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REGIONAL AND GROUP DIFFERENCES IN THE FRAMEWORK OF INTERNATIONAL COMPARATIVE PROJECT ROSE IN LATVIA

Abstract. *Analysis of regional diferences and group differeces (gender, language of instruction) based on International Project ROSE was carried out. Conclusions based on coefficient Cohen's d and T-test on independet samples indicate significant differences between the eastern part of Latvia called Latgale and the capital city Riga. Interest in natural sciences and technology depend on gender and the language of instruction in school.* The language factor is not simply the language itself, but is also dependent on family up-bringing which form the attitudes to natural sciences and technology in general. Students with Russian as language of instruction are much more eager to explore the natural sciences. The results in Latvia are similar to results obtained in other countries. The shortage of data from other countries is an obstacle to carry out international comparisons.

Key words: *comparative research, regional differences, language of instruction, group differences.*

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Introduction

The last three decades of the 20th century are marked by major international comparative research on the relevance of science and mathematics fields. It is not done at random - specialists believe that science and technology have a major significance on the economic development of every state, and influence globalisation under the conditions of growing competition. The crucial objective of this research is finding ways of transforming science teaching and adjusting it to the needs of modern society.

Currently in many European countries you can observe in adolescents, mainly, secondary school graduates, a declining attitude to further studies in science and technology. It usually is explained by difficulties in science studies, a lack of important for it in daily routine, and by general humanitarian tendencies, such as the exaggerated belief in the destructive impact of the achievements of science and technology on the environment. As a result, student attitude to sciences is undergoing a change in the general education.

Nevertheless, student attitudes to science are shaped not only by the pressure of public opinion but also by educational content and the learning/teaching process. No less important roles are played by cultural traditions, family up-bringing, and other factors, which, at the first glance, seem to have no connection to science. In this context analyzing of student attitudes to sciences and technologies is a relatively new approach, and it is based on the concept, that sciences and technologies *are relevant aspects in all states, irrespective of the culture and material development level* (Schreiner & Sjøberg, 2004).

Another aspect in this context are possible regional differences and how much these differences should be taken into consideration. In cases of large and multi-national states, the regional differences seem to be obvious. Yet these could also apply to relatively small states such as Latvia, Lithuania, and Estonia, which are "ordinary size" on the world map yet hardly conspicuous. In Latvia regional differences were detected in students coming from Valmiera region as opposed to Latvia, in general, in the well-known TIMSS study (Bagata, Geske & Kiselova, 2004). At the same time, without any more detailed statistic assessment of these differences, it is difficult to assess the significance of such regional differences. The authors themselves have pointed out quite relevant differences within the borders of one and the same region.

In this study, regional differences will be examined using the international questionnaire ROSE. The aim of the study is to establish the relevance the regional differences and the extent to which they should be taken into account for rational planning of other research and for obtaining maximum credible results with small expenses.

Short characteristics of the international comparative project ROSE

The international comparative research ROSE (The Relevance of Science Education) is a new type comparative research, as in distinction from TIMSS and OECD SSVP, it does not assess student knowledge, but by the analysis of the respondents' statements, tries to characterise student attitude to sciences and technologies (Schreiner & Sjøberg, 2004). This research has involved approximately 40 states and a target group are 15 year-old students who typically are in Form 9, thus, have reached the final stage of basic education. Moreover, student attitudes are analyzed in the context of multi-cultures, which itself is quite innovative, and a very promising approach to science didactics' research.

The instrumentation[1] of the project ROSE is a questionnaire consisting of 250 different statements, which are arranged into 10 sections. Three of them (A, C and E) are devoted to questions regarding the respondents desires to learn in science (altogether 108 statements). Other sections are devoted to the role of sciences in the respondents' schooling and the role of science for society, as well as the respondents' opinions on the environment, the selection of future careers and students experiences in science and technology. Besides there is also a section where the students can describe in a free form what they would like to research if they became scientists and why they would research it. The respondents also need to indicate the approximate number[2] of the books they have at home.

The questionnaire uses a 4-point Likert scale, which is an ordinal scale: respondents have to give answers ranging from a total negation (*not interested, I don't agree, never*) to an affirmative answer (*very interested, I agree, often*). Furthermore, the questionnaire displays only both extreme anchors, i.e., the totally negative and the affirmative answer. Yet the respondents can choose also any of the middle marks (categories). Additionally, by computer processing of the respondents' answers (numbers ranging from 1 to 4), two forms of results are obtained: either the average value of $\boldsymbol{M}$, where $1 \leq \boldsymbol{M} \leq 4$, (Juuti, Lavonen, Uitto, Byman & Meisalo, 2004; Gedrovics & Platonova, 2005), or, by excluding the first two values, and analyzing only those respondents' answers, who have given the affirmative answers provided by the scale (Sjøberg & Busch, 2005).

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1 For more information on ROSE project search: www.ils.uio.no/english/rose, as well as the first dissertation within ROSE project (Schreiner, 2006)

2 It is established by several international comparative researches, that there exists a correlation between the number of books at home and the pupils' results

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Table 1. Priority topics in Science.

Statements	Latvia/ 1065		Regions, except Riga		R E G I O N S/ total number of respondents													
					R i g a/ 215			Kurzeme/ 219			Latgale/ 265			Vidzeme/ 198			Zemgale/ 168		
	Mean	**R**	Mean	R	Mean	**R**	*Cohens d* Regons - Riga	Mean	**R**	*Cohens d* Kurzeme - Riga	Mean	**R**	*Cohens d* Latgale - Riga	Mean	**R**	*Cohens d* Vidzeme - Riga	Mean	**R**	*Cohens d* Zemgale - Riga
A22	3.09	**9**	3.07	13	3.16	**10**	-0.088	3.02	13	-0.138	3.22	13	0.061	2.99	12	-0.164	2.98	24	-0.164
A23	3.23	**6**	3.21	**6**	3.31	**4**	-0.110	3.16	**6**	-0.165	3.34	**6**	0.034	3.18	**4**	-0.143	3.13	12	-0.185
A25	3.04	14	3.06	14	2.97	18	-0.100	2.94	19	-0.033	3.12	24	0.168	3.04	**9**	0.078	3.15	**9**	0.194
A34	3.27	**4**	3.27	**5**	3.28	**6**	-0.011	3.33	**2**	0.057	3.22	12	-0.068	3.35	**1**	0.077	3.15	**7**	-0.128
A40	3.27	**5**	3.29	**2**	3.20	**8**	0.097	3.37	**1**	0.192*	3.42	**4**	**0.248***	3.10	**6**	-0.103	3.19	**4**	-0.011
C06	3.01	18	3.02	19	2.97	19	0.050	2.86	21	-0.111	3.14	20	0.177	2.93	15	-0.040	3.13	13	0.155
C07	3.04	15	3.05	16	3.00	13	0.050	3.03	12	0.031	3.19	17	0.199	2.90	16	-0.101	3.04	19	0.038
C08	3.30	**2**	3.29	**3**	3.34	**2**	-0.052	3.21	**3**	-0.133	3.43	**3**	0.099	3.20	**3**	-0.143	3.30	**3**	-0.040
C10	3.14	**8**	3.12	**9**	3.22	**7**	-0.095	3.06	**10**	-0.154	3.21	15	-0.010	3.02	11	-0.191	3.15	**10**	-0.065
C11	3.06	12	3.03	17	3.18	**9**	-0.148	2.94	18	**-0.246***	3.30	**8**	0.124	2.76	33	**-0.398***	3.06	18	-0.114
C13	3.29	**3**	3.28	**4**	3.34	**3**	-0.065	3.16	**5**	-0.191*	3.46	**1**	0.137	3.07	**7**	**-0.289***	3.38	**1**	0.044
C14	3.00	19	3.00	20	3.00	14	0	2.75	37	**-0.220***	3.27	**10**	**0.256***	2.82	26	-0.161	3.08	16	0.071
C15	3.19	**7**	3.17	**7**	3.29	**5**	-0.117	3.07	**8**	**-0.209***	3.36	**5**	0.072	3.10	**5**	-0.191	3.07	17	**-0.202**
E08	3.09	**10**	3.11	**10**	3.00	15	0.112	3.00	16	0	3.32	**7**	**0.344***	2.90	17	-0.099	3.16	**5**	0.162
E10	3.05	13	3.08	12	2.97	20	0.085	3.11	**7**	0.154	3.20	16	**0.256***	2.86	21	-0.115	3.10	14	0.134
E11	3.08	11	3.13	**8**	2.91	22	**-0.234***	3.04	11	0.136	3.26	11	**0.383***	3.04	**10**	0.142	3.14	11	**0.233***
E12	2.99	20	3.02	18	2.86	27	0.169	2.94	20	0.084	3.10	26	**0.260***	2.90	18	0.042	3.16	**6**	**0.312***
E13	3.02	17	3.06	15	2.86	28	0.200	3.02	14	0.159	3.05	30	0.188	3.06	**8**	**0.207***	3.15	**8**	**0.284***
E23	3.03	16	3.09	11	2.80	36	**0.308***	3.07	**9**	**0.289***	3.27	**9**	**0.517***	2.85	24	0.053	3.10	15	**0.311***
E42	3.34	**1**	3.30	**1**	3.48	**1**	-0.198	3.18	**4**	**-0.320***	3.44	**2**	-0.047	3.26	**2**	**-0.237***	3.30	**2**	-0.195

Cohen's d values d ≥ 0.2 are printed bold; d values, marked with asterix (*) indicate statistical significance according Independent-Sample T- test (SPSS)

Methodology of Research

The first survey of the international research ROSE was carried out in Latvia in the spring (March - April) of 2003, and then 1065 valid for the further data processing of Form 9 (mainly 15 – 16 year olds) student questionnaires were obtained from 39 schools from all Latvia's regions (from Kurzeme, Latgale, Vidzeme and Zemgale, as well as from Riga, which was considered separately). To obtain more valid results, approximately 2/3 of the questionnaires were collected from the schools with Latvian as the language of instruction and 1/3 – from the schools with Russian as the language of instruction. We are clearly aware that it is not the language of instruction itself determining student attitudes to sciences. The details of this research can be found in Gedrovics (2004).

The questionnaires were processed by use of SPSS programme, version 12.0.1., and were obtained conditioned average values ***M*** in each statement. Then these average values were ranked, giving the 1st rank (***R***) to the highest value in each sub-group of the respondents (regions). This arrangement defined more exactly which of the science topics students selected as interesting and very interesting and would, thus, like to study (***M*** > 2.5).

The significance of the regional and group differences, with answers given by the students from each region compared with the answers given by students in Riga[3] , we analyzed according to the methodology of Lavonen, Byman, Juuti, Meisalo & Uitto (2005), by using *Cohen's d* ratio[4] , which characterizes the average amount difference effect size of two independent respondent groups (*a* and *b*):

$$d = M_a - M_b \sqrt{[(SD_a^2 + SD_b^2)/2]},$$

where: M_a and M_b are the average values of two independent respondent groups and SD_a and SD_b are standard deviations of the average values of these groups

If *Cohen's d* ratio value is *d<0.2,* there is no effect between the two groups, small effect at $0.2 \leq d < 0.5$, moderate effect if $0.5 \leq d < 0.8$, and large effect if $d \geq 0.8$ (Lavonen, Byman, Juuti, Meisalo & Uitto, 2005). The average values were also compared by the method of independent-samples T-test.

As ROSE questionnaire consists of 250 statements, the full analysis of which in the regional context would occupy much more space as allowed to this publication, the article will focus on sections A, C and E, namely *What I want to learn about*.

Results of Research

I Latvia's student priority topics in science subjects

Before analyzing of the priority (popular) topics, namely, those topics, which the majority of students (***M*** > 2.5) recognise as interesting and very interesting, it must be emphasized, that all 108 statements of this section include a small number of such topics, related to one concrete science subject. Most of the offered topics are integrated and usually involve several fields. In the framework of educational process, we could speak only about that subject, which enlarges on the respective topic most widely. Moreover, these topics have a relatively small number of questions connected with chemistry (Schreiner & Sjøberg, 2004; Gedrovics, 2005). As it is shown by Table 1,

[3] As this research does not evaluate the pupils' knowledge, then on principle it absolutely makes no difference, which answers of the two respondent groups are compared; Riga's respondents have been chosen only as a standardised group just for convenience.

[4] http://web.uccs.edu/lbecker/Psy590/es.htm#II.%20independent

most 15-year-old Latvian students are eager to learn about phenomena and processes about earth (A25, *look* Appendix I), as well about space (A22, A34, C08), the impact of space on earth (A23), and also about health issues (A40, E8, E10- E13, E23).

Nevertheless, amid the priority topics you can also find those which contemporary science either has not yet understood (E42), or those which can be referred to as only partly science topics (C11, C13, C15), or even those beyond proper science (C10, C14), bordering on mysticism. Besides it is interesting to note, that by regional perception there are no crucial differences in the issues referring to various phenomena on the earth and in space, though, as soon they involve health issues and problems, which only partly are connected with sciences, statistically significant deviations can be observed among various regions of Latvia (Table 1).

Table 2. Most popular topics in science, ranged (*R*).

State-ments	LATVIA, total			REGIONS									
				Latgale		Kurzeme		Riga		Vidzeme		Zemgale	
	average	girls	boys	girls	boys	girls	boys	girls	boys	girls	boys	girls	boys
A22*	**9**	23	11	20	16	23	12	15	11	23	12	34	15
A23*	**6**	11	**6**	10	**6**	17	**6**	8	**2**	**9**	**5**	21	11
A25*	14	21	19	26	31	30	17	17	26	16	17	18	12
A30	28	65	**1**	72	**8**	69	**1**	56	**5**	52	**1**	63	**1**
A31	53	86	**8**	92	**9**	84	**10**	87	**4**	74	**6**	78	**9**
A32	31	59	7	62	**5**	64	7	49	**8**	64	**10**	57	7
A34*	**4**	7	**5**	16	23	**5**	**2**	**9**	**7**	**3**	**2**	19	14
A40*	**5**	**2**	16	**3**	**10**	**1**	**9**	**7**	15	**2**	34	**2**	36
A42	46	15	97	17	103	**4**	85	20	85	22	97	15	92
C03	48	78	**9**	74	7	81	**5**	83	14	73	**4**	92	**5**
C04	40	66	12	63	17	65	13	48	22	71	13	77	**3**
C06*	18	31	14	28	20	34	19	23	16	40	**9**	29	**4**
C07*	15	**38**	**2**	32	**3**	33	**3**	39	**6**	50	**7**	44	**2**
C08*	**2**	**6**	**3**	**7**	**2**	11	**4**	**5**	**3**	**8**	**3**	**4**	**8**
C09	26	**9**	67	**4**	75	21	67	**6**	60	18	70	16	76
C10*	**8**	16	13	18	21	24	11	**10**	**10**	14	20	14	20
C11*	12	**5**	50	**6**	33	**10**	52	**4**	32	**10**	80	**9**	48
C13*	**3**	**1**	33	**1**	30	**2**	42	**1**	23	**1**	50	**1**	19
C14*	19	12	55	**5**	41	26	60	13	36	12	60	**5**	55
C15*	**7**	**3**	30	**2**	46	**9**	27	**3**	18	**5**	27	**10**	45
E08*	**10**	**10**	28	**9**	13	12	37	12	37	17	41	**6**	26
E10*	13	13	34	19	25	**7**	20	14	38	19	48	**7**	41
E11*	11	14	22	11	22	**6**	39	24	27	11	21	**8**	25
E12*	20	20	37	30	29	13	47	30	30	15	39	13	17
E13*	17	19	29	29	52	15	26	31	29	7	24	11	24
E23*	16	17	31	15	11	**8**	24	28	50	20	42	12	31
E41	27	47	**10**	52	**4**	45	14	33	**9**	38	11	66	**10**
E42*	**1**	**4**	**4**	**8**	**1**	14	**8**	**2**	**1**	**4**	**8**	**3**	**6**
R_{av}	*18.2*	***24.9***	*23.3*	*26.1*	***23.7***	*26.2*	***23.8***	*24.2*	***22.3***	*24.9*	***27.2***	*26.2*	***23.6***

* *Most popular topics for all respondents in Latvia (average)*

Still it should be considered that from all 20 topics, which are recognised as the most interesting by the students of Latvia in total (Table 1), scarcely more than a half are such, where statistically significant differences are observed, moreover in majority of cases they are not really vivid in all regions. In addition, if we inspect the middle value ranges, it is obvious, that in Riga and in the

other regions together (without Riga!), the first ten most popular topics, are, in reality, the same, differing only in the ranking. In Kurzeme the most popular topics are almost the same ones as in Riga, while in the other regions the ranking of the most popular topics is slightly more different.

Much greater difference can be observed, if we compare the most popular topics preferred by boys and girls separately (Table 2). Of course, there are also topics, which are more popular or less popular both with boys and girls (A23, E42, and C08) regionally or in Latvia on the whole. However, the majority of the topics are gender specific, i.e., the gender related differences can be clearly observed. Boys are interested in topics related to explosive chemicals (A31), military technologies (A32, A30), contemporary technologies (C03, C07) etc., girls are interested in the topics connected with dreams (C13), teleporting of thoughts (C15), life and death issues (C11) and partly in issues linked with mysticism (C09, C10) as well.

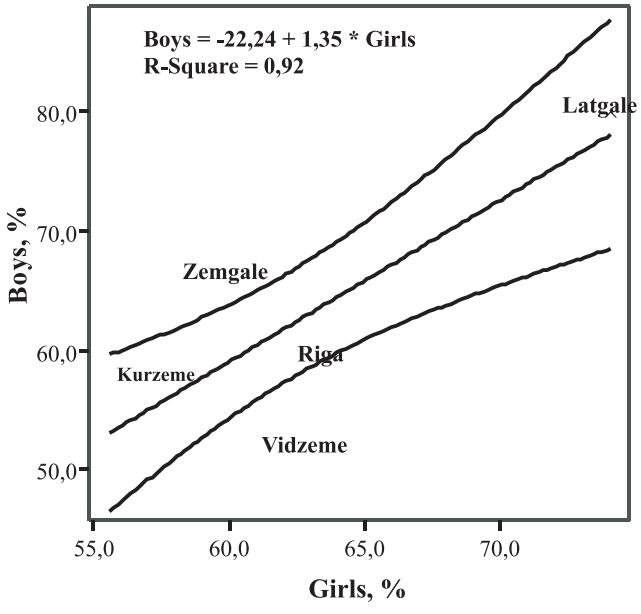

Figure 1. Respondents' desire to learn science topics, as a percentage of the total number of the topics offered.

Definitely, the answers given by Latvian students prove that boys are more interested in the issues somehow connected with technology, but girls are interested in issues involving the human body (health, beauty) and the soul. It confirms that girls have partly pseudo-scientific interests as found in a Danish study (Sjøberg & Busch, 2005). Other scientists have also come to similar conclusions in their works, for instance, (Lavonen, Byman, Juuti, Meisalo & Uitto, 2005).

In the regional perception there are differences similar to ones in the total survey (Table 1), as well as separately in groups of boys and groups of girls (Table 2). Without any additional research (interviews, discussions etc.), it is rather difficult to come to precise conclusions their interest motivation based only on the ROSE data, therefore, we have chosen the criterion – average rank, $R_{av,}$ by use of which (Table 2) we can see, that in all boys groups, except Zemgale, the boys' average rank is lower when considering the 30 most popular topics offered. Consequently, in the entire list these topics occupy a higher rank, i.e., the boys have a greater interest to learn about these corresponding issues.

Another criterion, which we have chosen as an indicator for characterising student interests, is the number of those statements, where the mean value is ***M*** >2.5, i.e., those that seem interesting enough to a particular group of respondents and worth to be learned (Fig. 1). As it is seen in the picture, in the schools of Latgale, in comparison with the other regions, the majority of the suggested topics by both boys and girls are regarded as interesting, worth

to be learned.

It is interesting to notice that the less popular issues, namely, those occupying the very last places (100 – 108) in the rank table, include such topics as, *Atoms and molecules* (A17), *How plants grow and reproduce* (A15), *Symmetries and patterns in leaves and flowers* (E01). Even more interesting, these three are considered as the most uninteresting ones both by boys and girls in all the five regions of Latvia, on the whole. A list of other issues appear also here as gender specific, for instance, girls are almost totally not interested in *Electricity, how it is produced and used in the home* (E27), *How petrol and diesel engines work* (A47) and *Organic and ecological farming* (E19), but the boys show almost no interest in *Detergents, soaps and how they work* (E26), *Plants in my area* (E25) etc. It is obvious, that the respondents of the subsequent group do not want to explore profoundly these and other similar issues, and if they appear in the lesson, then most likely, student results on these issues will not be good. Unfortunately, ROSE project suggests a bias answer, why some issues seem interesting to students, other – boring.

II Regional and group differences

The questionnaire data processing results prove that statistically significant differences have been observed both between regions and between genders. If the differences between the genders can be explained by different approaches to children up-bringing, as claimed by M. Dahlbom (Dahlbom, 1988), in some science subject learning/teaching elements and in student own experiences, then the regional differences, in such a relatively small state as Latvia, are neither easy to understand, nor to explain. By comparing the results obtained in separate regions with Riga region (Table 1), we can see that relatively more statistically significant differences are characteristic for Latgale – Riga, as well as for Kurzeme – Riga, it is proved both by independent-samples T-test and by *Cohen's d* ratio – in cases, when the proof has been obtained about the two averages' statistically significant differences according to independent-samples T-test, *Cohen's d* ratio is $d \geq 2$.

At first, by implementation of this observation the boys and girls' answers of each region were compared separately, and the findings revealed that almost two thirds of the affirmative answers contained statistically significant differences, respectively, from 58% in Vidzeme to 68 % in Kurzeme (in Latgale 60%, in Riga and Zemgale each 63%). In addition, in about 15% of the cases there is a large effect ($d \geq 0.8$) between girls and boys. Once again it proves that interest in sciences is gender specific.

By comparing the boys and girls' answers of two regions, according to *Cohen's d* ratio values, it was established that girls possess the greatest amount of statistically significant differences in cases of Latgale – Riga, Latgale – Kurzeme and Latgale – Vidzeme (respectively 73, 72 and 73% of statements). In the group of boys the major amount of statistically significant differences is observed in cases of Latgale – Kurzeme and Latgale – Vidzeme (respectively 67 and 65%), as well as in the comparison of Vidzeme – Zemgale respondents (38% of the answer differences are statistically significant).

One out of four *national variables,* i. e., values, which each state could create according to its own free will, the respondents' language of instruction was chosen in our case. After assessing of the answers given by the students with the Latvian and the Russian language of instruction, we have come to a conclusion that these two groups of the respondents differ very radically even according to their interest in the suggested science issues (Table 3).

Everything that has been mentioned above, prove a very great interests' diversity observed on the issue of the priority topics in sciences in regions of Latvia. As ROSE project does not assess student knowledge, then without further additional research it is impossible to establish the causes of these differences. Of course, we can speculate, referring to analogues in literature, nevertheless, it will not help to clarify the reasons of the differences. Moreover, the differences in majority of cases are statistically significant on the whole between the students with the

Table 3. **Comparison according language of instruction.**

Statement	LANGUAGE											
	Latvian, all students		Russian, all students		Latvian				Russian			
					Girls		Boys		Girls		Boys	
	M	*R*	*M*	*R*	*M*	*R*	*M*	*R*	*M*	*R*	*M*	*R*
A22.	3.03	**10**	3.22	14	2.99	22	3.08	12	3.19	23	3.27	12
A23.	3.20	**5**	3.29	**10**	3.22	7	3.20	**6**	3.22	18	3.38	**9**
A25.	3.04	**9**	3.04	31	3.08	18	2.99	16	3.06	35	3.02	33
A31.	2.60 [3]	56	2.90 [3]	45	2.24	88	3.11	**9**	2.45	83	3.53	**1**
A34.	3.35 [3]	**1**	3.09 [3]	26	3.34 [2]	**4**	3.36 [2]	**1**	3.14 [2]	31	3.02 [2]	34
A40.	3.19 [3]	**6**	3.44 [3]	**2**	3.43 [1]	**2**	2.86 [1,2]	23	3.43	**6**	3.44 [2]	**5**
C06.	2.93 [3]	19	3.18 [3]	19	2.83 [1,2]	33	3.10 [1]	**10**	3.21	19	3.14	23
C07.	2.93 [3]	18	3.29 [3]	**9**	2.69 [1,2]	49	3.28 [1]	**3**	3.20 [1,2]	21	3.42 [1]	7
C08.	3.27	**3**	3.39	**4**	3.28	**6**	3.25	**4**	3.36	**10**	3.43	**6**
C10.	3.11	**8**	3.20	18	3.13	14	3.08	13	3.19	24	3.20	17
C11.	2.94 [3]	17	3.35 [3]	**6**	3.22 [1,2]	**8**	2.53 [1,2]	63	3.53 [1,2]	**3**	3.08 [1,2]	26
C13.	3.21 [3]	**4**	3.46 [3]	1	3.55 [1]	**1**	2.74 [1,2]	38	3.67 [1]	**1**	3.14 [1,2]	24
C14.	**2.89** [3]	23	3.24 [3]	12	3.12 [1,2]	16	2.56 [1,2]	59	3.44 [1,2]	**5**	2.97 [1,2]	43
C15.	3.13	7	3.33	**7**	3.33 [1,2]	**5**	2.85 [1]	27	3.57 [1,2]	**2**	2.98 [1]	42
E08.	2.96 [3]	14	3.38 [3]	**5**	3.13 [1,2]	13	2.70 [1,2]	40	3.44 [2]	**4**	3.31 [2]	11
E11.	2.99 [3]	12	3.29 [3]	**8**	3.12 [1,2]	15	2.82 [1,2]	30	3.35 [2]	11	3.18 [2]	19
E42.	3.31	**2**	3.41	**3**	3.36	**3**	3.24 [2]	**5**	3.37	**8**	3.45 [2]	**4**

[1] *statistical significance within respective teaching language group (Latvian girls/ boys or Russian girls/boys)*
[2] *statistical significance between different teaching language groups (girls/ girls or boys/ boys)*
[3] *statistical significance between all students of Latvian teaching and Russian teaching schools*
Ranks (R) are established within whole group(for 108 statements)

Latvian language of instruction and the Russian language of instruction, as well as between the girls of the two groups, on the one hand, and the boys, on the other hand.

Thus, for example, the students with the Latvian language of instruction on the whole prefer as number 1 (***R***=1) the statement *How it feels to be weightless in space* (A34), but the students with the Russian language of instruction – the statement *Why we dream while we are sleeping…*(C13). Yet we have to admit that this statement is considered as the most interesting (***R***=1) only by girls, what's more, in both groups of the languages of instruction, while the boys have chosen it as the 38th (in the group with the Latvian language of instruction) and the 24th *interesting topic* (in the group with the Russian language of instruction).

It is worth noticing, that the boys with the Russian language of instruction recognise as the most interesting topic the statement A31 (*Explosive chemicals*), while the boys with the Latvian language of instruction – the already mentioned statement A34. In their turn, the girls rank the boys' popular statements respectively in the 88th and 4th places (with the Latvian language of instruction), and the 83rd and 31st places (with the Russian language of instruction).

Definitely, there are also some topics (C08, E42), which on the whole are considered as *very interesting* by both the students with the Latvian and the Russian language of instruction, their very high ranks testify it (Table 3). It could be mentioned, too, that from all 108 topics offered, the students with the Latvian language of instruction recognise[1] as interesting on the whole 60% of the topics (girls – 64, boys – 60%), but the students with the Russian language of instruction as such distinguish 74% of the topics (girls – 74, boys – 72%). Similar results were obtained while comparing schools with different language of instruction in the same area (e.g. two towns in Zemgale and Latgale, as well as in Riga). In schools with Latvian as a language of instruction 50%, 52% and 57% of the questions (topics) caused great interest. In schools with Russian as a language of instruction 74%, 88% and 65% of all topics caused great interest. These figures prove that the students in the schools with the Russian language of instruction show greater interest in sciences acquisition than the students in the schools with the Latvian language of instruction.

Nevertheless, within the framework of the same language of instruction no statistically significant differences can be observed between boys and girls. This established fact could be interesting in the context of education contents perfection, yet at first, the causes of the differences in interest should be discovered.

Obviously, at this moment we cannot claim the advantages of one or the other region, when choosing the representative respondent selection on the national scale.

Conclusions

1. The results of the international comparative research ROSE, based on various respondents' groups (regions, gender, the language of instruction) in Latvia, prove significant differences exist in 15 year-old student interests in science.
2. It is clearly shown that student science interests are gender specific, and it definitely has to be considered in the development process of science didactics perfection (teaching/learning contents, methodology etc.).
3. A statistically significant difference was established in the respondents' interests in science depending on the student's language of instruction. This difference may not be the language itself, but a difference in family up-bringing, as well as some peculiar nuance in methodology requiring further research work.

[1] with mean value ***M***>2.50 as criterion for acceptance

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References

Bagata B., Geske A. & Kiselova R. (2003). Using the IEA TIMSS Tests to Compare Pupils' Science Education Achievements at Regional and School Levels. *Journal of Baltic Science Education*, No 1(5), pp.34-41.

Bilek M., Radkova O., Gedrovics J. (2006). Czech and Latvian Students Interests in Science and Technology Education: A Comparative Study Based on ROSE Project. 9 p. In: *3rd International Scientific Conference Theory for Practice in the Education of Contemporary Society* 6-8 April 2006 Riga, /in press/.

Dahlbom M. (1988). Vad elever tyckt och tycker om skolans ämnen. In: *Häften för didaktiska studier*, No 5. - Stockholm: HLS Förlag, 30 s.

Gedrovics J., Platonova S. (2005). [Cognitive Interests of the Schoolchildren of Junior and Middle Age in the Field of Chemistry, Biology and Physics]. In: *Gamatamokslinis ugdymas bendrojo lavinimo mokykloje//Natural Science Education at a General School* (Proceedings of the Eleventh National Scientific Conference). Šiauliai: Lucilijus, pp. 121-132. [In *Russian*]

Gedrovics J. (2004). Report on Organizing the ROSE Survey: http://www.ils.uio.no/ forskning/ rose/documents/reports/ReportROSE_LATVIA.doc (24.01.2006.).

Gedrovics J. (2005). [International Comparative Project ROSE and the Place of Chemistry in it.] – *Konferences „Ķīmijas izglītība skolā - 2005" rakstu krājums/ Rīga, 2005.gada 6.oktobris*. – R.: LU Akadēmiskais apgāds, 2005, 46-54. [In *Latvian*]

Juuti K., Lavonen J., Uitto A., Byman R., Meisalo V. (2004) Boys' and Girls' Interests in Physics in Different Contexts: A Finnish Survey. In: *Current Research on Mathematics and Science Education*, Eds. A.Laine, J.Lavonen, V.Meisalo. Research Report 253, pp. 55-79.

Lavonen J., Byman R., Juuti K., Meisalo V. & Uitto A. (2005). Pupil Interest in Physics: A Survey in Finland. *NorDiNa*, No 2, pp.72-85.

Schreiner C. (2006). Exploring a ROSE-garden/Norwegian youth's orientations towards science – seen as signs of late modern identities. Oslo, University of Oslo, 315 pp.

Schreiner C. & Sjøberg S. (2004). Sowing the seeds of ROSE. Background, Rationale, Questionnaire Development and Data Collection for ROSE. *Acta Didactica*. - (4/2004): Dept. of Teacher Education and School Development, University of Oslo, Norway.

Sjøberg S. & Busch H. (2005). Ungdomskulturen: elevernes erfaringer, holdninger og interesser. I: S. Sjøberg. *Naturfag som almendannelse/ En kritisk fagdidaktik*. – Århus: Klim, 379-426.

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Appendix I

STATEMENTS, ANALYSED IN ARTICLE

Statements	Contents and contexts*	Full explanation
A15	*P*	How plants grow and reproduce
A17	*C*	Atoms and molecules
A22	*UZ*	Black holes, supernovas and other spectacular objects in outer space
A23	*UZ*	How meteors, comets or asteroids may cause disasters on earth
A25	*GZ*	Tornados, hurricanes and cyclones
A30	*CZ*	How the atom bomb functions
A31	*CZ*	Explosive chemicals
A32	*CHZ*	Biological and chemical weapons and what they do to the human body
A34	*UM*	How it feels to be weightless in space
A40	*HF*	How to exercise to keep the body fit and strong
A42	*LHF*	How radiation from solariums and the sun might affect the skin
C03	*LT*	The use of lasers for technical purposes (CD -players, bar -code readers, etc.)
C04	*ST*	How cassette tapes, CDs and DVDs store and play sound and music
C06	*T*	How mobile phones can send and receive messages
C07	*T*	How computers work
C08	*UM*	The possibility of life outside earth
C09	*UMH*	Astrology and horoscopes, and whether the planets can influence human beings
C10	*UM*	Unsolved mysteries in outer space
C11	*HM*	Life and death and the human soul
C13	*M*	Why we dream while we are sleeping, and what the dreams may mean
C14	*M*	Ghosts and witches, and whether they may exist
C15	*HM*	Thought transference, mind -reading, sixth sense, intuition, etc.
E01	*PB*	Symmetries and patterns in leaves and flowers
E08	*HQ*	Cancer, what we know and how we can treat it
E10	*HQ*	How to perform first -aid and use basic medical equipment
E11	*HQ*	What we know about HIV/AIDS and how to control it
E12	*HY*	How alcohol and tobacco might affect the body
E13	*HY*	How different narcotics might affect the body
E23	*HY*	How my body grows and mat ures
E41	*X*	Very recent inventions and discoveries in science and technology
E42	*X*	Phenomena that scientists still cannot explain

* look at (Schreiner & Sjøberg, 2004)

***Abbreviations**: B – Beauty; C – Chemicals; F – Fitness; G – Geo science; H – Human biology;L – Light; M – Mystery;P – Plants; Q – Health;S – Sounds; T – Technology; U – Universe; X – STS, NOS (integrated sciences); Y – Young body; Z - Hullabaloo*

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Резюме

РЕГИОНАЛЬНЫЕ И ГРУППОВЫЕ РАЗЛИЧИЯ НА ПРИМЕРЕ РЕЗУЛЬТАТОВ ПРОЕКТА ROSE В ЛАТВИИ

Янис Гедровицс

В статье рассмотрены региональные и групповые (пол респондентов; язык обучения в школе) различия в Латвии на примере результатов интернационального сравнительного проекта ROSE. Показано, что наиболее значимые различия наблюдаются между Латгалией и Ригой, что подтверждено расчетами коэффициента *Cohen's d* и T-тестом для независимых выборок. Подтверждено, что интерес к различным темам в области естетсвознания в значительной мере зависит как от пола респондента, так и от языка обучения в школе.

Однако *языковой* фактор скорее всего мнимый в том смысле, что не сам язык, а модель и традиции воспитания в семье имеют куда большее значение в формировании отношения к естественным наукам и технике в целом. При этом учащиеся с русским языком обучения проявляют значительно больший интерес к различным темам в области естетсвознания, что проявляется в большем количестве предпочитаемых тем из всей совокупности предложенных.

Общие результаты в Латвии сравнительно близки к таковым в ряде других стран в целом, однако из-за отсутствия подробных данных об исследованиях в других странах, в региональном разрезе проводить сравнения не предоставляется возможным.

Ключевые слова: сравнительные исследования, региональные различия, язык обучения, группы респондентов.

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