



Canadian Centre canadien
Light Source de rayonnement
Source synchrotron

Educational Proposal Information: Students on the Beamlines for Projects Starting in the 2023/4 School Year

What's New?

We have made a few changes to the process, the forms, and the expectations so please take the time to review this document carefully before you submit a proposal to participate in the SotB program.

1. Single Annual Call for Proposals – deadline is April 30th

You may recall from your training that developing the research question in a way where synchrotron techniques are necessary is the hardest part of the process. Allowing for an appropriate amount of time and space for this, increases learning and reduces stress for everyone involved – and it will strengthen the science the students are able to engage in.

This call, with the deadline set for the end of April, is for projects to start during the 2022-2023 school year. We will continue to be flexible with timelines leading to beamtime where possible and strongly encourage educators to start the process early and allow for lengthy project development.

2. The Canadian Light Source, and the Education Team specifically, have committed ourselves to walking a path of reconciliation.

This means that we respect Indigenous Ways of Knowing and oral traditions. We dedicate ourselves to moving forward in the spirit of partnership, reconciliation, and collaboration with Indigenous Peoples. We will integrate Indigenous perspectives with mainstream approaches and encourage conversations to advance reconciliation efforts. This reflects changes and expectations that are becoming realities of science research in Canada as evidenced in changes in expectations of Canadian funding agencies and regulatory bodies which are key parts of the experience SotB facilitates for educators and their students. There are changes to our application form accordingly.

3. Similarly, the Canadian scientific community recognizes there are barriers to Equity, Diversity, and Inclusion (EDI) for many. Plans to address this is reflected in policies, regulations, and funding requirements. The SotB program follows suit by asking for a plan as part of the proposal process.

The Students on the Beamlines Program

The [Students on the Beamlines \(SotB\) program](#) is designed to provide an authentic scientific inquiry experience for high school students. Participants must be a minimum of 14 years of age when they are collecting data on the beamline. By authentic scientific inquiry, we mean that we are attempting to provide an experience that is as close to what a professional scientist experiences as possible.

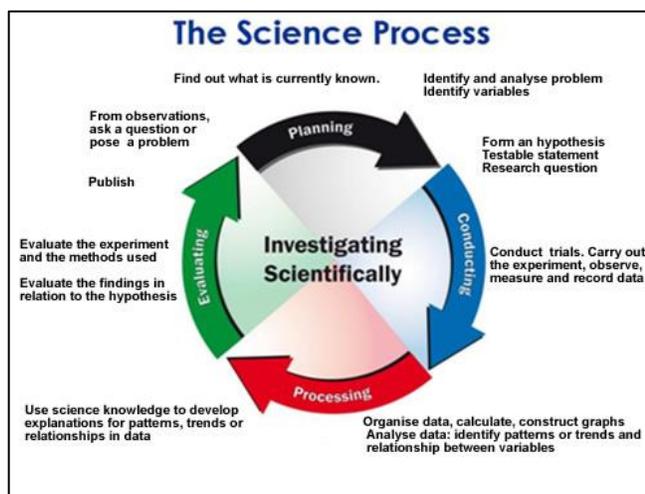
These are the key aspects of the program are as follows:

1. Student Driven

The students collectively make decisions regarding the direction of their project. Students are supported by mentors such as CLS staff, their teacher/educator, and often subject matter experts. The mentors and experts' role are to provide enough information and advice to enable students to make sound decisions but not to make the decisions for the students. CLS staff & educators are responsible to ensure students' safety throughout the whole process. The goal is to balance desired education outcomes (learning by doing with a focus on the process) and science outcomes (rigorous and structured research with a focus on results).

2. Authentic Scientific Inquiry

The SotB program is designed to provide students with an *authentic* scientific inquiry experience. By authentic scientific inquiry we mean that students will follow a process as close to a professional scientist as possible. Students are expected to review relevant peer reviewed literature and consult with other scientists, experts, Traditional Knowledge Keepers, and/or Elders to inform their question, hypothesis, and experimental plan. They must also communicate what they have learned through presentations, posters, articles, Traditional Cultural Expressions, or other relevant mediums, so that other scientists, the community, and the public can benefit.



3. **Synchrotron Relevant**

Students participating in the SotB program have the opportunity to use synchrotron techniques to aid in answering a research question. It is important for students to understand that a synchrotron is just one tool in a research toolbox. They are encouraged to develop a robust project that includes more than one approach to address a research question. *However, part of the question must require synchrotron techniques in order to access beamtime and members of the Education Team will help with that.*

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4. Teacher/Educator Training

At least one educator, advisor or supervisor (travelling with the students if in person) to participate in the SotB program **is required** to have had direct experience with a CLS program. Ideally, they would have attended the CLS Educators' Workshop to become familiar with a synchrotron research facility as it is very different than a classroom. Student safety is our priority. For more information about the Workshop visit our website: https://www.lightsource.ca/professional_development

5. Reconciliation and EDI

It is an acknowledged reality that there many barriers to equitable participation in the construction of scientific knowledge in our society. Just as Canada's science funding agencies are asking research facilities and scientists to be inclusive of Indigenous Ways of Knowing, respectful of Traditional Knowledge, and to include an EDI plan, so too will the SotB proposals include this in the experience for educators and students.

Competition - Educational Proposal

Competition for limited resources is a reality of the science world. We have a limited amount of beamtime, science mentorship support, and funding. As a result, we are forced to choose which groups we are able to support. **The focus of the competitive process is based on expected education outcomes.**

- **Teachers/Educators** submit an educational proposal form outlining anticipated educational outcomes for your students, yourselves, your school, your community, etc. and a suggested approach to science research planned for the project. We wish to work with the students to fully develop the science.
- Student contribution can be included when applicable and if you choose, but it is not expected. The expectation is that the *educator* is facilitating the experience – students will eventually plan the science project.
- The proposal is in two parts: sections that will be assessed formally and ones that are not part of the assessment, but provide context for us. *All sections require an answer*. Choosing not to provide that information, even if it is not part of the formal assessment, will place your application at a disadvantage

Part of our goal with the educational proposal is to ensure that CLS (and hopefully other) scientists are helping students with the science planned for a project and help students and educators through the science process. This way we are encouraging more collaboration in the project. With the educational proposal, we are looking for ways students can connect with other students, more experts, and the public.

***Schools who have not yet had the opportunity to participate in the SotB program and who can establish a higher need for a program like SotB, will be at an advantage.**

Educational Proposal Guidance

The purpose of the educational proposal and review process is to enable a way for CLS to be able to determine which schools to support for a SotB experience with limited resources. To guide you with filling out the educational proposal, below you will find guiding questions and a summary of what is expected.

Indigenous Land

Not sure which Treaty Territory, Unceded Territory or Métis Community your school is located on? This website: <https://native-land.ca/> could help in answering that question. Just enter your location and see which territory and treaty your school is located on. If you are unsure, connect to your community to learn about the Indigenous peoples in your area.

Team (350 words)

We are not looking for a list of names. It is likely that your team has not been built at the time of submission. We are looking for a description of the composition of the team you plan to have in place to contribute to the SotB project. Describing the strength of the team you are starting with (returning students, scientific, community, and/or administrative support for example) is a good place to start, but remember to add your plans for team development. Consider 3 to 15 students, but this can be adjusted if needed (please discuss this with us). Travel to the CLS is not required by all team members – including students. Some members can provide advice or support in sample preparation or research prior to beamtime, as an example.

- Who are you planning to involve in this project?
- Will you be including other educators, scientist, experts, Elders, Traditional Knowledge Keepers, or community members to the team? What subject area expertise are you planning to add through these team-members to help support the students?
- Are you recruiting a team of curious students with a cross-section of skills, abilities, interests and perspectives? What skills, abilities, interests and perspectives are you anticipating?
- Are you trying to reach or support a particular group of learners?
- How will you select these students?
- Are there opportunities for cross-curricular or cross-disciplinary connections?

Outcomes for the Team (350 words)

*****What we mean by ‘outcome’ is the anticipated or measurable changes or accomplishments that will result from the immediate participation in SotB (communication of program, personal growth, etc.). Consider all members of the team (not just students).**

- What do you expect the team members (students, teachers/educators, and potentially scientists) will be able to accomplish?
- What is your communication plan? Who is your audience for what information? How?
- What are some approaches and applications that will show the skills and knowledge attained by students through this program? Educators? Other mentors?
- What outcomes do you expect for yourself, as a teacher/educator? Can those outcomes extend to your colleagues? How?
- What do you expect your team to learn? Why is it important they learn those skills? Suggested areas to discuss: students (either as individuals or as a group); yourself and your colleagues (how does the program fit with your personal pedagogical philosophies); and your classroom or school.
- How might the program influence team member’s skills (confidence, teamwork, leadership, etc.)?
- Is this an extra-curricular activity or something offered within a class – why is it constructed that way?
- For both new groups and returning groups, outcomes should involve a communications plan.

The focus for this category should be on what you plan on doing for the CURRENT project proposed, if you have previously participated in SotB then those experiences could be used as examples.

Broader Impacts (350 words)

*****What we mean by ‘impact’ is an anticipated change that is long-term, systemic, or a long-term effect of an outcome because of participating in the SotB program (change in learning, teaching, community outlook, etc.). This is a natural extension of the previous category topic.**

Look for ways to involve your team in science and in learning BEYOND the project. For examples, students have talked about applying their new skills in teamwork, time management, and presentation in different ways. Teachers/educators have voiced changes in their perspectives towards assessment, how to implement inquiry-based instruction, and collaborative learning.

- What impact do you expect participating in SotB will have beyond the people directly involved? On the school? In your community? In science education? With reconciliation?
- Are you planning to present the results of the project to an audience? How? Who? Why?
- If there are ways that you can expand the impact of this experience with other students in your school, how would you do that?
 - Can your group of students involve others in sample preparation or data collection?
 - Is there a way to involve the community at large?
 - Are there cross-curricular connections that can be made?
 - Can other educators be involved?
 - Can what has been learned both scientifically and educationally/pedagogically be shared?

Our experience has shown us that the impact of this experience is far greater than we anticipated when we first designed the program. We would like to capture that and build upon it. Something that student groups consistently comment on after participating in SotB is how scientific research is a social construct. It requires that people work together to accomplish a common goal. We are looking for projects that can extend, build on, and reinforce this. Consider presenting a plan in how you want to engage the community.

Equity, Diversity, & Inclusion

*****Not a part of the decision to grant the student group beamtime**

As we described previously, science in Canada has recognized that there are systemic issues needing to be addressed. Organizations, regulatory agencies, and funding bodies across the country are reviewing their processes to identify how we can better build an equitable and diverse society that is scientifically literate. The CLS is following suit, including the Education Programs. This section is not being included in your assessment score, *at this time*. We are asking for this information to help provide a baseline so it can be built into the scoring system in the future.

- What is your school or community doing to promote EDI that connects to this project?
- Does your team reflect diversity? If you identify a gap, how can you address it?
- How do you plan to ensure the team you build reflects the diversity of your community?
- How do you plan to encourage inclusion of diverse peoples, perspectives, and approaches in your project?

Reconciliation

*****Not a part of the decision to grant the student group beamtime**

The CLS and the Education Team are committed to taking steps on a path towards reconciliation. We invite you to walk this path with us, and with the science research community in Canada. This section is not being included in your assessment score, *at this time*. We are asking for this information to help provide a baseline so it can be built into the scoring system in the future.

- How might your project, approach, or team work to advance reconciliation?
- How do your project ideas connect to inherent Indigenous rights? The Supreme Court of Canada has outlined principles for renewing relationships with Indigenous Peoples. <https://www.justice.gc.ca/eng/csj-sjc/principles-principes.html>

- Does your participation, or your project connect to any of the 94 Calls to Action? You might consider connecting more directly to the article, “Towards reconciliation: 10 Calls to Action to natural scientists working in Canada”.
<https://www.facetsjournal.com/doi/10.1139/facets-2020-0005>
- Does, or can, your project or approach connect to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)?
<https://www.justice.gc.ca/eng/declaration/index.html>

Science Topic (150 words)

*****Not a part of the decision to grant the student group beamtime**

As you would have read above, this section is not part of the scoring assessment, although it does require an answer. We actually prefer to work with your team to develop the science project. So not having a specific experiment, but an idea for how to include your students in how to approach this is welcome. The purpose of this section to provide context for the project should there be one. Is there something happening in your community that lends itself to a project? Are you incorporating this into a course and so need to narrow the focus somewhat to meet curricular goals?

- Do you have a plan on how to approach developing the experiment?
- If you already have a group of students, what are they interested in researching? Why?
 - Your team can have more than one topic.
- Do you have a group of experienced students and they would like to build on previous work?
- What do you want to find out about your topic(s)/interest(s)?
- Does the team’s interest relate back to the curriculum? If so, how?

We want to provide assistance to develop your project so that we can help you make sure to take advantage of the synchrotron techniques. The purpose of this section is to allow you or your team to describe the ideas that you already have. It should be very general and open-ended, particularly if the proposal is submitted before you are able to build your student team, but it is required. It would be helpful for us to know if you are developing this as a part of a course and would like to make specific curricular connections. **What we are not looking for is a project that has already been fully developed without consulting with us.**

Funding

*****Not a part of the decision to grant the student group beamtime**

We sometimes have limited funding available. Each group is expected to try and find funding for their own project. There are a number of places that will fund educational opportunities, such as large companies that have operations in your area.

We are applying for a grant from NSERC PromoScience to support those groups for whom funding is a barrier to participate in SotB. In this section, please outline what funding you need to be able to participate. Be sure to articulate especially if a lack of funding is a barrier for participation. Also, if there are other sources of funding you have access to or plan to apply for, let us know. We are willing to assist with these applications. Outline your expected costs and how much support you are asking from other grants.

This section will not have an impact on whether or not you are selected to participate, but will help us plan our resources to support you if we can. It is possible that you will be granted beamtime and we will not be able to provide funding. A lack of funding will not adversely impact your score.

Scoring of Educational Proposals

Educational Proposals will be scored according to the rubric below. ***The lower the score, the better.*** It might be worthy to note that although not as common in education, this style of assessment is common in the science research community for review of applications/proposals for facility access or funding, and many other things. Generally speaking we will be looking for educational proposals that achieve an average score of 2 or better.

- **1:** A score of 1 will be an educational proposal that encompasses innovative ways of doing things – a real “wow” factor.
- **2:** An average score of 2 indicates that there are plans for an excellent team, doing interesting things, learning from the project, and sharing what was learned both scientifically and in other ways.
- **3:** An average of 3 indicates that it is an acceptable proposal that will be granted beamtime only if there is time to give. In effect, a 3 is ‘*ordinary*’.
- **4 and 5:** An average score of 4 or 5 will not be granted beamtime. Essentially those projects do not convince reviewers that the time and resource it would take to do the project are worth the outcomes proposed. We do not anticipate there will be many of these.

Rubric

| | Research Team | Outcomes for Participants | Impact on Community |
|--------------------------------|---|--|--|
| Exceptional 1 | Innovative team composition | Innovative approach and application of skills and knowledge attained | Innovative approach to engage the community in or with the project. |
| Excellent 2 | Team includes new perspectives & additional support (eg: a diverse group of students, educators, scientist, community members etc.) | Learning outcomes are extends to full team (student, educators, etc.) where opportunities beyond the specific project are developed. | Engages non-team members at their school and/or their community in the project, includes cross-curricular connections. |
| Good 3 | Team is made of science students and a educator | Expected outcomes are focussed on student learning (personal, content and process). | Communicates experiences with their school or community |
| Needs Improvement 4 | Too many students or too few students; No real plan for a research team | Focused on factual or “content” knowledge only | Only team members are involved |
| Unacceptable 5 | Excluding people interested in the project | Focused on a pre-determined conclusion; Demonstration; Field-trip | Lack of communication or community involvement plans |

Dates to Remember

CLS has a January-December yearly cycle which does not fit well with the school September - June academic cycle. When you are planning your project, be aware of the following:

- **Beamtime runs in 2 cycles: January – June and July – December.** The call for proposals for each cycle goes out to all registered users at the beginning of the previous cycle with the deadline set at midway. Those proposals go through a peer review process, where beamtime is allocated and then scheduled. Education projects have a later deadline but are scheduled at the same time. **This means that SotB beamtime applied for January – June is typically scheduled in November of the previous year and beamtime applied for July-December is typically scheduled in the month of April prior to beamtime.**
- We have **two long periods of time when the synchrotron shuts down** user operations in the spring and fall to prepare equipment for extreme weather changes and allow maintenance, upgrades, or construction that cannot take place during a user 'run'. There are a few endstations that have alternate sources of light that are able to continue running during these shutdowns. **Be aware of these shut downs when planning on coming to the CLS by checking out the operations schedule:**
<https://www.lightsource.ca/users/operations-schedule.php>

*Something that has become apparent to us is that the **more time students are able to spend learning about their chosen area of research and preparing for their experiment** (doing preliminary tests, collecting or growing samples, etc.) **the more meaningful the entire experience is for them.** If there is a way to build this advance planning time into their experiment, we highly recommend it.*

| | |
|-------------------------------|---|
| Nov 25-27, 2022 | Educators' Workshop https://www.lightsource.ca/professional_development |
| Late January – Mid April 2023 | Synchrotron Shutdown <ul style="list-style-type: none"> • No scheduled beamtime |
| April 30, 2023 | Deadline for Educational Proposals |
| Late August – Mid Oct. 2023 | Synchrotron Shutdown <ul style="list-style-type: none"> • No scheduled beamtime |

Dates subject to change. Keep in touch with us!

Submit a proposal by filling out the form and email it to education@lightsource.ca before the deadline

There are exemplars available online, at the link below (see Guides)
<https://www.lightsource.ca/public/education/programs/students-on-the-beamline.php#GettingStarted>
 If you have any questions please contact any member of the Education Team via emailing education@lightsource.ca or direct email contact (addresses at link)
<https://www.lightsource.ca/public/education/education.php#MeettheTeam>