

# Learning Brief for the PEI BioAlliance Project: “CASTL”

SRDC’s Learning Support for Future Skills Projects



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# TABLE OF CONTENTS

|   |          |
|---|----------|
| <b>INTRODUCTION</b>                                       | <b>1</b> |
| <b>OBJECTIVES</b>   | <b>2</b> |
| <b>DESIGNING PHASE</b>                                    | <b>3</b> |
| Summary of the designing phase                            | 3        |
| <b>TESTING PHASE</b>                                      | <b>6</b> |
| Summary of testing phase                                  | 6        |
| <b>SCALING PHASE</b>                                      | <b>9</b> |
| Summary of scaling phase                                  | 9        |
| <b>SUMMARY OF PROJECT LEARNING</b>                        | <b>9</b> |
| Implications for those working in this area in the future | 12       |
| <b>APPENDIX A: LEARNING SUPPORT PLAN</b>                  | <b>9</b> |

## INTRODUCTION

Through a number of thematic calls for proposals, the Future Skills Centre (FSC) has supported the development, refinement, or expansion of approaches to develop skills for workers from a variety of backgrounds and in a variety of sectors and regions. These projects identify emerging and in-demand skills, and test new methods of training delivery. The insights that come from these projects will help inform governments, the private sector, labour, educational training institutions, non-profits, and academics on the broader adoption of novel approaches to training and skills development. Furthermore, the projects are required to mobilize knowledge and evidence among key stakeholders, institutions, and decision-makers for the purposes of improving policies and practices in Canada. FSC has engaged SRDC to support this process by developing and then implementing a customized learning support plan for each of several projects, based on past activities and current status.

This document presents the learning brief for the Canadian Alliance for Skills and Training in Life Sciences (CASTL), a project originally delivered by the Prince Edward Island BioAlliance, running from March 2020 to September 2022 (CASTL has since become its own separately registered non-profit entity). CASTL is a not-for-profit institution with the goal of addressing the shortage of skilled talent in Canada's bio-economy. CASTL both developed and implemented the project – one of many funded by the Future Skills Centre as part of a larger strategy to address the need for shock-proofing the future of work, with a particular focus on vulnerable populations in the Canadian workforce.

SRDC began its research on the project by reviewing all the available documentation related to the project, including the proposal, quarterly and annual reports, project information sheet prepared by FSC, work plan, learning reflection and final report. Using a standardized template, SRDC worked collaboratively with both FSC and CASTL to develop learning questions related to each of the three learning stages of the project: designing, testing, and scaling (See Appendix A). We then worked through a process to answer each of the questions. Beyond analysis of these documents, SRDC completed an interview with the CASTL lead in August 2023. Finally, SRDC shared and discussed with CASTL the findings to ensure their accuracy and appropriateness.

This learning brief presents a synthesis of the answers to the questions posed in the learning support plan. For each of the three stages the project engaged in, this document presents what the project has achieved, lessons learned, and recommendations with respect to future evidence generation that the FSC can utilize, filter, and distill for its ongoing dissemination projects.

## OBJECTIVES

CASTL comprised multiple initiatives to support skills and training in the Canadian bio-economy, focusing on three learning pathways: **newskilling** (new skills development for post-secondary and K-12 students), **reskilling** (skills development for unemployed or underemployed workers), and **upskilling** (skills development and enhancement for those employed in the bioscience and manufacturing sector). CASTL initiatives included: developing post-secondary bioscience programming (**newskilling**); ongoing delivery of **reskilling** programs for unemployed or underemployed individuals; implementation of K-12 programming (**newskilling**); and providing other biopharmaceutical manufacturing curricula to industry employers (**upskilling**).

More specifically, the project aimed to:

- Work with academic institutions, industry, industry associations and governments across the country to build skills development and training capacity for the biopharmaceutical manufacturing sector supported by industry-informed curricula;
- Continue development of **newskilling** programs underway with post-secondary partners, including the development of partnerships for specialized CASTL bioscience programming that supports post-secondary students in acquiring the theoretical knowledge, technical skills and professional competencies required for successful entry to the Canadian bioscience ecosystem;
- Implement the CASTL Bioscience **Reskilling** Program on a national scale in key geographic hubs of bio-industry activity including British Columbia, Ontario, Quebec, and the Atlantic region;
- Build on the success of CASTL's K-12 **newskilling** programming within K-12 school systems and communities across the country;
- Continue to increase awareness of bio-economy career opportunities by introducing students to industry earlier and through WIL opportunities and networking opportunities;
- Continue to work with provincial, regional, and national partners to reduce barriers to participation in the bio-economy for international students, newcomers, Indigenous peoples, and other underrepresented groups; and
- Continue to expand, evolve, and implement skills development and training programs that contribute to the success of the national bio-economy.



Although CASTL did not include a distinct logic model in their proposal, they did include some anticipated activities and outcomes within their projected workplan. A summary of these activities and outcomes is provided in Table 1 below.

**Table 1** CASTL anticipated activities and outcomes

| Key activities  | Expected outcomes   |
|---|---|
| <b>Newskilling</b>  |   |
| <ul style="list-style-type: none"> <li>Develop and implemented CASTL programming in collaboration with post-secondary institutions</li> </ul>                               | <ul style="list-style-type: none"> <li>Provides students with knowledge and skills to successfully enter the bio-industry</li> </ul>                                      |
| <ul style="list-style-type: none"> <li>Offer CASTL Student Financial Awards</li> </ul>  | <ul style="list-style-type: none"> <li>Encourage and support learning in bioscience, leading to increased bioindustry participation</li> </ul>                            |
| <ul style="list-style-type: none"> <li>Expand post-secondary partnerships across Canada to facilitate biopharmaceutical manufacturing program development</li> </ul>        | <ul style="list-style-type: none"> <li>Build skills development and training capacity for the national biopharmaceutical manufacturing sector</li> </ul>                  |
| <ul style="list-style-type: none"> <li>Expand K-12 programming through national partnerships</li> </ul>   | <ul style="list-style-type: none"> <li>Engage K-12 students in bioscience</li> </ul>  |
| <b>Reskilling</b>   |   |
| <ul style="list-style-type: none"> <li>Expand 12-week CASTL Reskilling Program across the country</li> </ul>  | <ul style="list-style-type: none"> <li>Support the rapid growth of Canada's biopharmaceutical manufacturing sector by improving training for frontline workers</li> </ul> |
| <b>Upskilling</b>   |   |
| <ul style="list-style-type: none"> <li>Develop and expand training programs for the biopharmaceutical manufacturing sector and deliver both in-person and online</li> </ul> | <ul style="list-style-type: none"> <li>Increase skills development and training opportunities to meet industry demands for skilled talent</li> </ul>                      |

Source: CASTL Targeted Call Workplan

## DESIGNING PHASE

### SUMMARY OF THE DESIGNING PHASE

CASTL increased investment in the education sector through a number of programs with the aim to meet the need for increased bioscience skills development in Canada. The need was

exacerbated in 2020 by the emergence of COVID-19. This section provides an overview of the details of each CASTL program, including demographic information on participants where available. Response to the programs will be discussed in the testing phase section of this report.

## CASTL Reskilling

The CASTL **Reskilling** program is a 12-week course providing participants with the basic knowledge and skills needed to enter the bioscience industry. It specifically targets unemployed and underemployed individuals to provide an accelerated pathway to unemployment.

The program consists of 8 weeks of online learning followed by 4 weeks of Work Integrated Learning (WIL) and training. It is delivered in collaboration with Holland College and Skills PEI. Further partnerships were explored with Nova Scotia Community College and New Brunswick Community College. Though there were three cohorts of the reskilling program delivered during the span of FSC funding, the program has continued and is now on its sixth cohort, with about 120 individuals having completed the program to date. Data from cohort one revealed participants (n=17) were roughly one third female, one fifth racialized persons, and one tenth people with disabilities, while cohort two (n=17) were almost half female, one fifth immigrants, and over one tenth people with disabilities.

## CASTL Upskilling – CASTL Online Academy and physical training centres

FSC funded an **Upskilling** pilot program delivered by CASTL, which involved 1) identifying emerging skills needs and gaps for current employees in bioprocessing and 2) using this information to develop comprehensive bioindustry **upskilling** delivered through online learning. CASTL collaborated with BIOVECTRA and the National Institute for Bioprocessing Research and Training (NIBRT) to develop and deliver this online training, referred to as the CASTL Online Academy. CASTL holds the exclusive rights to deliver NIBRT training content in Canada.

CASTL has reported a successful pilot of the **upskilling** program, which had a total of 907 enrolments in all courses. There were 700 course modules taken by 98 BIOVECTRA employees on the CASTL/NIBRT Online Academy in 2020.

Further to the CASTL Online Academy, CASTL has designed, built and launched a physical Biomanufacturing Training Centre in Prince Edward Island, which opened in October 2022. There are plans to open a second physical training centre in Montreal in Winter 2024, as well as a third centre in Vancouver in Summer 2024.



## Academic curriculum development and Work Integrated Learning (WIL) placements (Newskilling)

CASTL facilitated curriculum development and WIL placements with academic partners, supporting development and implementation of a specialized pathway in post-secondary life sciences as well as a regional WIL network.

CASTL partnered with the University of Prince Edward Island to develop a minor undergraduate program in biotechnology, involving new core and elective courses. CASTL also partnered with Acadia University, which currently has a BSc program specializing in Biotechnology. Acadia is currently developing a new minor program. CASTL partnered with the University of British Columbia to offer a 17-week online introduction to biopharmaceutical manufacturing to 3<sup>rd</sup> year students. CASTL formed a partnership with Holland College to deliver the CASTL Bioscience reskilling program to five cohorts.

## K-12 programming (Newskilling)

In partnership with STEAM PEI, CASTL offered K-12 programming in elementary and secondary schools in PEI, as well as summer camps. CASTL delivered 38 math literacy workshops and 16 bioscience workshops to a total of 1871 students at public schools in the province. Each workshop was one hour long for elementary and junior high school students, and 150 minutes for high school students. Elementary school participants (n=1214) focused on math and geometry during the workshops while middle grades (n=251) focused on biology and the natural world. High school students (n=406) focused on COVID-19 ELISA testing and contact tracing during their workshops.

In addition to these workshops, CASTL also offered seven children's "Bioscience" summer day camps in PEI during the summer of 2021. Each camp session ran for five full days over a week. Five camps were originally scheduled, but two additional camps were delivered due to a high level of requests for registrations. A total of 117 children participated in these seven camps, which focused on exploration of bioscience.

## CASTL award program (Newskilling)

CASTL also funded a financial award program designed to incentivize participation for people who self-identified as minorities in the Science, Technology, Engineering and Mathematics field (STEM). Their analysis of application data found 66 per cent of applicants identified as female, 25 per cent identified as visible minorities, and 16 per cent identified as members of the LGBTQ+ community.

In 2020, 32 CASTL Financial Awards of \$5000 each were granted to qualifying life sciences students attending three university partners. Each award recipient was expected to enter into a CASTL life sciences learning stream in their third year of study. Of the awardees, 15 were from Acadia University, 13 were from the Université de Moncton, and 4 were from the University of Prince Edward Island.

## What worked, what didn't, and why?

The main lesson learned from the development and delivery of the above programs related to academic partnerships, with CASTL discovering that the pace of academic programming development, approval, and implementation was much slower than they had anticipated. This was partly due to the lengthy procedures involved within post-secondary institutions, but also the rigour of their external approval processes. This slow pace was rarely compatible with bioindustry timelines. CASTL noted that the pace needed for change within bioindustry is driven by the need to hit ambitious development and production targets, while turning thoughts into action in academia takes much longer. CASTL found that its relationships with academic and bioindustry partners were key in order to keep program development progressing, e.g., coordinating partner planning sessions every three months.

CASTL also found that having buy-in was important as they were building partnerships. CASTL was originally pursuing biotechnology program development with the Université de Moncton, but they had to part ways due to unresponsiveness from the university. CASTL believes that this was likely due to a lack of an internal champion. However, CASTL was able to collaborate with the organization BioNB. This partnership may help to foster more academic partnership opportunities in New Brunswick in the near future.

External factors such as COVID-19 as well as the impact of Hurricane Fiona also presented challenges in program development by creating additional disruption and delays. However, CASTL noted that they were able to meet most of their milestones despite these challenges.

## TESTING PHASE

### SUMMARY OF TESTING PHASE

The questions related to the testing phase focused initially on the extent to which this project helped CASTL achieve its goals of supporting skills development in the biopharmaceutical industry, as well as on the specifics of testing and understanding program success.

CASTL was able to advertise project programming through webinars, meetings with partners, project reports, a career fair, and media releases. CASTL project updates were featured in the CBC, the Charlottetown Guardian, the Financial Post, Employment Journey, Entrestor, and Insight Magazine.

CASTL reported participant feedback on three of its initiatives: the **Reskilling** program, the **Upskilling** program, and the K-12 programming (**newskilling**).

## CASTL Reskilling

CASTL provided survey response data for cohorts 1 (n=17), 2 (n=17) and 3 (n=17) of the **Reskilling** program, with the most comprehensive data for cohort 2. Among cohort 2 participants, 13 were offered permanent employment in their sector upon program completion, with an average entry level salary of \$18.30/hour. Nearly all (16) cohort 2 trainees reported their learning needs were met, and a majority of participants thought that resource materials were easy to understand and appropriate to use. Nearly all (14) cohort 2 trainees said that the **Reskilling** training met their expectations, and the same number of trainees felt prepared for a job in the field. In cohorts 1 and 3, trainees rated overall program satisfaction highly (an average of 4.5/5), and in cohort 2 reported similar overall satisfaction (average 4.4/5).

CASTL surveyed an unspecified number of Industry supervisors of **Reskilling** participants. For cohort 1, roughly two thirds of supervisors reported a reduction and onboarding time required to train **Reskilling** participants. The same was reported by roughly half of cohort 2 supervisors and cohort 3 supervisors. Supervisors gave an overall performance rating of 4.7/5 for cohort 2 and 4.6/5 for cohort 3. Among all supervisors surveyed, two thirds would recommend **Reskilling** as a potential stream of talent, and all said they would be likely to participate in future **Reskilling** programs.

## CASTL Upskilling – CASTL Online Academy

CASTL also provided survey response data for an unspecified number of participants in its **Upskilling** modules offered through the CASTL Online Academy. Nearly all employees who took the courses said they would recommend them to others, with more than three quarters rating the courses 4/5 or better. More than three quarters of supervisors of employee participants said they believed the courses were a good investment. Half of supervisors also reported an improvement in employee job performance. Nine in ten supervisors rated the courses at least a 4/5.

## K-12 programming (newskilling)

For the K-12 workshops, 100 per cent of participating teachers surveyed were interested in booking life sciences workshops again in the future. Teachers were also evaluated separately based on grade level. Among elementary teachers, 31 of 50 responded to the survey request. They provided an average satisfaction rating of 4.9/5 for workshop content, 4.8/5 for curriculum alignment and 4.9/5 for delivery. Only 5 of 10 junior high school teachers responded to the survey request, providing an average satisfaction rating of 4.2/5 for workshop content, 5/5 for curriculum alignment and 4.4/5 for delivery. Finally, 8 of 10 high school teachers responded to the survey request, giving an average satisfaction rating of 4.9/5 for workshop content, 4.9/5 for curriculum alignment and 4.9/5 for delivery.

For the “Bioscience” summer camps, parents of participants were surveyed. Overall, comments from parents were considered to be very positive, with an overall parent satisfaction rating of 4.2/5.

## What worked, what didn't, and why?

For the WIL program, CASTL reported that it was originally a challenge to get industry partners to take on WIL students. However, over time the program success rate improved, with companies wanting more and more student participants. CASTL reported that they ended up struggling to recruit enough student participants due to the increased industry demand.

In terms of academic curriculum development, CASTL found that some academic partners had longer timelines than others. For example, the University of British Columbia was relatively quick to incorporate CASTL curriculum content into its programming, with only a few months needed between the initiation of the program and curriculum launch. However, other university partners, such as Acadia and the University of PEI, took over a year to incorporate the curriculum content due to university procedures and Senate approval timelines. CASTL also found that colleges seemed to be more agile to incorporate CASTL curriculum quickly in comparison to universities. CASTL attributed this to colleges being more used to an industry-needs focused model.

## SCALING PHASE

### SUMMARY OF SCALING PHASE

The project has begun to scale, aiming to expand its reach across Canada with a focus on building new relationships. By CASTL's account, there is no other organization doing quite what they are doing in Canada, in that there is no other organization with the depth of industry experience, trainers, and developed model of curriculum delivery paired with hands-on learning. Therefore, CASTL are looking to scale their services to the national level and expand their reach across more of the country. CASTL reported that two years of FSC funding provided the foundation for the initiatives they still carry out today.

#### What worked, what didn't, and why?

CASTL noted that capacity building has been a challenge with their small team. There is a need for their programming, but the rate at which the scope and scale of programs must expand in order to keep pace with industry demand is a challenge. CASTL suggests that additional financial and human resources are required to respond in step with the demands of industry.

CASTL also noted that academic partnership was critical for project scaling, which required taking the time to work with colleges and universities to build and develop post-secondary programs in order to implement curriculum. Further, providing the bioscience sector with industry-informed theoretical training has established CASTL as a go-to organization nationally for bioscience sector training, exemplified by CASTL's expansion into both British Columbia and Quebec.

## SUMMARY OF PROJECT LEARNING

### Meeting original objectives

This FSC-funded shock-proofing project was intended to be relevant to employees and employers in the biosciences sector.

As set out above, the key objective for the project was to support skills and training in the Canadian bioeconomy through multiple newskilling, reskilling, and upskilling initiatives.

**The project met its key objective through many of its programming initiatives** in newskilling, reskilling and upskilling, and has begun scaling initiatives to expand its reach across Canada.

We consider each individual original objective in turn:

- Work with academic institutions, industry, industry associations and governments across the country to build skills development and training capacity for the biopharmaceutical manufacturing sector supported by industry-informed curricula

CASTL was able to **successfully** implement its **upskilling** initiative through the CASTL Online Academy and physical training centres. After a successful pilot of the **upskilling** program, which exceeded enrolment targets, the initiative was scaled with various companies integrating CASTL modules into their internal curriculum. The CASTL Online Academy has received widely positive feedback from both employees participating in courses as well as supervisors of employee participants. CASTL also continues to expand its **upskilling** reach through the opening of t new physical training centres, one currently operating in Charlottetown, PEI, with the other two planned for Montreal and Vancouver.

- Continue development of **newskilling** programs underway with post-secondary partners, including the development of partnerships for specialized CASTL bioscience programming that supports post-secondary students in acquiring the theoretical knowledge, technical skills and professional competencies required for successful entry to the Canadian bioscience ecosystem

CASTL's post-secondary **newskilling** has been **largely successful**, with many lessons learned involving the collaboration between industry and academia. CASTL was able to build partnerships with UPEI, Acadia, and UBC. These partnerships have resulted in multiple biotechnology courses and programs being established at these institutions. CASTL was not able to establish a successful partnership with Université de Moncton, likely due to a lack of an internal champion for the project.

- Implement the CASTL Bioscience **Reskilling** Program on a national scale in key geographic hubs of bio-industry activity including British Columbia, Ontario, Quebec, and the Atlantic region

CASTL is in the process of scaling its **Reskilling** program across the country due to new program funding. The CASTL **Reskilling** program received widely positive feedback from both trainees and industry supervisors. CASTL also provided data showing its targeting of equity deserving groups including women, racialized persons, people with disabilities, and immigrants.



- Build on the success of CASTL's K-12 **newskilling** programming within K-12 school systems and communities across the country

CASTL's K-12 **upskilling programming delivered in PEI was successful**, with very positive feedback collected from both teachers and parents of participants of elementary, junior high, and high school students. CASTL hopes to continue this programming and expand its reach, as currently it has only been delivered within PEI.

- Continue to increase awareness of bio-economy career opportunities by introducing students to industry earlier and through WIL opportunities and networking opportunities

CASTL was **largely successful** in this initiative, and established similar lessons learned from working with both industry and academia. CASTL was able to support a regional WIL network to support WIL placements with academic partners. CASTL originally intended to establish a bioscience technician apprenticeship program, but this initiative has been stalled due to government apprenticeship approval timelines.

- Continue to work with provincial, regional, and national partners to reduce barriers to participation in the bio-economy for international students, newcomers, Indigenous peoples, and other underrepresented groups

CASTL collected some cohort data from its **Reskilling** program which revealed large participation rates from women, racialized persons, and people with disabilities.

CASTL also established a **successful** financial award program to support self-identified minorities studying in the STEM field at post-secondary institutions. These included equity deserving groups such as women, visible minorities, and members of the LGBTQ+ community. CASTL was able to offer 32 awards at three institutions (Acadia, Université de Moncton, and UPEI).

- Continue to expand, evolve, and implement skills development and training programs that contribute to the success of the national bio-economy

CASTL was **successful** in meeting this key objective based on the **newskilling, reskilling, and upskilling** initiatives outlined above. CASTL has cited a large demand for their services in the national bio-economy, and suggested future success would be contingent on CASTL's ability to expand in order to meet this growing need.

## Practices that seemed effective

Firstly, related to the design and testing phases, **CASTL found that academic programming initiatives had varying timelines that were often incompatible with bioindustry needs.** Though some academic partnerships had a quick turnaround between initial discussions and curriculum delivery (e.g., UBC), others took more than a year to implement CASTL curriculum into university programming. It was incredibly important to dedicate sufficient time to developing and maintaining academic partnerships to ensure curriculum development initiatives kept progressing and to secure internal buy in from institutions.

Secondly, CASTL highlighted that FSC funding was critical in laying the foundation for project programming and also leveraging for more funding elsewhere. However, they noted that they did not receive funding from their later application to the FSC Phase 2 call of projects. As CASTL had already been identified as a model project by FSC staff, they so sought explanation of the decision and its rationale but found this difficult to obtain. CASTL reported the feedback they did receive as conflicting and therefore hard to act on and learn lessons from.

## Practices to revise

**CASTL reported that capacity building and project scaling could be difficult with a small team.** CASTL identified that there was a need for their programming across Canada, but keeping pace with the demand was a challenge with their limited resources.

An additional lesson learned emerged from the difficulty CASTL experienced in keeping up with **FSC reporting requirements.** CASTL shared that as an exceptionally small team, they felt overwhelmed with the large number of reports FSC required, as well as the length and detail of each report. CASTL suggested that though larger organizations may have the resources to keep up with these reporting demands, requiring such reporting from small not-for-profit organizations could take attention away from actually delivering the project.

## IMPLICATIONS FOR THOSE WORKING IN THIS AREA IN THE FUTURE

- **Projects involving both academic and industry will likely have to navigate incompatible timelines.** Though responsiveness differs from institution to institution, academia often operates at a slower pace than industry. CASTL found maintaining relationships to be key to ensuring the project progressed.

- **Capacity building can be challenging for projects with a small team.** In CASTL's case, there was a strong need for programming, but it was difficult for the project team to keep up with industry demand. Therefore, additional financial and human resources can be beneficial to maintain an adequate scope and scale for similar projects.

## APPENDIX A: LEARNING SUPPORT PLAN

The Learning Support Plan structured questions according to the learning stages the project included. There could be up to five learning stages:

- **Discovery** with a focus on understanding the issues and/or needs (FSC Innovation Stage: Needs Assessment)

This includes approaches intended to gain real insights into the lived experiences of the target population and to build an understanding of the opportunity space prior to designing skills interventions.

- **Defining** with a focus on project rationale and/or how to address the issue (FSC Innovation Stage: Concept Generation)

This includes approaches intended to frame the opportunity(ies) identified (e.g., as a result of a prior discovery) for changing future outcomes, define target population and/or outcomes, and determine the most critical barriers and enablers to supporting change.

- **Designing** with a focus on program logic/design or "bringing the concept to life" (FSC Innovation Stage: Research/design/prototype)

This includes approaches intended to develop solutions: setting out how to prototype potential solutions and validate these with those in the target population.

- **Testing** with a focus on initial delivery (FSC Innovation Stage: Delivery and Iteration)

This includes approaches intended to be used to test solutions or otherwise support collective ability across the ecosystem to learn what works, adapt and refine.

- **Scaling** with a focus on scale and spread (FSC Innovation Stages: Scaling and Sustainable Scaling)

This includes approaches intended to increase the support for and/or adoption of known solutions or that would assist in identifying and persuading public and/or private funders and/or partners to dedicate their resources to increase the reach and/or impact of known interventions.

SRDC concluded that the CASTL project included three learning stages: designing, testing and scaling.

| Learning Stage                         | Learning and Gapfilling Questions   | Is more information required? | Possible information sources |              |              |                  |                    |
|--|---|-------------------------------|------------------------------|--------------|--------------|------------------|--------------------|
|  |   |                               | Documentation                | Project Lead | Participants | Project Partners | Other Stakeholders |
| Design                                 | What partnerships has the project undertaken to target its upskilling objective? How has the training/curriculum been developed?                                  | Yes                           |                              | Interview    |              |                  |                    |
| <b>Additional/Gapfilling Questions</b> |   |                               |                              |              |              |                  |                    |
| Design                                 | Are the five named programs (in the quarterly report) being implemented under the CASTL Regional Work-Integrated Learning Program, OR are they separate programs? | Yes                           | Quarterly reports            | Interview    |              |                  |                    |

|                |  | Possible information sources  |                   |              |              |                  |                    |
|----------------|--|-------------------------------|-------------------|--------------|--------------|------------------|--------------------|
| Learning Stage | Learning and Gapfilling Questions  | Is more information required? | Documentation     | Project Lead | Participants | Project Partners | Other Stakeholders |
| Design         | How were the summer camps organized? Is there data on its implementation or results according to objectives? How were school activities organized? Is there data on its implementation or results according to objectives? | Yes                           | Quarterly reports | Interview    |              |                  |                    |
| Design         | Did employers, underrepresented groups, displaced workers, or other stakeholders provide input during the program design process?  | Yes                           |                   | Interview    |              |                  |                    |
|                |  |                               |                   |              |              |                  |                    |
| Testing        | What has worked well in program implementation, i.e., what aspects of the partnerships with post-secondary institutions have worked well?  | Yes                           |                   | Interview    |              |                  |                    |



| Possible information sources           |   |                               |               |              |              |                  |                    |
|--|---|-------------------------------|---------------|--------------|--------------|------------------|--------------------|
| Learning Stage                         | Learning and Gapfilling Questions   | Is more information required? | Documentation | Project Lead | Participants | Project Partners | Other Stakeholders |
|  | What other components of programming has led to student success?  |                               |               |              |              |                  |                    |
| <b>Additional/Gapfilling questions</b> |   |                               |               |              |              |                  |                    |
| Testing                                | What are the strengths and weaknesses of using VR in this way/for this purpose?   | Yes                           |               | Interview    |              |                  |                    |
| Testing                                | Were there specific reasons why VR or visually-engaging websites would especially appeal to underrepresented groups and displaced workers? Are there other aspects of the program's design that respond specifically to the needs of these target groups? | Yes                           |               | Interview    |              |                  |                    |
| Testing                                | How effective is the project in supporting Canadians to be equipped for highly  | Yes                           |               | Interview    |              |                  |                    |

| Learning Stage | Learning and Gapfilling Questions  | Is more information required? | Possible information sources |              |              |                  |                    |
|----------------|--|-------------------------------|------------------------------|--------------|--------------|------------------|--------------------|
|                |  |                               | Documentation                | Project Lead | Participants | Project Partners | Other Stakeholders |
|                | skilled jobs in the life sciences sector?  |                               |                              |              |              |                  |                    |
| Testing        | How has the project enhanced the skills development, increased employee numbers, and increased job satisfaction of employees in Canada's life sciences sector? | Yes                           | Annual and quarterly reports | Interview    |              |                  |                    |
| Testing        | What are some examples of competency measurements in the WIL programs? How are these assessments developed?  | Yes                           |                              | Interview    |              |                  |                    |
|                |  |                               |                              |              |              |                  |                    |
| Scaling        | How will CASTL adapt/scale the project to facilitate effective collaboration between academic and bioindustry? How will their program adapt to                 | Yes                           | CASTL One Pager              | Interview    |              |                  |                    |

| Possible information sources |  |                               |                 |              |              |                  |                    |
|------------------------------|--|-------------------------------|-----------------|--------------|--------------|------------------|--------------------|
| Learning Stage               | Learning and Gapfilling Questions  | Is more information required? | Documentation   | Project Lead | Participants | Project Partners | Other Stakeholders |
|                              | their sometimes competing priorities?  |                               |                 |              |              |                  |                    |
| Scaling                      | Documentation mentions that CASTL is working on a new organizational structure to better facilitate network collaboration. Will this new structure assist in scaling up the project? | Yes                           | CASTL One Pager | Interview    |              |                  |                    |

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