

ORIGINAL RESEARCH ARTICLE

Perception of Arctic issues among young learners in Poland and Lithuania

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Summary In this work, we show the results from two different types of approaches designed to map the Arctic (Polar) perception of young learners in Poland and Lithuania. The first case study is composed of both closed and open questions (Case Study 1), while the second one is a closed, multiple choice type of questionnaire (Case Study 2). We have questioned a total of 274 learners in Case Study 1 and 80 in Case Study 2. In both cases, learners were divided into four age groups. The results show that the Case Study 1 questionnaire, due to its structure, provided more comprehensive information about the state of awareness among young learners in comparison with the limited option for answers (no open option) in Case Study 2. The results show that documentaries and nature films together are the dominating sources of information for all age groups. A very interesting finding came out from Case Study 1, which shows that school lessons dominate in public schools, with exception to high schools, however, other means of learning were also mentioned. Educational workshops play a very important part in learning among three youngest groups of students of public schools. In case of autonomic schools, it is lessons that play a key role in knowledge transfer at all levels of education, which is most likely related to the educational system in these schools, which regularly conduct

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group projects. Both studies show that nonformal education has an important role in education of young learners in Poland and Lithuania.

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1. Introduction

The earth is experiencing critical climate change and the Arctic is influenced by these processes faster than other regions (IPCC, 2014). We now realize that processes, which take place in the Arctic have a significant influence on other parts of the globe, and this includes impacts on both marine ecosystems and human activities, which in turn have serious socio-economic implications for the rest of the world, with special significance for Europe (ACIA, 2005; Arctic Council, 2013; IPCC, 2014). Understanding and evaluating the rate and pace of these changes is among the most urgent challenges for humans, so that appropriate adaptation scenarios for specific economic sectors and human activities could be prepared for the next generations (IPCC, 2014; Kerr, 2007; Walker, 2007). At the moment, a large amount of attention is given to environmental sensitivity and sustainability of the Arctic region, however, without the engagement of all people, not only indigenous but also those from other regions, these key issues will remain unresolved (Access-EU, 2019; Arctic NGO Forum, 2019).

To what extent will the climate change influence the Arctic environment and societies, hence societies of the world? Since climate change is rapidly altering the geography and modifies region's biodiversity, it is becoming increasingly clear to the European society that the Arctic is of key importance for the future of the next generations (Arctic Council, 2013; Arctic NGO Forum, 2019; Millennium Ecosystem Assessment, 2005; Potts et al., 2016). Therefore, much of European research activities are focused on the Arctic (Polar Regions) (Williams, 2012). What is important, decision-makers have realized that a proper approach to tackle scientific problems of the Arctic requires studies, which cross different disciplines, including oceanography, geosciences, physics, biology, space sciences and astronomy, as well as environmental sciences, socio-economic sciences and humanities (Access-EU, 2019; Arctic NGO Forum, 2019; Bray et al., 2012; Williams, 2012).

For centuries, Polar expeditions and discoveries have been given special attention by the general public. Harsh and unknown climate, low temperatures, the remoteness of the places has always created a special aura around places and people, such as explorers, scientists and journalists who worked in these regions. This is especially true in the case of young people, who have always been fascinated by the beauty of the Polar Regions and by Polar exploration and research.

It is crucial to increase the awareness of how much Polar issues are important in order to develop the next generation of world's society that will be ready to make science-based decisions for Polar regions protection and will provide secure outcomes for the entire planet. In times of globaliza-

tion, which results in global change including global environmental changes, it is obvious that science-based education plays a critical role in increasing the current condition of young learners awareness of the changing world (Bray et al., 2012; Hovelsrud et al., 2012; Kotyńska-Zielińska and Papanasiou, 2018). Properly designed and conducted science provides tools for meeting various social needs, including quality education (Herrenkohl and Bronwyn, 2017). There is a strong need for both researchers and educators to provide modern approaches to produce science-based information and hence secure proper means of education (Penuel, 2017). Such approaches should adopt an environmental perspective (Dawson, 2017; Philip and Azevedo, 2017), and they must take into consideration, that non-formal education involves a number of various contexts, many of which do not appear in schools (Philip and Azevedo, 2017). One of these aspects involves the danger that these activities are focused on those who are already well taken care of and thus will not benefit a lot (Feinstein, 2017). In this process, Polar issues are among the greatest challenges for educators of all levels.

One of the major issues that formal school systems face in these terms is lack of dedicated courses during which students could obtain a holistic picture of the changes, in which Polar issues should be of special importance, and thus be prepared to adapt and mitigate to the climate change (Arctic NGO Forum, 2019; Hovelsrud et al., 2012; Stocklmayer and Bryant, 2012). The majority of formal school education systems have not adapted to the changing world yet (Feinstein, 2017; Kotyńska-Zielińska and Papanasiou, 2018). Most textbooks and educational materials at all levels of formal education, include only bits and pieces of information used in various contexts at different lessons, at different school levels (<http://www.access-eu.org>).

This paper is the first attempt to study young learners' perception of the Arctic in countries which are distant to the region. Additionally, with this study we hope to map the ways of education which are most suitable for learners of various ages and in different types of schools.

2. Methodology

In our research, we aimed at the evaluation and assessment of the best practices in the area of teaching about Polar issues at different school education levels, various types of schools, in two non-Polar countries, Poland and Lithuania.

In order to match with the modern approaches, as described above, we designed the study to be able to map the differences between different age groups, gender, and types of schools. Our approach was dual, from an open question

questionnaire used in Poland to a closed, multiple choice question questionnaire used in Lithuania. We realize that this sample is not globally representative, but with the results from these surveys, we obtained important information, which will be used in our further research. Using the results of the surveys, we are aiming at the creation of dedicated courses/workshops for students of all ages and their teachers in order to provide necessary skills and know-how to get acquainted with the special characteristics of the Arctic environment, and the changes, which occur there. Having to deal with youth from non-Arctic countries, we decided to use two different types of questionnaires, hoping to deliver the best practice questionnaire as one of the results of this study.

Thus, in the first case study (Case Study 1), the questionnaire consisted of both closed and open questions and was applied to Polish young learners, of four educational levels, who came from 4 schools. The second case study (Case Study 2) provides information from 9 closed (multiple choice) questions, which were applied to youth from Poland and Lithuania. Both studies were conducted during the spring semester in 2018 and they were run independently. We decided to combine the results and analyze them since, we observed many similarities in answers, despite the differences in the approaches. In both case studies, questionnaires were anonymous and conducted in schools by the teachers. All teachers, who were responsible for the questionnaires were trained on Arctic (Polar) issues as well as on the survey itself. During the survey, teachers were ready to respond to any questions and/or problems. We didn't record any complications with an understanding of the questions from students. The same procedure was repeated in all cases. After 10 minutes, all students submitted their questionnaires and those were then analyzed by the team of researchers and educators-the authors of this paper. For the analyses of the responses, the results have been divided into different categories.

And so, in Case Study 1, all data were analyzed in four age groups, with respect to gender and type of school, semi-private (autonomic) and public. Knowing, that all respondents knew the purpose of the survey and understood all questions (no misunderstanding cases reported), in the remainder of the paper we assumed that all *No* and *I don't know* answers are negative answers.

For Case Study 2, all Polish questionnaire participants were of ages above 20, so their responses are not used in this study. In the case of Lithuania, we gathered a total of 80 questionnaires. All those young learners came from the public school system. Case Study 1 and 2 questionnaires were as follows.

2.1. Case Study 1

The first questionnaire is constructed to map the basic level of knowledge (questions 2 and 3). Questions 1, 5 and 6 provide information on how students perceive their formal and non-formal education activities and needs. Question 4 refers to the general interest of surveyed youth in Arctic (Polar) issues. The form of the questionnaire, which was given to Polish young learners is presented in Table 1.

2.2. Case Study 2

The questionnaire with 9 closed questions, which was given to young learners in Lithuania is presented below (Table 2). We have collected a total of 80 responses in Lithuania. Similarly to the first questionnaire in this study we map students' perception of the region (questions 4, 5 and 6), the role of the school versus other forms of gaining knowledge (questions 1, 2, 3) and their real interest in the Polar issues (questions 7, 8 and 9).

3. Results and discussion

3.1. Case Study 1. Closed and open questions applied to Polish young learners

In this section, we analyze the results of the surveys given to Polish learners. We consider 4 levels of education, two types of schools, autonomic (we use this name since this is an official English name of the surveyed schools) and public ones and we discuss the gender aspect in responses.

A total of 274 students from 4 schools and 4 educational levels were questioned (Figure 1). The division of the total number of boys and girls is presented in the graph. The largest number of students came from elementary schools, in two age groups 8 to 9 (early elementary) and 13 to 14 (elementary school) and the lowest from high school, ages, 17 to 19 (high school), with the highest number of boys and girls of ages 14–15 (junior high school).

We had a total of 186 students from public schools and 88 from autonomic schools. In terms of gender division, we questioned 131 girls and 143 boys in all four age groups (Figure 2).

In the following figures, we present the responses to all 6 questions of the questionnaire Figure 2 and analyze information in the graphs. Question 1: Did you learn anything about the Arctic during school lessons (Figure 3)?

It is obvious that the results are quite dispersed. In both cases of school types, the greatest number of negative answers came from students of ages 13–14 and 14–15, together. At the same time, the greatest number of positive answers came from a 14–15 age group of the public school and 13–14 age group of the autonomic schools. In both cases

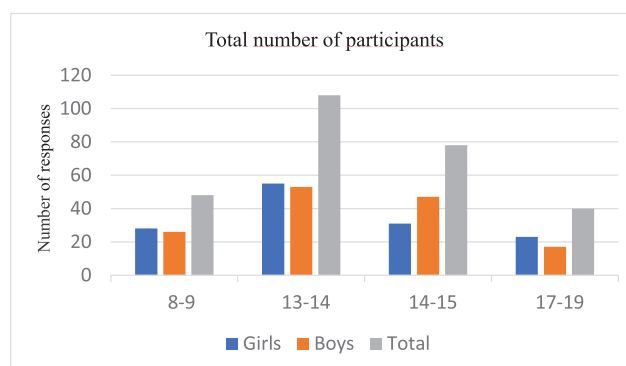


Figure 1 Division of the groups of students who participated in the survey.

Table 1 Case Study 1 questionnaire.

SEX (MARK WITH CROSS)	<input type="checkbox"/> FEMALE	<input type="checkbox"/> MALE	COUNTRY:
AGE:	SCHOOL:		
1. DID YOU LEARN ANYTHING ABOUT THE ARCTIC DURING SCHOOL LESSONS?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> DON'T KNOW
A. IF YOUR ANSWER IS NO GO TO QUESTION 2.			
B. IF YOUR ANSWER IS YES PLEASE WRITE IN WHAT LESSONS.			
C. IF YOUR ANSWER YES PLEASE WRITE WHAT YOU LEARNT.			
2. PROVIDE TWO WORDS WITH WHICH, YOU ASSOCIATE ARCTIC.			
3. CAN A POLAR BEAR EAT A PENGUIN?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> DON'T KNOW
4. WOULD LIKE TO ENHANCE YOUR KNOWLEDGE ABOUT THE ARCTIC?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> DON'T KNOW
5. WHERE DO YOU GAIN YOUR KNOWLEDGE ABOUT THE ARCTIC FROM? <input type="checkbox"/> DOCUMENTARY <input type="checkbox"/> NATURE FILM <input type="checkbox"/> ANIMATED FILM <input type="checkbox"/> BOOKS <input type="checkbox"/> EDUCATIONAL WORKSHOPS <input type="checkbox"/> SCHOOL LESSONS <input type="checkbox"/> OTHER.....			
6. HOW DO YOU BEST ABSORB KNOWLEDGE? <input type="checkbox"/> BOOK <input type="checkbox"/> SCHOOL LESSON <input type="checkbox"/> EDUCATIONAL WORKSHOP <input type="checkbox"/> MEETING WITH A SCIENTIST <input type="checkbox"/> OTHER.....			

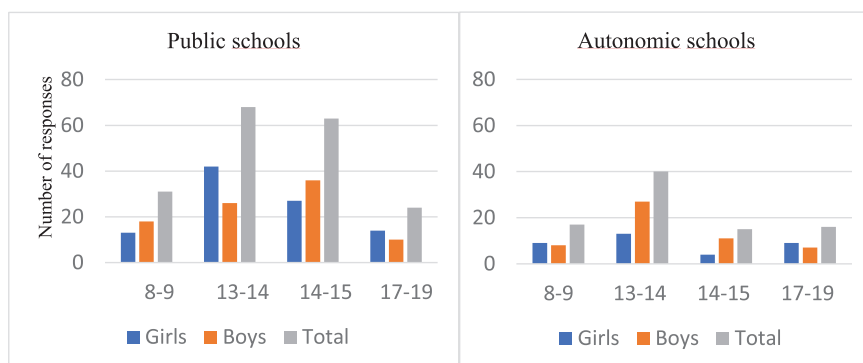


Figure 2 Division of the groups of students who participated in the survey, with division to a type of school and gender.

of school types, a number of positive answers shows a decreasing trend with age. Only the 14–15 age group from public schools breaks the pattern, however, these statistics can be distorted by different numbers of questioned students at different age groups. This response is somewhat confusing, since the older the students, the more occasions for learning about the Arctic they had. This situation is especially interesting and should be further investigated. Figure 4 presents the statistics for Question 1, with respect to gender.

In case of the gender division, the results are such, that in early elementary age both girls and boys give very positive feedback in both types of schools. In autonomic schools 100% responses were positive at this level of education, while in public schools the negative or uncertain responses were very few, among both boys and girls. Situation changes with the next level, where, the vast majority of boys and girls of ages 13–14 in public schools give negative feedback, and the situation is similar for autonomic schools. In the next education level, in case of both types of schools, situa-

Table 2 Case Study 2 questionnaire.

Address each question with a rank from 1 (very little) to 5 (agree very much).

1. In school, I have learnt mostly about:

- A) Polar regions
- B) Jungle
- C) Hot deserts
- D) Oceanic Islands

2. In school, I was most interested to learn about:

- A) Jungle
- B) Polar regions
- C) Oceanic Islands
- D) Hot deserts

3. I was seeing feature movies in the cinema and/or TV about the exploration of:

- A) Oceanic Islands
- B) Hot deserts
- C) Jungle
- D) Polar regions

4. I think that the most interesting stories were about:

- A) Hot deserts
- B) Jungle
- C) Oceanic Islands
- D) Polar regions

5. The landscape most endangered due to climate change is at:

- A) Polar regions
- B) Jungle
- C) Hot deserts
- D) Oceanic Islands

6. Most of the world's biodiversity can be found at:

- A) Jungle
- B) Polar regions
- C) Hot deserts
- D) Oceanic Islands

7. Having an opportunity to join the adventure expedition I would go to:

- A) Oceanic Islands
- B) Polar regions
- C) Hot deserts
- D) Jungle

8. The most important from the practical point of view are:

- A) Jungle
- B) Oceanic Islands
- C) Hot deserts
- D) Polar regions

9. Having a special reward at my disposal, I would offer it for the new exploration of:

- A) Hot deserts
- B) Polar regions
- C) Oceanic Islands
- D) Jungle

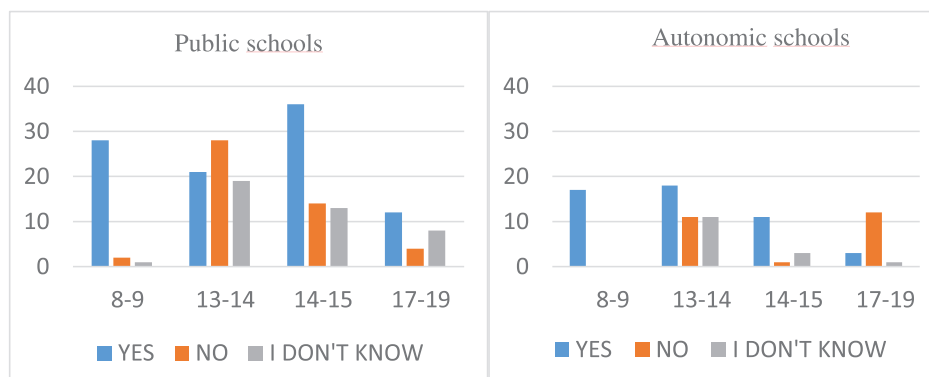


Figure 3 Did you learn anything about the Arctic during school lessons?

tion changes, and most girls and boys provide positive feedback. In case of high school students, the situation is very much mixed up. In public schools, more girls gave negative answers than positive, while significantly more boys gave positive answers to Question 1. An interesting case is observed for this age group in autonomic schools, where 100% girls responded negatively as well as the majority of boys.

Expecting to have a picture of how particular groups of students feel about their knowledge regarding the Arctic obtained in school, we decided to check if the information they absorbed reflect a proper understanding of the region

(Figures 5 and 6). Thus, the following two questions are as follows: Question 2: Provide two words, which you associate with the Arctic, and Question 3: Can a polar bear eat a penguin?

In both types of schools and all educational levels students associate the Arctic with proper, yet common pictures of the region, i.e. ice, cold, white, snow and frost. Three animals are present in the responses. Polar bears appear in answers of all age and gender groups in autonomic schools and public schools in groups of students of ages from 14 to 15 and older. It seems that seals are better recognized,

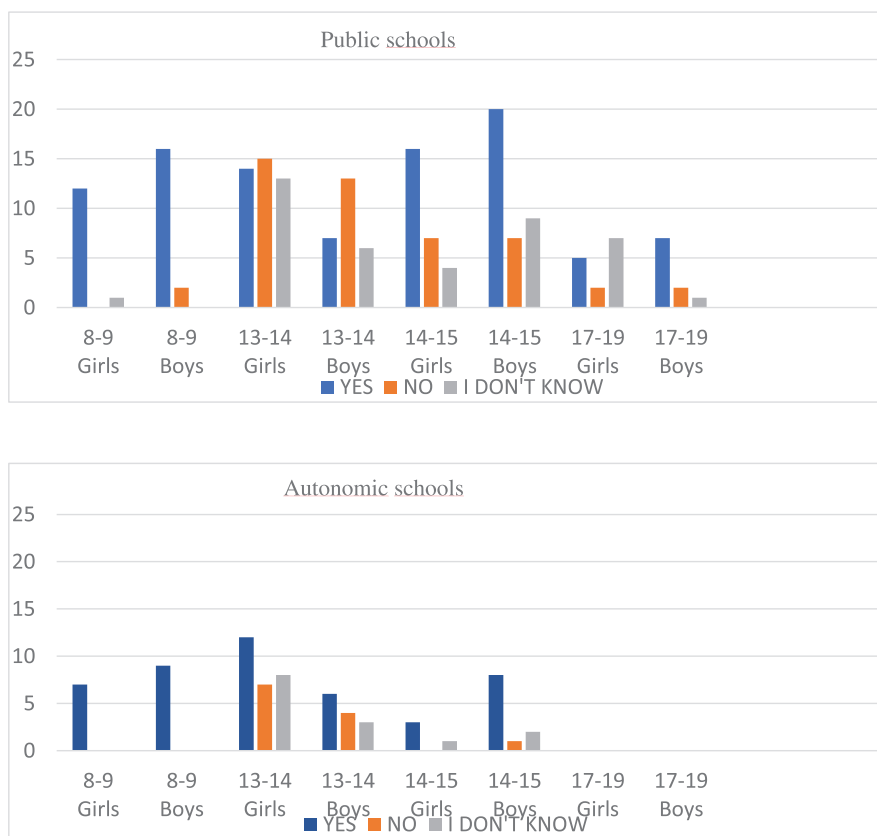


Figure 4 Did you learn anything about the Arctic during school lessons? Division with respect to gender.

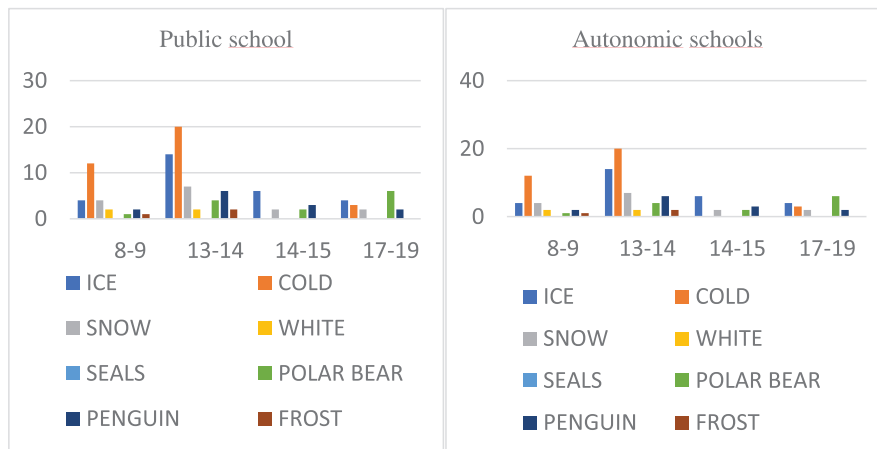


Figure 5 Question 2: Provide two words, with which you associate the Arctic.

since they appear in answers of all age groups in both public and autonomic schools. There is, however, a significant representation of penguins in every age group in both types of schools.

Anticipating certain level of confusion between the Arctic and the Antarctic the third question was to map to what extent this confusion is common among the learners. The results are presented in Figure 6.

This is an interesting case. Even though students in public schools claimed that they learnt something about the Arctic, we can see that perhaps not all proper things, since there are many Yes answers to this question. If you com-

bine them with *I don't know* response then we get more than 50% affirmative or undecided responses at all levels of education. These proportions are much better in case of autonomic schools, especially at younger ages. 100% learners of ages 8–9 gave a negative answer, then in age group 13–14, a combined Yes and *I don't know* responses exceed the No ones, and then at two oldest age groups, the number of negative and positive responses are comparable.

Following the anticipation that the level of knowledge about the Arctic is limited, the next question was drafted to find out if the learners are interested in learning anything more about the Arctic, hence, Question 4, was as follows:

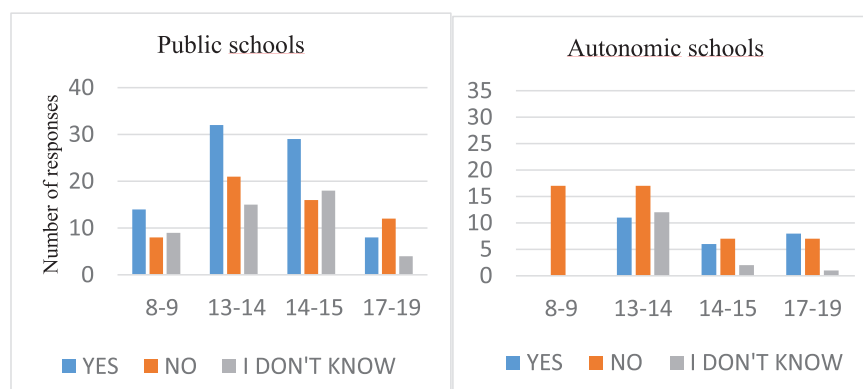


Figure 6 Question 3: Can a polar bear eat a penguin?

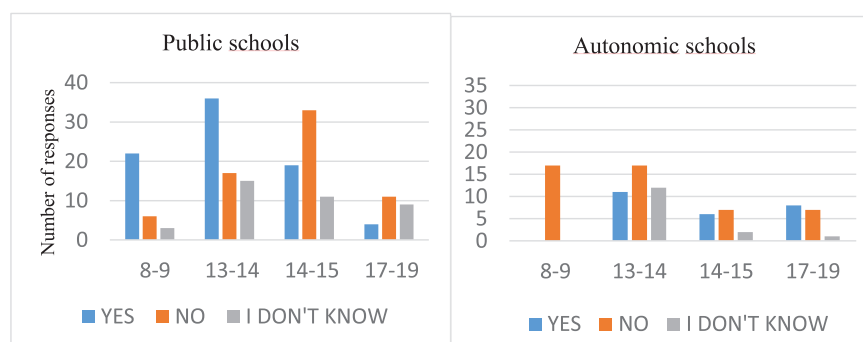


Figure 7 Question 4: Would you like to enhance your knowledge about the Arctic?

Would you like to enhance your knowledge about the Arctic? The results are presented in Figure 7.

In both types of schools, the results are mixed up. We can see that a significant number of students of all ages and in both types of schools are not interested or are not sure if they want to learn anything more about Arctic issues. The trend of not being interested increases with the age of students in both types of schools. There are more learners eager to learn something more about the Arctic than those uninterested only at the earliest education stage (ages 8–9). In other age groups, most learners give *No* or *I don't know* responses. There is only one exception from this rule, learners from age group 17–19 in autonomic schools, who are willing to learn more about the region. This result is in accordance with the results of other researchers, who reported that students' interest in gaining knowledge, while in schools, declines with years of being in the schooling system (Heddy and Sinatra, 2017; Osborne and Dillon, 2008; Vedder-Weiss and Fortus, 2011; Zusho et al., 2003).

The following two questions in the questionnaire were aiming at mapping where students gain their knowledge and what are their preferences in learning methods. Thus, these questions were as follows, Question 5: Where do you gain your knowledge about the Arctic from? Then Question 6 was as follows: How do you best absorb knowledge. In both cases, students could choose from suggested methods or could write other suggestions, not listed for the choice.

Students were informed that the documentary is intended to "document reality, primarily for the purposes of instruction or education, while the nature film is a documentary about animals, plants, or other non-human living creatures, usually concentrating on film taken in their nat-

ural habitat but also often including footage of trained and captive animals" (Wikipedia.org).

It is obvious that documentaries and nature films together exceed other responses in all age groups, in both types of schools (Figure 8). These two sources are followed by animated films, which are most popular among learners of ages 13–14, in both types of schools. School lessons are also an important source of knowledge, especially for age groups 13–14 and 14–15, and, it is not so obvious in high school. Books are more popular among age groups 8–9 and 13–14 (both school types), than among the older learners. Both graphs show that educational workshops play a very small role in educating our students about Arctic issues, and this is true for both types of schools. Other sources, such as e.g. games, Internet, film series, Wikipedia have been mostly provided by learners of ages 13–14 and 14–15, in both types of schools.

These results may be explained by a number of school lessons with the Arctic issues being discussed/mentioned, which students have at different levels of education. In Polish schools it looks as follows:

1. Early elementary school level: There is nothing in the curriculum about the Arctic.
2. Elementary school: 5 hours. There aren't lessons dedicated to the Arctic in elementary school, however, the Arctic is mentioned while talking about animals, climate, the landscape of ice deserts, climate and landscape zones, global environmental hazards, continents and oceans.
3. Junior high school: 7 hours. 1 hour dedicated to the Arctic and Antarctic plus 6 hours about: ice deserts, water

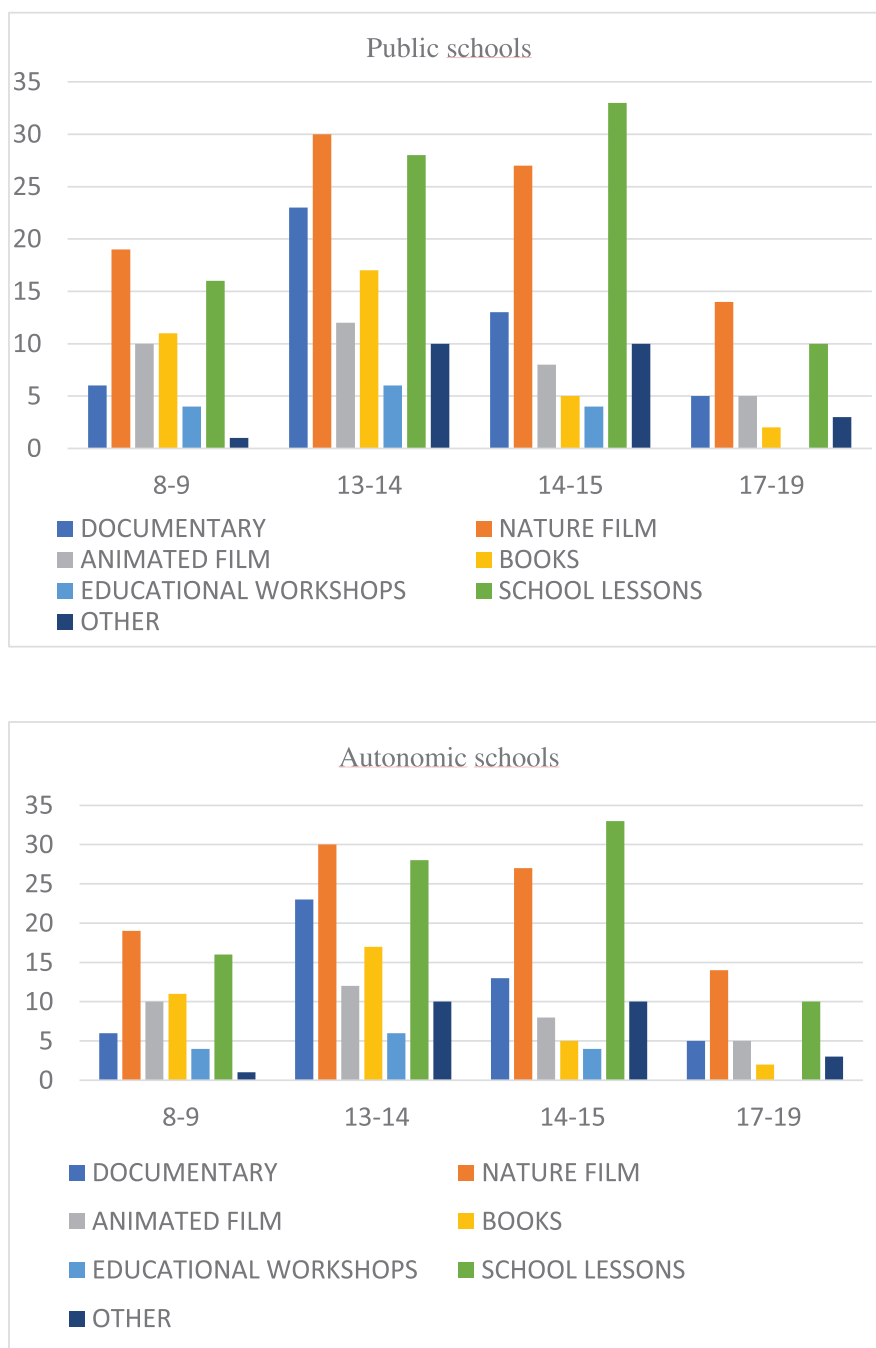


Figure 8 Question 5: Where do you gain your knowledge about the Arctic from?

cycle, continents and oceans, glaciers, life zones and climate.

4. High School: 1 hour. The Arctic is mentioned with regard to populations, culture circles, settlements, human impact on an environment or marine economy.

The final question was aiming at mapping student ways of learning. The answers are presented in [Figure 9](#).

School lessons dominate in public schools, however, in high school, other means of learning (such as Internet or Wikipedia.org) were mentioned as dominating. Interest-

ingly, educational workshops also play a very prominent role in learning among the three youngest groups of students in public schools. Books and meetings with scientists play a lesser, however, visible role in the process of gaining knowledge. In case of autonomic schools, lessons play a key role in knowledge transfer at all levels of education. Books are quite important, especially for both types of elementary schools, while educational workshops are important, however, they don't vary much from other options and in case of the 8–9 age group, educational workshops are almost not mentioned.

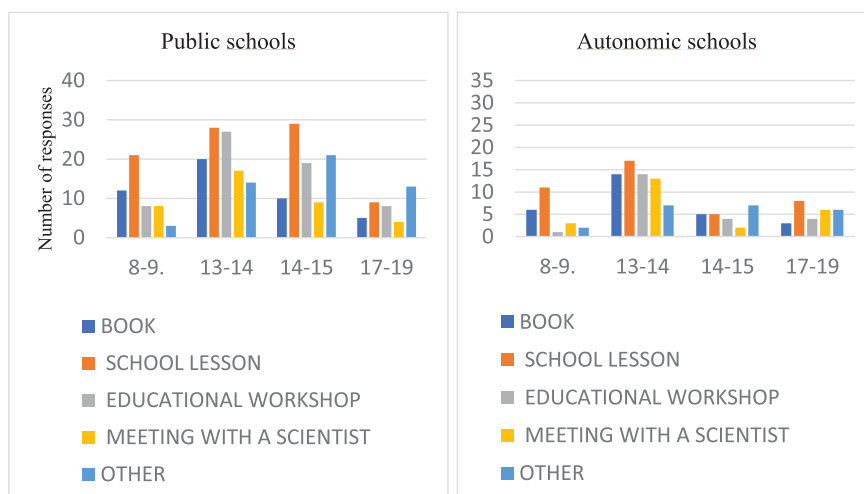


Figure 9 Question 6: How do you best absorb knowledge?

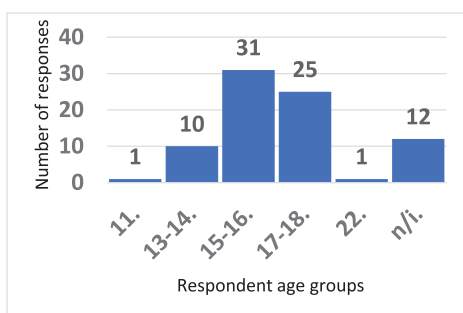


Figure 10 Distribution of students in particular age groups.

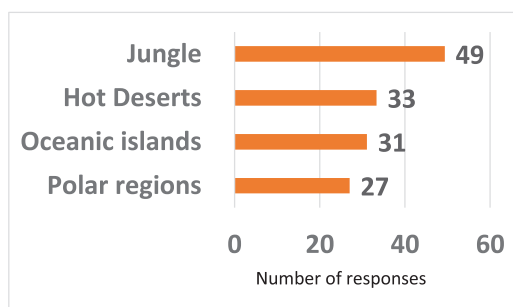


Figure 12 Question 2: In school, I was most interested to learn about... (% of participants that indicated scores 4 and 5 answering the question).

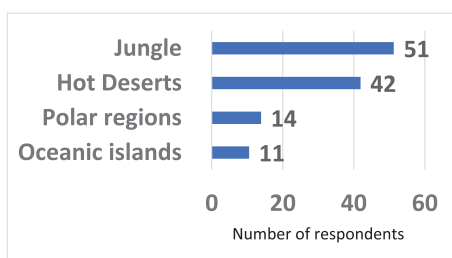


Figure 11 Question 1: In school, I have learned mostly about ... (% of participants that indicated scores 4 and 5 answering the question).

3.2. Case Study 2. Closed (multiple choice) questions applied to the Lithuanian young learners

In case of Lithuania, a total of 80 young learners in several age groups were questioned. The distribution of a number of students per each age group is provided in Figure 10.

Statistically speaking, age groups 11 and 22 do not contribute to the entire picture created based on the responses.

The first question in the questionnaire: In school I have learned mostly about ... The answers (only 4 – agree, and 5 – agree very much) to four suggested topics were as follows (Figure 11).

The vast majority of responses name the jungle (51%) and hot deserts (42%), while Polar regions were named by only 14% of respondents, followed by 11% who depicted oceanic islands. This may be explained by the results of the responses to the second question (only 4 – agree, and 5 – agree very much): In school, I was most interested to learn about... (Figure 12).

The division overlaps with the answers to the first question. Most students chose jungle and hot deserts, while oceanic islands and Polar regions were mentioned a similar number of times. So, the interest in particular topics most likely determined what the students wanted to study and thus remembered from school lessons. This has also influenced the responses to further questions, 3 and 4, i.e., Question 3: I was seeing feature movies in the cinema and/or TV about exploration of..., Question 4: I think, the most interesting stories were about... In responses to these questions, 57%, 64% of respondents chose the jungle for Question 3 and Question 4, respectively. Those were again followed by a comparable number of responses for oceanic islands, Polar regions and hot deserts, 49%, 45%, 44%, respectively (Question 3) and 44%, 42%, and 38% for oceanic islands, hot deserts and polar regions, respectively (Question 4). These statistics refer to the percentage of participants that indicated scores 4 and 5.

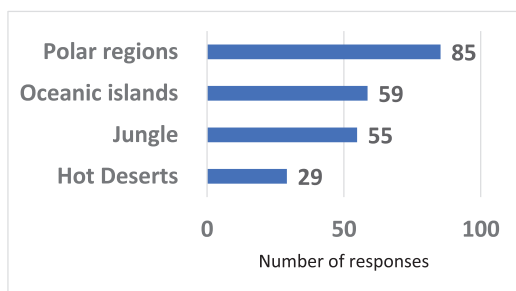


Figure 13 Question 5: The landscape most endangered due to climate change is at (% of participants that indicated scores 4 and 5 answering the question).

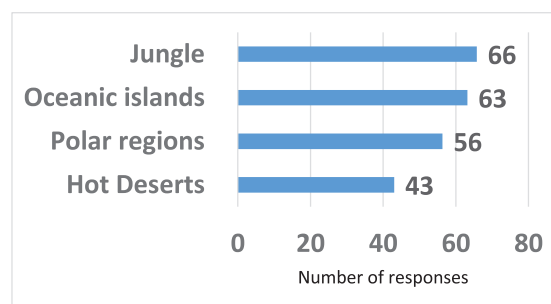


Figure 15 Question 7: Having an opportunity to join the adventure expedition I would go for... (% of participants that indicated scores 4 and 5 answering the question).

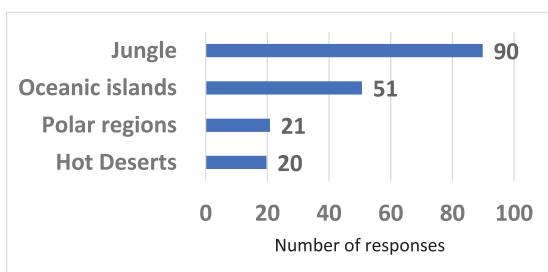


Figure 14 Question 6: Most of the world's biodiversity can be found at... (% of participants that indicated scores 4 and 5 answering the question).

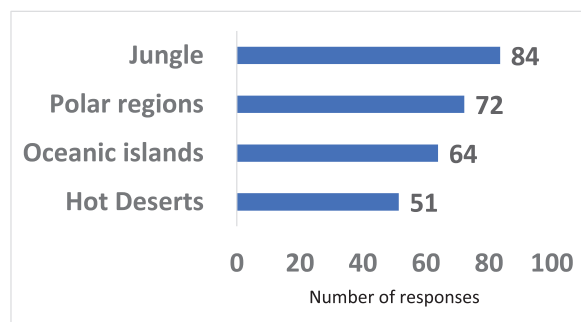


Figure 16 Question 9: Having a special reward in my disposition, I would offer it for the new exploration of... (% of participants that indicated scores 4 and 5 answering the question).

Interesting responses came from respondents to Question 5: The landscape most endangered due to climate change is at (Figure 13).

A striking 85% of responses refer to Polar regions, while jungle and hot deserts are mentioned only by 55% and 29% of respondents, respectively. Oceanic islands are also perceived as endangered regions (59%). With previous responses it may seem that Polar regions are not sufficiently reflected in films and TV programs, stories about them are not so interesting comparing with other environments. An interesting set of answers was provided in case of Question 6: Most of the world's biodiversity can be found at... (Figure 14).

Ninety percent of respondents chose the jungle, which was followed by oceanic islands (51%), and Polar regions and hot deserts with 21% and 20% of responses, respectively. In general, this set of responses shows that students have a proper understanding of the environmental problems caused by climate change and global patterns of biodiversity. This is also reflected in responses to Question 8: The most important, from the practical point of view, are..., for which 72% of respondents chose the jungle, which was followed by 54% of responses choosing oceanic islands, 47% for Polar regions and only 22% for hot deserts.

The last two analyzed questions are, Question 7: Having an opportunity to join the adventure expedition I would go for... and Question 9: Having a special reward at my disposal, I would offer it for the new exploration of ... Both questions show a sort of emotional attitude of respondents to

different regions of the world. The responses are presented in Figures 15 and 16.

Keeping in mind the previous answers regarding students' interests, 66% of jungle choices, followed by 63% of responses for oceanic islands, are not surprising. Polar regions were mentioned by 56% and hot deserts, by 43% of respondents. Slightly different is the distribution of responses in the case of Question 9 (Figure 16).

Eighty-four percent of respondents would support new explorations of the jungle, and 72% would support Polar explorations. Oceanic islands obtained 64% votes and hot deserts, 51%. Obviously, the jungle is at the top of all the answers provided by the respondents in Lithuania.

4. Conclusions

In this work, we have discussed the results from two types of questionnaires on the Arctic and Polar issues, which were conducted in Poland and Lithuania. Both studies vary in structure and so do the results. The following detailed conclusions encompass all important findings from both studies.

1. The Case Study 1 questionnaire, with a number of open questions, provided more inspiring responses from respondents, then the Case Study 2 questionnaire, in which only four fixed responses were to be chosen, and thus a rather limited space for imagination was provided to re-

spondents. Therefore, these responses can be regarded as bias. As a result of such a set-up, the Case Study 1 yielded more comprehensive information about the level of awareness of young learners regarding the Arctic issues.

2. The Case Study 1 (Questions 2 and 3) provided information, that a large number of Polish school students (independent of age and gender) are still confused about the Arctic issues, and this is true for both types of schools, public and autonomous. At the same time, the vast majority of respondents in Lithuania chose Polar regions as those most endangered due to climate change, which proves a certain level of awareness.
3. Question 4 in Case Study 1, yielded an interesting set of responses, i.e., most of the Polish learners are not interested in enhancing their knowledge about the Arctic. This is in line with the findings from other studies worldwide (Heddy and Sinatra, 2017; Osborne and Dillon, 2008; Vedder-Weiss and Fortus, 2011; Zusho et al., 2003). Simultaneously, jungle, hot deserts and oceanic islands have been chosen as interesting school topics by most Lithuanian students. Additionally, Lithuanian students would be less willing to support Polar exploration, versus the jungle exploration. It would be interesting to find out if this is related to a greater number of information in the Lithuanian media and schools regarding these regions versus the Polar ones.
4. Question 5 in Case Study 1, provided important information about the sources of knowledge about the Arctic. It is clear, that documentaries and nature films together exceed other responses in all age groups, in both types of schools. These two sources are followed by animated films.
5. A very interesting finding came out from the last question in the Case Study 1, which regards the means of how students best absorb knowledge. School lessons dominate in public schools, with exception to high school, where other means of learning (such as Internet or Wikipedia.org) were also mentioned as dominating. Interestingly, educational workshops play a very important part in learning among three youngest groups of students of public schools. Books and meetings with scientists play a lesser, however, visible role in the process of gaining knowledge. In case of autonomous schools, lessons play a key role in knowledge transfer, at all levels of education. This is most likely due to the fact that many school lessons are of group project type in autonomous schools, so students are familiar with such type of classes.
6. Both studies confirm the results from other studies that non-formal education has an important role in education, however, the level of its implementation is still not sufficient in schools and outside of school. Additionally, Polish students from autonomous schools, seem to benefit from modern approaches more than the students from the public school system.

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