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Literature Review

Exploring Collaborative Approaches to Indigenous Science Outreach Programs on Turtle Island: A Scoping Review

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Abstract

Introduction: Past and recent calls to action (e.g., Truth and Reconciliation Commission of Canada, 2015) call for inclusion of Indigenous Peoples, including residential school Survivors, in all stages/phases of program development and education. **Objective(s):** This scoping review identifies and maps the extent (i.e., level) of collaboration reported in published accounts of science outreach programming targeting Indigenous youth on Turtle Island (North America) between 2010 and 2022. Additionally, this review lists and describes program evaluation methods reported. **Methods:** Arksey and O'Malley's (2005) scoping review methodology was applied. Education Resources Information Center (ERIC), Education Research Complete (ERC), Academic Search Premier (EBSCO), CBCA Complete (ProQuest), SocINDEX (EBSCO), Google Scholar, and Google were searched for science outreach programs targeting Indigenous youth on Turtle Island between 2010 and 2022. Each program's process and methods were identified. A scoring schema was developed in collaboration with community members to map these data by extent of community collaboration (three categories; 0 = none, 1 = some, 2 = full). **Results:** In total, 20 programs were identified, and 12 (n = 12/20) programs met criteria for full collaboration during program development and implementation, while eight (n = 8/20) did not. Of the 12 programs, six (n = 6/20) programs reported collaborative evaluation. Diverse evaluation methods were reported and are described. Moreover, 15 (n = 15/20) programs were identified as taking place post 2015, with four (n = 4/15) being Canadian programs. **Conclusions**: A total of 20 STEM programs targeting Indigenous youth on Turtle Island were identified in this review. Although 60% of the programs reported collaboration during development and implementation of programming, only 30% collaborated with community during program evaluation. These findings are supportive of the need for ongoing education and research on collaboration with Indigenous communities at all stages of intervention/program development.

Keywords: Indigenous (Peoples), (program) development, (program) evaluation, collaboration, science education

Introduction

In 2016, 14% of Indigenous women and 8% of Indigenous men aged 25 to 64 in Canada had obtained a bachelor's degree or higher, compared to 32% of non-Indigenous women and 27% of non-Indigenous men (Arriagada, 2021). A bachelor's degree is often an entry-level requirement for STEM (science, technology, engineering, and mathematics) and applied science (e.g., health care) occupations, and Indigenous people on Turtle Island (North America) are underrepresented in these professions (National Science Board, 2010; Statistics Canada, 2018). This "achievement gap," or difference in academic achievement (as measured by standardized academic test scores), has been attributed to a web of systemic social and economic challenges, blended with historical and ongoing experiences of colonization—not lack of interest or motivation (Battiste, 2013; Canada Millennium Scholarship Foundation, 2005; Harkins et al., 2017; Longboat, 2012; Mullen, 2021).

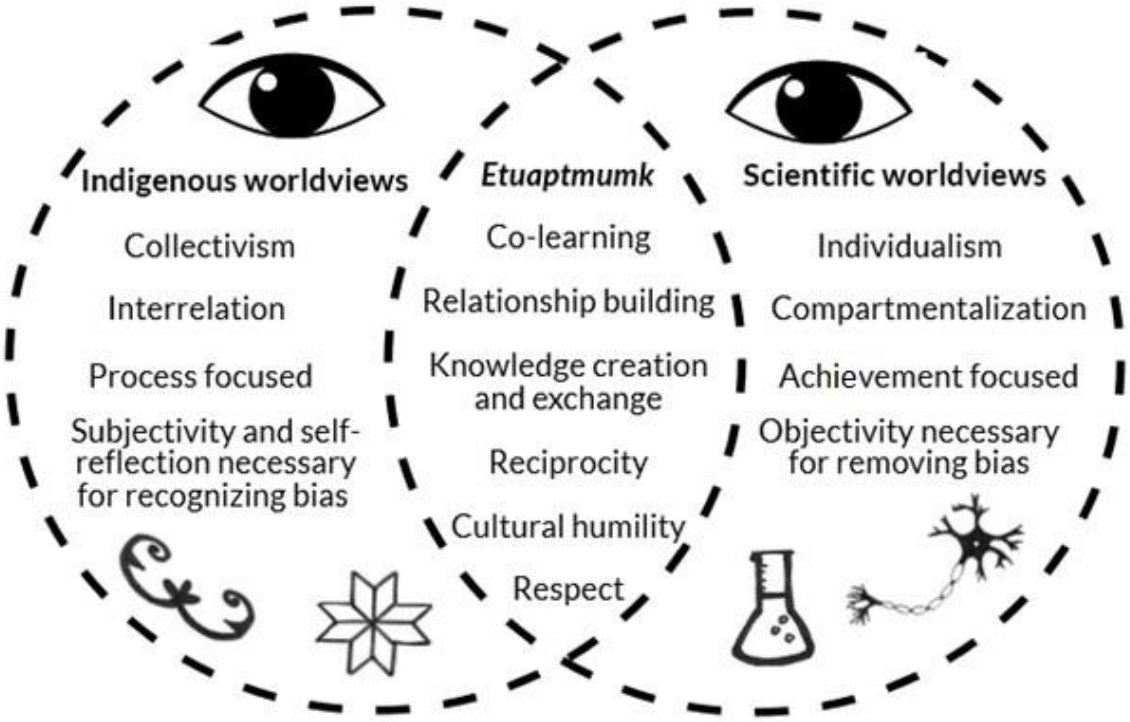
As part of efforts to recognize and address these differences, a variety of calls to action have been made, including the Truth and Reconciliation Commission of Canada's (TRC) Calls to Action (TRC, 2015). The calls to action related to education include the following: (a) Improving education attainment/achievement levels and success rates, (b) respecting and honouring treaty relationships and developing culturally appropriate curricula, and (c) enabling parental and community responsibility, control, and accountability (TRC, 2015). Moreover, in 2010–2011, Canadian and American governments released statements of support for the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP; Indigenous and Northern Affairs Canada, 2010; United Nations General Assembly, 2007; U.S. Department of State, 2011), which also includes articles similar to, or which reinforce, the aforementioned calls to action (e.g., integrate language and Indigenous methods of teaching and research). Additionally, in 2021, Bill C-15 brought into focus Indigenous Peoples' rights to establish and control their educational systems, and the bill was passed in the Canadian House of Commons (Bill C-15, 2021; United Nations General Assembly, 2007).

Although many calls and articles continue to go unanswered, there are examples of Indigenous- and non-Indigenous-led efforts to answer the calls. One community-led program committed to ensuring accountability is Mi'kmaw Kina'matnewey (MK). MK is a unified team of chiefs, staff, parents, and educators who advocate on behalf of and represent the education interests of 12 Nova Scotian (Mi'kma'ki) communities, while protecting the educational and Mi'kmaw language rights of the Mi'kmaq. Unlike a school board, MK serves rather than directs the activities of its members' local schools. Since its inception, MK has observed steady increases in high school graduation rates, reaching 90–95%, and an average attendance rate of 91%. Moreover, MK recently reported over 600 First Nations youth enrolled in post-secondary education (MK, n.d.). These findings contrast with the statistics highlighted above pertaining to the "achievement gap."

The principle of Two-Eyed Seeing grew out of a shared aim of facilitating communication and relationship building between people, groups, and institutions (including MK) with differing or multiple perspectives. Based on the Mi'kmaw concept *Etuaptmumk*, the gift of multiple perspectives, Two-Eyed Seeing is a guiding principle offered by Mi'kmaw Elder Dr. Albert Marshall, the late Elder Dr. Murdena Marshall, and Dr. Cheryl Bartlett of Unama'ki (Cape Breton, Nova Scotia) to encourage and support co-learning. Indigenous Knowledge Systems and Western Knowledge Systems (e.g., Western science) are respected as unique by Two-Eyed Seeing (Figure 1). Using the analogy of "knowledge gardening" or "growing forward," reciprocity, process, and patience are prioritized over defending, outcomes, and efficiency. As in gardening, in co-learning one must take time to prepare the soil, allowing seeds to set and roots to take hold before we see the plant growing and blooming (into new knowledge and shared understandings). Ongoing engagement and

relationship building nurtures opportunities for meaningful and reciprocal relationship building and actively avoids application of knowledge without context (Bartlett et al., 2015; Littletree et al., 2020).

Figure 1
Two-Eyed Seeing



Note. Teachings of Etuaptmumk are represented in the centre of the Venn diagram. Image created by C. Purdy (2019) to represent Etuaptmumk/Two-Eyed Seeing.

Methods

The six-step Arksey and O'Malley (2005) scoping review framework and the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) extension for scoping reviews (Tricco et al., 2018) were both applied to develop and answer our research question. The principle of Two-Eyed Seeing guided the authors and reviewers at each step, most notably during step six: consultation. Research ethics exemption was granted by the MSVU Research Ethics Board (2019-022, 2022-018) and Mi'kmaw Ethics Watch. Following scoping review standards, this review did not draw conclusions about the efficacy of programs and methods.

Step One—Identifying the Research Question

This scoping review aimed to answer the following research question: What is the extent to which collaboration took place during development, implementation, and evaluation described in published accounts of science outreach programming targeting Indigenous youth on Turtle Island?

This scoping review identifies and maps the extent of collaboration in the development, implementation, and evaluation (three steps of community programming) of science outreach programming for Indigenous youth on Turtle

Island between 2010 and 2022 (Fernandez, et al., 2019). "Extent" has been defined as the level (expressed as a category) to which collaboration took place with Indigenous communities during programming for Indigenous youth.

Step Two—Searching for Relevant Studies

The aim of this scoping review was to identify and map collaboration occurring during development, implementation, and evaluation of science outreach programs targeting Indigenous youth on Turtle Island since 2010. The base year 2010 was chosen because this was when several key guidance documents on community collaboration, developed with Indigenous Peoples, became accessible on Turtle Island (Canadian Institutes of Health Research et al., 2018; Government of Canada, 2014; Indigenous and Northern Affairs Canada, 2010; TRC, 2015; United Nations General Assembly, 2007).

Definitions of terms that made up our research question, aim, and search strategy were co-developed by the authors and community partners in advance of search implementation. For instance, "science outreach program" was defined as any camp, event, after-school program, or club that targeted Indigenous youth (up to 18 years) with the aim of increasing access to STEM knowledge, skills, or role models, and with an underlying aim of promoting STEM education. This includes STEM career exploration, mentorship activities, field trips, hands-on STEM activities, academic preparation related to STEM, or skill building in STEM. STEM includes biology, physics, chemistry, environmental science, computer science, engineering, and mathematics. Turtle Island is used to describe the traditional territories on North America, but this review focused on Canada and the United States.

A keyword search strategy (Table 1) was developed and conducted with the support of the Mount Saint Vincent University Science Librarian, Coordinator of Collections and Reference (MR). Peer-reviewed literature, including grey literature (e.g., organizational reports, websites, graduate dissertations) and conference abstracts were considered for inclusion. Databases searched included Education Resources Information Center (ERIC), Education Research Complete (ERC), Academic Search Premier (EBSCO), CBCA Complete (ProQuest), SocINDEX (EBSCO), Google Scholar, and Google (e.g., media, program websites). Boolean operators (AND, OR, NOT) were used to systematically search databases for publications on science outreach programs (Table 1).

Table 1

Keyword Search Strategy

STEM Terms		Program Terms		Audience Terms		Audience Terms
Science OR Technology OR Engineering OR Math OR STEM	AND	Program OR Club OR Camp OR Mentorship OR Promotion OR Outreach	AND	Indigenous OR Native OR First Nation OR Indian OR Aboriginal OR American Indian	AND	High School OR Elementary OR Middle School OR Youth OR Adolescents OR Children

Eligibility criteria for this scoping review included the following: (a) Programs targeting school-aged Indigenous youth (18 years old or younger); (b) programs being developed, implemented, and evaluated in Canada or the United States; (c) programs published, implemented, and evaluated between 2010 and 2022 (publications using data collected before 2010 excluded); (d) programs that have reported on any form of program evaluation (e.g., report on conclusions formed about program success and how they were formed); and (e) programs that identify as a science outreach program (defined above).

Step Three—Selecting Studies

Screening, extraction, and listing were completed by three trained independent reviewers in 2019 (CP, KB) and 2022 (CP, MC). Conflicts were reviewed and resolved by the senior author (SG), in consultation with the other co-authors (AS, AM, VP). Eligible literature was identified, duplicates were removed, and titles and abstracts were screened. In cases where multi-year reports/publications were identified, the most recent was included. If more information was needed from programs, authors emailed the programs directly. All reasons for exclusion were recorded in the data extraction tool (Table 2) by each reviewer, then collated.

Step Four—Charting and Mapping Data

A scoring schema (Tables 3 & 4) was created with community input, to map the extent of collaboration based on data retrieved using the data extraction tool. Table 3 maps program development and implementation by three categories: 0 = no collaboration, 1 = some collaboration, and 2 = full collaboration. Table 4 maps evaluation, but many programs were vague about their evaluation process, so only two categories were developed: 1 = collaboration and 0 = no collaboration. After the schema was developed, it was tested until scoring consensus was achieved.

Step Five—Reporting

The traffic light method was used to describe categorized programs (by the collaboration schema), based on their level of collaboration

Table 2

Excerpt From Data Extraction Tool

Title, Date	Location	Program Details	Development/ Implementation Collaboration	Evaluation Collaboration	Evaluation Methods Used
Storywork in STEM-Art: Making, Materiality and Robotics within Everyday Acts of Indigenous Presence and Resurgence, 2019	Washington	A four-session, three-hour weekly workshop series that centred families' stories to reposition families' relationships to robotics and STEM	Collaboration with local district school's Native Education program	No mention of community collaboration	Videotaped observations, field notes, post-interview

Note. STEM = Science, technology, engineering and mathematics

Table 3
Collaboration Scoring Schema—Program Development, Implementation

Level of Involvement	Description	Criteria
Level 0: No Collaboration	Decisions about program needs, content (etc.) driven from outside of the community (e.g., researchers, funders, organization owners).	1. No report of Indigenous consultation or involvement in development or implementation. 2. No Indigenous world views are reported as being included in program content.
Level 1: Some Collaboration	Decisions about programs needs seem to be driven from outside of the community; however, Indigenous world views are incorporated into program content, indicating use of community resources or collaboration in implementation.	1. There is no report of Indigenous community members, partners, right holders (etc.) being consulted or involved in the program development stages. 2. Community members (Elders, Knowledge Keepers, etc.) lead or are involved in the program to provide cultural knowledge, OR a framework for incorporating Indigenous world views is reported for program development/implementation without report of consulting the community.
Level 2: Full Collaboration	Decisions about program needs are driven by the community through collaboration with community members.	1. There is report of community consultation in defining goals, objectives, or aims, or in developing content for the program. 2. Community members (Elders, Knowledge Keepers, etc.) lead or are involved in the program to provide cultural knowledge, OR a framework for incorporating Indigenous world views is reported for program development/implementation.

Table 4
Collaboration Scoring Schema—Program Evaluation

Level of Involvement	Description	Criteria
Level 0: No collaboration	Community partners/members are not involved in evaluation; evaluators or researchers make decisions about evaluation methods, outcomes, or measures to be used. Success is defined from outside of the community.	1. Involvement of Indigenous community partners or representatives at any level of the evaluation process is not reported. OR Evaluation is developed based on previous research published about work in Indigenous communities, but not based on current community served.

Level 1: Collaboration	Evaluation methods, measures, or outcomes are created in consultation with community partners/members.	1. Consultation, shared decision-making, or collaboration is reported for at least one area of evaluation (e.g., defining success, choosing methods, determining measures, creating protocols, implementing the evaluation).

during development, implementation, and evaluation (0 = red, 1 = amber, 2 = green). The traffic light colours were selected to support mapping, as these colours have widespread application, recognition, and acceptance in knowledge translation (Ahluwalia, 2019; Scarborough, 2015). Program evaluation methods were also reviewed and described. These results were then summarized and reported in accordance to scoping review methodology (Arksey & O'Malley, 2005). In accordance to scoping review methodology, a quality appraisal was not conducted.

Step Six—Consultation

Although it is a term commonly used in knowledge translation and scoping review literature, "stakeholder" should not be used when addressing or communicating with Indigenous Peoples (Indigenous Corporate Training Inc., 2018). Stakeholder is often used to describe an individual, group, or organization that may be impacted by the outcome of a project, program, or research. Indigenous people and communities are not mere stakeholders, they are rights and title holders (Indigenous Corporate Training Inc., 2018).

Review consultation was guided by Two-Eyed Seeing and facilitated by the co-authors (see acknowledgements) through oral communication and relationship building with local communities, such as various Elders, Knowledge Keepers, Indigenous scholars, and community-based educators. Co-author Elder Dr. Albert Marshall provided guidance on the authors' understandings of Two-Eyed Seeing and collaborative relationships. Consultation is a dynamic process, rooted in establishing, building, and maintaining relationships and trust. Meaningful consultation must include listening to community concerns, discussing their concerns, and being prepared to accommodate those concerns (Sylliboy et al., 2021).

Results

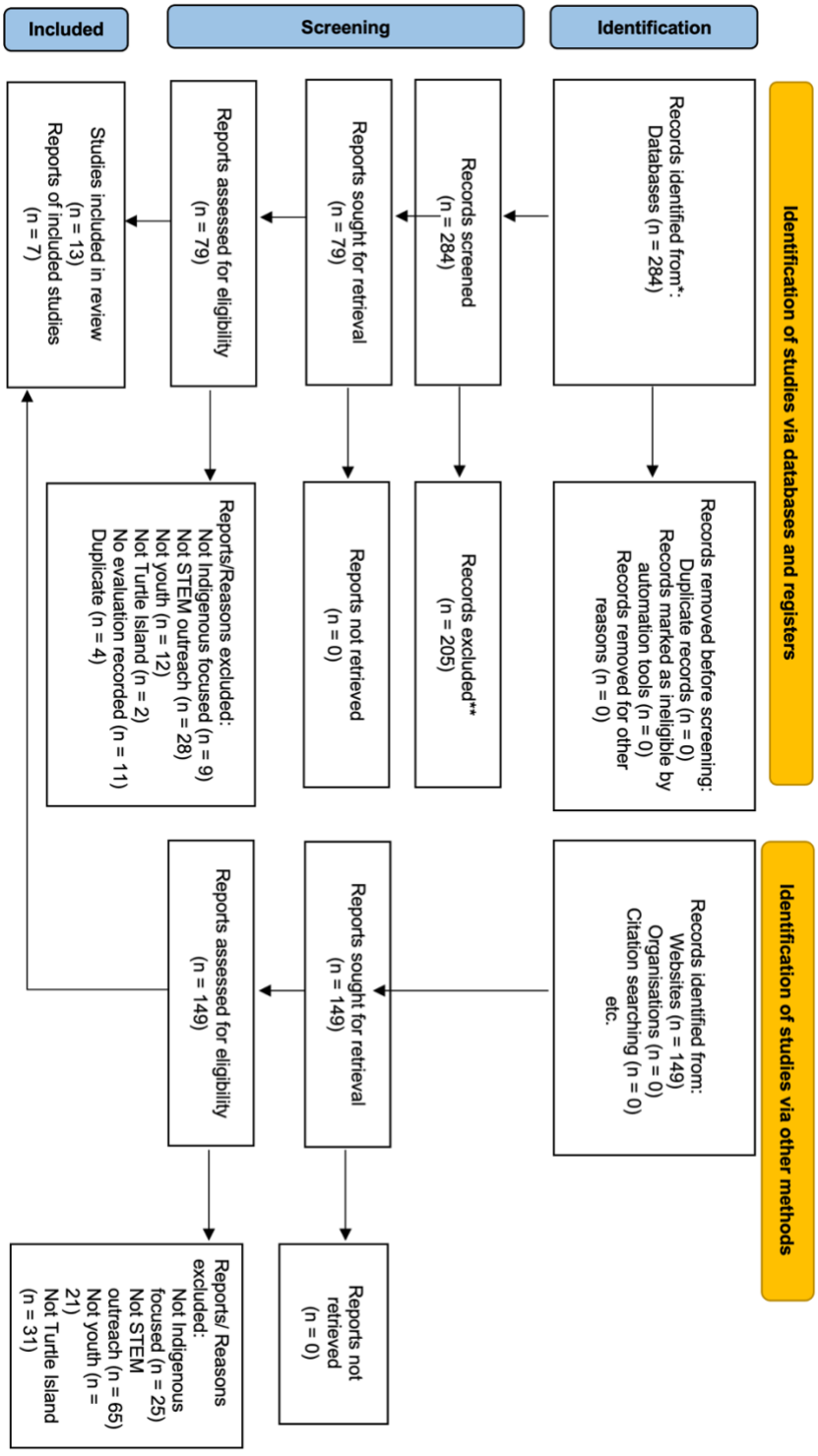
Twenty programs (n = 20; see Appendix) were identified across Turtle Island (United States: n=14/20; Canada: n=6/20) that met inclusion criteria (2019: n=12/20; 2022: n=8/20). All program records were published between 2010 and 2022, with the majority published between 2017 and 2022 (n=13/20 or 65%). Fifteen of the programs reported after 2015 (post-TRC publication; n=15/20), with four (n=4/15) being developed, implemented, and evaluated in Canada. Figure 2 (completed PRISMA flow chart) illustrates the process implemented for identification, screening, and inclusion of studies. Reasons for exclusion were in line with established eligibility criteria. That is, programming was excluded if it (a) did not focus on Indigenous youth, (b) did not include STEM, (c) was from outside of Turtle Island, or (e) the authors did not report evaluation methods.

Extent of Collaboration—Development and Implementation

Using the scoring schema (Table 3), it was identified that 12/20 science outreach programs met criteria for level 2, full collaboration. Twelve programs reported collaborating during content development and described efforts and measures to ensure that Indigenous perspectives were incorporated into programming. Discussion of "culturally

Figure 2

PRISMA Flowchart of the Search Results and Study Selection and Inclusion Process



Note. STEM = Science, technology, engineering, and mathematics; Turtle Island = North America.

appropriate curricula" was a reoccurring theme in programs that met criteria for full collaboration. These programs also reported details on community engagement that aligned with recent calls to action, articles, and guidelines (Canadian Institutes of Health Research et al., 2018; Government of Canada, 2014; Indigenous and Northern Affairs Canada, 2010; TRC, 2015; United Nations General Assembly, 2007). Six programs (n=6/20) met criteria for level 1, some collaboration, in which collaboration was reported only during program implementation. These six program reports lacked details on community consultation, compared to those in level 2. It is possible that these programs did consult with community representatives but did not report this in their work. Lastly, two programs (n=2/20) met criteria for level 0, no collaboration. These two programs did not report any consultation. These data have been mapped in Figure 3, using traffic light colours to highlight extent of collaboration.

Extent of Collaboration—Evaluation

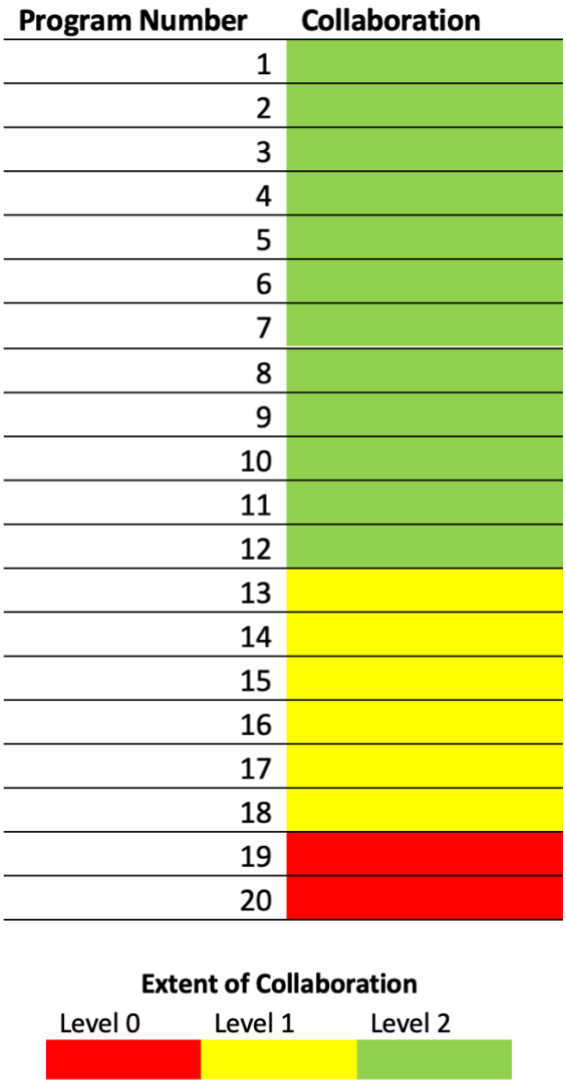
Fourteen (n=14/20) programs did not report evaluating programming in collaboration with community, consequently meeting criteria for level 0, no collaboration. Six programs (n=6/20) met criteria for level 1, collaboration. The six programs that reported collaboration during programming evaluation also met criteria for level 2, full collaboration, in their programming development and implementation stages. Figure 4 maps extent of collaboration during program evaluation planning, implementation, and analysis.

Evaluation Methodology

The 20 science outreach programs reported nine evaluation methods (n = 9), collectively (Table 5). Thirteen of the programs reported using questionnaires, while 13 (n=13/20) programs reported conducting interviews (Augare et al., 2017; Bernstein et al., 2015; Canevez et al., 2022; Dalbotten et al., 2014; DeRiviere, 2015; Gamble, 2014; Littrell et al., 2020; Miller & Roehrig, 2018; Patrick, 2018; Ricci & Riggs, 2019; Simonds et al., 2019; Tzou et al., 2019; Wesley-Esquimaux, 2015). Evaluation methods reported also included focus groups (n=4), informal conversations (n=4), attendance/performance (n=2), and document reviews (n=3; Bernstein et al., 2015; Bosman & Chelberg, 2019; Canevez et al., 2022; Cheeptham et al., 2020; Dalbotten et al., 2014; Kant et al., 2018; Patrick, 2018; Stevens et al., 2016). Observational methods were reported in several reports, but it was often unclear what "observation" meant or what was measured.

Figure 3

Map Showing Extent of Collaboration in Program Development and Implementation

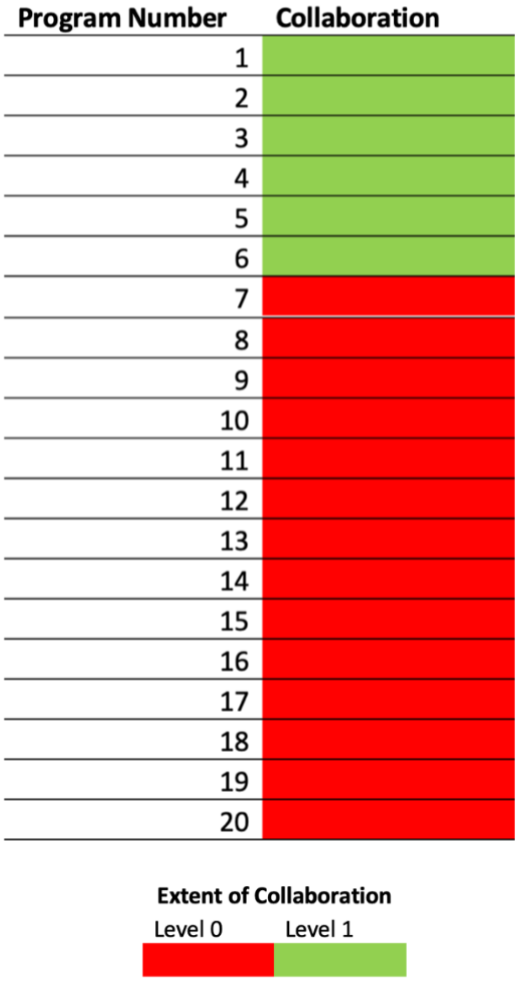


Lastly, there was one "novel method" reported called the "test tube confidence exercise," where

students were asked to measure an amount of liquid into a test tube, corresponding with their confidence in performing a learned skill/activity (Gamble, 2014). This was done before and after (pre/post) learning the activity, to determine changes in confidence. Generally, evaluation was described in a few lines and was lacking several details (not repeatable). Based on the information provided, we categorized methods into three main categories: (a) Qualitative/Subjective, (b) Quantitative/ Objective, and (c) Other (Table 5). This categorization was done to support future reviews and application of the existing research.

Figure 4

Map Showing Extent of Collaboration in Program Evaluation



Discussion

This scoping review identified and mapped the extent (level) of collaboration reported for science outreach programming targeting Indigenous youth on Turtle Island between 2010 and 2022. The three steps of program planning processes (development, implementation, and evaluation) were used to categorize and map the identified programs (Fernandez et al., 2019). While extent and methods of collaboration differed between programs, many reported full collaboration or some collaboration in program development and implementation. This was not followed through to program evaluation, with only six programs reporting collaboration at that stage. The programs that met criteria for collaboration during evaluation reported at least one incident of collaboration or engagement (e.g., evaluation development, selection of evaluation methods, choosing participants; Augare et al., 2017; Dalbotten et al., 2014; DeRiviere, 2015; Miller & Roehrig, 2018; Patrick, 2018; Ricci & Riggs, 2019). Both the United Nations Declaration on the Rights of Indigenous People and the TRC Calls to Action (TRC, 2015; United Nations General Assembly, 2007) stress the importance of collaboration with Indigenous Peoples through all the steps of program planning (development, implementation, and evaluation). When this is not done, the risk of doing work *to/on* Indigenous people rather than *with/for* Indigenous people is noteworthy (Murphy et al., 2021).

Most programs identified in this scoping review (n=13) were reported between 2017 and 2022. In addition to the increased reporting of programs, we also identified increased reporting of collaboration in programs between 2017 and 2022. This may be due to the publishing of the TRC Calls to Action in 2015 (TRC, 2015). Several of the calls to action call upon the federal government and others to collaborate with Indigenous communities to support Indigenous youth and their education—for instance, items seven, 16, and 66 (TRC, 2015). Despite this, few programs (n=6) identified reported collaboration with

Table 5
Evaluation Methods Reported

Qualitative n=31	Quantitative n=19	Other n=4
Interviews n=13	Questionnaires n=13	File documentation/review n=3
Observation n=10	Performance n=4	Novel method n=1
Focus Groups n=4	Attendance/participation n=2	
Anecdotes, comments, informal conversation, or reflections n=4		

Indigenous communities during the evaluation stage of programming. When researchers fail to collaborate during program evaluation, their findings may only be relevant for general publication, and may be of no use to the community (Murphy et al., 2021). For instance, the evaluations developed may not include outcomes deemed relevant to the community (people and communities have varying definitions of success). Communities should directly benefit from programming and research (Murphy et al., 2021).

Various terminologies have been used in the literature to describe how collaboration happens, including community-led, community-based, or participatory approaches (Baum et al., 2006; Tremblay et al., 2018; Wallerstein & Duran, 2010). In some forms, community-based can look like participatory approaches, meaning they are informed by community in various aspects of research/program processes. Participatory approaches, however, emphasize collective inquiry grounded in community participation through research and critical reflection, thus making it an emergent process that is shaped as understandings evolve, and participatory approaches are more reflective of current calls to action (Baum, 2006; TRC, 2015; United Nations General Assembly, 2007; Wallerstein & Duran, 2010). From a Two-Eyed Seeing perspective, for instance, collaboration is a way to co-create knowledge and co-learn with each other (Bartlett et al., 2012). Within Indigenous communities is the belief that everyone should work together as "we," instead of "I" (Bartlett et al., 2012). The idea of co-creating knowledge is beginning to be adopted by organizations including the Joanna Briggs Institute (JBI). Recent guidance has been published by JBI to move away from the term "consultation" and toward "co-creation of knowledge" while conducting scoping reviews (Pollock et al., 2022). To reiterate, when working with Indigenous communities, collaboration means that the community determines and/or leads and sets the pace/level of consultation and engagement (Tremblay et al., 2018).

Limitations

While this scoping review examined science outreach programs across Turtle Island, it likely did not include all programs that exist. Not all science outreach programs that engage youth end up as manuscripts or open access documents, and many do not publicly report evaluation details. Additionally, as a common limitation of the review process, our search strategy may have limited the results, therefore limiting the conclusions reported (Peters et al., 2020). The programs included provide a sample of programming and associated collaborative approaches with the means to produce reporting. In addition, some reports/publications lacked details about their collaboration, consultation, or partnerships and therefore may have been placed in an inappropriate category if collaboration occurred without being reported. Lastly, in following the scoping review methodology, a critical appraisal

was not completed, and this limits the ability to compare results across studies.

Recommendations for future work

This review grew out of the honours work of an Indigenous undergraduate student and two dietetic interns who identify as settlers and are interested in co-learning with Indigenous people. It is an example of Two-Eyed Seeing (co-learning, knowledge gardening) in action. The authors encourage subsequent reviews and syntheses on this topic, building on this work. Two future reviews conceptualized by the co-authors include (a) a scoping review that maps programming objectives to Calls to Action or the United Nations Declaration on the Rights of Indigenous People, and (b) syntheses of community-defined success in programming. Including terminology such as food, nutrition, and environment in the search strategy should be used to broaden the search, as these are science terms as well. If details on collaboration with Indigenous communities are missing in the reports, researchers can call the programs to gain more information. In this scoping review, authors did not call programs, but rather emailed programs to gain more information; however, no response was obtained.

Conclusion

This scoping review mapped the level of reported science outreach program collaboration with Indigenous community members, at all stages of programming, and identified potential areas for future work/development. It was concluded that the level of reported collaboration present during program development and implementation stages met community-defined expectations (schema) for collaboration, although there was a lack of reported evaluation collaboration in the literature. Although the authors recognize programs may have engaged in participatory approaches and not reported their evaluation methodology processes, either finding (lack of collaboration and lack of reporting) can be (should be) addressed in future efforts. The findings from this scoping review are supportive of the need to continue to educate the public, educators, and researchers on the calls to action, including collaboration/participatory approaches at all stages of programming. We still have much work to do.

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Appendix

Included Literature in the Scoping Review

Citation	Study Setting	Description of Program
Augare et al., 2017	Montana	An environmental science-based program engaging Native American youth in Two-Eyed Seeing.
Becker et al., 2017	Nebraska	Physiology program developed for Native American youth interested in pursuing STEM careers.
Bernstein et al., 2015	Alaska	Science and engineering program based out of the University of Alaska developed for Indigenous middle school students interested in STEM.
Bosman & Chelberg, 2019	Wisconsin	A renewable energy and environmental science education program developed for high school-aged Native American youth.
Canevez et al., 2022	British Columbia	A science, technology, engineering, and mathematics-based program incorporating Indigenous knowledge for Indigenous youth.
Cheeptham et al., 2020	British Columbia	A science and health science-based program aiming to expose youth to careers in science and health science, developed for Indigenous students aged 13 to 15 years old.
Dalbotten et al., 2014	Minnesota	A place-based science, technology, engineering, and mathematics-based program for Indigenous students in grades 5 to 12.
DeRiviere, 2015	Winnipeg	A mathematics-based program incorporating Indigenous knowledge and culture, developed for Indigenous youth.
Eglash et al., 2020	Michigan	A computer science and mathematics-based program creating online simulations of traditional Anishinaabe arcs developed for Indigenous high school students.
Gamble, 2014	Ontario and Nunavut	A science, technology, engineering, and mathematics-based program for Indigenous youth aged six to 16 using Two-Eyed Seeing to encourage STEM education and related careers.
Kant et al., 2018	South Dakota	Science, technology, engineering, art, and mathematics program developed for Native American girls interested in STEM careers.

Littrell et al., 2020	Colorado	A place-based science program to engage Native American students to learn about climate change and its impacts.
Miller & Roehrig, 2018	Minnesota	A science, technology, engineering, and mathematics-based program incorporating the cultural game of snow snakes. The program was developed for Indigenous students in sixth grade.
Patrick, 2018	British Columbia	A weeklong engineering camp for Indigenous youth that incorporates land-based learning.
Ricci & Riggs, 2019	California	A geoscience summer program developed for Native American youth to engage in culturally appropriate geoscience activities.
Simonds et al., 2019	Montana	An environmental health literacy program for Native American youth.
Stevens et al., 2016	Arizona	Science and engineering cultural program based out of Arizona for Native American middle school students interested in STEM.
Tzou et al., 2019	Washington	An engineering program developed for Native American youth to participate in robotics workshops grounded in storytelling.
Unsworth et al., 2012	California	A field-based geoscience program for Native American youth.
Wesley-Esquimaux, 2015	Manitoba	A science, technology, engineering, and mathematics-based program for Indigenous youth in grade 11 to spend a week researching with a mentor at a university.