and teacher, who directs the Humanities Digital Media Zone (HDMZ), a resource center for media development that serves the entire campus, and is the CinOptic Enterprise advisor. Although collaboration is increasingly common across scientific and engineering fields, the addition of a faculty member from humanities brought together more disparate fields and helped foreground the value of humanities and communications disciplines for the student cohort.

To assist with the transition from Michigan to Denmark, the key mentors from Michigan Technological University traveled with the students and stayed in Denmark for one week during which time they helped the students adapt culturally and scientifically, and assisted with the creation of digital content. Further mentoring over the summer was based in the learning management system (LMS) Canvas. Discussions, individual quizzes, and poster revisions were all undertaken in Canvas.

For a number of reasons, facilitating cohort creation was also an extremely important part of the mentoring process. A cohort starts a program at the same time and is given planned activities that provide professional, social, and emotional support (Nimer, 2009). The students needed to come together from different universities and majors and live in a foreign country, which was a new experience for most of them. Building trust and a strong peer-support network was essential. Cohort formation has been shown to positively affect learning and, through member collaboration, cohorts also foster a shared understanding of academic and professional goals and team responsibilities (Bista & Cox, 2014; Nimer, 2009). The cohort was supported by four Michigan Technological University faculty and three Aarhus University faculty.

This paper describes different aspects of the IRES program and examines how the international and interdisciplinary goals of the project were enhanced through mentoring in many different ways, most especially communication, which worked interdependently with the scientific, intercultural, and

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Technical Communication (STC), Communication, Culture, and Media (CCM), and Sound Design. The students receive credit for the Enterprise experience and are, on average, with the team for four semesters. This enables them to take on projects that extend beyond a single semester and to participate in opportunities like the IRES grant, which will incorporate a new student from the team each year of the three-year grant. The advisor for the team oversees their work and provides continuity for the organization. Although only a single student is involved in the training and travel for the IRES grant, the entire team supports the work through planning, peer-mentorship, and project evaluation. Thus all majors on the team contribute to the success of the project.

interpersonal mentoring that occurred. Perspectives on the experience are provided by the key faculty mentors and two of the research students.

**Orientation**

Before the students and faculty mentors departed for Denmark, they participated in a week-long orientation at Michigan Technological University. The students needed support, guidance, and mentoring related to the scientific, social, and professional demands of the trip. The orientation was designed to introduce them to their projects, prepare them for laboratory work in Denmark, assist them with cohort formation, and prepare them for some basic media production and social media communication, the subject of which will be the focus of the next section. Meeting student expectations for the orientation was paramount to the outcome of their experience and research (Bell, 2016).

The goal of the scientific part of the orientation was to introduce the students to their summer projects and to provide baseline laboratory techniques that would be needed in the molecular biology labs at Aarhus University. The students were given papers on their research projects and also a lecture on DNA structure and stability. A lab safety orientation and a short lab experiment was provided to confirm that the students understood basic lab techniques, such as the use of pipettes (pipetting) to transfer and measure small volumes of liquid in the lab. The students finished the orientation by making formal presentations on prior research conducted by the three Danish PIs with whom they would be working. These presentations gave the students an opportunity to practice scientific communication skills and helped Dr. Heldt gauge their understanding of the proposed research projects.

The social aspects of the orientation were geared towards cohort formation among the diverse students from different universities and different majors. Three students were from Michigan Technological University and the remaining students were from three other universities, representing five different majors in the disciplines of science, engineering, and humanities. All the students were housed together in the dorms at Michigan Technological University and had most of their meals together. Along with standard ice-breaker games, two other activities were added to encourage cohort formation: a local hike and the Michigan Tech Challenge Course (e.g., Low Ropes Course). The hike took over two hours and allowed the students to get to know each other informally and to practice their newly acquired photography skills. The challenge course encouraged team building as the students worked together to problem solve, surmount obstacles, identify strengths, and communicate effectively (Goldenberg, Klenosky, O'Leary, & Templin, 2000). The mentors participated in some of these activities, including many of the meals, the hike, and the challenge course. This helped solidify the trust needed for students to accept e-mentoring from the U.S. mentors while the students were abroad.

*Faculty Perspective: Dr. Caryn Heldt*

Having the students live, eat, and work together for a full week was helpful in solidifying cohort formation prior to the students' departure to Denmark. It allowed cross mentoring of the students due to their varied scientific and geographical backgrounds. However, the cohort formation may have been too strong, as the incentive to explore and meet new people in Denmark may have been hindered by the students' reliance on one another, a common problem in study abroad situations (Bell, 2016). In future orientations, greater emphasis needs to be placed on the importance of US students' interactions with the host institution's student body. One method may be to assign a student mentor from the host institution to each U.S. student (Koskinen & Tossavainen, 2004).

It was determined after work commenced in Denmark that there was not enough in the orientation on the science aspect of the work. This is likely due to a miscommunication between the U.S. PI and

the Danish PIs on expectations about the scientific work to be conducted. This aspect of the project is being improved for future cohorts so that the scientific expectations and student preparation are more aligned with the work that will be performed.

*Student Perspective: Hannah Cunningham and Cameron Miller*
The orientation was crucial to the success of our cohort and the overall trip. It allowed us to come together initially and start creating trust in our group. It was hard at first trying to come together because we were a mix of different disciplines and from different universities. Having a week before the trip to get to know one another was really helpful before the trip.

The orientation also served to help build confidence for the scientific work to be conducted in a biology laboratory, as shown in Figure 1. It helped expose us to various biological lab techniques that may have been new to some of the students. Coming from an engineering background, we did not have much experience working in a biology lab. During orientation, the cohort learned pipetting skills and the basic rules of working with DNA. The lecture on DNA gave us knowledge on the biological concepts that were necessary for the work. Both of those sessions allowed us to work together in a professional manner and have base scientific knowledge of our projects.

Figure 1. Hannah Cunningham working with Danish researcher.

The social aspects of orientation allowed us to build a rapport with one another. We spent almost every second together and got to know each other well. Hiking at a local waterfall was a lot of fun and also encouraged bonding. We talked among ourselves to get to know more about our past experiences and how we felt about the upcoming Denmark trip. The ropes course forced us to work together to encourage bonding and a reliance on one another. It also established a sense of mutual trust between the members of the cohort. Beyond what was scheduled, we worked out and went on runs, got ice cream, and toured Michigan Technological University's campus. This made the transition to Denmark much easier because we had already developed some background with each other and had some sense of trust. This trust assisted greatly in problem-solving both in the lab and outside of it.

**Science Communication**
With increasing regularity, scientists are communicating among themselves and to the public through a number of different channels and media, such as video and animation on blogs and social media, which creates a real need for those entering the field to be mentored and trained in these newer forms of communication (Bik & Goldstein, 2013; Yeo, 2015). Informed by a stronger sense of audience, purpose, and convention, those representations can contribute more readily to the science communication strategy and documentation of an experience. A primary goal of this project was to promote communication as an integral part of scientific research and to demonstrate the importance of public science communication to the student participants. From the outset, formal mentoring on science communication through the inclusion of the CinOptic student (Figure 2) and media faculty was designed to help students develop their skills and awareness before, during, and after their time abroad.

Figure 2. Taran Schatz, the communications student embedded with the cohort in Denmark.

Communication training also has the advantages for the study abroad experience as a whole. When students study abroad, they are often asked to document their experience. Social media can be an excellent way for them to do so. Too often, however, social media is touted as native ground for the digital generation. Scholarly accounts of how it can be used as a pedagogical tool during study abroad make it clear that students are expected to already know or figure out how to use it themselves (Deans, 2012; Kelm, 2011). This approach can result in moments of embarrassment for the students' universities when students post inappropriate content because they have not been prepared to use social media for new rhetorical purposes and audiences (Kowarski, 2010). Moreover, without adequate preparation, such efforts can yield results that do little to support the process of professionalization with regard to the use of these tools. A 2018 Pew Survey on "Teens, Social Media & Technology" indicates that teens use social media to communicate with family and friends, to connect with those who share their interests, and for entertainment (Anderson & Jiang, 2018). Professional networking and knowledge exchange is often a goal for scientists who use social media (Bik & Goldstein, 2013) and may have some overlap with those purposes in connecting with pre-existing communities. However, when social media is used in an effort to increase public understanding of science, professionals must carefully consider how to connect with audiences who need ways to understand the technical complexity and significance of the content. The target audiences may have additional resistance to the social or ideological implications of the science or with trust in the dissemination medium itself (Collumb, 2014; Funk, 2017). Professionals also understand that social media is part of a larger communication strategy and must consider when to use them and for what purposes (Macnamara & Zerfass, 2012).

During the IRES orientation at Michigan Technological University, five of the seven days included some form of communication education. In the first year, our primary focus was on the creation of documentary materials. The research students participated in photography and videography workshops. They were also formally interviewed on camera and introduced to the ongoing filming by the media student, who produced two short documentaries about the project. In addition, the students underwent training on how to use social media as part of a broader research communication strategy for public engagement. Students' research presentations were also required during orientation, a precursor to the final poster development in which each student was challenged to synthesize and represent his or her seven weeks of work for an interdisciplinary scientific audience at their respective institutions.

As a way for the students to think about image creation and the scientific community, students were introduced to photographic principles through professional images documenting the 2017 March for Science. We expected that students would use their phones or point-and-shoot cameras, so the orientation concentrated on what could be accomplished with those tools. They were asked to evaluate how certain techniques added to the public presentation of science and scientists, considering the impact of scale, lines, depth, point of view, juxtaposition, and symmetry, among others. We also discussed what kinds of subject matter make for interesting photographs, as well as ethical behavior and cultural expectations about public photography in Denmark. The research students were then given a "scavenger" list of techniques and approaches and sent out to capture images around campus. Because we hoped that they would be able to contribute some video content to the documentary but didn't want to overburden them, we equipped the research students with two GoPros and microphones that they could use to shoot interviews with each other and take with them to the lab or on excursions. One workshop was focused solely on technical use of the cameras and basic interview framing. Students practiced by taking the cameras with them on the hike during orientation and were encouraged to practice with the cameras throughout the orientation.

While workshops and practice over several weeks were not enough to transform the research students into expert communicators and media producers, the consistent integration of communication practices and mentorship sent a clear message that communication is an essential, rather than peripheral, component of scientific research. Moreover, the emphasis on communication as a professional activity with established norms, practices, and standards required students to differentiate between *using* a communication tool or medium and *knowing how to use* it in order to achieve rhetorical goals. As with interdisciplinary work across science and engineering fields, this insight encourages students to recognize the benefits of collaborating with communication experts as part of the scientific endeavor.

*Faculty Perspective: Dr. Erin Smith*

The addition of communication into this project is unique in its willingness to address common assumptions about what students today are prepared to do in the realm of digital communication. The first assumption is that students are prepared to produce meaningful media using their phones. However, their sense of purpose and audience for these activities is usually quite different from that required for professional communication. By incorporating two workshops during the orientation on basic photography and videography instruction (Figure 3), we were able to give the students exercises to practice their photography and videography skills and receive feedback. This coaching did improve the quality of what the science students produced when they were responsible for documenting portions of the experience.

The second assumption—one that we made to some extent in the first year—is that students are already prepared to communicate via social media because they have grown up with it and use it in their personal lives. This assumption proved wrong on more than one count. First, we found that not all students in the cohort were using social media on a regular basis, if at all. It also became clear that the regular social media users were accustomed to using it in ways and for purposes that have little resemblance to how it is deployed strategically by professionals.

Figure 3. Bianca Jones practicing with the GoPro during orientation.

Our focus in the first year was on the documentary creation. We had initially planned for the students to contribute regularly to the project's Twitter and Instagram accounts, but this did not happen as often as we had hoped. We quickly discovered that the students needed more structure and support if they were going to contribute effectively and consistently to social media channels for the project. In 2018, we will set publishing goals and deadlines, and work with the students to produce a list of topics and hashtags that they can use to help them publish images and news about the project as they work. The communication student will have a stronger focus on this area and provide more support for the process by interacting with the research students on drafts of their posts, as well as image creation and selection.

The documentary production undertaken by the communication student also had some useful byproducts in terms of communication education overall. It helped to reinforce the science students' role as representatives of the project. They were called upon to give formal and informal interviews where they were asked to describe the research. They also had to consider what needed to be documented, even during sightseeing and recreational activities, in order to represent the international nature of the experience. After the communication student left the cohort at the end of

the second week, it fell to the research cohort to conduct the interviews near the end of their projects in Denmark. In general, the process formalized a level of articulation and responsibility for the research projects that would not have been achieved without guidance and mentoring in media production.

*Student Perspective: Hannah Cunningham and Cameron Miller*
PowerPoint or poster presentations are common in research and in most classes that engineers or scientists take. However, overcoming language barriers in Denmark and having to present our research on social media in such a way that the general population could understand each presented its own set of challenges. Even though many people speak English in Denmark, the laboratories used signs in Danish to give instructions, provide warnings, and identify storage cabinet contents. We couldn't learn where things were just by overhearing people talk because they didn't speak English to each other. Off campus, it was in a similar situation. Typical conversations weren't in English. While in stores or at the laundromat, we had to figure out ways to understand and communicate without relying on English.

We had to describe research that was being done in relatively simple terms to an audience assumed to have little to no science background. It was actually quite fun because we eventually realized that the best way to share on social media was to take a picture and then explain the photo. This helped us learn how to present research to people who spoke a different language and people who may have never had biology or chemistry. The mentoring from the media faculty and the media student made us think more about how we presented our scientific information.

Serving as documentary subjects, we were far more aware of ourselves and how we presented our research. As Taran, the media student, followed us around the laboratory asking about this and that, we were forced to explain the surroundings, equipment, and processes to a future audience who we couldn't see. Interviewing each other also created chances for peer-to-peer mentoring. It was a true test to be able to express ourselves in a manner basic enough for the general public to understand but technical enough to be accurate.

**Interdisciplinary and International Interaction**
The IRES experience involved both interdisciplinary and international collaboration. The students participating in this experience were a group of interdisciplinary students with a wide variety of majors. Many of the students were completing work outside their background and interacting with many people from other disciplines. This could cause communication issues that were not the result of language barriers but rather of disciplinary barriers. Mentoring from both the U.S. and Denmark team helped the students understand many of the interdisciplinary issues that arose.

International teams benefit not only from interdisciplinary knowledge, but also from cultural differences in research practice that allow a challenge to be explored from many different avenues, ultimately leading to increased success in solving difficult problems (Barjak & Robinson, 2008). It has been documented that international research collaborations often increase the productivity of a researcher and the impact of the research (Barjak & Robinson, 2008). One possible reason is that international collaboration is more expensive than domestic collaboration, and therefore the impact needs to be greater to justify its cost. It may also be that only extremely motivated individuals participate in these types of collaborations.

From the student perspective, students who have international experiences as part of their education are expected to have an increased understanding of global issues and gain compassion for people from different cultures (Bell, 2016). They should also see an improvement in their communication skills to better engage with a global and diverse workplace and teammates. While

mentoring was not explicitly targeted towards this part of the project, it was integral to the experience, and students were asked to comment on the cultural challenges they experienced through Canvas discussions. Students and their PIs mentored one another about topics of their own specialty and about their own culture.

*Faculty Perspective: Dr. Caryn Heldt and Dr. Erin Smith*
Mentoring was not explicit for the interdisciplinary and intercultural aspects of the trip. Interdisciplinary mentoring often happened through opportunities to listen in on conversations between the experienced researchers from both countries in organized discussions. When the students were first introduced to their mentors, they had an opportunity to hear the U.S. PI and her Danish counterparts talking together about the nature of interdisciplinary work. The researchers discussed the value they find in approaching scientific questions from different perspectives, citing instances where their own work benefited from it. At one gathering, Dr. Birgitta R. Knudsen, project coordinator at Aarhus, described how "the language…is often what is the major obstacle of collaboration." She told a story about a project where researchers from different fields were discussing substrates and only to discover after a somewhat confusing two-hour discussion that the participants had completely different disciplinary definitions of the term substrate. As their scientific U.S. mentor, I [Dr. Heldt] related a similar story. These interactions with faculty frequently inspired students to reflect on some of the differences between the disciplines within the cohort and to begin thinking of their own research as informed by a specific disciplinary approach as opposed to a universal one. These insights helped support the communication goals of the project as well.

Intercultural mentoring was also addressed informally. The students were given a brief cultural introduction that consisted of "being polite and knowing your surroundings." However, almost immediately situations arose that forced the students to confront difference. During their first week in Denmark, they discovered that the lab would be closed for two days for national holidays, which sparked research about the holidays and their purpose. Dr. Knudsen urged them to travel when they got the chance and said it was her hope that the students would "learn how to be more open-minded because they will see a different way of acting." When the students were asked to reflect on aspects of being a foreigner through the Canvas, these reflections led to conversations within the cohort that were beneficial.

It is well known that students often revert to the comfortable and socialize only with the other U.S. students when put into longer-term international situations (Bell, 2016). It was the case that there was less incentive for the students to be proactive and immerse themselves in the local culture because they had each other. They did not have as much interaction with the Danish students as was hoped. However, they did have Danish AirBnb hosts who took an interest in them, invited them for dinner, and engaged them in conversations about the culture and customs. This was an unexpected and welcome form of informal intercultural mentoring that the students enjoyed very much.

*Student Perspective: Hannah Cunningham*
The interdisciplinary aspect of working in a biology lab was challenging for me. I came from a heavy technical engineering background with little biology exposure. There was a definite learning curve as I stepped into the role required for molecular biology. My lack of knowledge was not met with any resentment or exasperation, but with an understanding that my expertise was different and there was going to be a learning curve. My PI and I were able to build on my lack of knowledge and hone my technical skills through extensive data analysis. During my seven weeks in Denmark, I felt as though I benefited from working with someone from a different discipline. Not only did it improve my molecular biology skills, but I also learned how to better communicate my biomedical engineering education to someone from another discipline. I believe my PI and I were a stronger group together

because our expertise complemented each other.

Working with native Danish speakers made communication a little more difficult. It was a unique experience to collaborate on creating the scientific poster with someone whose native language is not English. As a native English speaker, I commonly use slang terms or words that a native English speaker would understand in context but that a non-native speaker would not. Some chosen words might be grammatically correct, but the non-native speakers were able to point out more precise words. It was interesting to have my work evaluated and reviewed by a non-native speaker. Many times, I had to justify the words I was using. This was an experience that would not likely have occurred if I had remained in the U.S. to conduct research.

*Student Perspective: Cameron Miller*
The background that I had prior to arriving in Aarhus was chemical engineering with some biology and biochemistry experience. I had worked in Dr. Heldt's lab so I already had some technical lab experience. However, the work I did in Denmark was more focused in molecular biology. Having the graduate student and the Danish PI attempt to explain biology to a chemical engineer and a biochemist (my student research partner) was challenging and interesting. We both picked up on the topics quickly and if one of us did not understand, the other would explain it. Working with people from different science backgrounds was extremely valuable because people from different backgrounds solve problems differently.

Not only did I learn biological techniques, but I also learned about Danish culture through learning Danish words. The graduate student and I talked about the Danish idea of *hygge* which loosely translates to "coziness." It is the idea of the kind of comfort one has at one's home and enjoying the simple things in life. Learning words that are untranslatable teaches a lot about culture. Learning about *hygge* taught me about how the Danes approach life and the ideals they strive to achieve. The Danes enjoy their homes and their family. They value the time one spends with one's parents, siblings, and extended family. I saw this first hand with one of our AirBnb host families, as they were all close and you could tell they all love and support each other. One similar kind of word from the United States is the term Yooper. A "Yooper" in the simplest terms means someone who lives in the Upper Peninsula of Michigan. However, Yooper has more important cultural connotations. Yoopers are hearty and trek through the coldest nights. They come together when times get tough. They enjoy eating pasties (food from their mining heritage) with their friends. Some words can't be described; they can only be experienced. The Danish *hygge* and the American *Yooper* are both untranslatable experiences. Getting to experience another culture and doing a research internship in another country was a big enhancement to my professional and social skillset.

**Mentoring Overseas**
There were three phases to the mentoring of the students. The orientation started with mentoring by the Michigan Technological University faculty. Once the students were in Denmark, they were mentored remotely by the Michigan Technological science mentor and locally by the Danish faculty and graduate students. The communication mentor did not interact with the research students after she left Denmark, leaving the CinOptic student to support their media work. When the student returned with the documentary footage, her role shifted to advising him on the completion of the documentary project. The primary focus of the overseas mentoring was on science and interpersonal relationships. Because trust was built between the students and the faculty mentors during the orientation and their week of travel together, the Michigan Tech faculty were able to mentor remotely through Canvas more successfully.

After the students had been in Denmark for three weeks, surveys and discussions boards were used to estimate the students' scientific engagement and their interpersonal and emotional status. The

main discussion board prompts asked them to describe their research and what things surprised them the most about living in a foreign country. Responses ranged from reflections on sitting among people who were speaking a different language – "It gives me more time to think and reflect," to things they were learning from Danish students about Danish culture and social values – "as long as you do your job and do it well, you don't have to worry about things like having [health] insurance." A survey was used to check in with them about group dynamics, which we had to monitor from a distance. This format allowed people to speak openly to their mentors.

Towards the end of the stay, when the students began working on their science posters, Michigan Technological University faculty were able to critique them along with the research mentors in Denmark. At the end of the experience, the students all returned to their home institutions where they completed final surveys and posters through Canvas. A post-orientation survey was used to assess their overall response to the trip. The students provided positive feedback on how different aspects of the orientation helped them with the experience overall. Three of the five students spoke specifically about the value of the media training and all referenced some aspect of the communication preparation as being important to their overall sense of achievement.

*Faculty Perspective: Dr. Caryn Heldt*
Mentoring the students was easy during the orientation. The faculty controlled the schedule and had meals with the students to get to know them better. It was a great time to get to know the students and to have discussions about aspects of the trip that made them nervous. The students were very open about their backgrounds and insecurities. We did our best as a team to give them the confidence needed to pursue this very exciting but unusual experience.

The scientific aspects of the mentoring were straightforward and embraced by all of the students as it was conducted by both U.S. and Danish mentors. The students had access to the Michigan Technological University faculty, the Aarhus University faculty, and the Aarhus University graduate students. In the end, the posters the students created were well done and presented at their local universities.

Most of the students participated in discussions and surveys to gauge their adaptation to Denmark, but all of them were slow to respond to emails. It would be best in this situation to have an older student assigned as group leader and facilitate communication with the U.S. faculty. It is also possible that online meetings and communication applications, like Slack, would have helped.

*Student Perspective: Hannah Cunningham*
I was the only student assigned to work with my Danish PI. This offered me the chance to work one on one with her, which meant we worked more closely together than the others did with their PIs. The nature of my project also increased the amount of collaboration between us, something that occurred less in the other groups. We had meetings almost daily, and my relationship with her quickly became the most significant one that I formed while in Denmark. She offered advice on places to visit, heightening my Denmark experiences. Though her, I learned about the local culture and we connected through our shared experiences of the U.S.

During the research, she easily guided me through things I didn't understand, many times sitting down with me and going through confusing subjects step by step. Through this experience, I learned the value of communicating my strengths to my mentor so that she could help me learn how to apply them, even if it didn't seem obvious to me at the start. I didn't expect to be able to apply my engineering education in a biology-based laboratory, but we were able to find a way to use my data analysis skills on the project. It was a good example of how disciplines can work together in unexpected ways. The mentoring I received during this program was indispensable to my learning

and experience, both professionally and personally.

*Student Perspective: Cameron Miller*

I was assigned to work with another student from the cohort along with the Danish PI and her graduate student (Figure 4). The mentorship was more trial and error. Our PI gave us more general information and broad ideas and then allowed us to investigate on our own. When we had questions, the graduate student often answered our questions and helped us troubleshoot issues with experiments. This mentoring model helped both myself and the other U.S. student grow, as it allowed us to form our own independence in the laboratory setting while still giving us the support we needed. The graduate student often informed us of events that the department was having, Danish holidays and celebrations, and good places to eat at and visit in Aarhus. Our PI was always interested in what we were doing and would often ask what we have seen and give us recommendations on what to do next. This mentorship was extremely valuable to me and helped me grow as a person and as a scientist.

Figure 4. Cameron Miller having a meeting with his Danish PI and graduate student mentors.

**Conclusions**

This project provided six U.S. students the chance to explore a new country and culture, learn new science, and explore digital communication as a method to disseminate science to the general public. Mentoring was explicitly provided in the areas of cohort formation, the science to be performed, and in communicating the science via formal interviews and social media. Less explicitly, informal mentoring helped the students adjust to a different culture. This mentoring grew more organically through the relationships formed between the U.S. students and the Danish students and PIs. Overall, we were extremely pleased with the outcome of this project. We look forward to applying what we have learned from the first year to two more summers of mentoring students as we continue to traverse the rich, interdependent, and at times uncharted territories of interdisciplinary/international research and science communication.

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**Appendix A Documentary Production of the Trip**
https://www.youtube.com/watch?time_continue=1&v=GJM6AJYcARo

**Appendix B Ongoing Social Media Accounts for the Summer of 2017 and Future Summers from the Same Grant Program**
Program Twitter Account: @IRES_Singapore
Program Instagram Account: @IRES_Singapore