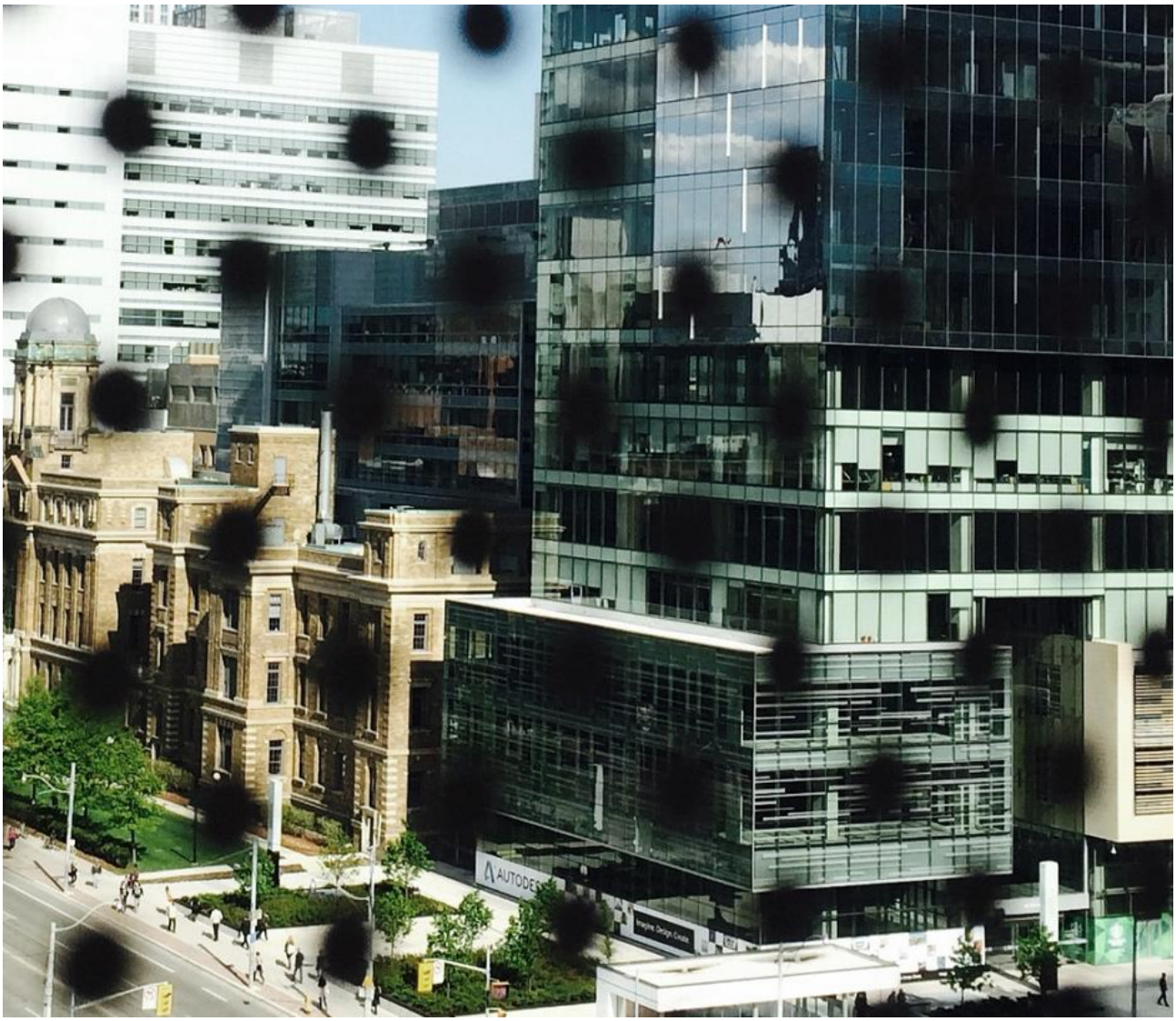

SCIP

SCIENCE CAREER IMPACT PROJECT

Initiatives & Outcomes
2014-2021

Part of my joy in learning is that it puts me in a position to teach;
nothing, however outstanding and however helpful, will ever
give me any pleasure if the knowledge is to be for my benefit alone.

- Seneca

Executive Summary

Career potential in industry is measured differently than in academia. How can life science graduate students and postdoctoral fellows seeking careers in industry convince hiring managers they can deliver value? **Without experience that employers can relate to and the ability to market their skills and potential effectively, life science trainees will not be competitive in the industry job market.**

From 2014 to 2021, the Science Career Impact Project operated with the mission to deliver transformational experiences to science trainees seeking careers in industry. This final report, *Initiatives & Outcomes*, showcases the results of the Project. Our 15 volunteers developed and delivered programs in Toronto and Ottawa, independently and with other organizations. These initiatives engaged >450 trainees and faculty and contributed to many industry career launches. We also conducted research that raised awareness of professional development opportunities for trainees and universities.

Marketing Yourself Effectively through the Resume: Based on the premise that an effective resume showcases potential by telling stories about experiences that highlight skills and impact, we developed a resume workshop and delivered 29 workshops to 273 trainees and 11 faculty/instructors. We developed and deployed a 16-minute online training module.

Building Your Portfolio through Job Simulation: As an alternative or companion to an internship, job simulation enables trainees to develop skills and a portfolio of projects to prepare themselves for the job market and convince employers of their potential. We established a collaboration with the Life Sciences Career Development Society (LSCDS) at the University of Toronto, developed a mentored job simulation program, and delivered the program to 184 trainees. As of Jan. 2021, the industry employment rate of graduates exceeded the historical benchmark. The team published two manuscripts with alumni success stories. To continue the program in 2021 and beyond we transferred it to LSCDS. To enable other universities to launch programs, we published a white paper on program design considerations with co-authors from the University of Toronto and the University of British Columbia.

Identifying Career Development Opportunities: We partnered with LSCDS to study how PhD graduates have prepared themselves for the non-academic job market. A total of 446 life science graduates and trainees from the University of Toronto were surveyed to assess the impact of career development activities on employment. We published a manuscript with actionable insights for trainees and universities.

To start their careers, trainees must define their aspirations, and acquire the skills and experiences they need. Professional development programs developed by the Science Career Impact Project have enabled trainees to start careers in industry. Such programs should be encouraged and expanded for interested trainees.

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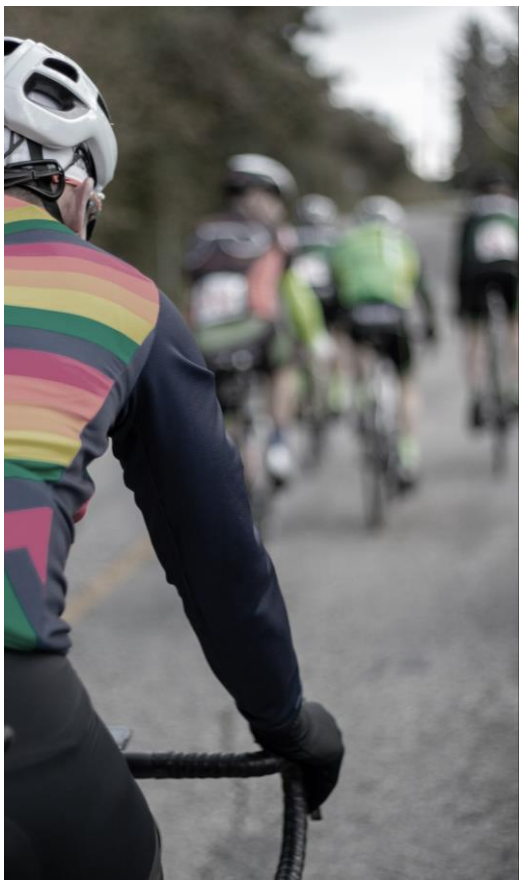
1 The Challenge

As scientists-in-training, life science graduate students and postdoctoral fellows develop many valuable skills. For example, they develop hypotheses and test them through research; they derive insights from data; they explain complex information with clarity; they lead projects and teams. As they make discoveries in their field, trainees present at conferences, publish their findings, and secure funding – all career currency in academia.



In industry, success is measured differently in terms of revenue, efficiency, growth, and customer satisfaction. How can life science graduate trainees seeking careers in industry convince hiring managers they can be productive and deliver value? In contrast to business and engineering students who can demonstrate their ability through internships, life science graduate students typically have no such industry experiential learning opportunities in their curriculum.

Without experience that employers can relate to and the ability to market their skills and potential effectively, life science trainees will not be competitive in the industry job market.

2 Our Mission and Story

The mission of the Science Career Impact Project is to deliver transformational experiences to science trainees seeking careers in industry.

As life science graduate trainees and alumni, we share an interest in industry careers, and a passion for developing people and our community. We believe that trainees can benefit from our experience and insights navigating the job market.

From 2014 to 2021 we developed and hosted programs and workshops in Toronto and Ottawa, both independently and with other organizations. Through these initiatives we reached >450 trainees and faculty, contributing to countless industry career launches. We conducted research on career development opportunities and published articles that have reached thousands of trainees, universities and employers.

At the conclusion of the Science Career Impact Project, our programs and resources continue to be available.

3 Marketing Yourself Effectively: Resume Workshop

Key Concepts

An effective resume showcases **potential to be productive** in the target role and **deliver value** to the organization by **telling stories about experiences that showcase skills and impact**.

A resume filled with captivating 2 to 3-line challenge-action-result stories is compelling to hiring managers.

Program Development and Execution

Validated **resume content strategy** through observation of graduate business school trainees and first-hand experience

Developed and piloted 2-session resume workshop with **personalized feedback** and **peer-to-peer coaching** in **small groups**

Recruited and trained team of **10 volunteer facilitators**

Delivered a total of **29 workshops** to **273 trainees** and **11 faculty/instructors**

Developed **online module** for continued, broad access

3 Marketing Yourself Effectively: Resume

273 trainees* and **11 faculty/instructors** participated in a total of **29 resume workshops** from 2014 to 2020

*MSc / MEng / MASc / PhD students / postdoctoral fellows

University of Toronto, Faculty of Medicine

- Department of Biochemistry
- Department of Cell and Systems Biology (2 workshops)
- Department of Immunology
- Department of Medical Biophysics (3 workshops)
- Institute of Medical Science (2 workshops)
- Department of Molecular Genetics
- Department of Pharmacology, Applied Clinical Pharmacology
- Graduate Life Sciences Education
- Canadian Diabetes Association (student organization)
- Life Sciences Career Development Society (student organization; 5 workshops)

University of Toronto, Faculty of Pharmacy

- Department of Pharmaceutical Sciences (5 workshops)

University of Toronto, Faculty of Engineering

- Department of Chemical Engineering

Research Institutes

- Hospital for Sick Children Research Training Center, Toronto
- University Health Network Office of Research Trainees, Toronto

Non-Profit Organization

- Science to Business Network (Toronto, Ottawa; 3 workshops)

Testimonials

“Make time for this workshop, it's worth every minute. You will have your blind-folds lifted to see yourself and your skills in a different light. And then, most importantly, how to communicate that to others.”

“The workshop is extremely useful in helping you effectively communicate your skills to individuals in the science field as well as people outside of the science field.”

“The knowledge gained from the workshop is critical to landing a job in industry. This type of information is not readily available through our graduate departments/programs.”

“The workshop has completely transformed the way I look at resumes. In addition, it gave me a new perspective on how to market my skills.”

Press

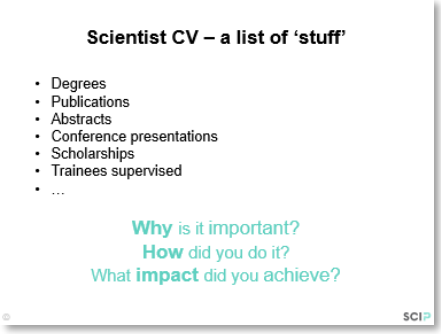
The Science Career Impact Project is helping trainees distinguish themselves and get noticed.

Dworski S. October 2015. Drive your way into a job: using CAR statements to write an impactful resume. Office of Research Trainees Times, University Health Network. https://uhntrainees.ca/wp-content/uploads/2016/04/ORT-Times-October-2015.pdf

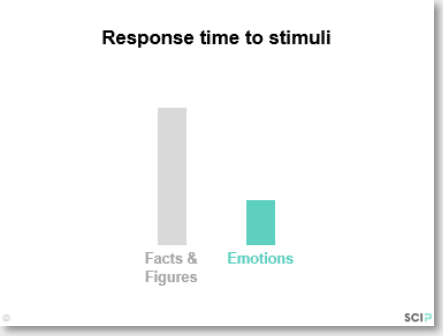
Resume Workshop Online Module

Science Career Impact Project. 2019. Resume Writing for Non-Academic Jobs. Toronto. 16 minutes, 21 seconds.
vimeo.com/328041539

To get noticed, you need to catch the attention of hiring managers and hold it. You need to convince them you have the potential to be productive in their organization. We will share with you a resume writing technique we've used to get noticed by hiring managers and invited for interviews.
(0:35)

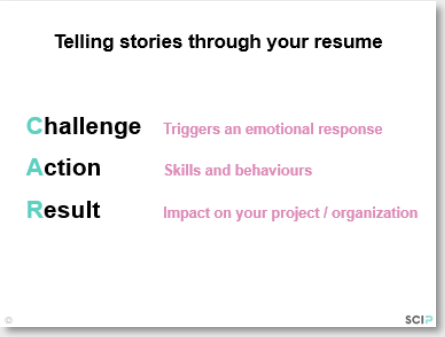


The list of stuff on your scientist CV does not explain why your accomplishments are important, how you achieved them, and the impact they had on your organization. These critical elements are the career currency outside the lab.
(1:36)

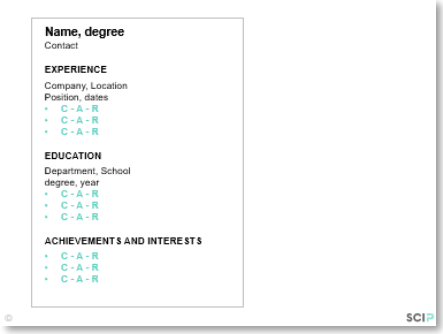


Our brains are wired to react to emotional stimuli. We can leverage this aspect of our biology to capture a hiring manager's attention by telling stories about our experiences through the resume. These stories can be structured in a way that triggers an emotional response.
(3:20)

3 Marketing Yourself Effectively: Resume



Every captivating story starts with a challenge – the problem you were trying to solve. The challenge triggers an emotional response. The reader will want to learn how you responded to the challenge. The second part – action – covers the skills and behaviours you used to solve the challenge. Finally, the result is the impact you had on your project or organization. (4:18)



In each section of your 1-page resume, you will tell Challenge-Action-Result stories about your experience, each 2-3 lines long. Employers are looking for a reason to believe you can take on challenges and produce results in their organization. With 1 page, you will have provided multiple examples of exactly that. (4:50)

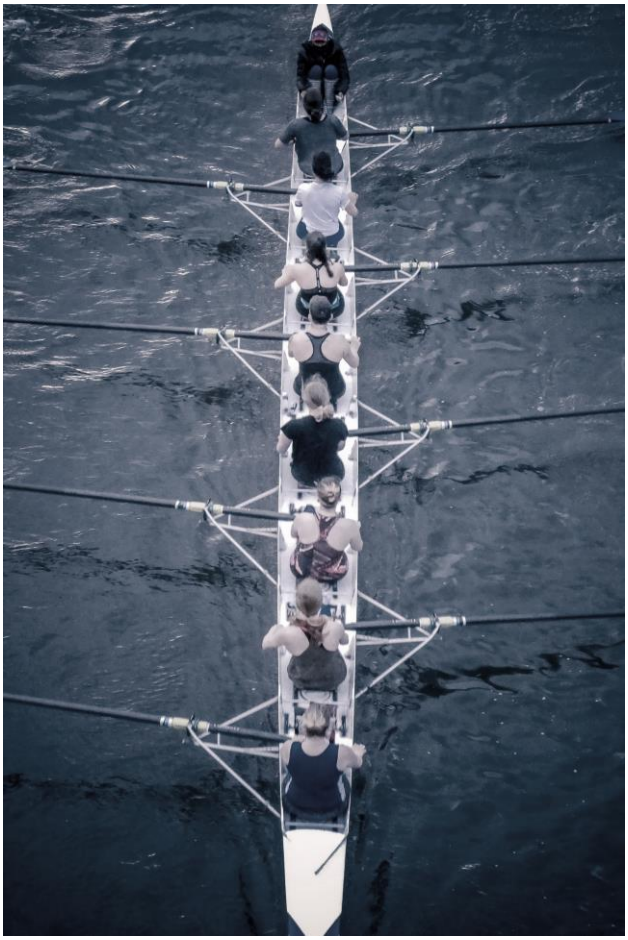
Tailor your resume for each role. Based on the job posting, identify the key skills and behaviours required in the role; identify your experiences in which you have used those skills and behaviours and had a positive impact; tell stories about those experiences. (10:38)

4 Building your Portfolio: Job Simulation

Key Concepts

Job simulation – a form of experiential learning – enables trainees to develop their **skills** and a **portfolio of projects** that employers can relate to.

Job simulation helps trainees **prepare themselves** for the job market and **convince employers** they have the potential to be productive and deliver value.



Program Framework

Trainees work in teams on **simulated industry projects with mentorship from professionals**

Trainees

- Identify a business or policy challenge
- Conduct research and analysis
- Propose a solution to address the problem
- Present their findings to industry professionals

Mentors

- Provide feedback on proposed topics and quality of the work
- Explain complex aspects of their field

Framework can be adapted to any sector

Program Development and Execution

Validated the **mentored job simulation strategy** with 1 mentor and 1 trainee

Established **collaboration** with Life Sciences Career Development Society (LSCDS) at University of Toronto, and **co-developed program framework for the Industry Team Case Study**

With LSCDS, **delivered pilot program** to 11 trainees in 3 teams mentored by 3 professionals (2016)

With LSCDS, **refined and delivered program** to 125 trainees in 30 teams mentored by ~30 professionals (2017-2019)

Advised LSCDS to **support program delivery** to 48 trainees in 12 teams mentored by 12 professionals; for continuity in future years, **transitioned program** to LSCDS (2020)

To enable launch of job simulation program at other universities, in collaboration with LSCDS (University of Toronto) and Center for Blood Research (University of British Columbia), published **white paper on program design considerations** (2021)

Program Benefits

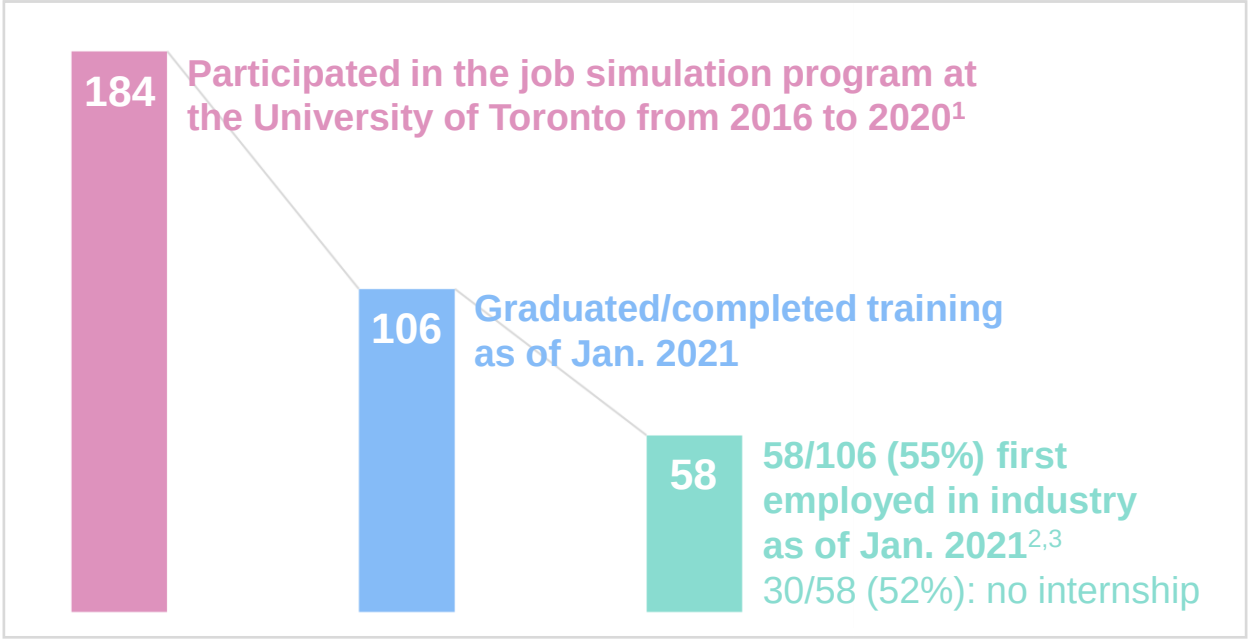
Trainees	• Develop specialized knowledge and industry insights that can lead to meaningful conversations with hiring managers • Develop technical skills and behavioral strengths • Develop project portfolio that hiring managers can relate to
Industry Advisors	• Mentor and coach talent • Hone people development skills
Employers	• Incubate, scout and acquire specialized talent • Develop people leaders
Universities	• Deliver valuable training to students and prepare them for the workforce • Recruit top students by increasing graduate employment metrics • Build connections with employers

Project Examples: Pharmaceutical Industry

Context	Project
Competitive analysis	Cross-study comparison of two drugs
Licensing due diligence	Probability of new drug approval
Presentation to physicians	Summary of drug efficacy and safety
Submission to Health Authority	Request for priority review
Steering committee engagement	Clinical trial design
Medical Affairs strategy	Physician engagement plan
Shaping regulatory policy	Proposal for regulation of new drug category
Submission to payers	Reimbursement proposal for new drug
Patient identification	Diagnostic assay development

Trainee Outcomes

To prepare for industry employment, **job simulation is an alternative or companion to an internship**



[1]Includes MSc, MHSc, MASc, PhD, PharmD, postdoctoral trainees

[2]Alumni were first employed in pharma/biotech, devices/diagnostics, consulting, banking/finance, professional services, IT, communications

Source: Sealey D, Meyer-Miner A, Kozma K. 2021. Employment Outcomes of Life Science Industry Job Simulation Program Alumni at the University of Toronto—Where are They Now? (see Appendix)

[3]Historical benchmark: from 2012 to 2015, 951 PhD graduates in life sciences at the University of Toronto (Faculties of Medicine, Dentistry, Pharmacy, Public Health). In 2016, 20% were employed in the private sector (industry). Reference: 10,000 PhDs Project, School of Graduate Studies, University of Toronto; Retrieved March 25, 2021 from www.sgs.utoronto.ca/about/Pages/10,000-PhDs-Project.aspx

Testimonials

“This model is useful for anyone interested in setting up a specific development plan or to pursue a career change.”
- Director, Clinical Development, pharmaceutical company

“[…] advisors and trainees definitely benefit […] It is rewarding to see the trainees grow from knowing nothing about the industry to having a direction and know what they are doing.” - Program Mentor

“Great opportunity to help coach and mentor others who have an interest in the pharma/biotech industry.” - Program Mentor

“It is the best program out there for science graduate students. So it is a very meaningful way to volunteer.” - Program Mentor

“I developed valuable analytical skills and learned about the pharmaceutical industry. My facilitator […] supported me through the entire process. I now understand a number of technical aspects that will help me transition from academia to industry.” - Trainee

“It will greatly increase your knowledge about working in industry in the area you are interested in. It has given me the confidence to have great base knowledge on the job […] and may give me an advantage over others applying to the same job without this experience.” - Trainee

“I would highly recommend participation as a way to gain novel insights on industry roles, develop team work and communication skills, and to develop mentor relationships/ networks within industry.” - Trainee

“It is one of the best ways for students to gain highly relevant experience for future careers in the industry.” - Trainee

“You will learn so much about the industry that you are interested in and about yourself as well as how to work in a team.” - Trainee

“Valuable and translatable experience that will help you stand apart from other job candidates.” - Trainee

“If you are thinking about a career in industry, this program is an essential resource.” - Trainee

Press

"[…] educated scientists experience difficulties as they emerge from the laboratory in search of professional opportunities: difficulties embodied in the words 'This position requires 1-2 years of professional experience.' The Science Career Impact Project may have an answer […]"

Freeman M. 20 Dec. 2016. Bridging the academy-to-industry gap. Office of Research Trainees Times, University Health Network. www.uhnresearch.ca/news/bridging-academy-industry-gap?redirect=ort/ort_December2016

"A major source of frustration for freshly-graduated job seekers is job descriptions asking for industry experience. [… The] Industry Team Case Study (ITCS) gives trainees the opportunity to gain experience in completing industry-relevant projects before they go out into the job market."

Pogoutse A. 18 April 2017. ITCS [Industry Team Case Study], a look back on two years. Life Sciences Career Development Society, University of Toronto. www.lscds.org/itcs-a-look-back-two-years-on/

"[They] recognized the uncertainty that both applicants and recruiters commonly display concerning academy-to-industry transitions, so they set out to help bridge the gap. SCIP and LSCDS designed their […] program to empower students to craft and execute career-targeted projects in order to provide them with industry-relevant know-how, valuable exposure and, perhaps, a leading element in their career portfolios."

Freeman M. 1 Sept. 2017. How case studies can help to smooth the academy-to-industry transition. University Affairs. www.universityaffairs.ca/career-advice/career-advice-article/case-studies-can-help-smooth-academy-industry-transition/

"The ITCS program is designed to provide an active-learning and professional skill-building experience to trainees via a four month long, trainee-directed, collaborative project under the guidance of an industry facilitator. By engaging in the ITCS, trainees build their professional network, learn the expectations of an industry position, and deliver projects that can supplement their job applications."

Toeama B. 14 Dec. 2018. 2017-2018 Year-end review: the Industry Team Case Study. Life Sciences Career Development Society. www.lscds.org/blog/kbjb1vhytfq6k77sly7mbn832kty9x

Publications – success stories

Yung A, Wehrle C, Rinchon C, Sealey D. 11 November 2019. Getting hired in industry - life science graduate students use case studies to get noticed by employers. OSF Preprints.

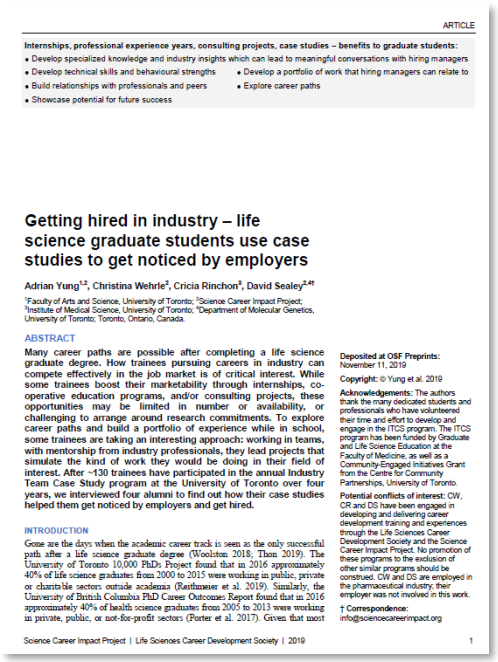
https://doi.org/10.31219/osf.io/x6fny

Abstract

Many career paths are possible after completing a life science graduate degree. How trainees pursuing careers in industry can compete effectively in the job market is of critical interest. While some trainees boost their marketability through internships, co-operative education programs, and/or consulting projects, these opportunities may be limited in number or availability, or challenging to arrange around research commitments.

To explore career paths and build a portfolio of experience while in school, some trainees are taking an interesting approach: working in teams, with mentorship from industry professionals, they lead projects that simulate the kind of work they would be doing in their field of interest.

After ~130 trainees have participated in the annual Industry Team Case Study program at the University of Toronto over four years, we interviewed four alumni to find out how their case studies helped them get noticed by employers and get hired.



ARTICLE

Internships, professional experience years, consulting projects, case studies – benefits to graduate students:

- Develop specialized knowledge and industry insights which can lead to meaningful conversations with hiring managers
- Develop technical skills and behavioural strengths
- Develop a portfolio of work that hiring managers can relate to
- Build relationships with professionals and peers
- Explore career paths
- Showcase potential for future success

Getting hired in industry – life science graduate students use case studies to get noticed by employers

Adrian Yung[1,2], Christina Wehrle[3], Cricia Rinchon[3], David Sealey[3,4†]

[1]Faculty of Arts and Science, University of Toronto; [2]Science Career Impact Project; [3]Institute of Medical Science, University of Toronto; [4]Department of Molecular Genetics, University of Toronto; Toronto, Ontario, Canada.

ABSTRACT

Many career paths are possible after completing a life science graduate degree. How trainees pursuing careers in industry can compete effectively in the job market is of critical interest. While some trainees boost their marketability through internships, co-operative education programs, and/or consulting projects, these opportunities may be limited in number or availability, or challenging to arrange around research commitments. To explore career paths and build a portfolio of experience while in school, some trainees are taking an interesting approach: working in teams, with mentorship from industry professionals, they lead projects that simulate the kind of work they would be doing in their field of interest. After ~130 trainees have participated in the annual Industry Team Case Study program at the University of Toronto over four years, we interviewed four alumni to find out how their case studies helped them get noticed by employers and get hired.

INTRODUCTION

Gone are the days when the academic career track is seen as the only successful path after a life science graduate degree (Woolston 2018; Thon 2019). The University of Toronto 10,000 PhDs Project found that in 2016 approximately 40% of life science graduates from 2000 to 2015 were working in public, private or charitable sectors outside academia (Reithmeier et al. 2019). Similarly, the University of British Columbia PhD Career Outcomes Report found that in 2016 approximately 40% of health science graduates from 2005 to 2013 were working in private, public, or not-for-profit sectors (Porter et al. 2017). Given that most

Deposited at OSF Preprints: November 11, 2019

Acknowledgements: The authors thank the many dedicated students and professionals who have volunteered their time and effort to develop and engage in the ITCS program. The ITCS program has been funded by Graduate and Life Science Education at the Faculty of Medicine, as well as a Community-Engaged Initiatives Grant from the Centre for Community Partnerships, University of Toronto.

Potential conflicts of interest: CW, CR and DS have been engaged in developing and delivering career development training and experiences through the Life Sciences Career Development Society and the Science Career Impact Project. No promotion of these programs to the exclusion of other similar programs should be construed. CW and DS are employed in the pharmaceutical industry; their employer was not involved in this work.

† **Correspondence:** info@sciencecareerimpact.org

For highlights, see Snapshot Poster in Appendix.

4 Building Your Portfolio: Job Simulation

Sealey D, Yung A, Rinchon C, Wehrle C. 28 September 2020. Case studies give grad students a chance to tackle industry challenges. University Affairs.

www.universityaffairs.ca/career-advice/career-advice-article/case-studies-give-grad-students-a-chance-to-tackle-industry-challenges/

This article, prepared after 184 trainees participated in the job simulation program (Industry Team Case Study) at the University of Toronto, is an adaptation of the previous article.

We share highlights of our interviews with four alumni, including how they gained a competitive edge in the non-academic job market.

UA AU University Affairs Affaires universitaires

Career Advice

Case studies give grad students a chance to tackle industry challenges

By participating in the Team Case Study program at U of T, life science graduates gain a competitive edge in the non-academic job market.

BY DAVID SEALEY, ADRIAN YUNG, CRICIA RINCHON & CHRISTINA WEHRLE | SEP 28 2020

Post a comment

Since 2016, approximately 180 trainees have participated in the Industry Team Case Study (ITCS) program at the University of Toronto in which teams of graduate students and postdoctoral fellows lead job simulation projects mentored by industry professionals. Trainees investigate a business or policy challenge and deliver a report or proposal to persuade a target stakeholder to follow a strategy or solution. The program was developed by the Science Career Impact Project and the Life Science Career Development Society and focuses on the biotechnology/pharmaceutical sector.

How case studies helped alumni get hired in industry: common themes

- Discover technical skills, behavioral strengths and career path
- Learn and apply sector-specific knowledge
- Uncover trends and develop insights about the field
- Network and develop a community of support
- Apply for a job using a case study to market skills, knowledge and experience

Publication – white paper

Kozma K, Meyer-Miner A, Chio J, Mak S, El-Boraie A, Sealey D. 2021. Developing an industry job simulation program for graduate and postdoctoral trainees in the life sciences. Canadian Journal of Career Development. 20(2), 84-93.

https://doi.org/10.53379/cjcd.2021.102

Abstract (abridged)
We share design considerations for developing a job simulation program based on our experience over 5 years with the Industry Team Case Study program at the University of Toronto. The article covers four areas of program development: starting the program, recruiting advisors and trainees, designing the program and project framework, and evaluating program effectiveness. Academic institutions and student organizations can use this information to start their own job simulation programs focused on their employment sector of interest. Employers can participate in these programs to develop and scout talent.

PRACTITIONER & COMMUNITY
BEST PRACTICES (NON-PEER REVIEWED)

CANADIAN JOURNAL OF CAREER DEVELOPMENT | REVUE CANADIENNE DE DÉVELOPPEMENT DE CARRIÈRE

Developing an Industry Job Simulation Program for Graduate and Postdoctoral Trainees in Life Sciences

Katelyn Kozma
University of Toronto, The Hospital for Sick Children
Anne Meyer-Miner
University of Toronto, The Hospital for Sick Children
Jonathan Chio
University of Toronto, University Health Network
Stefanie Mak
University of British Columbia
Ahmed El-Boraie
University of Toronto, Centre for Addiction and Mental Health
David Sealey
University of Toronto, Science Career Impact Project

Abstract

In the life sciences, many graduate students and postdoctoral fellows find it challenging to enter the non-academic workforce after completing their programs. Through experiential learning, trainees can develop the knowledge, technical skills, soft skills, and project portfolio that employers value, and compete effectively in the job market. In this article, we share design considerations for developing a job simulation program based on our experience over 5 years with the Industry Team Case Study program at the University of Toronto. In this program, which is focused on the biopharmaceutical sector, trainees identify a business or policy challenge, conduct in-depth research, develop a solution to address the problem, and present their findings to industry professionals. For mentorship and coaching, trainees are matched with industry professionals. This article covers four areas of program development: starting the program, recruiting advisors and trainees, designing the program and project framework, and evaluating program effectiveness. Academic institutions and student organizations can use this information to start their own job simulation programs focused on their employment sector of interest. Employers can participate in these programs to develop and scout talent.

Across North America a minority of life and health sciences PhD graduates become tenured faculty (Council of Canadian Academies, 2021; Edge & Munro, 2015; Langin, 2019). Moreover, a substantial proportion gain employment in a non-academic sector. For example, in 2016 over 40% of University of Toronto life science PhD graduates from 2000 to 2015 were employed in a non-academic sector (Reithmeier et al., 2019). Similar findings were reported at the University of British Columbia for the 2005 to 2013 period (Porter et al., 2017). Studies have reported that the interest of life science PhD candidates in non-academic careers trends higher towards the completion of training (Fuhrmann et al., 2011; Her et al., 2018; Roach & Sauermann, 2017) Despite the interest of trainees (graduate students and postdoctoral fellows) in non-academic careers, many find it challenging to enter the workforce after graduation (Council of Canadian Academies, 2021; Edge & Munro, 2015).

Life science trainees may encounter "skills gaps" when pursuing industry careers. Even though they have advanced knowledge and skills, trainees may be unaware of career paths available to them or how to connect the soft skills they have with those sought out by employers (Archer-Kuhn & Rancourt, 2019; Council of Canadian Academies, 2021; Craig & Markowitz, 2017; Edge & Munro, 2015; Tomasson Goodwin et al., 2019). In addition, some trainees may need more opportunities to develop the soft skills sought out by employers (BioTalentCanada, 2020; Council of Canadian Academies, 2021; Edge & Munro, 2015).

In either case, experiential learning programs can help trainees prepare themselves for the job market. Such opportunities include internships (temporary employment at a trainee level), job simulation (completing projects like those done by professionals but in a non-employment context), job shadowing (observing a professional in the workplace to learn about job expectations), and site visits (observational visits to a workplace) (Council of Canadian Academies, 2021; Edge & Munro, 2015; Watt et al., 2020). Experiential learning activities are associated with benefits for trainees including recognition of transferable skills (Seibley et al., 2020; Simcha et al., 2017; Yung

5 Identifying Career Development Opportunities: Research

Focus

Our research on graduate professional development opportunities aimed to provide trainees with actionable insights on how their peers have prepared themselves for the job market, and to provide departments and institutes with insights on opportunities to support and develop career training programs for early career scientists.

Key Questions

Incoming graduate student	Master's / doctoral / postdoctoral trainee	Professor	Academic administrator
How do I find a thesis supervisor who will support my exploration of career options?	How can I prepare myself to compete effectively in the job market?	How can I support a multi-disciplinary training environment, and empower my trainees to prepare for their chosen careers?	What types of programming can we develop and support to increase the employability and impact of our future alumni?

Publication

Her S, Jacob M, Wang S, Xu S, Sealey D. 2018. Non-academic employability of life science PhDs: the importance of training beyond the bench. bioRxiv 485268.

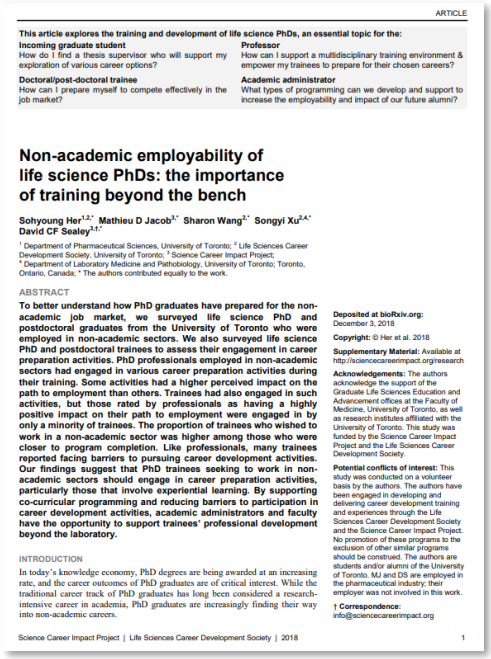
https://doi.org/10.1101/485268

Abstract

To better understand how PhD graduates have prepared for the non-academic job market, we surveyed life science PhD and postdoctoral graduates from the University of Toronto who were employed in non-academic sectors. We also surveyed life science PhD and postdoctoral trainees to assess their engagement in career preparation activities.

PhD professionals employed in non-academic sectors had engaged in various career preparation activities during their training. Some activities had a higher perceived impact on the path to employment than others. Trainees had also engaged in such activities, but those rated by professionals as having a highly positive impact on their path to employment were engaged in by only a minority of trainees. The proportion of trainees who wished to work in a non-academic sector was higher among those who were closer to program completion. Like professionals, many trainees reported facing barriers to pursuing career development activities.

Our findings suggest that PhD trainees seeking to work in non-academic sectors should engage in career preparation activities, particularly those that involve experiential learning. By supporting co-curricular programming and reducing barriers to participation in career development activities, academic administrators and faculty have the opportunity to support trainees' professional development beyond the lab.



ARTICLE

This article explores the training and development of life science PhDs, an essential topic for the:

Incoming graduate student
How do I find a thesis supervisor who will support my exploration of various career options?

Professor
How can I support a multidisciplinary training environment & empower my trainees to prepare for their chosen careers?

Doctoral/post-doctoral trainee
How can I prepare myself to compete effectively in the job market?

Academic administrator
What types of programming can we develop and support to increase the employability and impact of our future alumni?

Non-academic employability of life science PhDs: the importance of training beyond the bench

Sohyoung Her[1,2,*] Mathieu D Jacob[3,*] Sharon Wang[2,*] Songyi Xu[2,4,*] David CF Sealey[3,†,*]

[1] Department of Pharmaceutical Sciences, University of Toronto; [2] Life Sciences Career Development Society, University of Toronto; [3] Science Career Impact Project; [4] Department of Laboratory Medicine and Pathobiology, University of Toronto; Toronto, Ontario, Canada; * The authors contributed equally to the work.

ABSTRACT

To better understand how PhD graduates have prepared for the non-academic job market, we surveyed life science PhD and postdoctoral graduates from the University of Toronto who were employed in non-academic sectors. We also surveyed life science PhD and postdoctoral trainees to assess their engagement in career preparation activities. PhD professionals employed in non-academic sectors had engaged in various career preparation activities during their training. Some activities had a higher perceived impact on the path to employment than others. Trainees had also engaged in such activities, but those rated by professionals as having a highly positive impact on their path to employment were engaged in by only a minority of trainees. The proportion of trainees who wished to work in a non-academic sector was higher among those who were closer to program completion. Like professionals, many trainees reported facing barriers to pursuing career development activities. Our findings suggest that PhD trainees seeking to work in non-academic sectors should engage in career preparation activities, particularly those that involve experiential learning. By supporting co-curricular programming and reducing barriers to participation in career development activities, academic administrators and faculty have the opportunity to support trainees' professional development beyond the laboratory.

INTRODUCTION

In today's knowledge economy, PhD degrees are being awarded at an increasing rate, and the career outcomes of PhD graduates are of critical interest. While the traditional career track of PhD graduates has long been considered a research-intensive career in academia, PhD graduates are increasingly finding their way into non-academic careers.

Deposited at bioRxiv.org: December 3, 2018

Supplementary Material: Available at http://sciencecareerimpact.org/research

Acknowledgements: The authors acknowledge the support of the Graduate Life Sciences Education and Advancement offices at the Faculty of Medicine, University of Toronto, as well as research institutes affiliated with the University of Toronto. This study was funded by the Science Career Impact Project and the Life Sciences Career Development Society.

Potential conflicts of interest: This study was conducted on a volunteer basis by the authors. The authors have been engaged in developing and delivering career development training and experiences through the Life Sciences Career Development Society and the Science Career Impact Project. No promotion of these programs to the exclusion of other similar programs should be construed. The authors are students and/or alumni of the University of Toronto. MJ and DS are employed in the pharmaceutical industry; their employer was not involved in this work.

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Science Career Impact Project | Life Sciences Career Development Society | 2018 1

For highlights, see Snapshot Poster in Appendix.

Press

"We would like to share with you an excellent paper […that…] examines HOW life sciences PhDs gain the necessary skills to prepare themselves for the job market and improve their employability. […] The paper aims to draw a roadmap to help trainees prepare for roles outside academia, based on the experience of their peers, and suggests how academic departments and institutions can support the career development of their trainees."

Resetca D. 6 Dec. 2018. Planning career development outside of academia. Life Sciences Career Development Society. www.lscds.org/planning-career-development-outside-of-academia/

"I recently sat down with two of the co-authors […] whose deep insights and inspirational career paths will surely motivate those seeking industry positions. Their development of this project as well as advice for trainees on how to prepare effectively for industry careers can be summarized into 4 key points: Explore, find mentors, and discover your passions; Seek out opportunities in your chosen field that can positively impact your employability; Learn how to present your experience tailored to each opportunity; Start early! Prepare yourself for your career now."

Chiaranunt P. 29 Jan. 2019. A Conversation on the non-academic employability of life science PhDs. Life Sciences Career Development Society. www.lscds.org/blog/i8kyjcykeoubksr0vhf1gw9ci8dh1l

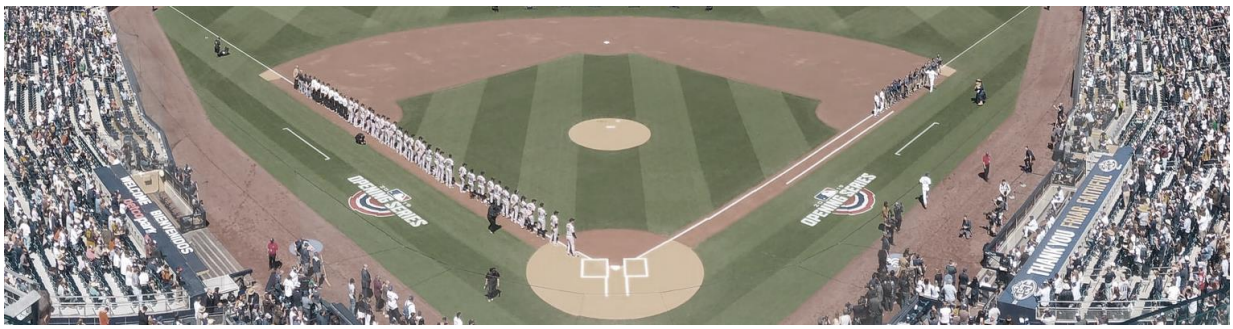
6 Conclusion

The **Science Career Impact Project** developed and delivered resources and programs that helped life science trainees start their careers in industry. The Project also delivered research that raised awareness of graduate professional development opportunities. These outcomes are set up to continue benefiting future trainees:

- resume training module is available online;
- job simulation program continues at the University of Toronto;
- white paper can be used as a resource to start job simulation programs sponsored by universities and/or employers;
- research insights can be acted on, and follow-on research questions can be investigated.

The Project was conducted by a team of 15 volunteers committed to mentoring others. This team included mid-career professionals, trainees, and early career professionals who joined after participating in the programs as trainees. While developing trainees, team members also had the opportunity to develop their own professional skills.

To start their careers, trainees must define their aspirations, and acquire the skills and experiences they need. Professional development programs developed by the Science Career Impact Project and other organizations are more widely available today than they were in 2014. These initiatives should be encouraged and expanded for interested trainees.



7 Contributors

Leaders & Founders

David Sealey	Managing Director, Co-Founder
Krishana Sankar	Director
Christina Wehrle	Director
Anne Tran	Co-Founder

Team Members

	Resume Workshop	Job Simulation	Research
Parco Chan	●	●	
Tracy In		●	
Mathieu Jacob		●	●
Connie Kim		●	
Yunee Kim		●	
Urja Lathia	●		
Mandy Lo	●		
Stephanie MacAllister	●		
Krishana Sankar	●		
David Sealey	●	●	●
Michelle Siu	●		
Nancy So	●		
Anne Tran	●		
Christina Wehrle	●	●	●
Adrian Yung			●

Community Partners

Center for Blood Research, University of British Columbia

Life Sciences Career Development Society, University of Toronto

Science to Business Network

The Science Career Impact Project received no external funding and was not directly affiliated with any institution or employer.

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Sealey D, Meyer-Miner A, Kozma K. 2021. Employment outcomes of life science industry job simulation program alumni at the University of Toronto—where are they now?
For Snapshot Poster, see Appendix.

Kozma K, Meyer-Miner A, Chio J, Mak S, El-Boraie A, Sealey D. 2021. Developing an industry job simulation program for graduate and postdoctoral trainees in the life sciences. Canadian Journal of Career Development. 20(2), 84-93.
https://doi.org/10.53379/cjcd.2021.102

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https://doi.org/10.1101/485268;
https://www.biorxiv.org/content/10.1101/485268v1.supplementary-material
For Snapshot Poster, see Appendix.

Appendix

Selected Posters

Job Simulation

SNAPSHOT POSTER

Yung A, Wehrle C, Rinchon C, Sealey D. 2019. Getting hired in industry—life science graduate students use case studies to get noticed by employers.

Getting hired in industry – life science graduate students use case studies to get noticed

Adrian Yung[1,2] Christina Wehrle[2] Cricia Rinchon[3] David Sealey[2,4]

[1]Faculty of Arts & Science, University of Toronto; [2]Science Career Impact Project; [3]Institute of Medical Science, University of Toronto; [4]Department of Molecular Genetics, University of Toronto; Toronto, Ontario, Canada.

Challenge

- Without hands-on, relatable experience, life science MSc and PhD graduates may not be competitive in the industry job market, even for entry-level positions
- Action-learning experiences such as internships, professional experience years, or consulting projects may be limited in number, not supported by all academic departments, or challenging to arrange around research or personal commitments

Industry Team Case Study

- Developed by the Science Career Impact Project, and the Life Sciences Career Development Society at the University of Toronto
- Graduate students and postdoctoral fellows work in teams to simulate industry projects with mentorship from industry professionals
- Teams identify a business or policy challenge, investigate the topic, generate insights, and develop a report, white paper, infographic, or presentation to present a solution or persuade a target audience to follow a strategy
- Mentors provide feedback and guidance on the proposed topics, information sources, and quality of the work, and explain complex aspects of their field
- ~130 graduate students/postdocs & 19 mentors have participated since 2016

Case Study Areas of Focus

(to date)

- Research & development
- Product development
- Clinical trials
- Regulatory affairs & policy
- Market access (reimbursement)
- Medical affairs
- Business development
- Marketing

Industry Team Case Study Alumni Profiles (based on first-person interviews)

	Parco **MSc Pharmacol. & Toxicology** **Market Access Consultant**	**Alex** **PhD Cell & Systems Biology** **Regulatory Affairs Associate**	**Nathan** **MSc Cell & Systems Biology** **Regulatory Affairs Associate**	**Tracy** **PhD Immunology** **Medical Science Liaison**
Interests	Drug development process, business strategy	Science, convincing reviewers with data	Biotechnology, health science, public policy	Interface of science & business, translating research findings into impact
Case studies	Request for priority review: drug for breast cancer Reimbursement strategy: drug for cystic fibrosis	Pre-New Drug Submission (NDS) briefing package: vaccine	Regulatory policy white paper & infographic: cannabis edibles	Clinical evidence comparison: two drugs for psoriasis Pre-NDS briefing package: vaccine Treatment landscape for renal cell carcinoma
Challenges & learnings	Terminology & stakeholders Strategic mindset to anticipate & overcome barriers Technical knowledge & resources	Laws & regulations Opportunities to engage Health Canada Clinical trial process & evidence translation	Laws & regulations Policy development	Time management Information resources Leveraging skills developed in graduate school
Using case studies to get noticed by employers	Included in resume & described in interview Discussed alternative scenarios & approaches	Included in cover letter, resume & portfolio Impressed with applied skills & non-academic experience	Included in cover letter Impressed in interviews; became focus of discussion	Included in resume, portfolio & presented in interviews Intrigued & impressed by content & initiative

Case Study Benefits for Trainees	Develop specialized knowledge and industry insights which can lead to meaningful conversations with hiring managers	Develop a portfolio of work hiring managers can relate to	Develop technical skills and behavioural strengths	Build relationships with professionals and peers	Explore career paths	Showcase potential for future success

Job Simulation

SNAPSHOT POSTER

Sealey D, Meyer-Miner A, Kozma K. 2021. Employment outcomes of life science industry job simulation program alumni at the University of Toronto—where are they now?

Employment Outcomes of Life Science Industry Job Simulation Program Alumni at the University of Toronto—Where are They Now?

David Sealey[1,2] **Anne Meyer-Miner**[2,3,4] **Katelyn Kozma**[2,4,5]

[1]Science Career Impact Project; [2]Dept. of Molecular Genetics, University of Toronto; [3]Developmental and Stem Cell Biology, The Hospital for Sick Children; [4]Life Science Career Development Society, University of Toronto; [5]Cell and Systems Biology, The Hospital for Sick Children

Challenge

- Life science graduate trainees may not be competitive in the industry job market if they do not have knowledge, skills and experience that employers can relate to
- Experiential learning, including job simulation, can help trainees prepare themselves for the job market

Job Simulation Program @ Univ. of Toronto: Industry Team Case Study (ITCS)

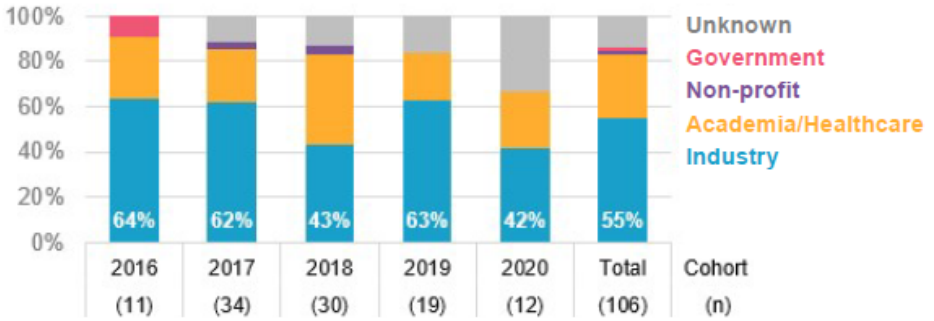
- Trainees (graduate students, postdoctoral fellows) work in teams on **simulated industry projects with mentorship from professionals**
- Trainees
  1. **Identify a business or policy challenge**
  2. **Conduct research and analysis**
  3. **Propose a solution to address the problem**
  4. **Present their findings to industry professionals**
- Mentors provide feedback on proposed topics and quality of the work, and explain complex aspects of their field
- Program developed and operated by Science Career Impact Project and Life Sciences Career Development Society

Conclusions

- Life science job simulation program, internships and other training were associated with employment in industry
- To prepare for industry employment, job simulation is an alternative or complement to an internship

Sector of first employment after completing degree/fellowship

- 184 trainees participated in the job simulation program from 2016 to 2020 (p4)
- As of Jan. 2021, 55% (58/106) of the trainees who had graduated / completed training were first employed in industry



- Historical benchmark: 951 life science PhD graduates from 2012 to 2015; in 2016, 20% were employed in private sector (industry); see Methods (p4)

Job simulation program benefits

Trainees	• Develop knowledge, insights, teamwork, technical skills, project portfolio • Engage hiring managers and boost employment prospects • Explore careers
Industry Advisors	• Mentor and coach talent • Hone people development skills
Employers	• Incubate, scout and acquire specialized talent • Develop people leaders
Universities	• Deliver valuable training to students and prepare them for the workforce • Recruit top students by increasing graduate employment metrics • Build connections with employers

Paths to employment in industry

58 alumni graduated / completed training after the Industry Team Case Study job simulation and were first employed in industry

Sector	Industry job simulation: project		First employment in industry: role		
	Clinical Development	Assay Development	Clinical Devlpmt., R&D	Data Science	Project Management
	Market Access	Product Development	Market Access	Business Development	Consulting
	Medical Affairs	Business Development	Medical Affairs	Sales & Marketing	Investment Banking
	Regulatory Affairs	Marketing	Regulatory Affairs	Medical Communications	Market Research
	Internship in industry: employer		**First employment in industry: employer**		
Pharmaceutical Biotechnology Healthcare	Apopharma Gilead Iconthin Biotech Corp Janssen Johnson & Johnson	Mint Pharmaceuticals Northern Biologics Paradox Immunotherapeutics Proteorex Therapeutics Sanofi Pasteur	AbbVie BlueRock Therapeutics Dalriada Drug Discovery Edesa Biotech Gilead Janssen	Johnson & Johnson Mint Pharmaceuticals Novartis Pfizer Sanofi Pasteur Triumvira Immunologics	
Devices Diagnostics	Fluidigm GE Healthcare	Roche Molecular Diagnostics	Fluidigm Geneseq Technology Inc. Globus Medical	Medgenome Neuroblot Thermo Fisher Scientific	
Consulting Professional Services	Bereskin & Parr LLP Boston Consulting Group KSAR & Associates MORE Research Group	Sixsense Strategy Group Toronto Bioscience Consulting Group Trindent Consulting	Arnot Research and Consulting Bain and Company Boston Consulting Group ClearView Healthcare Partners EY Financeit GlobalData Plc	IQVIA Klick PIVINA Consulting Preyra Solutions Group Shift Health Sixsense Strategy Group Windsor Clinical Research	
Information Technology	BenchSci	Knowtions Research	BenchSci conversationHealth	Knowtions Research	
Banking Finance	Bank of Montreal Bee Group Ventures Beehive Venture Capital Bloom Burton & Co.	Canada Pension Plan Investments Diamas Capital Mitsui & Co. Global Investment Ltd.	Bloom Burton & Co.		
Communication	Massive Science	QuillDrive	Cactus Communications	Integrated MedHealth Communication	
Other	DermEdge		Canadian Tire Corporation	WeavAir	

Many trainees pursued other development activities including internships in non-profit organizations and/or other training

	Internship in non-profit		First employment in non-profit
Health	BioCanRx	Osteoarthritis Research Society International	Canadian Partnership Against Cancer
	Canadian Cancer Society	United Against Cancer	Canadian Psoriasis Network
Consulting	180 Degrees Consulting	University Consulting Group	
	Endeavour Consulting	University of Toronto Consulting Association	
	Meristem Health		
Research	Ontario Institute for Cancer Research	Vector Institute	
Other	Agincourt Community Services Association	March for Science Toronto	
	American Society of Human Genetics	Overseas Chinese Healthcare Innovator Society	
	Health Innovation Hub	TO Health	
	Foundation for Student Science and Technology		

	Other training		
Professional Designation	Charted Financial Analyst	Law	Project Management Professional
Post-Secondary Education	PhD degree (post-Master degree)	Seneca College: Pharmaceutical Regulatory Affairs & Quality Operations	Algonquin College: Regulatory Affairs
Research Training	Good Clinical Practice	Good Manufacturing Practice	Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans
	Good Laboratory Practice		
Courses, Workshops, Certificates	Bloomberg Professional Services: Market Concepts	Lighthouse Labs: Web development bootcamp	SAS Certified Programmer
	Cheeky Scientist: Scientist MBA for STEM PhDs	Hospital or Sick Children: Scientist Knowledge Translation Training Workshop	Ted Rogers Centre for Heart Research: Entrepreneurship for Cardiovascular Health Opportunities
	Clearview Healthcare Partners: Connect 2 Clearview	Medical and Related Sciences: Venture Ready Project	Rotman School of Management: Pharmaceutical Strategy, Business of Healthcare
	DataCamp: Data Science	Mitacs: Foundations of Project Management	University of California San Diego: Drug Development
	Data Science: The Data Incubator	Mitacs: Skills of Effective Communication	University of Toronto: Medicine by Design, Quantitative Methods for Business Management
	Duke-NUS Medical School, Centre of Regulatory Excellence: Medical Affairs	NSERC: Collaborative Research and Training Experience Program	Y Combinator: Startup School
	Graduate Management Consulting Association: Business Fundamentals (miniMBA)	Ontario Bioscience Innovation Organization: Health to Business Bridge MedTech Bootcamp	
	Impact Centre: Entrepreneurship		

>180 trainees participated in the job simulation program from 2016 to 2020

Cohort	2016	2017	2018	2019	2020	Total
Total	*11*	*45*	*41*	*40*	*47*	*184 (100%)*
***Master**	-	12	19	11	19	*61 (33%)*
PhD	11	25	18	23	17	*94 (51%)*
Postdoc	-	6	2	2	8	*18 (10%)*
PharrmD	-	1	-	-	-	*1 (<1%)*
Other	-	1	2	4	3	*10 (5%)*

*MSc, MHSc, MASc

Methods

- Publicly available data were retrieved from institutional sources (eg, University of Toronto Online Thesis repository, department websites), online networks (eg, LinkedIn) and other online sources (eg, PubMed) to identify training activities and employment outcomes of Industry Team Case Study job simulation program alumni
- Data were current as of January 2021
- To determine a historical benchmark rate for sector of employment, data were derived from the 10,000 PhDs Project, School of Graduate Studies, University of Toronto (Reithmeier et al. 2018. Retrieved March 25, 2021 from www.sgs.utoronto.ca/about/Pages/10,000- PhDs-Project.aspx). From 2012 to 2015, there were 951 PhD graduates in life sciences (Faculties of Medicine, Dentistry, Pharmacy, Public Health). Their employment as of 2016: post-secondary, 47%; private (industry), 20%; public, 18%; charitable, 4%; individual, 1%; unknown, 10%. These rates were not compared to the rates for the Industry Team Case Study alumni due missing data on potential confounding factors.

Suggested Reading

Kozma, K., Meyer-Miner, A., Chio, J., Mak, S., El-Boraie, A., Sealey, D. (2021). Developing an industry job simulation program for graduate and postdoctoral trainees in the life sciences. Canadian Journal of Career Development. 20(2), 84-93. doi.org/10.53379/cjcd.2021.102

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Research

SNAPSHOT POSTER

Her S, Jacob M, Wang S, Xu S, Sealey D. 2018. Non-academic employability of life science PhDs: the importance of training beyond the bench.

Non-academic employability of life science PhDs: the importance of training beyond the bench

Sohyoung Her[1,2,*] **Mathieu D Jacob**[3,*] **Sharon Wang**[2,*] **Songyi Xu**[2,4,*] **David CF Sealey**[3,*]

[1] Dept. of Pharmaceutical Sciences, University of Toronto; [2] Life Sciences Career Development Society, University of Toronto; [3] Science Career Impact Project; [4] Dept. of Laboratory Medicine and Pathobiology, University of Toronto; Toronto, Ontario, Canada; * The authors contributed equally to the work.

Background

- In 2016, >40% of University of Toronto life science PhD graduates from 2000 to 2015 were employed in non-academic sectors (Reithmeier et al. 2018. 10,000 PhDs project.)

Objectives

- To understand how PhD trainees have transitioned to non-academic careers
- To identify the most impactful career preparation activities, and potential barriers to participation
- To identify opportunities to develop programs to prepare PhD trainees for their career path of interest

Methods

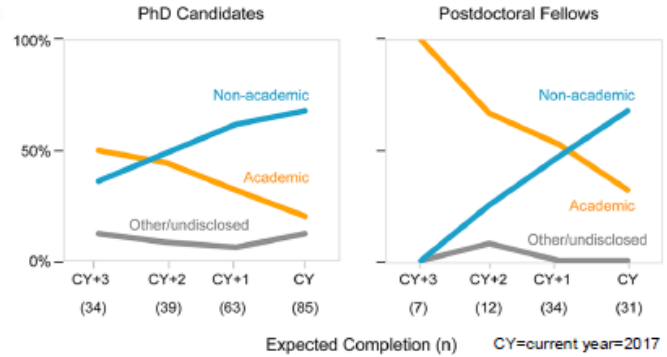
- Surveyed life science
  - trainees (PhD/postdoc trainees at U of T & affiliated institutes);
  - professionals (completed life science PhD/postdoc programs at U of T & affiliated institutes in 2010+ and are employed in non-academic sector)
- Collected data online (30Jan.-3Mar. 2017)

1. Survey Participants Analyzed

Trainees	PhD Candidate	244
	Postdoc	86
Professionals	Completed PhD	79
	Completed Postdoc	37
Total		446

2. Target Sector of Employment (Trainees)

Higher rate of seeking non-academic employment closer to completion



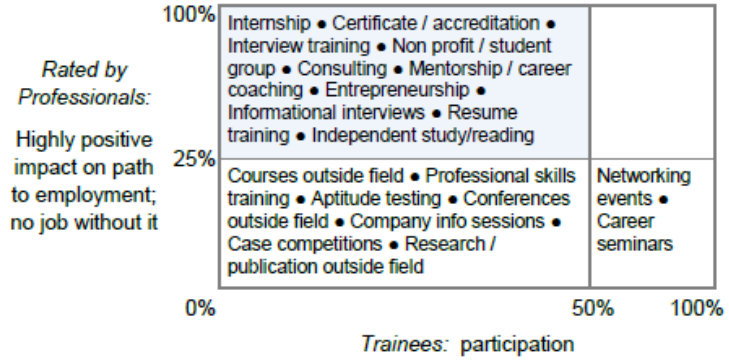
3. Top Functional Areas of Employment (Professionals)

PhD training is relevant for various roles

Research & Development	30%
Medical Affairs	16%
Regulatory Affairs	15%
Business Development	15%
Medical / Scientific Communications	13%
Consulting	9%
Sales / Marketing / Project Mgt.	ea. 7%
Data-Informatics-IT / Clin. Research	ea. 4%

4. Opportunities for High-Impact Training

High-impact career development activities as rated as by professionals had low trainee participation rates



5. Barriers to Participation in Extracurricular Training

Many trainees face barriers to extracurricular training

	Trainees	Professionals
Yes	46%	39%
Time / workload	32%	18%
Supervisor	3%	13%
Awareness / availability / location	6%	6%
Cost / funding	4%	0%
Other	7%	8%

Recommendations

- Increase participation of interested trainees in career development programs
- Increase institutional awareness of non-academic career development
- Increase institutional support for non-academic career development programs

www.ScienceCareerImpact.org

twitter.com/SciCareerImpact