Arctic education in the field of polar research

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Abstract: In the modern world, the Arctic is one of the most actively developing regions of the world. Interest in this area appeared in the XVI century and has not faded to this day. Currently, the Arctic has become a subject of interest for specialists in various fields: history, tourism, Economics, Geology, ecology, international relations and political science. In addition, the Arctic is a place of cooperation between many countries, especially in the field of education and science, because without them it is impossible to imagine the development of any region. The article illustrates and analyzes the current state of education in the Arctic. The presented diagram of the member universities of the University of Artic allows us to draw a conclusion about the leadership of Russia in the number of Universities where training in the field of polar research is taking place. The author lists the main international exchange programs, their description and conditions, Russian Universities with characteristics of the main areas of training and scientific achievements in various fields. The article presents a list of scientific events on the Arctic theme, upcoming in 2020, indicating the place and time of the event. In conclusion, the author makes a conclusion not only about the advantages of Arctic education, but also about specific problems.

1. Introduction

The Arctic has become of particular interest to experts in various areas: history, tourism, economics, geology, ecology, international relations and political science. The issues of the Arctic region prospects and its development problems are currently being discussed. People who live in the Arctic can afford and long to obtain a higher education due to high rates of economic growth in their countries. Besides traditional professions (for example, economists and lawyers), students are trained to become specialists in polar studies in most part of higher education institutes in the Arctic region.

The Arctic higher education issues are vitally important. Unfortunately, there are no any works related to this problem, the only information that is available is about universities, its activities, statistics and plans for the future without any data analysis. As for the question of human capital, it is often raised at conferences, for instance, within the framework of the one called “The Arctic: the past and the present”. Basically, issues mainly touched upon are related to population policy and key figures, as well as population resettlement in the Arctic zone of the Russian Federation [1], [2]. Moreover, many investigators suggest that human capital, work and education are interrelated; they also mention the necessity of overcoming the problem of severe climate to develop human capital [3], [4], [5], [6]. Also, special attention is paid to the Northern Sea route: the authors discuss the possibility of the Northern sea route becoming international [7]. Researchers describe the role of the Russian Federation in the management of the Northern sea route and the state's policy on this issue [8].
2. Main part
The Arctic region is known to have been separated into five areas of responsibility represented by Russia, the United States, Norway, Canada and Denmark. However, there are no sharp boundaries between them. Furthermore, environmental issues and problems of the Arctic area development are considered by the Arctic Council. It consists of Denmark, Iceland, Canada, Norway, Russia, the United States, Finland and Sweden [9]. Certain Arctic higher education institutes provide labour market with highly qualified personnel in order to achieve sustainable development.

The concepts of education and “human capital” are inextricably linked, as it is impossible to develop the Arctic region without conducting studies and research into the area and only people can deal with it. Therefore, there is one more question: can robots replace human beings? The reason for asking is quite clear - there are certain factors that prevent human capital development in the Arctic region. They are the following: severe climate conditions, low wages, low life expectancy, negative social and psychological factors.

The authors of the article would like to conclude that robots cannot replace people under given conditions. They can be used as auxiliary components of the research process. That is actually observed nowadays. There are several reasons for this opinion. Firstly, we should not forget about the contact and when considering the issue of robot implementation, it is missing. Secondly, it is difficult to talk about high-level artificial intelligence, Internet of things, and other technologies that would make it possible to substitute for human capital.

The same conclusion can be made in terms of education. Although there are some obstacles (harsh climate, lack of skilled professionals, experience and work placement; and what is more, training programmes fail to conform to current requirements), it should be noted that online courses and distance learning will have a negative impact on personnel training in general and on human capital in particular.

The University of the Arctic (UArctic) is an international network, consisting of universities, colleges, and other research and development centres, and organizations (about 180) with an interest in promoting research and education in the Arctic region. UArctic activities are regulated within the framework of Strategic Plan 2020. Its main objectives and targets are providing access to education, conducting polar studies, extending knowledge of the North, establishing successful partnerships [10].

![Figure 1. Higher education institutes of UArctic](image_url)

This circular diagram can show that Russia has the largest number of institutes included in UArctic. Consequently, Russian higher education institutes provide the widest range of training courses.

Within the framework of this international educational project, there are several cooperation programmes for the Arctic educational institutions. The Bachelor of Circumpolar Studies is one of the most popular ones. It gives students from the Arctic region the opportunity to join UArctic. For instance, in Russia, NArFU (Northern (Arctic) Federal University) participates actively in this academic mobility
programme, allowing students to learn distantly major contemporary issues related to the region, peoples and cultures, history and political science of the Nordic countries, as well as natural resources of the Arctic [11].

Moreover, there is also the north2north student exchange program that provides opportunities for students to live in another region for 3-12 months. Universities and colleges throughout Canada (12 institutes), Denmark (8 universities), the Faroe Islands (1 university), Finland (12 higher education institutes), Greenland (3 universities), Iceland (3 universities), Norway (7 higher education institutes), Russia (26 universities), Sweden (4 universities), and the United States (5 universities and 1 college) participate in the north2north program. While taking part in the north2north, students can do both things – complete a course and carry out their own research projects. NorthTREX related to the programme is aimed at professors who are longing to improve their knowledge of polar studies [12].

A Field School is a short-term academic program consisting of several theme-based courses for young researchers. The programme mainly focuses on geography, geology, archaeology and ecology [13].

The Northern Research Forum is an international platform for an effective dialogue and discussions about all the issues concerning the arctic region: economics, political science, geology, and ecology. “The Arctic Yearbook” is the outcome of the work conducted by the Northern Research Forum [14].

There are two main universities in the Russian regions of the Arctic. Specialists in polar studies are trained there. They are Murmansk State Technical University or MSTU (water resources and ecology of the Arctic region are the major issues), and Northern (Arctic) Federal University named after M.V. Lomonosov (ecology, regional studies and international relations of the Arctic are the main fields of study). We should also mention that besides bachelor and master degree programmes, there is one more educational project called “The Arctic floating university”. It is supported by the Northern (Arctic) Federal University in cooperation with Rosgidromet (the Russian meteorological service) and the Russian Geographical society.

Here is a list of some more Russian higher education institutes in which students are taught to become highly qualified experts in the Arctic region research:

- Moscow State Institute of International Relations (MGIMO) – “Management” – “International business in the oil and gas sectors and development of Arctic resources”;
- Saint Petersburg State University (SPbU) – “Ecology and nature management” – “Comprehensive study of the polar regions environment”, “Geoeconological monitoring and rational use of natural resources”;
- The Ammosov North-Eastern Federal University (NEFU), (Yakutsk) – “Political science and regional studies” – “Regional studies of the Arctic”;
- National Research Tomsk State University (TSU), (Tomsk) – “Ecology and nature management” – “Siberian and Arctic Studies” [15];
- Russian State Hydrometeorological University (RSHU), (Saint-Petersburg) – “Polar meteorology and climatology”, “Integrated coastal zone management in the Arctic regions” [16];
- Saint Petersburg Mining University – “Offshore oil and gas well drilling”, “Developing and exploitation of offshore hydrocarbon deposits” [16];
- St. Petersburg State Marine Technical University – “Material engineering and application technology of materials in the Arctic” [16].

Thus, we have concluded that Russian researchers are becoming more and more interested in polar studies, including those who are from non-Arctic countries as well. Factors facilitating the significant progress achieved by Russian universities in the area of polar studies are climatology development and advanced resources of the Arctic climate data analysis (e.g. SATIN), development of field installations strategy map and assessment criteria of Western Arctic Shelf deposits projects, laser stations installation for industrial enterprises [16].

Besides that, an annual forum called “Arctic: Territory of Dialogue” has been taking place in Russia since 2010. Before 2018, it was held at different venues, including Northern (Arctic) Federal University,
in Arkhangelsk. All the events within the framework of the forum have been arranging in Saint Petersburg since 2019. Discussions mainly focus on the issues of economics and ecology, problems of sustainable development and safety [17]. “Personnel training for the Arctic region development” was one of the forum sessions organized to study and analyze questions of education. After considering the results of debates at the session, basic solutions to the current problems were suggested. Moreover, 45 agreements were signed following the results of the session. Several of them were education-related:

- The agreement on providing favorable conditions for training personnel aimed at working for ship building and ship repairing enterprises, for conducting joint scientific and technological research, for setting up and launching co-projects on the basis of mutual interest (Sakha Republic (Yakutia), “The Middle Neva Shipbuilding Plant” and “Zhatajskaya shipyard”);
- The agreement on creating a Russian-Chinese Arctic research and development centre in order to study the Arctic region and to preserve its natural diversity (P.P. Shirshov Institute for Oceanology, RAS (The Russian Academy of Sciences) and Qingdao National Laboratory for Marine Science and Technology (China);
- The Russian Geographical society and the Arctic Society of Finland negotiated an agreement on cooperation in scientific and cultural areas to investigate the Arctic region [18].

The issue of studying abroad in general and participating in exchange programmes in particular is currently one of the most crucial for citizens of the Russian Federation. It is quite complicated to apply to foreign universities or even to be given the opportunity to intern abroad. However, as for the education in the Arctic, students from Arctic universities undertaking bachelor or master degree programmes related to polar research are now offered a chance to enroll at one of partner universities on a competitive basis. Russian students are required to finish their first or second year training at home university in order to apply to a full-time study in a bachelor's degree (it depends on a country and university), and they also need to prove their level of a foreign language (generally, it is English), and pass entrance exams, if necessary.

Apart from educational institutions, congresses and conferences are organized every year, as well as winter and summer school courses covering the Arctic region topic. For example, the following events are expected to take place in 2020:

1. The fifth international scientific conference “Arctic: history and modernity” will be held on March 18-19, 2020 in Saint-Petersburg [19];
2. The UArctic Congress 2020 will be organized on October 5-8, 2020 in Reykjavik, Iceland. The theme is “Together towards a sustainable Arctic” [20];
3. The CIRP winter school 2020 “Challenges and prospects for international cooperation in the Arctic” will take place on February 2-6, 2020 in Veliky Novgorod (Novgorod the Great) [21];
4. The X International congress of Arctic social sciences (ICASS X) will be organized on June 15-19, 2020 in Arkhangelsk. The theme it will cover is “Arctic Generations: Looking Back and Looking Forward” [22];
5. The XII International conference on permafrost (ICOP 2020) will be held on June 22-26, 2020 in Lanzhou, China. The theme of the conference is “Permafrost environments under persistent warming: challenges for scientific assessment and engineering practice” [23];
6. The International PhD school “Russia in the Arctic dialogue: local and global context” will take place on June 13-20, 2020 at NArFU [24];
7. The VI international summer school in glaciology will be organized by the University of Alaska, on June 6-16, 2020 [25];
8. The conference “A Changing Arctic” will be held on June 2-5, 2020 in Tromsø, Norway [26];
9. The winter course “Ice mechanics” 2020 will take place on February 10-15, 2020 in Vladivostok [27];
10. The Arctic winter school 2020 will work between February 25 and March 7, 2020 in Yakutsk [28];
11. Summer school on Arctic studies at Hokkaido University. Researchers from overseas are gathering at Hokkaido University this summer in 2020 [29];
12. Norilsk State Industrial Institute invites participants to an international scientific conference “Scientific capacity of the Arctic”, which is to take place on April 25, 2020 [30];

13. The 2020 Polar Law Symposium will be held on November 23-25, 2020 in Japan [31];

14. Cryosphere 2020: International Symposium on ice, snow, and water in a warming world will take place on September 21-24, 2020 in Iceland [32];

15. The III International conference on polar climate and environmental change in the last millennium will be organized on September 24-26, 2020 in Poland [33].

After analyzing and considering the information posted on websites related to the events described above, we can say that attention is mainly focused on ecology and climate in the Arctic region. Culture, history and tourism are also relevant issues concerning the Arctic.

3. Conclusion

Therefore, nowadays, there are more and more training and retraining courses and programmes for specialists in polar studies, to solve the most important strategic problems of the Arctic development, in particular, to solve the problem of migration [34], [35]. At the country level, support for education will enable more and more people who are interested in the Arctic (e.g. scholarships, work placement and assistance in participating in exchange programmes). Human capital development should also be controlled at the country level. Developing human capital agency is reported to start working in 2020. It will be aimed at providing staff assistance for new projects. Then, Corporation for Development and Fundraising Agency will also start their work in the future [36].

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