

Work-in-Progress: Running an in-person NSF IRES Program in South Korea before and during COVID-19

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The goal of the National Science Foundation (NSF)'s International Research Experiences for Students (IRES) program is to provide high quality educational experiences for small groups of U.S. students through active research participation in collaboration with foreign researchers at an international site and provide students with international collaborative research training and a personal network on which to build future collaborations.

Interdisciplinary Research in Korea on Applied smart systems (IRiKA) is an NSF IRES Track I program that commenced in 2019. During each year of the three-year program (2019 - 2021), a cohort of 5 students selected from three participating U.S. institutions are sent to South Korea for 8 weeks to work on their own research project at their assigned laboratories. In Summer 2019, the first cohort of five students completed their 8-week immersive research internship at a top-ranked Korean university.

COVID-19 affected most, if not all, in-bound and out-bound international programs. IRiKA was no exception. In late February 2020, the program was canceled altogether because no viable alternative could be offered for Summer 2020, as institutions world-wide were grappling with disruptive challenges the pandemic brought on. In Fall 2020, with contingency plans in place and an additional Korean host site aboard, the project team solicited applications. However, in early 2021, before the final selection of the 2021 cohort was complete, two of the three U.S. participating institutions announced that international travel would not be permitted for their faculty and students. The project team went on to select a cohort from one U.S. institution only and continued to monitor the travel health notice level for Korea. While some modifications were made to the in-country program to comply with the COVID-19 regulations in Korea, the 8-week research experience was in-person and remained largely uncompromised for the 2021 cohort.

In this Work-in-Progress paper, the three US-based lead investigators compare the two versions of the IRiKA program – before and during the pandemic – and share the lessons learned. The no-cost-extension will allow IRiKA to continue until Summer 2022. Selection of the Summer 2022 cohort will be complete by early March of 2022.

Program Overview

The unifying research theme of IRiKA is smart systems with the subtopics of sensors, emerging electronics, and materials & process development. Smart systems incorporate sensing, actuation, wireless connectivity, and machine learning, which requires interdisciplinary expertise in biomedical, computer, electrical, industrial, mechanical engineering for seamless implementation. IRiKA students will learn how the systems approach brings together interdisciplinary technological solutions for manufacturing, healthcare, energy, safety and security, transportation, and logistics.

Applications are accepted online between October and January, but promotion of the program takes place year-around at three participating U.S. universities. To attract underrepresented applicants, in addition to using the program website, social media, e-mail, print, information sessions, and faculty referrals, the program directors actively reach out to the student organization chapters of the National Society of Black Engineers (NSBE), Society of Hispanic Professional Engineers (SHPE), and Society of Women Engineers (SWE).

Accepted students are required to attend the pre-departure orientation and training that start 6 weeks prior to the start of the program. Due to the different geographical locations of the students (mid-west and southeast), the sessions are virtual. The three sessions, each spaced about two weeks apart, are held between May and June. Students are expected to contact their Korean host lab mentors before the second session and report on the interaction and discuss the preparation assignment given by the host lab advisor. This assignment helps students build connection with the host lab and understand the research project they will work on. Thus, they can hit the ground running when they arrive at the host labs. Other topics covered include:

- Mandatory items - travel documents, weekly research progress report and blogs, surveys
- Korea - weather, packing tips, arrival information, meeting point at the airport, safety tips, must-have apps, getting around, accommodation
- Research - expectations, lab culture in Korea
- Professional Development workshop while in Korea

The professional development workshop is run by Dr. Moser of Northwestern University. The workshop, titled “Advanced Professional and Presentation Skills for Undergraduate Mentees and Graduate Mentors” consists of a series of lectures and one-on-one coaching for US undergraduate participants in IRES and their mentors in Korea. It focuses on collaborative dialogue and the development of presentation skills necessary for success within academic research environment.

Students travel to Korea in early June and engage in in-country activities for 8 weeks. The June date is set to accommodate students attending institutions on the quarter system. In addition to conducting research and attending weekly cohort meetings led by the US lead faculty, IRiKA students will visit Korea’s government research institutions and global leaders in the tech industry such as Samsung, LG, and Hyundai.

To evaluate the program, the investigators utilize: 1) standardized instruments; 2) surveys, interview protocols, and rubrics that have been developed for use evaluation of other training programs at UFIC; 3) survey and interview questions specifically tailored to IRiKA; and 4) students’ weekly blog posts while they were in Korea. The evaluation plan includes opportunities to gather formative data and to understand students’ perspectives of the programs’ impacts, even if those impacts are outside the anticipated or desired outcomes articulated by the program. Surveys are administered pre-, mid-, and post-program. Post-program interviews take place 4-6 months after the students return to the U.S. and after the student graduates from his or her undergraduate institution.

Applicant Data

Table 1 shows finalists' data collected from years 2019, 2020, and 2021. Finalists were selected after the initial screening of the applications by a committee of the three U.S. leads and host faculty in Korea. The reviewers considered completion of relevant foundational coursework and academic achievements as evidenced by a cumulative GPA. The committee took into account that there may be discrepancies in performance in the classroom and lab for some talented students.

Table 1: IRiKA Finalists' Data

	Year X	2019	2020	2021
Number of Finalists	University of Florida	3	7	5
	Louisiana State University	5	11	6
	Northwestern University	5	12	3
Class Standing as of Spring of Year X	Freshman	8%	13%	14%
	Sophomore	31%	33%	36%
	Junior	38%	37%	29%
	Senior	23%	17%	21%
Prior Research Experience	Yes	85%	63%	64%
	No	15%	37%	36%
Gender	Male	54%	63%	43%
	Female	46%	37%	57%
Ethnicity	African American	23%	7%	22%
	Asian	31%	27%	7%
	Caucasian	38%	56%	50%
	Native American	0%	3%	7%
	Choose not to disclose	8%	7%	14%

COVID-19 Impact and Adjustments

Due to heightened concerns over COVID-19, all universities participating in IRiKA suspended all international programs on March 1, 2020. A no-cost extension was filed to offer the program in Summer 2022 to make up for the cancellation. Recruiting resumed for Summer 2021 when the Centers for Disease Control and Prevention (CDC) issued Level 2 Travel Health Notice for South Korea in November 2020. The project team decided to give preference to students who accepted the offer for the 2020 program, which resulted in the number of available spots for Summer 2021 being reduced.

In early 2021, Louisiana State University and Northwestern University announced student participation in IRiKA would not be approved due to uncertainties and risks surrounding international travel during the pandemic. In March 2021, the project team decided to select a cohort consisting of six University of Florida students that included two selected for the cancelled 2020 program.

The project team continued to monitor the travel health notice level while making adjustments to the program. The significant change was adding stringent pre-departure requirements for the 2021 cohort to ensure their safety and to comply with the South Korea's COVID-19 policies. This included proof of vaccination, PCR-testing for air travel, and confirming availability for full 10 weeks of in-country activities. The extended period was due to the 2-week quarantine requirement in Korea and the project team's decision to preserve the full 8-week research

experience, unless the COVID situation in the Korea got worse and students would have to return to the U.S.

Programmatically, there were three modifications. (1) While the students were in quarantine, three check-in Zoom meetings were held. The time was used to foster adhesion among the cohort, discuss Korean culture, and review fundamental research skills including hypothesis formulation, literature search, experimental design, data management, and report writing. (2) The in-person Professional Development Workshop was converted to an online offering, as Dr. Moser was not able to travel. An additional session was added to the original eight to sync the workshop sessions with the research period. The first session was held while the students were in quarantine. (3) Industry and government lab visits could not be arranged due to internal COVID-19 restrictions of the organizations. Instead, students were given more opportunities for cultural excursions planned on their own.

Discussion

The finalists' data in Table 1 show a significant rise in number in the second year of the IRiKA program. This can be attributed to the 2019 cohort's active contribution to promoting the program and successful dissemination of their subsequent achievements. The alumni have won prestigious scholarships and awards (Goldwater, NSF Graduate Research Fellowship); are pursuing graduate degrees; and have accepted employment offers at leading tech companies. Also notable is the drop in students with research experience. This directly reflects the reduced undergraduate research opportunities brought on by the pandemic. According to a survey conducted on undergraduate students from 17 institutions who either were doing research in Spring 2020 and/or had planned to do research during the Summer 2020, the experience was severely affected by significantly reduced workload or the opportunity was cancelled altogether [1].

Despite the challenges posed by COVID-19, analysis of the surveys administered to the 2021 IRiKA cohort revealed that the learning objectives of the program were achieved in terms of research and global competency. They were satisfied with the level of interaction with the research team, the mentoring they received, and access to research equipment. The cancellation of the industry and government lab visits was somewhat of a disappointment, but given the circumstances, the students were understanding. Global competency was measured by a modified version of the International Critical Thinking (IntCRIT) & International Communication (IntCOMM) Attitudes and Beliefs Survey developed at University of Florida [2] and mapped onto the five characteristics of a globally competent student, as identified by the National Association of State Universities and Land Grant Colleges Committee for International Education [3]. The cohort expressed confidence in the ability to work as a member of a cross-cultural team, willingness to adapt to and integrate into a different cultural environment, and avid motivation to become proficient in the Korean language. Some responded they would very likely seek future opportunities, including pursuing a graduate or a professional degree in Korea. The decidedly different attitude of the general population towards COVID-19 and dutiful compliance to policy and guidelines turned out to be a major source of culture shock. There was a prevailing sense of gratitude for being afforded the rare opportunity to do research abroad and to fully experience a different culture during a pandemic that mostly shut down international programs.

The omicron wave is waning. As of February 1, Korea has reduced the mandatory quarantine period from 2 weeks to 1 week. While there is no predicting 2022 IRiKA's future, the project team is cautiously optimistic about being able to bring back parts of the program that had to be forfeited due to the pandemic. However, should travel not be possible, the contingency plan is to run the 8-week research internship virtually with feasible projects. In whichever shape or form, the third iteration of IRiKA is expected to yield a set of data still influenced by COVID-19.

Acknowledgment

The program has been funded by the National Science Foundation (NSF Award #1827173 & #1827183).

Reference

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