Information seeking behaviour of national minorities' secondary school students for scientific research purposes

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Abstract:

Internet in Latvia (a country in the Baltic region) became available for the wider public in the beginning of the 21st century. Online news, reference type information and social networks are everyday life necessities of modern individuals in Latvia. Current Latvian schoolchildren were born and raised in the Internet era, and these children are potential researchers. That is why it is so important to understand how modern schoolchildren conduct complex information searching processes for research purposes, what skills they possess, what problems they face and if they use library products and services.

The case study was made in April, 2012 with the purpose of determining national minority secondary school students' information seeking behaviour during the scientific research process: what information channels and resources they use and in what language this information is.

Carol Collier Kuhlthau's model of Information Search Process was chosen as a theoretical framework for this study. Complete study includes the results of six interviews with the schoolchildren who are doing their research on different IT topics and the results of the questionnaire completed by 119 secondary school students who did their research projects on different topics. This case study consists of the key findings from the interviews, and these interviews have revealed that schoolchildren pay great attention to the information search process.

Keywords: secondary school students, information seeking behaviour, scientific research.

1 INTRODUCTION

In the online settings there is different and continuously available information. However, online information has some disadvantages. First of all, many online resources are not qualitative. These information resources tend to be misleading. Second, due to large amount of information, it is not easy to find pragmatically appropriate resources. Potentially useful information resources often were not found. Third, the vast majority of online information resources are in English, but not all Latvian schoolchildren know English well enough for

making scientific research. Fourth, information use, analysis and synthesis are not the same as physical access to information (Shenton, 2008). It is essential that not only information search and retrieval system should be highly qualitative and easy to use, but also information system users could define relevant information queries, plan and successfully apply different search strategies, and search for different format information resources (Bates, 1989; Nicholas, 2010).

Research questions
1. How secondary school students are searching and selecting information resources for scientific research purposes?
2. What information channels secondary school students use for scientific research purposes; what information resources are selected, and in what language are these information resources?
3. Do secondary school students use products and services of the school library and/ or other Latvian libraries for scientific research purposes?
4. What are the criteria for evaluation of the information resources?
5. What secondary school students feel in the beginning and in the end of the information search process?

Conceptual background
In 1990 Information Science researcher Carol Collier Kuhlthau developed the Information Search Process (ISP) model. This model is described in her article *Inside the Search Process: Information Seeking from the User's Perspective* that was published in the *Journal of the American Society for Information Science* (Kuhlthau, 1991). The ISP model was based on the findings of five studies made between 1983 and 1989. These studies led Kuhlthau to identification of the different individuals' common search process features and to understanding that search process of the human beings is influenced both by cognitive and emotional processes.

Kulthau found out that there is a gap between the user's information seeking behavior and information system. The information system traditionally has been seen as a tool for collecting and classifying the information in a manner to provide more easy and precise information retrieval. It is the reason why in the majority of Information Science studies was used systemoriented approach, when the research object was information search system, its features and usability, but not the user's informational needs and problems. Kulthau stated that traditional (systemoriented) vision is characterized by certainty and order, while problems of the users are characterized by uncertainty and confusion, so the researcher must be able to determine not only the ideal system usage, but also its real usability.

The ISP model determines that the user makes constructive actions, looks for the meaning with the aim to broaden the scope and knowledge on the certain topic or issue. Search process of this kind is associated with a number of information search sessions rather than one inquiry. Uncertainty and anxiety are the feelings that the individual experiences on the early stages of the search process. Information search process is connected with creation of the meaning and building an opinion. Creation of the meaning occurs within the framework of individual's mental attitude, when newly acquired information is assimilated into existing knowledge. Formal and informal information channels are used for the information gathering, and everyday life experiences influence the decision making process. In the result individual builds an opinion and gains an understanding of the specific problem, object or phenomenon.

It is common for the individual to share or present its opinion and to exchange the information.

Kulthau's ISP model includes three aspects of the human life: emotional (feelings), cognitive (thoughts) and physical (activities). These aspects affect each stage of an individual's information search process: initiation, selection, exploration, formulation, collection, presentation (Kuhlthau, 1991).

2 METHODOLOGY

Research Settings and Participants

The research was conducted at the Riga Classical Gymnasium that is a general educational institution, founded in 1983. In school year 2011/ 2012 total number of the Riga Classical Gymnasium students was 1 357 students, 254 of whom – secondary school students.

The Riga Classical Gymnasium is an educational institution of national minorities with Russian language as the main language of the educational process, and students belonging to different ethnic groups: Russian, Latvian, Ukrainian, Jewish, Polish, Azerbaijan, Georgian, Belarusian and other. Students are learning English from the first grade and a second foreign language (German or French) from the fourth grade. Moreover, secondary school students attend 140-hour Latin language course. Gymnasium is practicing multilingual approach to the educational process, when some subjects are taught in Russian, Latvian and English.

Students' scientific research results are presented in the school's *Idea Fair* (first to sixth grade), Students' research conference (seventh to ninth grade) and Gymnasium's scientific research conference (tenth to twelfth grade). Tenth to twelfth grade secondary school students during the school year are writing their scientific research papers and attending the 32-hours course Scientific Research. Making at least one scientific research paper is obligatory for each secondary school student. Students are allowed to write a scientific research paper in groups consisting of up to three students. The Riga Classical Gymnasium also gives students the opportunity to participate in a variety of interest groups (language, art, sports, IT, etc.), as well as to take elective courses. Gymnasium regularly organizes different social events (Alijevs, 2012).

The Riga Classical Gymnasium has a library, which products and services may use schoolchildren and teachers. School library has a library loan and a reading room. Working hours of the library loan: weekdays 12.00 – 17.00. Working hours of the reading room: weekdays 8.00 – 20.00 and Saturdays 10.00 – 15.00. School library collection has more than 30 thousand items (books and periodicals) in the Latvian, Russian, English, German, French and Spanish languages. Library reading room has workstations with the Internet connection, and this reading room is often used for organizing local and international meetings, seminars and conferences (Rīgas Klasiskā ģimnāzija, 2012).

Interview description

Structured interview method was applied in this case study. All interview's questions (see Appendix 1) were divided into six thematic sections according to Kulthau's ISP model: first set of questions was devoted to scientific research topic, students' prior knowledge, organization of the scientific research process; second – to the information search process in the perspective of students' activities and feelings; third – to information search process in the perspective of information channels and resources used by students; fourth – to information channel and resource features; fifth – to information search problems and sixth – to the end of the information search process.

Interviews of the Riga Classical Gymnasium students were organized in three sessions (two students on one day). Six tenth grade students (in the *Interview results* part entitled as S1, S2, etc.) participated in individual interviews: four boys (S1-4) and two girls (S5-6), 16 to 17 years old. Interview language was Russian, and the case study author has gained written parental permission to interview the students. Interviewees were chosen on the principle of voluntary participation and according to students' school results (very high: S1-2, high: S3-4 and average: S5-6).

3 RESULTS
Interview results
Despite the fact that all students wrote research papers on IT, their topics were absolutely different: impact of the IT, IT ergonomics, IT usage for the education purposes, IT education. Titles of the interviewee papers were: *IT education management in Latvia*; *Ergonomics of the mobile devices*; *Using interactive whiteboards at school*; *Graphic tablets at school*; *Impact of the computer games on children and youth* and *Solid-State Drive use at school*.

Students' responses were characterized by the attitude towards the selected research topic and the results to be achieved. Three respondents indicated that they are particularly interested in the research topic; two respondents indicated that they would like to gain additional knowledge about this topic; three respondents believed that topic of their research paper is very urgent and three respondents saw practical application of their research results. One respondent wanted to improve the learning process at school.

Interview results showed that the students' experience in the research topic and writing the research paper is minimal. For example, 50% of the respondents did not have previous experience or knowledge on this topic. One respondent had a minimum knowledge, two – were using object of the research in their daily life (mobile devices) or at school (interactive whiteboard). It became evident that students made their research works in several ways: 67% of the respondents conducted mixed studies (analytical and practical). Only one respondent made solely analytical study (analysis of the official documents), and one – solely practical study (based on experiment). One respondent has chosen an unusual sequence of making research paper – in the beginning she collected empirical data and afterwards wrote theoretical analysis of the problem: "At first, I will collect practical data and then analytical [...]" (S6).

Interviews revealed that making a research is accompanied by the certain feelings and emotions: 67% of the respondents stated that in the beginning of the scientific research process they felt interest, 50% – fear, panic and anxiety, 33% – uncertainty, 33% – felt that they will do something useful, 33% – that it will be a time consuming process, 17% – that it will be a complex process and 17% – felt thirst for discovery. Difficulties during the research process were predicted by the student with average results, but the thirst for discovery – by the student with very high results. Interest was experienced mostly by boys. Anxiety was explained by the lack of experience: "[...] I felt anxiety, because I made this process for the first time, being afraid to make something wrong, doing my best, writing, learning, getting more information, visiting libraries – it was so complicated" (S6). Nearly all respondents (83%) reported that they have not made schedule/ plan for making their scientific research paper. This fact has probably made students to experience uncertainty and anxiety.

Students were optimistic towards their information searching skills. 50% of the respondents evaluated their information searching skills as good. For example, one student has found all necessary information: "[…] if I need something, I will definitely find it" (S6). Two respondents described their skills with a grade (4 from 5 or 8 from 10). 50% of the respondents evaluated their information searching skills as average. Two respondents explained it with the use of the Internet: "Average, because I use Internet" (S3) and "Average, because I use Internet and then libraries. Though, I do not use libraries very often" (S5). Interconnections between students' results and self-evaluation have not been observed. Student with very high results was self-critical, but student with average results was optimistic.

Careful information selection indicates that the information search process is well-considered and planned process. 67% of the respondents planned the information search process for the purpose of the scientific research. One student informed that "[...] planned *what* and *where* will search" (S2). One student did not plan his information search process.

Respondents described information search process in different ways. Respondents' answers could be divided into three groups: answers, where are mentioned a) places, b) procedures and c) things/ objects. Respondents, who mainly mentioned places, informed about information channels and physical movements: "I visited my acquaintances' private library [...]" (S1) and "In the beginning I searched information about the SSD in the Internet. Then I went to the Centre[1], Library of the University of Latvia [...], went to Ventspils[2] ..." (S6). Respondents, who mainly mentioned things, informed about information channels: "[...] searched for thematic literature, different articles and facts" (S3) and "In the beginning I tried to find references and notes [...]" (S4). Only those respondents, who mainly mentioned procedures, informed about information seeking behaviour: "While I searched for the information, I, of course, read it, deselected those information resources that were not suitable, classified others" (S2) and "I searched for the information, read it, selected what I needed" (S5). These students have read the content and made selection according to their information needs.

Finding relevant information depends on knowledge about varieties of the information search. 67% informed that they make search queries only using keywords. One student made an interesting comment on that: "I put them [keywords] in double quote marks. I only have to insert the right theme at *Google* [...]" (S6), and it means that students are aware of the specific features provided by the search engines. Only one respondent made subject browse, and one combined two methods (keyword search and subject browse).

Interviews revealed that information search process is also accompanied by certain feelings and emotions. 67% of the respondents told that they are interested in searching for the information. This interest may be associated with the thirst for knowledge and discovery or possibility to find something useful. Two respondents were not able to clearly describe their feelings. They mentioned that they are persistently looking for the information until they find it.

Students rely on other people when searching for the information. 67% of the respondents used help of the other people. In two cases, the person was the research mentor (IT teacher),

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[1] Centre of Riga
[2] Town approximately 190 km from Riga

and in two – an acquaintance (other IT teacher and mother's friend – programmer). All persons were professionally related to the research topic – IT.

After making analysis of the interview data, it became clear that all respondents perceive information channels and resources as a whole. Four respondents indicated that they used Internet as the information channel. Two respondents indicated that they used library. Careful analysis of the interview text revealed that all six respondents used the Internet, because two respondents used digital library. However, traditional library was used by four respondents (acquaintance's private library, two times Library of the University of Latvia and Library of the Ventspils University College). One respondent planned to visit a library.

Respondents explained their choice in the following way: "Internet, because there you can find a lot of information, and you only have to choose what you need" (S3), "I use libraries, but in the beginning [of the information search process] – Internet. Internet helps to outline the objectives. Internet helps to refine research objectives, and for further nuances I am visiting libraries" (S4), "Internet. There is easier to find; easier than delving into books. Of course, in the books you can find more useful information, but on the Internet everything is at hand" (S5) and "Internet, *Google*, because I think it is the most efficient way" (S6). Thus, the Internet is used because of the great amount of information, it helps to get general, reference type information and it is easy to search for information on the Internet. The Internet helps students to achieve their goal – to write a scientific research paper.

Interview results also revealed that a great number of the respondents used books, periodicals (magazines), *Wikipedia*, as well as other online information resources. Respondents indicated that they also used traditional encyclopedias and audiovisual materials. Several respondents used word *scientific* (book, article, film, etc.). One respondent avoided making references to other authors' research papers: "I think that referring to other [research] works is not an effective way. I believe that it will be easier to find an appropriate book and find information there [...]" (S2). Respondent, who used online forums, stated that "[...] after reading the article, I will read the comments – people's reviews whether the article is true" (S3). Broad use of *Wikipedia* is explained in a following way: "Mostly *Wikipedia*, because there is all classified in a convenient way" (S5). Students like text that is written in the popular science style; that is understandable and contains hyperlinks.

All respondents tried to find significant differences between information search in the traditional and electronic settings. Opinions of the respondents are almost similar. Advantages of electronic information settings are speed and convenience of the search process, as well as the large amount of available information. One respondent mentioned that a significant advantage of the electronic text is possibility to make keyword search using the Ctrl+F keyboard combination. Other respondent mentioned option of the related information search. Another respondent, despite the fact that he uses only Internet for the information search and retrieval, did not deny the quality of the traditional settings. Only one respondent believed that the information search on the Internet is more difficult than in the traditional settings. This respondent used Internet to obtain a general information, but visited library on a regular basis.

Respondents had various opinions about the libraries. Two respondents did not visit libraries for the purpose of making scientific research (one of them was planning to visit it later, one – used digital library), one respondent did not see importance of the libraries, but for three respondents library had a special role: "The library is a richer source of information than any

search engine. I believe that the library is something more ..." (S2), "Once a month I am going to the library to verify the information that I have gathered [...]" (S4) and "The great role, because I went to the library, opened the book on computer hard disk drives and started to read [...]. I did not find such information on the Internet [...]" (S6). Students visit libraries to find specific information and make verification of the information that was found on the Internet. These three respondents belonged to different groups, so visiting of the libraries is not related to student's achievement level.

Interview results revealed students' behavior towards using/ reading of the text. All respondents claimed that they carefully read entire text in order to know all nuances and do not miss something. However, some respondents noted that their reading style depends on the information resource. In some cases, students read just two or up to 20 pages. Despite the commitment to read the whole text, only two respondents read slowly till the end or as many pages as they could. Other respondents spent starting from 10 minutes to up to one hour for reading one information resource. Two respondents mentioned that their reading time depends on the number of pages. Approximate calculations show that respondents spent between one and a half minute and three minutes for reading one page of the text.

Interview results also showed that the majority of the respondents make analysis of the selected information, as well as read and verify text in compliance with the selected research topic. Other processes made with information are: browsing by title, selection, processing, modification, copying by hand, copying, making notes, copying of hyperlinks and making quotations and references. Making analysis of the information is common for students with very good and good results, but copying – for students with average results.

Interactivity was not the key factor for choosing the particular information resource. However, some respondents believed that the interactive resources are more fun and easier to work with. Some respondents mentioned that they focused only on quality and reliability of the information resource. One respondent associated interactivity with a format: "No, I do not care where [to read]... on the computer screen or in the books [...]" (S6). The majority of the respondents also had the same opinion about decision making related to the use of the information for the scientific research purposes. Only two respondents had difficulties with the decision making. There were correlations between the sense of anxiety and the decision making.

Respondents' opinions about the information quality are different. Students with very high results believed that relevant or good information should be clear, evidence-based and meaningful. Students with high results believed that relevant or good information contains references and IT manufacturers' reviews. Students with average results believed that relevant or good information is clear, concise and thematically relevant. In addition, these respondents mentioned that the relevant information – statistical data (from the primary sources) and different prognosis. Different answers were also given to the question about the authoritative information resources. Students with very high results believed that authoritative information has been verified, well-known in scientific societies, proved in the result of the scientific experiments. Students with high results believed that authoritative information is popular (for example, information posted by the popular IT manufacturer) and reliable. Students with average results believed that authoritative information is clear, concise and thematically relevant or the results of experiments made in the laboratory environment.

Most respondents avoid anonymous information resources when they are writing scientific research paper, and try to avoid unpopular publishers or websites, but reposts or information without references seems doubtful to them. Complex information, resources with a large amount of text and terms, as well as texts with a low amount of content are excluded for effort minimization. Only one respondent stated that she reads absolutely all information resources and always finds useful information.

Language of the information resource did not have very significant role. However, respondents indicated that they had to understand this language. 67% of the respondents prefer information resources in Russian. 50% – stated that it is easier and more convenient for them to use information resources in Russian. One student considered searching for the information in English, because sometimes information in Russian is a poor quality translation from English. One student selected information resources in English, because he wrote research paper on a very specific topic, and thematically relevant information was available only in English. One respondent selected information resources in Latvian, because his research paper was written in Latvian. In total respondents mentioned Russian language five times, Latvian and English – three times, German and French – once.

Problems during the information search process are inevitable. All respondents informed that they faced different types of problems. Most respondents had problems with the information resource reliability or relevance, as well as difficulties in finding too specific information. Occasional problems: too large amount of information, information accessibility ("[...] you must be registered as a library user; you need reader's card everywhere" (S4)) and homogeneous content. To solve these problems, respondents: continued the searching process, looked for the information about the text author, verified information in several sources, registered as library users and browsed "everything everywhere".

50% of the respondents found all necessary information (one student with very high results, two – with high results), and felt confident. One of them (student with very high results) felt particularly confident: "[...] I believe that I can present my research paper, because I know what I am capable of" (S2)[3]. One respondent (student with very high results) has found some information and continued to search. He said: "[...] an element of uncertainty still remains, because it is always possible to learn something new today or tomorrow; something that will lead me to the new ideas, encourage to reconsider some aspects of the research and to modify my paper" (S1)[4]. Similar thoughts also had student with average results: "New information appears every day, so I cannot find everything. A week ago I read one resource and now I have found another. Information will complement and supplement. It is the Internet!" (S6). Despite this fact, student felt confident, because she collected empirical data[5]. Second student with average results had not found all necessary information and did not feel confident. This respondent believed that uncertainty was caused by the incompleteness of the scientific research paper. It led to the conclusion that completeness of the information search is connected with the sense of certainty.

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[3] This plan has not been implemented, because student's family emigrated from Latvia in the end of the school year 2011/ 2012.
[4] This student has changed his research topic to completely different (*Invention of the washing machine with RFID technologies*) and finished his work in the beginning of 2013. This research has got second place at the school scientific research contest on the city level.
[5] This student has not finished scientific work, because could not complete theoretical part. She changed scope of the research from IT to Art&Humanities in the beginning of the next school year.

Interview results helped to determine secondary school students' information behavior model, and is characterized by:

1. Information search on the Internet and at the libraries, as well as getting help from other persons;
2. Using online information resources, as well as the traditional ones (paper books and periodicals);
3. Information search process using keywords, shifting back and forth between different information channels and resources;
4. Quick and pragmatic evaluation of the information, analysis and verification, copying and pasting (copy-paste) of the selected information.

4 DISCUSSION AND CONCLUSION

Comparison of the case study results with the Kulthau's ISP model (Kuhlthau, 1991) showed that there are many similarities. During the initiation stage secondary school students experienced uncertainty and anxiety. They wanted to understand what the point of their research is. Students' choice was connected with an interest that ensured positive emotions. Detailed research on the topic and information search process let students to have doubts. They tried to figure out whether the research was made in the right way, were there any mistakes made or should the work be redone/ modified. Finding of all necessary information increased secondary school students' satisfaction and interest. In the result, students, who had completed or almost completed the information search process, felt relief. On the contrary, students, who made information search process in a careless manner, had a lack of confidence.

The results of the interviews have helped to find the following answers to the research questions of the case study:

1. Most students (67%) of the Riga Classical Gymnasium plan their information search process for the scientific research purposes. Secondary school students perceive information search process as a set of certain actions, moving between different information channels and resources. Majority (67%) of the Riga Classical Gymnasium students conducts information search only by using keywords. Secondary school students believe that the information search process is an interesting activity.
2. Different information channels (both electronic and traditional) are used for the acquisition of information for the scientific research purposes. All students of the Riga Classical Gymnasium use Internet for the scientific research purposes, and a wide variety of information resources. All students use online resources, and a great number of students use traditional books and periodicals. Mostly (67%) in Russian.
3. Many students (67%) of the Riga Classical Gymnasium use products and services of the school and non-school libraries for the scientific research purposes. Some of them see a great importance of the libraries, but some think that the Internet is the richest source of information.
4. Secondary school students think that the high-quality information resources are clear, concise, meaningful, evidence-based, thematically relevant and written by professional authors. While authoritative information is clear, concise, reliable, verified, thematically relevant, popular, contains facts and evidences, and is written by professional authors.
5. Half of the Riga Classical Gymnasium students found all necessary information and felt confidence at the end of the information search process.

Further studies on the information seeking behaviour of national minorities' secondary school students can focus on the practical aspects of the information seeking behaviour by using observation method.

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APPENDIX 1
Interview questions

Topic/ previous knowledge / organization of the research
1. What is the topic of your scientific research?
2. Why have you chosen this topic?
3. Did you have previous experience/ knowledge on this topic?
4. Will it be analytical or practical research?
5. Please describe your feelings when you started the research?
6. Have you made schedule for the development of the scientific research paper?

Information search processes and feelings
1. How good are you in the information searching (self evaluation)?
2. Did you plan the information search process for the scientific research purposes?
3. Please describe your activities during the information search process for the scientific research purposes?
4. What searching methods did you use (subject browsing, keyword search, etc.)?
5. Please describe your feelings during the information search process?
6. Did you use help of other people during the information search process for the scientific research purposes?

Information search channels and resources
1. What information channels do you use for the scientific research purposes? (Why?)
2. What, in your opinion, are the main differences between traditional ("paper") and electronic information search settings?
3. What information resources did you use for the scientific research purposes? (Why?)
4. What is the role of libraries in your information search process for the scientific research purposes?
5. Did you carefully read all text of the information resource? (How many pages do you usually read?)
6. What actions did you make with the selected information resources?
7. Is the interactivity of the information resource important to you?

Information search qualities of channels and resources
1. Is it easy for you to select information resources?
2. What, in your opinion, is appropriate/ good information?
3. What, in your opinion, is authoritative information?
4. What information resources do you "weep"?
5. Is the language of the information resource important to you?
6. What languages of the information resources do you prefer?

Information search problems
1. What problems have you encountered during the information search process for the scientific research purposes?
2. How did you solve these problems?

Finishing the information search
1. Did the topic of the scientific research paper become "closer" to you?
2. Have you found all necessary information resources?
3. Do you feel confident? (Why?)