UArctic

Report on graduate education conducted by UArctic thematic networks during years 2005-2021

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1.0 Introduction

University of the Arctic (UArctic) thematic networks (hereafter referred to as TNs) were established as a new program in 2005, when four TNs were also endorsed. These first TNs were: Arctic Medicine, the Verdde Program, the UArctic Indigenous TN on Community Based Natural Resource Co-Management, and Arctic Agriculture and Nature Use. Since then the number of TNs has risen every year although some TNs have closed their operations and many have changed their leadership and host organizations. Currently, as of summer 2022, there are 58 TNs in operation, including four that were endorsed in 2022 by the Assembly of UArctic. The networks include both Arctic and non-Arctic partner institutions, and their topics and focus range widely, from arts and design to natural sciences. All TNs can be found on the UArctic website (uarctic.org). In the website, TNs are clustered into six categories: 1. Business, Politics & Law, 2. Culture & Social Sciences, 3. Engineering & Technology, 4. Health & Education, 5. Humanities & Arts, and 6. Natural Science. Notable is the fact that as many TNs are inter- and transdisciplinary in their activities and focus, and are clustered under several categories.

TNs are frameworks for UArctic's joint education, research, and outreach. Their activities include research projects, educational offerings, seminars, workshops, events, publications, and more. Within the realm of education, TNs have developed and offered courses and programs mostly at the Master's and PhD level, with only very few courses conducted at the Bachelor (undergraduate) level. Graduate education options range from individual courses with changing topics such as summer and winter schools, to standalone PhD courses, to full degree programs at the Master's level. All of these are developed and taught jointly by Thematic Network partners (either with some or all), in some cases together with two or more TNs. In addition to TNs there are five UArctic Institutes, which are self-governing units devoted to research, monitoring, and education throughout the Arctic. Empowered by local knowledge and international-level academic expertise, they facilitate the development of multidisciplinary solutions for challenges facing the Arctic and in some cases also organize educational programs targeted to a variety of audiences and also to Indigenous youth as courses. These are listed as "other courses" as they are not offered in Academic programs or institutions.

There is no fixed term for a Thematic Network's existence, and with more new TNs starting up than old ones being closed down the number of TNs has risen every year. Three of the first four TNs from 2005 are still operating: Verdde, the only one still operating with original host organization and name, and Health and Wellbeing in the Arctic, which initially started as the Thematic Network on Arctic Medicine, and Northern Food Security, which started as the TN on Arctic Agriculture and Nature Use. These last two have also changed their host organizations and leaders during the past years. Of these three, Arctic Medicine / Health and Well-being in the Arctic has particularly focused on developing joint education offerings at both the Masters and

PhD level. This TN has taught more students over the years than any other.. The former TN on Arctic Medicine hosted the Finnish national PhD Graduate School of Circumpolar Wellbeing, Health and Adaptation since 2002, with international partners who formed the initial membership of the TN starting in 2005. In 2005, the network also founded CirNet - Network for International Master's Programme in Circumpolar Health and Wellbeing, with partners in Sweden, Russia and Canada, which was a starting point for developing the Master's program on Health and Well-being in Circumpolar Area (MCH), the first UArctic Master's program from which students graduated with a full Master's degree.

This report focuses primarily on graduate education courses and programs, but briefly addresses other types of educational offerings developed by UArctic TNs between 2005 and 2021. As TNs have different foci and objectives, not all have offered graduate education. The report thus took into account only those TNs that have developed and offered graduate education. In addition, those UArctic Institutes that focus on educational activities, whether vocational schools or Bachelor level were included. The results are based on data analysis of collected information from annual reports and several UArctic documents, a survey and interviews to TN leads and former students. The main objective was to collect as complete as possible data of UArctic TNs' graduate education in order to 1. estimate the impact of UArctic education so far, 2. record and analyze its development over the years, and 3. provide a platform for future recording. The report includes both data and numbers on different types of graduate education, topics, interdisciplinarity versus single disciplinary education, number of students and analysis of the impact of the education conducted by TNs since the onset of the first four networks in 2005. The impact was evaluated through the results of a survey directed to TN leads, interviews with former students, and best practices shared by TN leads in joint TN leadership team meetings. The results are also summarized in a SWOT analysis diagram, which highlights the strengths, weaknesses, opportunities, and threats of UArctic TNs graduate education.

2.0 Methods

The analysis of UArctic TNs graduate education included qualitative and quantitative data analysis. First, the quantitative data on number of courses, number of students, their geographical distribution and other useful information was organized and processed into charts which helps to visualize and address the development of UArctic TNs graduate education throughout the years. Secondly, the survey and interviews were analyzed in a discursive manner which allowed extrapolation of the strengths, weaknesses, and opportunities of the courses to students and communities.

The definition of UArctic TNs Graduate education used was broad and it was left to TN leads themselves to decide if the educational activities fall under TN activity or not. The idea has always been to be more inclusive than exclusive. A separate category for "Special courses/other" was added to take into consideration those courses which were held as a special training courses to local communities, or workshops, seminars or events, but were directed to graduate students, and other courses which were open to everyone but developed by TNs as graduate level courses.

2.1 Quantitative data analysis

The quantitative data analysis consisted of retrieving, organizing and processing data regarding UArctic TNs graduate education in the period 2005-2021. This data was retrieved from reports and various documents delivered by TNs during the years of their operation and it included the list of courses, years in which they have been open to students, TNs involved, institutions and teachers involved, and further data useful for evaluating the levels of interdisciplinarity and indigenous participation.

The deep analysis of TNs annual reports and other relevant documents (online meeting minutes, presentations given at leadership team meetings, and so forth) from 2005 to 2021 was conducted in order to collect as much information as possible regarding the graduate education offerings. The outcome of this exercise was a dataset consisting of courses and programs organized by year with the following information: title of the course/program, responsible TN/s, type (PhD course, Master course, summer/winter school, full master program), theme (using six TN categories), instructors, number of students, students per country, online/on site/hybrid format, location, credits (ECTS), duration, institutions involved, and Indigenous components. In total 47 TNs and one UArctic Institute were engaged in educational activities and thus were included in this report. These TNs were contacted in a second phase for more detailed information, particularly on missing data around students who participated in the graduate courses. Due to the retirements of leaders, TNs that don't exist anymore, lost files, etc., it was sometimes challenging to obtain

contacts or the missing data. On the other hand, the response from former Thematic Network leaders was very supportive and people did their best in searching for old files.

In terms of definitions, interdisciplinarity was analyzed by looking at the courses that were developed jointly by more than one thematic network, the courses that included teachers from different TNs, and the courses whose curricula included different subject areas. The Indigenous component was measured in terms of Indigenous People' participation (both as teachers and students) and of subjects (e.g. topics on Indigenous Knowledge and practices, traditions, language, community development). The data was processed to highlight trends in UArctic TNs graduate education over time and by different types of courses, the geographical distribution of students, interdisciplinarity, and the Indigenous participation in the courses.

2.2 Qualitative data analysis

To evaluate the impact of the UArctic TNs graduate education on students in terms of their career development and Arctic knowledge learning, and the benefits to their home communities, an online survey was . students were also asked if they would participate in an interview. The impact was measured in terms of benefits to students' future career, their connection to the Arctic, and the opportunities and possible advantages provided to their communities. Two former students were interviewed to evaluate the outcome of UArctic courses from their own perspective, considering the impact to their academic and professional career, the Arctic expertise developed and the possible networking opportunities. The survey also collected feedback on the support provided by the UArctic Thematic Network Office in developing the education offers. Finally, the survey solicited suggestions for improving the support given by TNs office.

Best and worst practices were discussed and presented by some TN leads during the May 2022 TNs leadership team meeting. This valuable shared knowledge was also used to develop a SWOT (strengths, weaknesses, opportunities and threats) analysis of UArctic TNs graduate education.

2.3 Limitations

The project encountered a number of challenges and obstacles that limit the results, although without critically impacting the scope of the project. These are due to the history of and practices in annual TNs reporting. For the first few years after 2005 the annual TNs reports didn't include information on the number of courses conducted or other detailed information. Over the 16 years of operation, different types of reporting were tested, and in the end it fell to each TN lead to fill in the information requested. This resulted in under reporting in many cases (despite

numerous reminders). During the past ten years or so, data on the numbers of activities conducted (number of courses, master's programs, joint research projects, publications, seminars/workshops/sessions organized, conference presentations and other outreach, exhibitions given) was gathered through w annual news released, annual online conversations, and information sent by email. However, no personal information on students participating in the courses was collected or reported. Therefore, in order to receive this information for this report, personal contacts with individuals were needed. However, accessing the missing information was challenging, as several TNs have changed leads and/or host organization throughout the years. The current leads may not possess data on previous activities, while those who left may not have access to that information either since some have retired.

To overcome the issue of missing data, some adjustments were made: the average number of students was estimated by using the average number of students in the courses for which the information existed and an approximation of 15 students/course was used to calculate the total number of students.

The geographic distribution of students is also a rough indicator for the same reasons described above. The map includes all the information found; however, since several TNs were not able to provide such information. Still, the map remains an indicator of TN reach and more importantly a good way to visualize the large pool of students coming from almost every continent of the World.

Secondly, it is notable that for historic reasons in Europe, it is not possible to count the number of Indigenous students who participated in courses. A person's race is not collected as part of course registration, and there is no data available in any European organization/. Therefore, the number of Indigenous students is based on self-identification given by some TNs, and this is by no means the full number of Indigenous students who participated but more an indication of the minimum number.

Finally, this project was originally intended to evaluate the interdisciplinarity of education and the gender balance of students. As noticed during the project, without having full access to all course curriculums it was not possible to assess the inter- or transdisciplinary nature of the education. It is known that many TNs work together and organized interdisciplinary and even transdisciplinary courses, however looking at the outcome of the efforts in trying to assess it, it was clearly under-estimated and thus left out from this report as it would have given false result which would have not been fair to TNs. In case of gender balance, the data was not either collected and no estimations could be either done as it would not provide any particular insights due to the large uncertainty.

3.0 Results

Thematic networks during the years 2005-2021, TNs delivered 474 graduate courses including Master's and PhD courses, Master's degree and PhD degree programs, Summer and Winter schools, Field courses, and other special courses (Figure 1) with almost 11 000 students (Figure 9) from 67 different nations (Figure 10). All these different types are considered as a "graduate course" in this report when all educational activities are discussed as one parameter.

Figure 1 shows that from 2005 to 2017, the number of courses grew steadily, as the number of TNs grew at the same time, with a slight decrease in the years 2017-2019 and then a drop in 2020, when the pandemic dramatically affected the education sector. As a consequence of the Covid-19 crisis, courses and programs were paused, canceled, or postponed. The pandemic has been a disruptive event which could not be foreseen. However, as is shown in the results, 2021 registered a jump in the number of courses, which has also outnumbered the pre-pandemic levels. This data reveals that TNs were able to react promptly to the situation by moving courses online and finding new ways to educate. When the annual number of TNs is taken into account and a ratio between TNs and graduate courses is calculated, the increase is not exponential but after the first few years stays closer to two courses by each TN (Figure 2).

A closer look at the data shows that PhD and Master's courses were the most numerous offerings, with 110 PhD and 114 Master's courses followed by 93 summer and winter schools, 64 offerings of full Master's programs (note that these are not 64 different programs as each program was counted as one in every year of they being enrolled and thus, as an example a three year-program was counted three times) and then finally 46 special and 36 field courses (Figure 3).

When looking at course topics using the six categories under which TNs are clustered (Figure 4), Health & Education was the most numerous category, due to the activity of the TN on Health and Well-being in the Arctic. Culture & Society was the second most popular including special courses targeted for Indigenous reindeer herding youth organized by EALAT Institute for Reindeer Husbandry. The Thematic Network on Health and Well-being is the TN which has organized the most graduate courses during the 16 years of its existence (Figure 5). It should be noted that the figure does not intend to highlight the most productive networks, because the number of courses is not indicative of the effort nor of the impact of the work of the members. In addition, the numbers indicated the total for the period 2005-2021, thus newer networks may be very active, but their count is lower than those of networks established years ago, which have offered courses over a longer period. Furthermore, TNs have different focuses, some concentrate on providing education, and others research, events and publications. Therefore, the chart gives a highlight on those networks which have focused on graduate education and should be used as a list of TNs and UArctic Institutes with a specific focus on educational offerings.

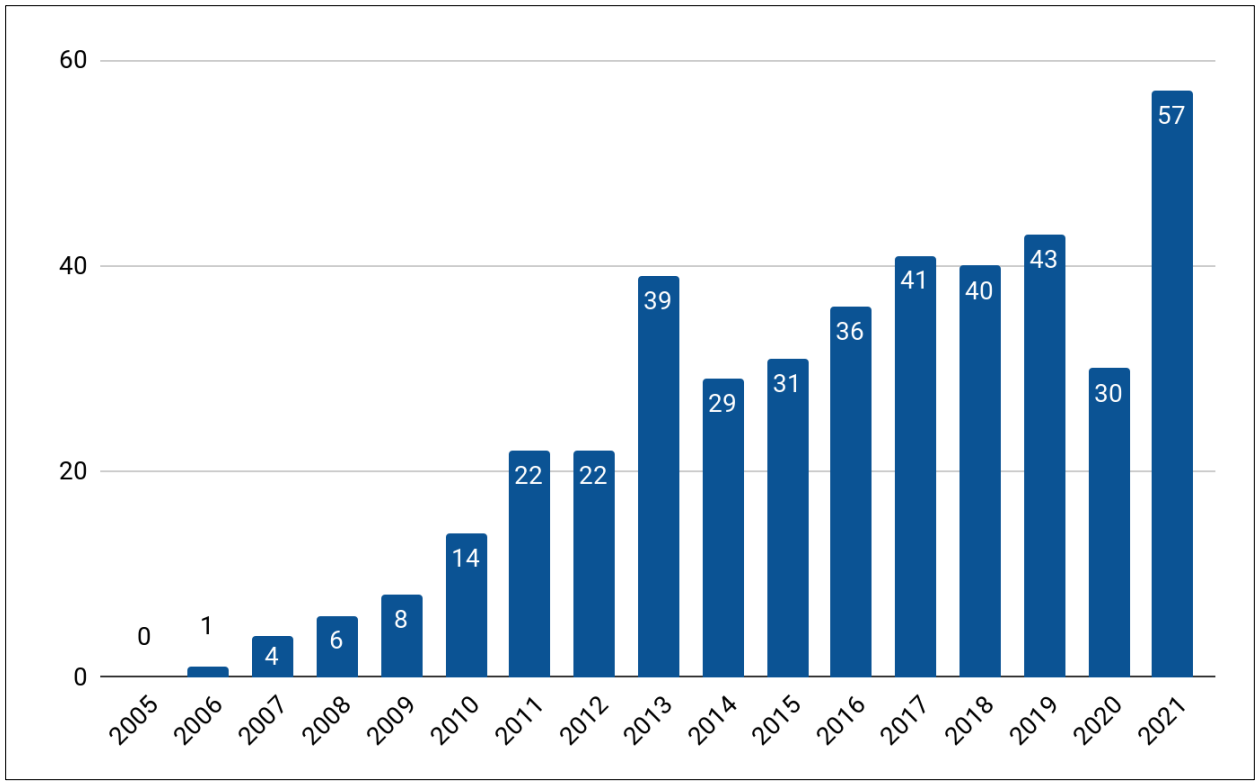

Figure 1. Number of total UArctic TNs courses and programs in the period 2005-2021.

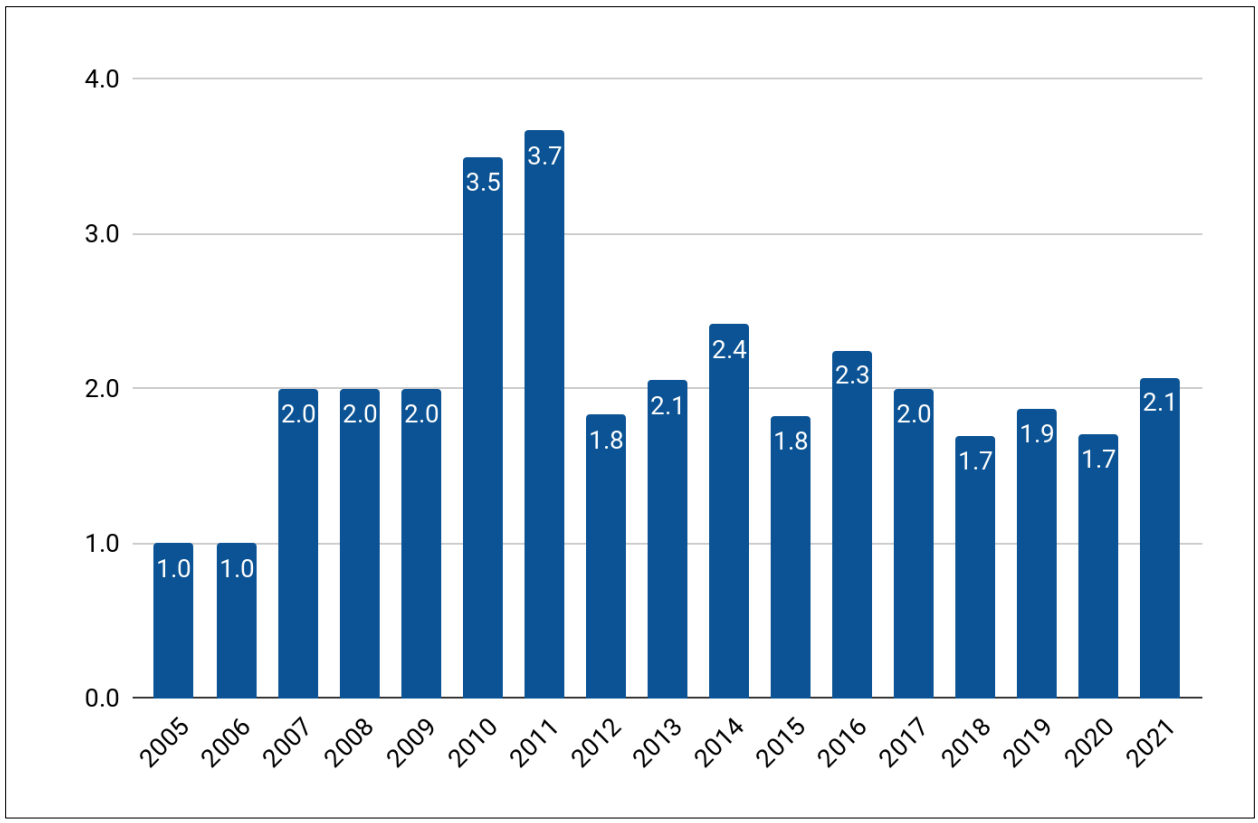

Figure 2. The ratio between annual number of graduate courses and Thematic Network 2005-2021.

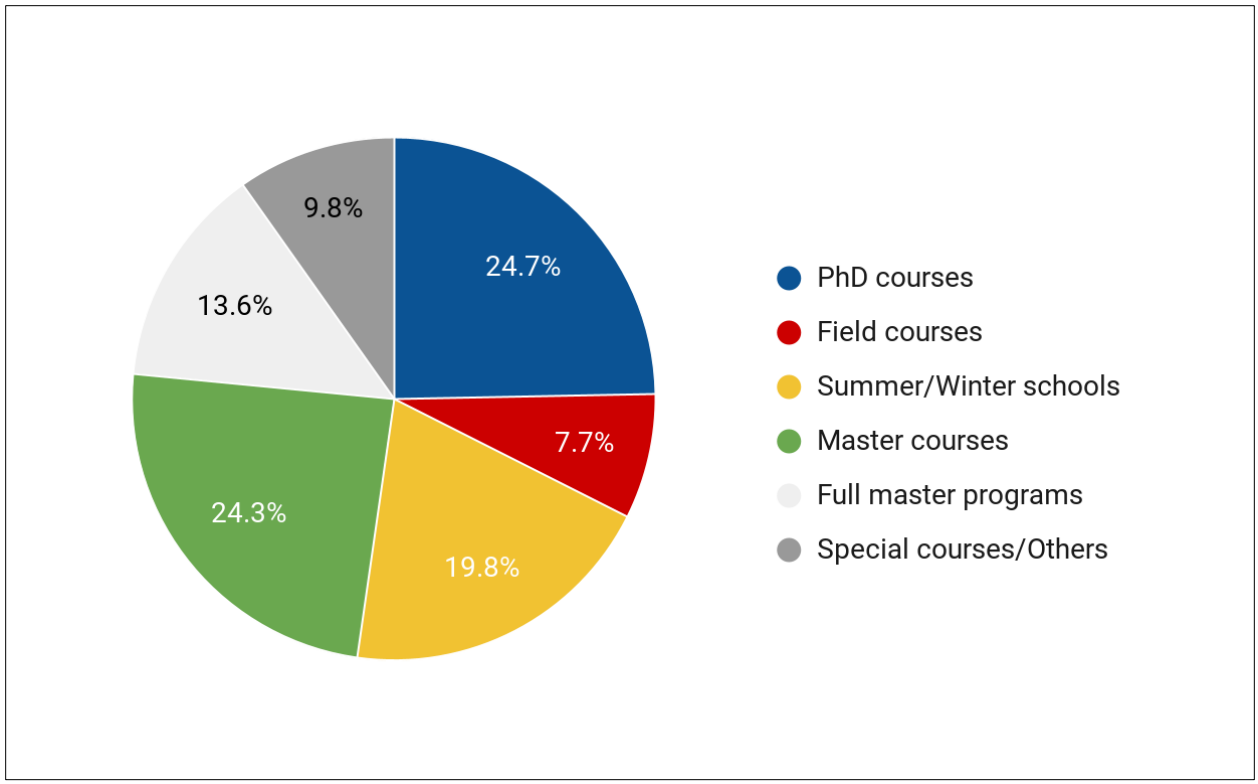

Figure 3. UArctic thematic networks graduate courses in the period 2055-2021 divided by type.

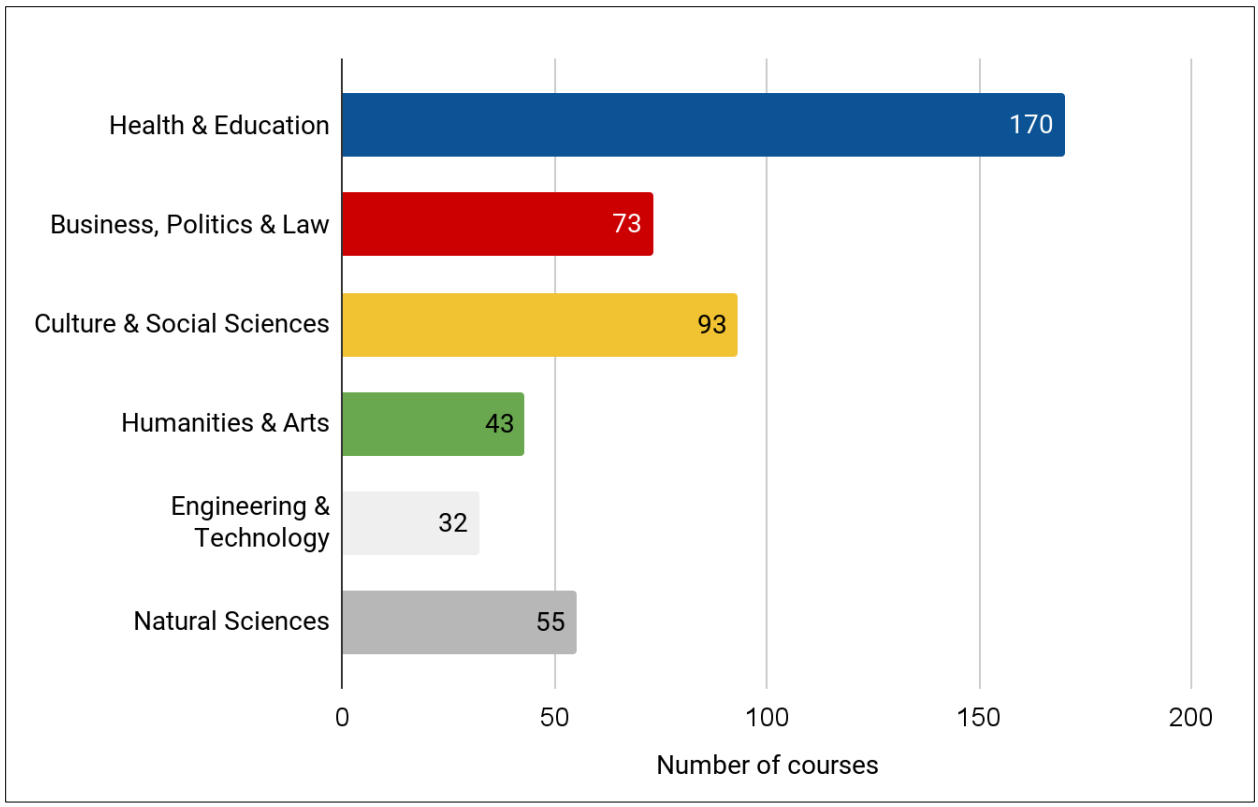

Figure 4. Number of courses divided by category of thematic networks 2005-2021.

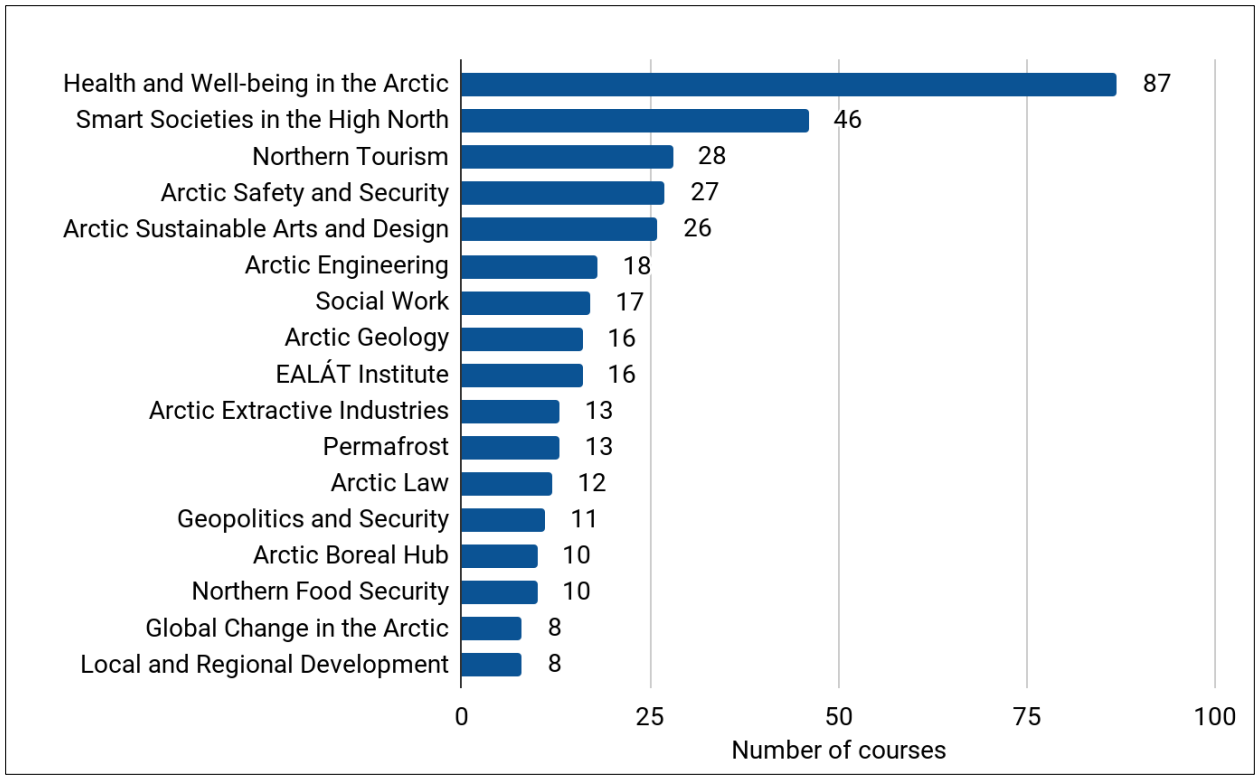

Figure 5. Number of courses per thematic network 2005-2021.

3.1 PhD and Master level courses

Looking more closely, Figure 6 shows the development of graduate courses and programs divided by type in the period 2005-2021. The two most numerous types were PhD and Master courses (short term courses). Until 2017, PhD courses outnumbered Masters' courses. Since 2018, the number of PhD courses has declined, with a jump in 2021. Meanwhile, Master's courses have steadily increased, except for a decline during Covid-19 pandemic in 2019-2020, surpassing the number of PhD courses since then.

Figure 7 displays the trend of graduate courses over time by. The wave-like trend, which is strongly evident in PhD courses but also present in Master courses and winter/summer schools, is likely to be linked to funding issues. Finally, full master programs have also grown in number since 2005, but they have stabilized in recent years and after a phase of gradual increase in the period 2008-2021, stayed at an average of around 6 master programs per year (Figure 8). In 2021, the following six UArctic TNs master programs were available: International Master's Program Arctic Art and Design, Nordic joint Master in Social Work and Welfare "NOSWEL", Master's program on Preparedness and Emergency Management, Master's of Northern Tourism (NOTO), UNE Master's Program in Ocean Food Systems, MGIMO and UNITAR Open Joint Master's Program. The latest two have been launched in 2021.

Appendix 1 lists all full master programs created by UArctic TNs in the period 2005-2021. The Master program of Northern Tourism actually builds up on a core of three master courses jointly developed by seven institutions of the TNs on Northern Tourism since 2016.

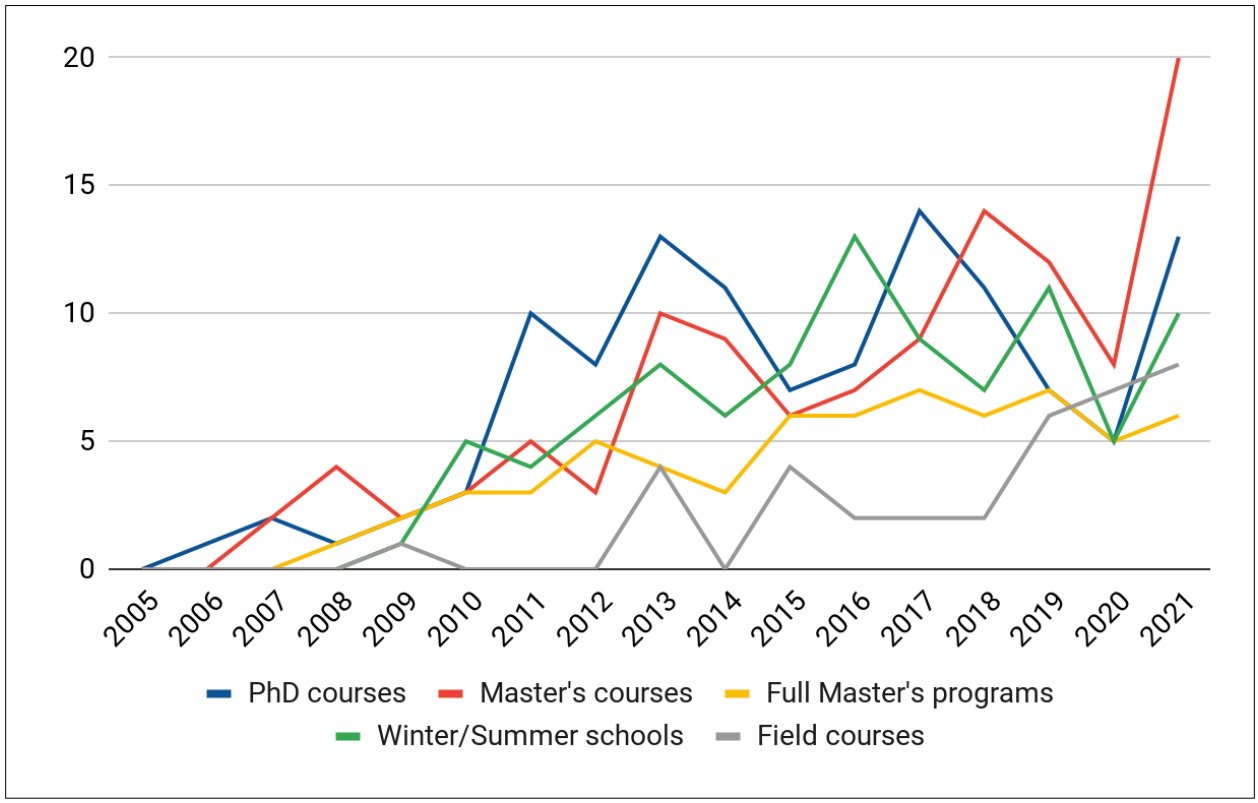

Figure 6. UArctic TNs graduate education by type 2005-2021.

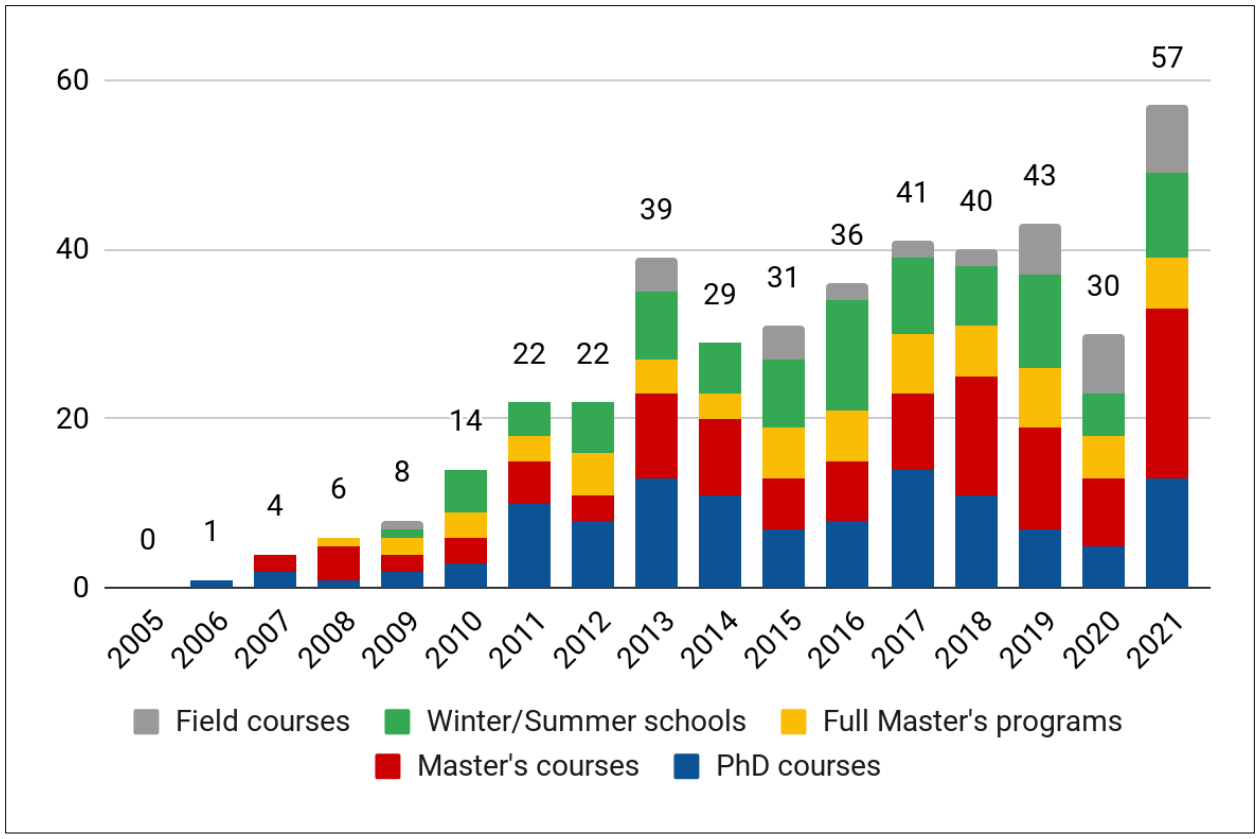

Figure 7. UArctic TNs graduate education by type 2005-2021.

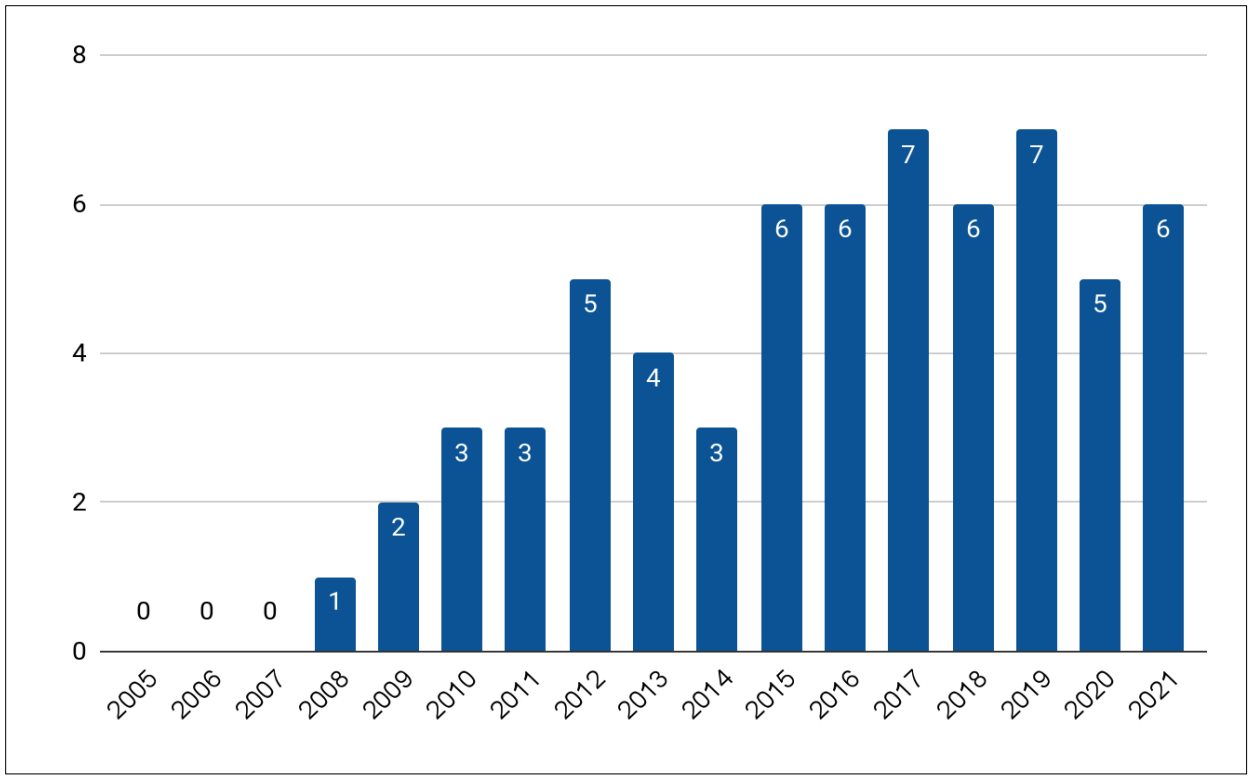

Figure 8. Number of full Master's programs in the period 2005-2021.

3.2 Special courses/programs

This report also covers a category of courses named “special courses/other” which include courses activities like those of the TN Model Arctic Council, which has regularly offered graduate students interested in international relations and the Arctic the opportunity to participate in a simulation of an Arctic Council meeting. The Model Arctic Council simulation was held back to back with either Arctic Council Ministerial or Senior Arctic Officials meeting in the Chairmanship country. The latest planned Model Arctic Council simulation during Russia’s Arctic Council Chairmanship period was put on hold due to Russia’s invasion of Ukraine. The activity, which culminates in a proper event that simulates the Arctic Council meeting, is preceded by a preparatory course. Another interesting example comes from the EALÁT Institute, which has organized the “Training Program: Training of Future Arctic Leaders”, a professional training course directed to a group of young Indigenous reindeer herders from across the circumpolar Arctic. In the period 2005-2021, UArctic TNs and UArctic Institutes offered 46 special courses.

3.3 Students

From 2005 to 2021, the total number of students enrolled in courses is estimated to be 10,733 during (Figure 9). The number is an estimation based on the average number of students calculated from existing data, which was then used as an estimate for students in those graduate courses and programs for which no data was available. The Covid-19 pandemic led to a drop in the number of students and the number of courses. However, in 2021, the trend returned to positive, with a noticeable boost in the number of students compared to 2019. The jump may be attributed to the ability of TNs and their members to adapt to digital education, therefore making use of online platforms for courses, workshops and seminars.

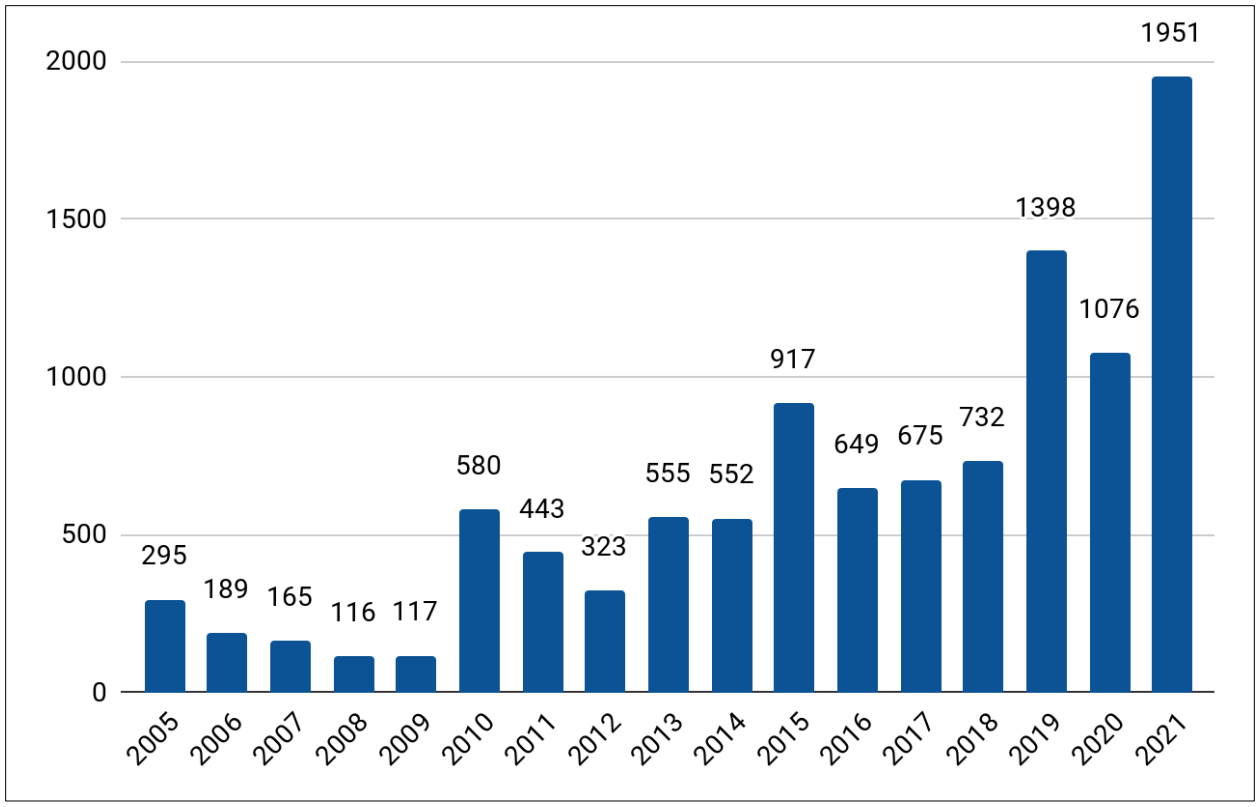

Figure 9. Estimated number of students per year in the period 2005-2021.

Students enrolled in UArctic TNs graduate courses during 2005-2021 came from 67 different nations (Figure 10). Due to missing data for some students' home organizations, the map is not exhaustive, but it represents the data which was available. Moreover, differences between the reporting by the networks should also be remembered. For example, Norway counts 1507 students, as one TN did several courses based in Norway and was able to report exact numbers. High numbers in some countries disrupted the map, as it was not possible to distinguish the difference from other countries. To correct this distortion, a maximum of 500 students was applied to represent the darkest shade in the map.

Nevertheless, the map is still insightful, as it provides a visualization of the spread of UArctic TNs graduate education, even outside the Arctic region. Furthermore, as we know these numbers are partial, real numbers are likely to be much higher.

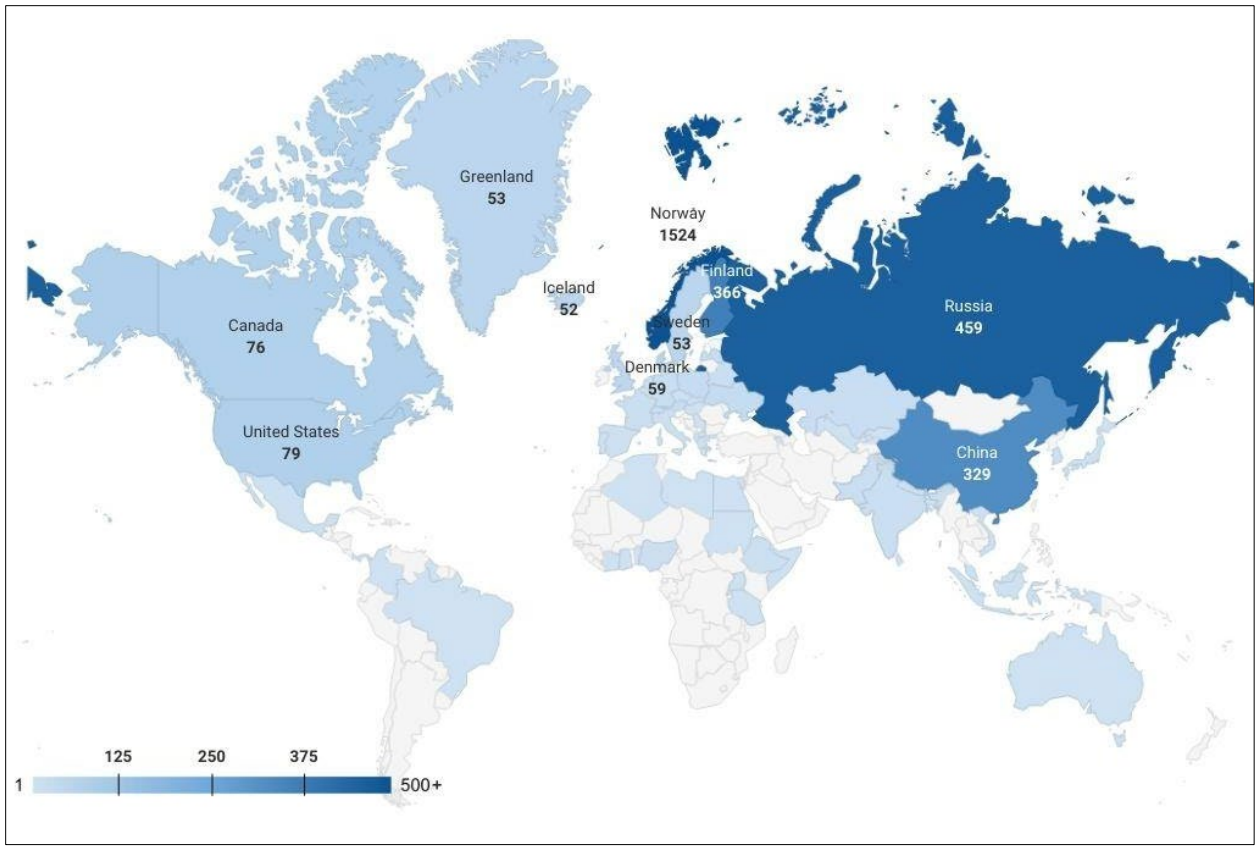

Figure 10. Geographical distribution of students, total numbers of the period 2015-2021.

Finally, regarding student enrollment, it is worth underlining that TNs apply different strategies in accepting students. Student enrolment is influenced by Thematic Network's decision in terms of openness of the courses only to students of the networks' members, to all UArctic members' students, or even to everyone without any discrimination.

3.4 Indigenous Knowledge and participation

Among the UArctic's six values, the respect and inclusion of the perspectives and knowledge of Northern Indigenous peoples are highlighted. Therefore, UArctic encourages the inclusion of Arctic Indigenous Peoples and their knowledge systems in TNs graduate education.

This analysis included an evaluation of the participation and inclusion of Arctic Indigenous Peoples and their perspectives by looking at the participation of Indigenous instructors and students. In addition, the subjects of the courses were analyzed where it was possible to do (e.g. topics on Indigenous Knowledge and practices, traditions, language, community development). We found that 30% of all UArctic TNs graduate courses included an Indigenous component. Importantly, the actual numbers are likely to be higher, as multidisciplinary and many general

courses and programs, such as “Arctic Studies” or “Northern Tourism” are likely to include Indigenous Knowledge content and/or Indigenous teachers. However, the courses/programs were counted only in the cases when it was possible to ensure that the Indigenous Knowledge or issues were in fact included in the curricula.

Among the courses with an Indigenous component, some examples are worth noticing. First, in 2018, the Thematic Network on Arctic Law started its first course on “The Inuit of the Arctic and subarctic”, within the Master’s program in Native American Studies at the University of Lethbridge in Alberta, Canada. The course accepted up to 40 students, but the number of students wanting to enroll in the course was way larger. The additional students were invited to attend the course, although they could not formally register. Secondly, the EALÁT Institute, which has since its birth a particular focus on Indigenous Peoples and practices, offered a professional training program called “Training of Future Arctic Indigenous Leaders”, during the years 2011-2013, directed to a group of young Indigenous reindeer herders from across the circumpolar Arctic. The institute again proposed a similar course in 2019, which was a winter school described as a “new Education Program for Arctic Indigenous Youth on Food Innovation and Business Development”. In addition, the EALÁT Institute has supported several PhD and Master students in their dissertations concerning Indigenous reindeer herders, and there are many more examples that could have been used as EALAT Institute has conducted extensive work in training Indigenous youth. Finally, another interesting example comes from the former TNs on Local and Regional Development, which developed a business school in Russian rural areas with a focus on protection and sustainable use of renewable natural resources, in 2012 and in 2017. Several Indigenous people attended the courses.

3.5 Impact assessment

Although figures regarding the number of students, the level of interdisciplinary and Arctic Indigenous participation may give some insights on the capacity and outcomes of the courses, a better understanding of the impact of UArctic Thematic Network graduate education may be deduced by analyzing the feedback and considerations of TNs Leads and former students. The results of the analysis of the survey directed to TN Leads, the interviews with two former students and the best practices shared by TN leads in joint TN leadership team meetings were put together to identify the strengths, weaknesses and opportunities of UArctic Thematic Network graduate education.

3.5.1 Survey results

We fielded an online survey in order to collect feedback from the TNs leads on the development of graduate education. The survey was composed of 15 questions, divided into three parts of five

questions each. The first section focused on the overall challenges and opportunities of the courses, the second one was centered on students, while the last one addressed the impact of the courses on Arctic Indigenous and local communities. The survey was open for a month and a half and netted 19 responses.

The survey highlighted that the development of UArctic TNs graduate education required a large amount of effort and encountered several difficulties. 74% of respondents admitted to having obstacles in the development phase. Furthermore, when evaluating how much these difficulties actually affected the development of the courses on a scale from 0 to 100, the average answer was around 61.

When looking at the causes behind the difficulties, the most common problem reported was the accreditation from educational institutions, followed by agreeing on the structure of the courses. In "Other" respondents specifically pointed out challenges in finding sufficient funding (Figure 11).

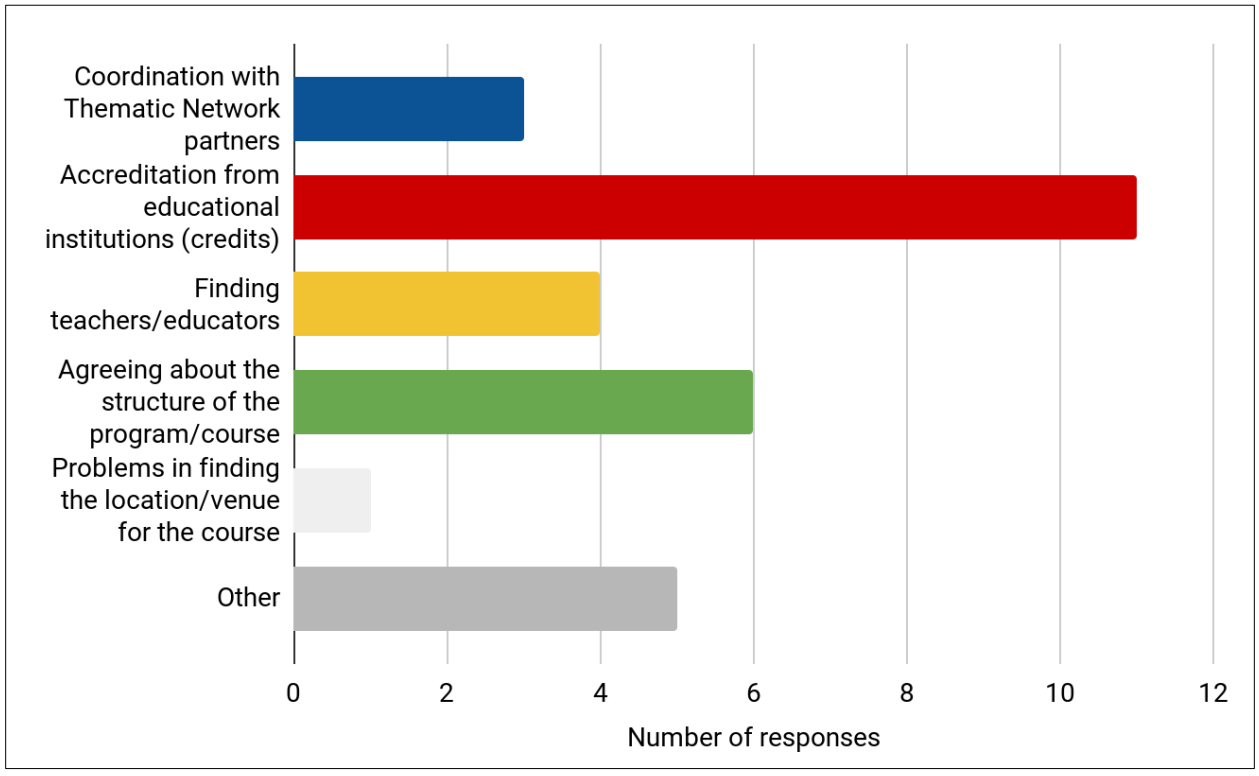

Figure 11. Most difficult issues identified in planning the joint graduate courses.

To overcome such challenges, TN Leads may have contacted the UArctic TNs or UArctic Academic Office for support. Two thirds of the respondents found the UArctic TNs and Academic Offices helpful. However, the rest were either somewhat unsatisfied or felt that they didn't get any support.

In order to find out how UArctic could support TN leads better, the survey asked what kind of help they would have needed from the UArctic TNs or Academic Office. The open answers have been analyzed through the codification process for qualitative analysis. Most of the respondents focused on coordination, underlining the need for a structured coordination, focused on administrative, academic and political obstacles, which could operate as a bridge across partners to solve formalities like registration or accreditation. One respondent highlighted that such difficulties were even more pronounced when working with non-Arctic universities, while one TN lead suggested that a better integration between individual universities' and UArctic's programmes would greatly benefit the performance of UArctic graduate education. In their own experience, more students were attracted by UArctic programmes when the courses were taught as teaching blocks in attractive locations externally.

Impact to students

The second section of the online survey aimed to highlight the impact of UArctic TNs graduate education on students. As an opening and confirmatory question, 94% of respondents agreed that the courses have had a positive impact on the students. Looking at the ways students have benefited from the courses, it is noticeable that several respondents focused on the opportunity for debate and disagreement among students with different theoretical backgrounds and approaches, thus highlighting that courses that were coordinated by different universities acted as a stimulus for new interpretations and integration of different perspectives. Secondly, respondents reported that students gained expertise in particular in Arctic-related knowledge, also mentioning Indigenous Peoples and Knowledge. Lastly, participating in courses provided students with an important opportunity to experience an international environment and to expand students' own networks.

Overall, it is clear that UArctic TN graduate education was especially valuable as a connector between universities from different countries, thus being a bridge between different scientific approaches and cultures, beyond providing Arctic-focused teaching.

When asked whether the courses had a positive impact on students' career development in addition to the academic and social benefits, almost half the respondents could not give a clear answer. Only 50% of respondents were sure that courses had benefited the career of their former

students. Furthermore, to estimate the strongest points of the UArctic Thematic graduate education for students, the survey asked to choose the best features of the courses in terms of benefit to students. Figure 12 shows that networking, both among students and with researchers and instructors, and gaining expertise in Arctic-related topics were the strongest advantages of UArctic TNs graduate courses. In addition, respondents mentioned other strong points, such as:

- Field trips including evaluation and learning workshops organized in rural communities,
- Experiencing the Arctic context as it is (climate, infrastructure, communication, etc.),
- Sharing of practice-based experiences,
- Meeting with industry and community.

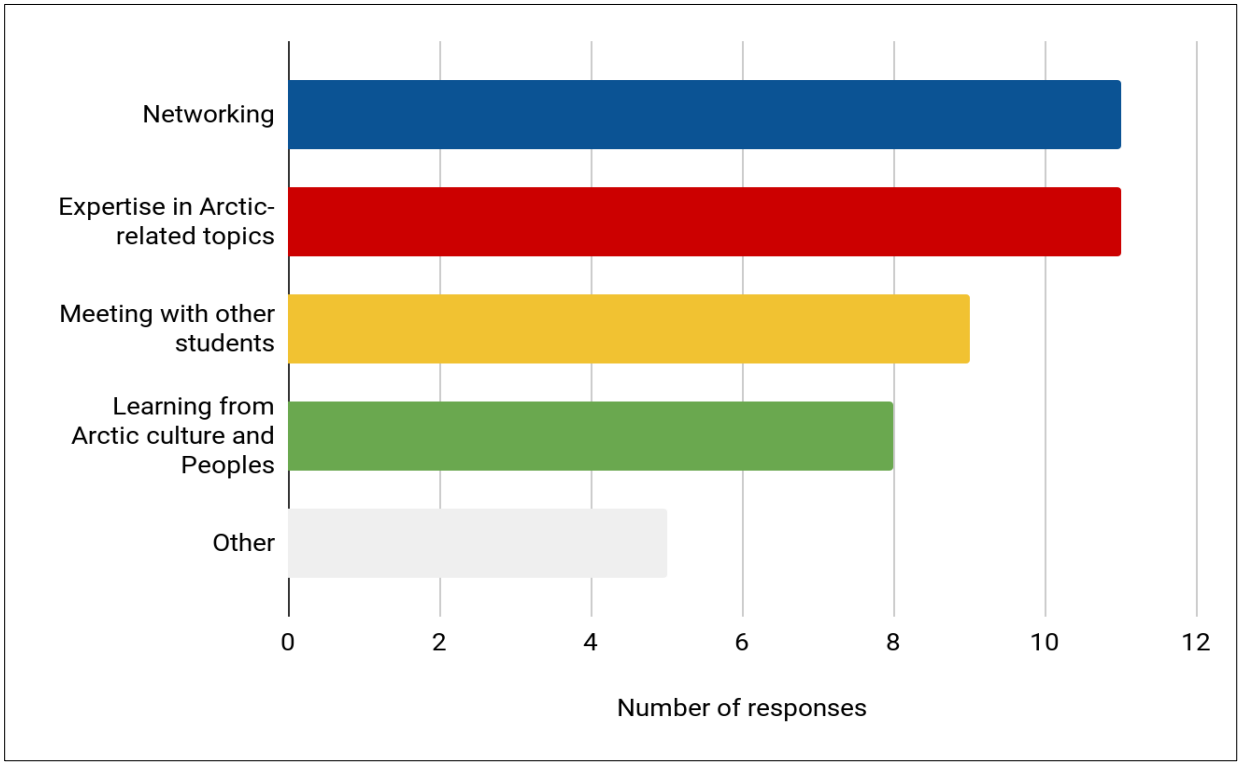

Figure 12. The features of the courses that benefited students the most.

Impact to local and Indigenous communities

The survey was also intended to find out if TN graduate education has had any impact on Arctic local and Indigenous communities and, if so, in what way. Respondents were not as certain as they were for students in saying that courses have had an impact on them; however, half of the respondents answered that courses have affected Arctic local or Indigenous communities, 13%

of them felt their courses did not impact the communities, while the remaining 38% said that it was difficult to state yes or no.

In terms of the ways in which UArctic TN graduate education have impacted Arctic local and Indigenous communities, respondents in particular pointed out that courses promoted the understanding of the Arctic, in the sense of "think Arctic-related", allowing students to get in touch with the perceptions and struggles of the Indigenous communities in the North. Also, courses promoted the protection of Arctic Indigenous Peoples' rights and allowed communities to better communicate their needs and demands to the outside world. Moreover, considering that some of the students are native to these communities, they could bring back the knowledge acquired at UArctic into their own communities. Finally, courses also included participatory methods. In addition, workshops and on-site courses were seen as an effective way to revitalize the Indigenous cultures, while in other cases students helped communities in practical work, and in offering assistance. Field courses also provide Arctic communities with some financial and economic benefits from hosting students and educators.

Respondents were asked share examples, if they had them, of the impact of courses to the communities. Respondents listed field visits and business schools. In particular, it is worth highlighting the business school established by the UArctic Thematic Network on Local and Regional Development in the municipality of Oktjemsty in Yakutia (2009-17) and the various development workshops in the Izhma and Kortkeros region of the Komi Republic (2011-16) and in the Gamvik municipality in Northern Norway. Out of a total of 87 local and regional development workshops, 16 were organized in Indigenous communities of northern Norway and Russia. Respondents also gave examples of local stakeholders collaborating together as a consequence of UArctic TN courses, or the collaboration that the Thematic Network itself has established with local communities. Finally, former students were also included, as some of them have then worked for institutes in Arctic countries that do research and assistance to the communities.

The last question was an invitation to provide additional comments that TN leads might like to share. One respondent suggested that UArctic graduate education would benefit from an educational model that integrates more theory- and praxis-based knowledge and competence, while another respondent underlined that it would be extremely beneficial to have a group or person to help with the formalities when developing and establishing a new course/program. One last comment instead focused on the importance of UArctic graduate education: "students have great ideas, communities and industry have concerns; academics are the bridge".

3.5.2 Discussions with former UArctic students

To achieve a deeper understanding of the impact of UArctic TNs graduate courses to students, two interviews were conducted with former students who had a different background and educational history. The first interviewee was an employee at the Government of Greenland and therefore, she could present the view of a worker. She took part in the UArctic Thematic Network on Collaborative Resource Management-organized special course for community workers, representing the Arctic Indigenous community. The second interviewee was the first student who graduated from UArctic, both from the first master's and the first PhD program developed by the UArctic Thematic Network on Health and Well-being in the Arctic.

Questions focused on their experience with UArctic graduate education, the strengths and weaknesses of the programs they attended, what benefited them the most, and the impact on their future careers. The first respondent stated that she gained benefits from the course as it impacted her work at the Government of Greenland. She pointed out that the course provided her **tools for working with Indigenous Peoples Rights and Indigenous knowledge and that the course had a positive impact on her job in terms of experience in completing tasks**.

The second interviewee provided many insights on her experience as an UArctic graduate student and listed several positive and negative aspects of the courses she attended. She was the first graduate of the 120 ECTS (2-year) MA program "Health and Wellbeing in the Circumpolar Area (MCH)" developed under the TN on Health and Well-being in the Arctic and was awarded a Master of Health Sciences degree in 2010. Later in 2015, she was the first graduate of the UArctic doctoral program and received a PhD in Arctic Health (University of Oulu, Finland).

Regarding her experience during the master program, she was particularly amazed by the geographical composition of the group of students: there were 10 students all together coming from Russia, UK, Australia, Canada and the United States. Moreover, she was impressed by the coordination. She found that the administrative coordinators were very helpful in solving bureaucratic issues and also that they supported students in making choices and they tried to alleviate stress, while the scientific coordinator was very inspiring and strongly motivated her to complete the program.

According to her experience, the best features of the UArctic graduate programs she attended were the flexibility of the curricula, the possibility to add and integrate other courses to the program through funding instruments to get credit from other universities, summer schools, networking, and the overall environment highly driving the forward and critical thinking. However, in her opinion, the group of students was a bit too diverse in terms of experience and of English language proficiency. She suggested that the difference in the level of experience among students may have been one of the reasons some students have dropped out of the

master program, as it was not meeting their expectations. Furthermore, the time zone difference was particularly challenging, and the time schedule of courses was hard to follow as it was arranged according to the work, family and study commitments of the students.

With regards to career development, the UArctic graduate programs gave her the advantage to continue her job based on such education. As she had gained specific expertise on Arctic Health at UArctic, she had the priority over the rest of well-educated candidates in the position she is now occupying.

Moving to the impact that the courses have on students, the features of UArctic graduate programs that she considers as most impacting the student are the possibility to get study credits from other universities so as to enrich your study path as you wish, the networking opportunities and the motivation of like-minded students.

Finally, as she comes from an Arctic country (Russian Federation), the last question was directed to the impact of courses to the Arctic communities. She evaluated **the courses as extremely beneficial to raise the human capital in regions through various training programs, which in turn affects several issues, from demographic to economic to various societal developments of the Arctic.**

4.0 SWOT analysis

The SWOT analysis reported in Table 1 combines all the points raised by the leads of TNs and students either through interviews, the survey and other information exchange received during this project.

Table 2. SWOT Analysis diagram.

Strengths	Weaknesses
● Resilience: quick adaptation to changing environment (Covid-19) and adoption of online teaching methods ● Confrontation among students with different theoretical backgrounds and approaches ● Arctic-focused knowledge ● International environment, geographical diversity within the group of students ● Networking ● Flexibility of the curriculum, possibility to get credits from other universities ● Promote understanding of the Arctic and protection of Indigenous People Rights ● Raise human capital in Arctic communities, also brings social and economic benefits (field schools may include practical assistance to communities and economic gains) ● UArctic coordination support to students ● Summer schools ● Stimulant environment, critical thinking	● Communication between TNs and UArctic Office 1. Substantial underreporting from TNs 2. Insufficient support from UArctic office on bureaucratic issues ● Missing guidelines on what is UArctic activity, TN Leads define their UArctic activity according to standards they set by themselves ● Unstable funding ● Bureaucratic issues among partners in the creation of joint courses: accreditation, registration ● Too diverse academic background among students ● Time zone difference ● Challenging to follow the schedule, not fixed
Opportunities	**Threats**
● Establish a network of UArctic Alumni ● Promotion of field courses based in other partners' countries, attractive to students ● Strengthen and restructure the administrative coordination and support at UArctic level ● Establish fixed methods to design your own program by mixing and adding courses from other universities ● Promote the creation of international joint courses among UArctic members to attract more internationals, structuring a service that helps the development of such courses	● Unstable funding does not guarantee the regular development of the courses ● If UArctic TN Office is not sufficiently updated, it could lead to productivity loss (e.g. activities of TNs are not promoted in the website, the office cannot operate to solve issues if it is not informed) ● Reporting is incorrect as TN leads do not report activities in a systematic nor specific way ● Projects to create courses may not be concretized due to bureaucratic issues ● Too large eligibility criteria, not meeting expectations, drop out of the program ● Lack of fixed structure, complex to find time zone matches among students, risk of resulting dispersive ● Big variety in educational systems and legal aspects among UArctic members' higher educational institutions

5.0 Discussion and conclusions

This project analyzed the overall trend of UArctic TNs graduate education, highlighting its main features and underlining its strengths and weaknesses.

The quantitative analysis revealed an overall gradual increase of all types of graduate courses endorsed by UArctic TNs during the period 2005-2021, reaching the total amount of 423, plus 46 special courses. The number of students shows an analogous positive trend, growing from 295 in 2005 to 1951 in 2021, and recording a total amount of 10 733. When looking at the ratio between the number of courses and the number of TNs annually, the result is quite stable over all the period, around 2, except for a peak in 2010-2011. This shows that the increase in the number of courses is due to the growth in new TNs.

Despite the general positive trend throughout the period, all courses present a wave-like tendency. The irregular development of courses may be caused by unstable funding schemes, which affected the possibility to deliver courses.

Furthermore, the figures show that the pandemic considerably affected the development of graduate education in 2020, causing a drop in the number of courses delivered. However, the TNs and UArctic Institutes demonstrated a great ability of resilience, as the number of courses in 2021 not only recovered to the pre-pandemic levels, but also outnumbered the amount of 2019. Thus, it is evident that the networks adapted to the changing environment (Covid-19) by adopting and experimenting with new online teaching methods.

Finally, the data collection process has unveiled a systematic issue regarding reporting of TNs activities. First, it highlighted a substantial underreporting by TNs. Secondly, it appears that TNs leads do not follow the guidelines for identifying what should be referred to as the Thematic Network's activity. For instance, are activities undertaken by an individual member of the Thematic Network alone considered a Thematic Network's activity or not? In general, the findings highlight the need to find a more efficient and systematic way to report the activities of TNs, including graduate education.

The results of the qualitative analysis given by the codification of survey results, interviews and past experiences were elaborated into a SWOT analysis, which schematized the strong points and the weaknesses of UArctic TNs and unfold the opportunities for improvement and the possible threats of not addressing the flaws.

The survey highlighted difficulties in developing joint graduate education programs. The strongest challenges encountered by the members were the bureaucratic and administrative issues, first of all the accreditation requirements from the members' institutions. TNs leads also expressed a desire for stronger assistance from UArctic to address such issues. With regards to

the support of the UArctic Academic and TNs Offices, insufficient reporting may cause productivity loss, in terms of both promotion of such activities but most importantly in terms of assistance. Furthermore, the complexity of having different administrative regulations not only among countries but also between institutions makes it difficult for the UArctic offices to deal with such formalities. Therefore, the report highlights the profitability of addressing the issue of accreditation among different institutions through a focused project.

In terms of benefits for students from the courses, the following issues were raised: 1. Networking, both among students and with teachers; 2. Disagreements and debates among students with different theoretical backgrounds and approaches, thus highlighting that courses coordinated by different universities are a stimulus to new interpretations and integration of different perspectives, 3. Gaining Arctic-related knowledge, 4. Experiencing an international environment.

Overall, it is clear that UArctic TNs graduate education has been and is especially valuable as a connector between universities from different countries, thus being a bridge between different scientific approaches and cultures, beyond providing Arctic-focused teaching.

In addition, courses bring also advantages to local and Indigenous communities in many ways: they raise the human capital within the communities and they bring economic benefits thanks to field trips, and in some cases also practical assistance.

Therefore, to further take advantage of the strengths of UArctic TNs graduate education, it would be profitable to establish a network of UArctic alumni, while continuing to promote the creation of international joint courses among UArctic members and the development of field courses in external locations, which are attractive to students.

To conclude, UArctic TNs have grown impressively and improved in the period from 2005 to2021, demonstrating the efforts and enthusiasm of TNs' members in promoting education and research in and about the Arctic region. These courses have benefited both students and Arctic Indigenous communities, and enhanced the knowledge about and understanding of the Arctic both within and outside the Circumpolar region. To make this possible, TNs have overcome several challenges, in particular those due to bureaucracy and funding needs. The report highlights such issues with the purpose to improve and solve those obstacles that hinder the development of UArctic joint graduate education. Among the issues raised, it is worth highlighting the insufficient or incorrect reporting. These findings should serve as an initial instrument around which to start a discussion about new and better ways to systematically collect information on UArctic TNs graduate education.

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Appendix 1

Table 1. List of full master programs developed by UArctic TNs in the period 2005-2021 (those being enrolled in 2021 are highlighted in blue)

Year	Title	Thematic Network	Theme	Online/ On site/ Hybrid	Location	Duration, Credits (ECTS)	Institutions	Comment
2008-2016	Master in Sustainable Energy Management	Smart Societies in the High North (SmartNorth) - Energy in a New Time	Engineering & Technology				University of Nordland	
2009-2014	Master's program in Health and Well-being in Circumpolar Area	Health and Well-being in the Arctic	Health & Education			2 years, 120	University of Lapland, Luleå University of Technology, Northern State Medical University, NARFU, University of Manitoba, University of Southern Denmark, Denmark Center for Health Education	
2010	Joint Master's program in Northern Governance and Development	Local and Regional Development	Culture & Social Sciences			40		Joint master program by TN on Local and Regional Development and TN on Northern Governance
2011-2014	Joint Master's program of Social Work with a Comparative Perspective	Social Work	Culture & Social Sciences		Norway	2 years, 120		Organized around three topics: 1. Social issues, 2. Aboriginal peoples, welfare/ well-being/ social policies, 3. Social politics.
2012, 2015	Master's Program in International and Comparative Law - The MICLaw Master Programme	Arctic Law	Business, Politics & Law			2 years, 120		Specializations in Arctic Law and Governance

2012	International Master's Program in Rural Development (formerly titled Northern Governance and Development)	Local and Regional Development	Culture & Social Sciences			2 years, 120	Department of Atlantic Canada Studies at Saint Mary's University in Halifax	
2012-2018	Master's Program in Tourism in Northern Dimension	Northern Tourism	Culture & Social Sciences				Higher School of Economics and Management, Government of the Arkhangelsk region, University of Lapland (2018)	The program will have courses from each partner university, however students must register to their home universities. Includes a 30-credit joint component of online and field studies organized in collaboration by Cape Breton University, UiT The Arctic University of Norway, Umeå University, University of Iceland, the University of Lapland, the University of Oulu and Vancouver Island University.
2013	National version of Master's Program on Rural Development by NEFU/Yakutsk	Local and Regional Development	Culture & Social Sciences		Russia	2 years, 120	North Eastern Federal University	Taught in Russian
2015-2021	International Master's Program Arctic Art and Design	Arctic Sustainable Arts and Design (ASAD)	Humanities & Arts		Finland		University of Lapland	Web Page

2015-2017	Master's program of Health and Wellbeing in the Arctic (curriculum updated)	Health and Well-being in the Arctic	Health & Education			2 years, 120	University of Oulu, University of Lapland, Luleå University of Technology, Northern State Medical University, NARFU, University of Manitoba, University of Southern Denmark, Denmark Center for Health Education	
2015	Joint Master's Program in Tourism, Cultural Heritage and Environment	World Images of Indigenous Peoples of the North	Culture & Social Sciences				Double diploma with the university of Versailles Saint-Quentin-en-Yvelines, France	
2016	Master's Program in Permafrost	Permafrost	Natural Sciences				University of Alaska Fairbanks, The University Centre in Svalbard (UNIS), University of Copenhagen	
2017	Master's Program in Translation	Arctic Lingua	Humanities & Arts					
2017	Master's program in "West Nordic Studies, Governance and Sustainable Management"	Ocean Food Systems	Culture & Social Sciences				Ilisimatusarfik / University of Greenland, Nord University, University of Akureyri, University of Iceland, University of the Faroe Islands	
2017	Master's program in Energy Management	Smart Societies in the High North (SmartNorth)	Business, Politics & Law		Russia		Business School MGIMO University	
2017-2021	Nordic joint Master in Social Work and Welfare "NOSWEL"	Social Work	Culture & Social Sciences			2 years, 120	Aalborg University, Umeå University, University of Stavanger	The student will spend one semester at each university. Web Page
2018-2019	Finnish-Japanese Arctic Studies Master's Program	Arctic Law	Business, Politics & Law			2 years	University of Helsinki. University of Oulu, Hokkaido University	

2018-2021	Master's program on Preparedness and Emergency Management	Arctic Safety and Security	Business Politics & Law	Hybrid	Norway	3 years part-time, 90 each year	Nord University	Web Page
2018	Master's Program on Risk management and societal safety	Arctic Safety and Security	Health & Education	On site	Norway	2 years, 120	University of Stavanger	
2019	Master's Program in Engineering	Arctic Engineering	Engineering & Technology	Online	Online	2 years	University of Alaska Anchorage	
2019	Joint Master's Program on National security	Arctic Safety and Security	Health & Education					
2019-2021	Masters of Northern Tourism (NOTO)	Northern Tourism	Culture & Social Sciences		Finland		Cape Breton University, UiT – the Arctic University of Norway, Umeå University, University of Iceland, University of Lapland, University of Oulu, Vancouver Island University	Builds on the 3-course program developed by network partners. Web Page
2021	UNE Master's Program in Ocean Food Systems	Ocean Food Systems	Natural Sciences	Hybrid	US, Iceland	1 year, 60 ECTS and 36 Cus	UNE, Holar University, University of Akureyri	Active collaboration with the MAR-BIO graduate degree partnering the University of Gothenburg Sweden, Holar University Iceland, Nord University Web Page
2021	MGIMO and UNITAR Open Joint Master's Program	Science Diplomacy	Culture & Social Sciences	Hybrid	Plural locations			Web Page