The Research Co-op Program at Drexel University
Programmatic Structure and Learning Outcomes

Abstract

Cooperative education is a central component of Drexel’s academic programs across all undergraduate majors; 93% of students participate in at least one six-month work experience. These experiences not only develop student professional skills that are aligned with classroom learning, but co-op extends the breadth of learning outcomes that are key to successfully fulfilling career requirements upon graduation. As part of Drexel’s 2007-2012 strategic plan, increasing research opportunities for undergraduates was identified as a high priority. The introduction of Research Co-ops represented a novel initiative to achieve this strategic and funding was provided for students to work with faculty researchers primarily on campus but in some cases extending nationally and internationally. The focus of this initiative was to provide experiences for students interested in research across a wide range of disciplines and eventual progression to graduate school and a research career. Research Co-ops provide six-month full-time work on research projects with deliverables such as peer-reviewed papers and presentations, including presentations at Drexel’s Research Day. Twice annually, Research Co-op proposals submitted by active research faculty are vetted through Drexel’s Steinbright Career Development Center; those projects selected are provided funding, often as a match to the faculty member’s existing research funding. Typically upper division students apply and are selected by the faculty member. Students are provided opportunities to work on state-of-the-art research projects, gaining a better perspective on the key questions being addressed in their discipline and contributing to solutions of these questions under the mentorship of faculty, graduate researchers, and post-doctoral fellows. In many fields, this initiative partially addresses the broader impact of funded research supported by government funding agencies such as the National Science Foundation and the National Institutes of Health. This presentation will describe the logistics of the Research Co-op program; provide examples of Research Co-op projects across a range of disciplines; provide data on Research Co-op outcomes from student and faculty surveys; demonstrate how Research Co-ops connect with Drexel’s 2012-2017 strategic plan, particularly focusing on global impact and other institutional strategic priorities; and, show areas of alignment with student learning priorities and institutional learning outcomes assessment.
Introduction

Drexel University’s mission has highlighted experiential learning over the years, and the mission statement highlights the key connection between academic programs and co-operative education.

_Drexel University fulfills our founder’s vision of preparing each new generation of students for productive professional and civic lives while also focusing our collective expertise on solving society’s greatest problems. Drexel is an academically comprehensive and globally engaged urban research university, dedicated to advancing knowledge and society and to providing every student with a valuable, rigorous, experiential, technology-infused education, enriched by the nation’s premier co-operative education program._

Similarly, Drexel’s vision statement connects education and research and ends by relating “educational value, jobs, and new ideas for bolstering our economy.”

_Drexel will be the Philadelphia region’s leading university excelling in high-quality experiential education, online learning, translational research, technology transfer and business incubation, and urban revitalization. Drexel will use and leverage all of its assets—outstanding faculty; highly motivated students; 130,000 alumni; a pragmatic and entrepreneurial culture; co-operative education; Drexel e-Learning; and our superior location at a major transportation hub—to create an accessible, relevant, and market-leading educational and research platform that benefits our diverse community of students, advances our scholarly work, and champions economic development in our region. Drexel will join the ranks of the most impactful and competitive universities in the_
United States at a time when the nation is clamoring for educational value, jobs, and new ideas for bolstering our economy.

The Steinbright Career Development Center (SCDC) at Drexel University centrally oversees co-operative education, career services, and pre-professional advising. Co-op is integrated with coursework and other experiential learning activities and to learning assessment for full-time undergraduates. As an academic partner with Drexel’s colleges and schools, SCDC provides COOP 101 as a required introductory course into career planning, policies and procedures, interview skills, and resume development. SCDC also provides data to academic units on co-op outcomes through the Employment Summary and Planner (ES&P) and on career outcomes through surveys conducted in conjunction with Drexel’s Office of Institutional Research, Assessment, and Effectiveness (IRAE) and the Center for Labor Markets and Policy.

93% of Drexel’s 13,000 full-time undergraduate students participate in six-month co-ops – either one co-op in a four-year program or three co-ops in a five-year program. The SCDC currently places approximately 5,700 students in co-op jobs regionally, nationally, and internationally with about 77% of the positions paid. Placement rates over the past several years, including years of economic recession in the US, have consistently been in the 97-98% range.

In an effort towards continuous quality improvement in learning outcomes mandated by Drexel’s strategic plan and accrediting bodies, a learning assessment plan was developed in recent years based on a set of eleven Drexel Student Learning Priorities (DSLPs) – see Table 1 – leading towards the goal of each student ultimately building a successful career plan. These involve direct and indirect assessment at the program and course levels, and co-op evaluations through the ES&Ps as well as exit and follow-up surveys of graduate outcomes contribute substantively to assessment-guided initiatives and programming changes. The DSLP framework
is included in most survey instruments so that these key characteristics will be measured throughout a student’s academic career. At the program level, mappings of course outcomes with well-developed syllabi lead to broader programmatic learning outcomes. Co-op evaluations provide a unique element of direct assessment. Several new co-curricular programs have been developed to better strengthen student attainment of individual DSLPs, such as a new leadership development program in engineering.

**Table 1 – The Drexel Student Learning Priorities (DSLPs)**

- Responsible Citizenship
- Research, Scholarship, and Creative Expression
- Professional Practice
- Leadership
- Global Competence
- Technology Use
- Self-Directed Learning
- Information Literacy
- Ethical Reasoning
- Creative and Critical Thinking
- Communication
- Build Your Future

Drexel’s graduates are prepared for a wide range of careers academically and through experiential learning. In Drexel’s 2007-12 strategic plan, particular note was given to providing greater opportunities to move students to research careers, most notably to graduate school, through undergraduate research. Various undergraduate research initiatives have been instated including the “Students Tackling Academic Research (STAR)” program for rising sophomores, informal and formal research activities with faculty, research-oriented co-ops, and the Research Co-op program discussed in this paper. More recently, the University has instituted an International Research Co-op program, motivated by global initiatives in Drexel’s 2012 Strategic Plan.
It should be remarked that as Drexel has developed into a highly comprehensive research institution, it acknowledges the breadth of research, scholarship, and creative work of its faculty and students. Thus Research Co-ops mirror the diversity of such activities with recognition focusing on the current interdisciplinary foci - energy and the environment, computing, and healthcare - and the activities of interdisciplinary institutes such as the Expressive and Creative Interaction Technologies (ExCITe) Center. We note that research-related co-ops at peer institutions, such as University of Cincinnati and Georgia Institute of Technology, are often directed to Engineering disciplines.

Drexel’s Research Co-op program was rolled out in academic year 2008-09 supported by strategic funding and continues to develop today with approximately twenty-five projects funded annually. The goals of the program are to increase exposure of undergraduates to the research process and to research teams as a means to broaden student career choices particularly towards graduate research. The team generally consists of faculty, post-docs and/or graduate students, staff, and the research co-op. These are paid positions of approximately $14,000 for a six-month period; for projects with external funding, the salary provided by the university is matched by grant funding where possible. The anticipated outcomes are that students interested in research careers will be provided with a graduate-level academic experience that will better inform their career choices.

Projects are proposed twice yearly by faculty, reviewed by SCDC and the Office of the Provost, and awarded to faculty. The application has become more comprehensive since the inception of the program and requests project title, duties, skills required, expected deliverables, and matching funding. Faculty whose projects are chosen subsequently advertise the position and interview and select a qualified student. The proposals have clearly defined deliverables,
and it is expected that students will have opportunities for co-authored publications and presentations on their work. Follow-up of a completed Research Co-op follows the format of the ES&P with student and faculty feedback. First-time faculty proposals are generally given preference since the intent is that faculty, having completed one cycle will, if possible, apply to fully fund future research co-ops.

From 2008 to 2013, this program has supported 121 projects, and our results are derived from assessment of these projects. The breakdown of academic units from which faculty have participated is provided in Table 2. Examples of selected projects and outcomes are provided in the appendix. In order to illustrate interdisciplinary activities at Drexel, we call attention to two projects that were completed during the early stages of development of the ExCITe Center that couple engineering and fashion design to embed technologies into wearable fabrics. In particular, a Fashion Design student joined a research group comprised of materials scientists and electrical engineers to design a smart garments prototype using nanotechnology while an Engineering student developed and characterized wearable antennas into fabric substrates. Upon completion of the co-op, the Fashion Design student provided the following résumé description of the project with the intent to enter graduate school: *A collaborative research experience working in between a Nanotechnology lab and the Fashion Design department. Very hands on, interactive and challenging to learn more about engineering and how to manipulate new knowledge with traditional fashion design and sewing techniques.* The Engineering student is currently pursuing a PhD in the lab of the faculty member who supervised this project.

<table>
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<tr>
<th>Table 2. University Colleges and Units With Funded Research Co-op Projects</th>
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<tbody>
<tr>
<td>College of Engineering</td>
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<tr>
<td>College of Arts and Sciences</td>
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<tr>
<td>College of Medicine</td>
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<tr>
<td>Westphal College of Media Arts and Design</td>
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<tr>
<td>College of Computing and Informatics</td>
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Student scholarly accomplishments included posters, including those required for presentation at Drexel Research Day, co-authored papers and conference presentations.

Student and faculty responses in the ES&P questionnaires for Research Co-ops were compared with answers of over 22,000 students in general co-op jobs over this period. We note that student response rate was 100% and the faculty response rate was 51.2% for research co-op program participants while the overall student response rate was about 99% and the employer response rate is between 60 and 65% each co-op cycle.

ES&P questions to faculty supervisors addressed the following:

- Would you re-hire?
- Level of student preparation
- Attendance
- Time management
- Punctuality
- Dependability
- Attitude appropriate to work environment
- Productivity
- Effective oral communication
- Effective written communication
- Overall performance

Aggregated responses (3 and above on a scale of 1-5, with 5 most positive) for these questions scored >90%, with faculty supervisors slightly more critical of Research Co-ops than other employers. Compilations of responses around these criteria for the Research Co-ops yielded information on faculty experiences with their students. Qualitative coding of free response questions on student strengths and weaknesses can be found in Tables 3 and 4 below.
Overall, about 65% of the faculty did not suggest changes to students’ academic preparation while 18.2% suggested that students have more related experience and knowledge. Less than 10% of faculty desired for each: greater student initiative and self-motivation and more experience with data analysis and research methods with less than 2% noting a desire for: more professionalism and for improved focus and attention to detail.

**Table 3.** Top Five Student Strengths Identified From Faculty Feedback on Research Co-op Student Performance

<table>
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<th>Student Strengths</th>
<th>Percentage</th>
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<tr>
<td>Work Ethic / Time Management</td>
<td>50.0%</td>
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<tr>
<td>Initiative / Self Motivation</td>
<td>46.7%</td>
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<tr>
<td>Interactions with Others</td>
<td>23.3%</td>
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<tr>
<td>Experience / Technical Skill</td>
<td>21.7%</td>
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<tr>
<td>Application of Knowledge</td>
<td>18.3%</td>
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*n = 62*
Table 4. Top Five Student Weaknesses Identified From Faculty Feedback on Research Co-op Student Performance

<table>
<thead>
<tr>
<th>Student Weaknesses</th>
<th>%</th>
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<tbody>
<tr>
<td>None Identified</td>
<td>28.3%</td>
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<tr>
<td>Initiative / Self Motivation</td>
<td>16.7%</td>
</tr>
<tr>
<td>Professionalism</td>
<td>13.3%</td>
</tr>
<tr>
<td>Communication</td>
<td>11.7%</td>
</tr>
<tr>
<td>Work Ethic / Time Management</td>
<td>11.7%</td>
</tr>
<tr>
<td>Previous Experience / Knowledge</td>
<td>8.3%</td>
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</tbody>
</table>

Aggregated responses (3 and above on a scale of 1-5, with 5 most positive) for these questions scored >85%, with students slightly more positive of Research Co-ops than the general population. Students noted a slightly higher satisfaction with areas related to their experiences; they noted slightly lower self-assessments on oral and written communication when compared to the general population. Tables 5 and 6 below identified the best features and greatest challenges indicated by students in free response questions on their post co-op experience evaluations.

Finally, almost 45% of Research Co-ops expected to move to industry or the private sector.
Summary

Co-op experience provides a critical perspective to students on pursuing various career choices. We believe the Research Co-op program has created an effective mechanism to provide highly motivated students the opportunity to experience academic research and has provided faculty with strong undergraduate students to advance their research. While these experiences have focused several students on a research agenda, the students are likely to ultimately follow paths of the general population to seek employment after graduation rather than proceed to graduate school. Faculty expectations of students tend to be in line but somewhat more critical than general employers. The analysis of faculty comments suggests that a more careful proposal development and guidance to faculty on the student selection process are essential to attain an optimal fit between student and mentor. The collection of information on student deliverables and actual artifacts by the Steinbright Career Development Center is being enhanced this year to better assess the effectiveness of the program.

Acknowledgements

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