Early Research Scholars Program at UIC Adjustments

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In this poster, we provide an update to the adoption of the Early Research Scholars Program (ERSP), developed at the University of California San Diego, to our institution, the University of Illinois at Chicago (UIC). The program was designed to support retention of students from marginalized backgrounds in the field of computing especially during the second year of their major.

Currently, the project at UIC is in its third year of the grant, having served three cohort of students thus far. In this poster, we focus on discussing adjustments of the program to fit 1 credit hour structure, as well as student impact in the three cohorts. The program has served majority women students and continues to strive for representation of minoritized students in the fields of Computer Science and Electrical and Computer Engineering.

We also share evaluation results from the first cohort, as well as results from the reflections collected starting with the second cohort. These reflections show the ways in which students are impacted by the program as well as areas of improvement.

Finally, we discuss what aspects of ERSP at UIC are working well so far and have translated well from the original program, and which aspects need further adjustment and improvement.

ERSP Background

The Early Research Scholars Program (ERSP) was developed at the University of California San Diego. The central components of ERSP are "1. a course-supported apprentice model in which students work on real research problems within an active research group as they learn the fundamentals of Computer Science (CS) research in a structured class setting. 2. A dual mentoring framework in which students are. co-advised by a central team of ERSP mentors and a faculty or graduate student research mentor. 3. A team-based structure that builds community and. student-to-student support" [1]. ERSP runs during the full academic year starting with the fall semester. In the first half of the program, students learn basic research skills that are common across CS and they develop a research proposal as a team. In the second half of the program, students work on the research project proposed and are directly supervised by a faculty or graduate student research mentor. This design offloads some of the research training that faculty may have to do with undergraduate students new to their research lab.

ERSP is structured using a cohort-model so that students work in teams wherein support is provided via class meetings, research meetings, and team meetings. Aside from the faculty that oversee ERSP, there is at least one graduate student designated to ERSP who assists with goal-setting and technical advice for each team of undergraduate student researchers.

ERSP Adoption at UIC

The University of Illinois at Chicago is a mid-tier research school, with a large minoritized population. What makes UIC a good fit in contrast to other ERSP partner institutions is that UIC is a Hispanic Serving Institution, with 40% of the student body, which is Pell-grant eligible.

Also, as UIC is mainly a commuting school, programs like ERSP are crucial for helping students develop a sense of community on campus. In addition, the College of Engineering at UIC has a large transfer student population, which would also benefit from having access to a community on campus.

The adoption of ERSP at UIC was enabled by a larger project supported by an NSF Grant (#1821501). In the larger ERSP project, UIC along with Stanford and University of California Santa Barbara have adopted ERSP in consultation with Dr. Alvarado who is in charge of ERSP at UCSD. The adoption of ERSP at UIC began in early 2019 with the recruitment of ERSP students. Recruitment was done in first-year CS and Electrical and Computer Engineering (ECE) courses and via emails to students who were part of the Minority Engineering Recruitment and Retention Program, the National Society of Black Engineers, the Society of Hispanic Professional Engineers, and the Society of Women Engineers. During this time, faculty in ECE and CS were also recruited to review applications. In total, there were 31 CS applicants and 28 ECE applicants. Following the review guidelines provided by UCSD, faculty reviewed and rated all of the applications. Our goal for the first year of the program was to accept at least 16 CS students and 12 ECE students. As a result, 17 CS students and 12 ECE students were accepted into ERSP in spring of 2019 and instructed to sign up for the program to begin with the ENG 294 course titled "Introduction to Computer Science and Engineering Research" offered in the fall of 2019. ENG 294 is a dedicated course to ERSP and it was created using the start-up guide provided by ERSP at UCSD [2]. Only ERSP students were part of this course. There were two faculty teaching the course and a graduate student in CS.

The first cohort of ERSP students in Fall 2019 consisted of 11 ECE undergraduates and 17 CS undergraduates. Although 12 ECE students were accepted, 1 left the program in the first week. All 28 students completed the first half of ERSP by taking the ENG 294 course. In spring 2020, all but 2 students returned for the second half of ERSP. Both students did not continue in ERSP due to academic reasons.

Out of the 28 students accepted, 21 students self-identified as female, 6 as male, and 1 as non-binary. Three students self-identified as Hispanic/Latinx and 2 as Black or African American. The remainder of the students identified either as Asian or White.

ERSP Changes for Adoption at UIC

Two faculty (one from CS and one from ECE) worked together to adopt ERSP at UIC. At UIC we adjusted the model in the following ways: (1) extended the majors included to also include ECE students, (2) adjusted the 4-quarter program structure to fit within 2 semesters, and (3) reduced the fall semester class from a 4-credit hour class to a 1-credit hour class. The adoption of ERSP at UIC included the critical components of the ERSP model; namely, course-structure to teach fundamentals of research (i.e., ENG 294), dual mentoring, and team-based structure.

The inclusion of ECE students into ERSP was made easier by having a faculty member in the same department. For example, recruitment of students and faculty in ECE was made possible by having a faculty member in the department who could easily reach out to these two groups. In addition, minor changes were made to the ERSP curricula developed by UCSD in order to

incorporate ECE. Only minor changes were necessary because all the topics covered in ENG 294 were easily translatable from CS to ECE. These minor changes included: providing examples of research presentations that were related to ECE, providing examples of ECE research papers, providing in-class examples about publishing (e.g., journals, process of publishing) relevant to ECE.

There were two main reasons for semi-major or major adjustments to ERSP at UIC. The first reason is that UIC runs on a 15-week semester system whereas ERSP was developed for a 10-week quarter system. The second reason is that we had to adjust the 4-credit course to a 1-credit course. For both of these reasons, we implemented the following semi-major changes to ERSP: grading was primarily based on the final report, in-class sessions were reduced to once-a-week for 50 minutes and some topics and in-class exercises were removed. All of these changes were made in consultation with the larger ERSP team including Dr. Alvarado at UCSD. In the ERSP model, grading is based on several items including the final report; however, for our implementation of a 1-credit course, we found that the final report was the primary deliverable for the semester and thus the grading was based only on the final report. The course topics that were not covered in ERSP at UIC due to time restrictions included: ethics in research, oral communication, peer-review (reduced time from 3 classes to 2 classes), and basic statistics and hypothesis testing. We also had to remove the following in-class exercises due to time restrictions: final proposal presentation and reflections.

One of the components that was critical to our adoption of ERSP, especially in ENG 294, was logging because it helped us to identify team issues and determine proposal progress. Another critical aspect of the course was allocating time during class to check-in with each of the teams. Check-ins were done by the faculty and the graduate student.

Conclusion

Overall, the changes made to the ERSP model were not major, but they were necessary for the adoption of the program to an institution like UIC. These changes were incorporated to ensure that the program met the goals and kept its critical components (i.e., ENG 294 course, dual-mentoring, and team-based structure). After the first year of the program, we plan to report on student outcomes and assessment data as well as provide a more detailed report of the adjustments made to ERSP at UIC.

References

[1] M. Barrow, S. Thomas, and C. Alvarado, "Ersp: A structured cs research program for early-college students," in *Proceedings of the 2016 ACM Conference on Innovation and Technology in Computer Science Education*, 2016, pp. 148–153.

[2] n.d., "ERSP | Instructor resources." [Online]. Available: http://ersp.ucsd.edu/index.php/instructor-resources/. [Accessed: 28-Jan-2020].