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SCIENTIFIC RESEARCH ACTIVITY EVALUATION: LITHUANIAN UPPER SECONDARY SCHOOL STUDENTS' POSITION

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Abstract. *Human progress is inseparable from scientific achievements. The role of scientific achievements and knowledge in the modern world progress process is evident. Science can help the humanity a lot: create a more comfortable life, predict natural phenomena, foster humanistic traditions, educate society, change the development of society and so on. Today it is obvious, that the basis of country's prosperity is its members' perceptiveness, ability to discover, research and create. Therefore, society, its education system is concerned with forming conditions, encouraging young generation to try their abilities in scientific research activity, develop necessary competences and to know scientist's, researcher's activity and career peculiarities already in a secondary school. After carrying out the research, the opinions of upper secondary school students (9-12 forms) about scientific research activity at school were analysed, Lithuanian comprehensive school upper secondary school students' attitude towards researcher, scientist's activity was revealed. Factor analysis was carried out applying the main component method and Varimax rotation with Kaiser Normalization. After carrying out this analysis it became clear that upper secondary school students do not relate their future with scientific research activity, researcher's career is considered to be not perspective and of low prestige.*
Key words: *comprehensive school, science education, scientific research activity, teaching process.*

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Introduction

The requirements of society to education are constantly changing: at the beginning of the 8th decade economical attitude to education was prevailing, the significance of economics to education and reproductive role of education were accentuated; in the 9th decade every person's need to develop, to seek for self-realization in professional career and become stronger in society seeking higher education was emphasized. In the 10th decade of the last century learning society's idea was accentuated which was supplemented by information society idea corresponding to global enormous progress of information technologies, economic changes and rapid development of all science branches (Reich, 1992).

The science today is perceived in a broad way. It is treated as a part of culture and business basis, satisfying material and spiritual human needs. Today it is universally acknowledged that in this modern world technological progress, innovations, knowledge economy are the basis of country's economy and culture development. An obvious connection is noticed between the country development level and knowledge economy part in general economy. Country future depends on rapid development of science and technologies, especially of those countries whose natural resources are not abundant and the main product is produced owing to intellect. A rapid change of labour market needs and knowledge becoming the main condition of success in the market economy based on competition raises new requirements to the abilities of its subjects as well, to acquire such knowledge, which would allow not only to survive, but also to overcome in the competitive fight. Today the essential abilities in the knowledge society become research abilities, thanks to which fundamental or applied type of knowledge is obtained. Therefore, today every society raises new education purposes, seeks to reconstruct its

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education system so that it could govern innovations influenced by globalization and could prepare the young generation to live in globalized world and act in competition based market economy. In modern world not only to master knowledge but also to create and take part in society and world changes himself becomes especially important ability. Therefore, a lot of attention should be paid to pupils' scientific research work ability formation, critical thinking, creativity and productive self-expression education. However, lately the decrease of youth wishing to relate their life and activity with the scientist's career has been noticed, the number wishing to study natural sciences is diminishing. Therefore, a great role falls to comprehensive school educating students' cognitive abilities, forming scientific research activity knowledge and abilities and a positive attitude towards scientist's career.

Today attitude towards learning is more often based on cognitive theory which accentuates inner man's knowledge acquisition processes. The essence of cognitive theory lies in pupil's education which is related with constructivism – individual perception creation – concept. From the point of view of constructivism, learning is understood as an active process, as a constant formulation of hypotheses and decision making. Constructivists stress that pupils' learning doesn't happen only observing, listening and feeling, The most important are thinking structures, which are developed referring to individual's activity and experience. The aim of such teaching is not to pass over and get information, but to encourage and educate pupils' understanding and activity, to teach them to understand the world in which he lives, to understand the meaning of events, to research, experiment, collectively solve problems (Woolfolk, 1995; Brooks & Brooks, 1999). Today these abilities are very important, because research in different man's activity spheres becomes permanent state. Therefore, already at school pupils have to have an opportunity to acquire scientific research activity skills and to experience joy of discovery.

In the process of becoming a personality, pupil's encouragement to cognise actively occupies a special place. The pupil, who is involved into the process of cognition, is encouraged observe, research, analyse, generalise. Scientists claim, that only active pupil's cognitive activity can make a great influence on the development of personality. Contemplating of how to encourage the highest degree of thinking, education process researchers usually speak about the ways which are similar to teaching to discover and research. Thus, today seeking to encourage pupil's active cognition, scientists present various teaching strategies (and methods) such as, (*evidence based teaching*) (Petty, 2008), (*problem-based learning*) (Maggi, 2000), (*project-based learning)(*Atkinson, 2001; Berman,1997), (*critical thinking*) (Paul, Binker, Martin & Adamson, 1989) and other. All these teaching strategies (and methods) can be realised while organising pupils' scientific research activity, where pupils raise problems, argue, critically think, search and so on.

A teacher who tends more often to organise pupils' reproductive activity, can achieve necessary results, however, the fact that pupils mastered readymade information and acquired knowledge and skills, doesn't mean yet that they mastered creative scientific research activity experience. To teach research and discover is impossible, in fact, if the teacher and pupils are not experienced to discuss things, and if there are no norms in class, allowing sharing ideas frankly and straight through dialogue and discussions. Learning only according to a pattern, the pupil doesn't acquire independent learning and searching skills. The teacher can explain the pupils the phenomenon, tell about a thing, however, a live way of discovery strengthens the knowledge in a better way. This cannot be achieved only by giving instructions. Students' independent learning has to be given not for memorising the material of the textbook, but for solving life and cognition problems, for doing different projects. Learning is not a perfect repetition of the things that were taught, but an active process of meaning creation, during which interpretations occur of what was taught. The value of such teaching is double: important things are learnt, besides, research skills and independence develop, which will be useful in future. Thus, a bigger effect will be achieved plunging a pupil into a situation in which he will feel uncertainty and doubts and various questions will arise to him, than explaining everything and teaching according to a pattern. This kind of situation is created very easily during scientific research activity, in which conditions are formed to educate pupils' scientific and critical thinking, insight, creativity, to develop personality features. Organising pupils' scientific research activity, assumptions are made for pupils to act actively and independently. Teachers, using discovery and research teaching methods, raise questions, problems and these have to speak up their ideas. The teacher "doesn't teach", "doesn't explain" the pupils important ideas, but forms favourable conditions and encourages research and discover (Arends, 1998).

In this activity active learning takes place, doing thinking tasks. Working in this way, students learn to research, understand a problem, formulate aims and tasks, raise a hypothesis, form its check-up plan, analyse research results, check the obtained conclusion reliability, raise a new problem when necessary and so on. In other words, pupils master scientific cognition elements.

Teacher's proper methodological preparation to organise pupils' scientific research activity forms assumptions for the pupil to achieve the level, when he himself can independently formulate hypothesis, choose research methods, means, discuss about different attitudes and to evaluate them independently and critically, present his research, share the obtained experience during scientific research activity. Pupil's motivation, inclination to realise himself in scientific research activity isn't of less importance E.P. Iljin (2000) notes, that not distinctive intellectual abilities separate a scientist researcher from the other people, but strong scientific research activity motivation, which combines several passions: love for truth, wish to create and discover and the fame of discovery. Therefore, it is important for the pupil to have an opportunity to find out about scientist's activity and career peculiarities.

The problem is that the youth are not charmed so much with the scientist's, researcher's career. Such tendency has been observed for a long time all around Europe and in Lithuania as well. However, reasons causing such tendency are not known. It has been previously determined that essential hindering factors of student interest in scientific research activity include a) lack of teachers' motivation; b) student orientation to choosing an easier less efforts requiring way, c) poor material base at school, d) shortage of methodology of how to organize scientific research activity for students; e) insufficient teachers' preparation for scientific research activity (Lamanauskas, Augienė, 2009).

Thus, **research object** is scientific research activity in comprehensive school. The main **research aim** is to analyse upper secondary school students'(9-12forms) opinions about scientific research activity, to reveal what is Lithuanian upper secondary school students' attitude to scientist's, researcher's career, how students value scientific research activity.

Methodology of Research

General Characteristics of Research

Research was carried out in January - April 2011. The method of research is surveying (filling in a questionnaire). The undertaken research mainly agrees with Lithuanian context as the survey involved the respondents from different comprehensive schools (concerning type and localization). Data were collected from 20 schools. The research is based on the attitude that pupils' opinion and assessment researches are important because they allow to identify urgent problems or to specify already known ones. Referring to respondent suggestion analysis, it is possible suggest problem solution ways, evaluate possible consequences. Opinion researches are an effective means seeking to initiate the changes. Preliminary results were published previously (Lamanauskas, Augiene, 2011).

Instrument of Research

For data collection, an anonymous questionnaire was distributed. The applied questionnaire was prepared by authors. The instrument contained such major parameters:

- Evaluate general statements about scientific research activity, e.g., I like researching nature (11statements altogether);
- Evaluate personal scientific research activity abilities (6 abilities);
- Evaluate statements about scientific researcher's activity (profession) (21statements);
- Evaluate statements about who gave and who gives information about scientist's activity (profession) abilities (9 statements).

The questionnaire also included a demographical part and some other additional variables (for example, an open question about whether respondents would like to become scientists/researchers in future, whether teachers encourage participate in research activity? and other).

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Sample

1338 respondents participated in the survey. The distribution of the respondents regarding the sex and grade is presented in Table 1.

Table 1. Characteristics of the respondents (N/%).

Grade	Sex		Total
	Female	*Male*	
The 9th grade	182/25.5	185/29.6	367/27.4
The 10th grade	173/24.3	197/31.5	370/27.7
The 11th grade	152/21.3	112/17.9	264/19.7
The 12th grade	206/28.9	131/21.0	337/25.2
Total	713/100.0	625/100.0	1338/100.0

The distribution of respondents regarding sex and grade is, in fact, proportional, research sample is considered sufficiently representative. Sampling was structured applying the stochastic method of group selection i.e. a consecutive 'bunch' system. Schools from all 10 Lithuanian regions (districts) were included into sample.

Statistical Procedure

To assess the obtained data, the indexes of descriptive statistics (absolute and relative frequencies, popularity indexes, standard deviations) were employed. Every statement was given the calculated popularity/significance index ($0 \leq PI/SI \leq 1$). The closer is PI/SI value to 1, the more important is the statement to the respondent. To establish differences between variables, non-parametrical chi-square criterion χ^2 was applied. Spearmen rank correlation coefficient rho (ρ). was used to establish links between variables.

A 21 statements factor analysis was carried out applying the main component method and Varimax rotation with Kaiser Normalization. The main aim of the factor analysis is to reduce the number of variables. The number of factors was established on the basis of Kaiser Criterion, i.e., those factors are analysed which Eigen values are equal or bigger than 1. Data, obtained on the basis of sample absolutely suit for carrying out factor analysis. Two methods were applied in order to evaluate whether the data set was appropriate for the factor analysis: Bartlett`s Test of Sphericity and Kaiser-Meyer-Olkin (KMO) test. Sample suitability for factor analysis results will be presented in table 2.

Table 2. KMO and Bartlett's test results.

Kaiser-Meyer-Olkin (KMO) test		0.924
Bartlett`s Test of Sphericity	Chi- square (χ^2)	6452.904
	df	210
	p	0.000

Table 2 indicates that all values are quite high (Rivera, Ganaden, 2001; Nasledov, 2005). Bartlett's Test of Sphericity test shows that the data correlation matrix is not equal to 1 and that data are correlated, therefore they are suitable for factor analysis. Kaiser-Meyer-Olkin (KMO) test proves that factor analysis suits for the data (KMO=0,924).

To set the differences between the variables Stjudent criterion applicable for two independent samples was used, also One-way Anova analysis was carried out. The instrument of data processing is SSPS statistical software package.

Results of Research

The results of the research, as it was believed, show that respondents are not willing to relate their career with the researcher's, scientist's activity. 11.5% of the respondents would like to be researchers in future, 43.4% - wouldn't like. The rest of them didn't have clear position, were not sure about their attitude.

Having analysed presented statements about scientific research activity (Table 2) we can see, that the respondents evaluate searching for information on the internet most favourably (PI=0.65). It is obvious, that pupils like more not only what they do while learning but in their free time as well. The youth nowadays spend a lot of time searching the net. Also, the respondents like excursions based on environmental/nature studies (PI=0.60). This shows, that pupils like such ways (forms) of research activity organisation, during which teaching environment can be changed, they can directly corporate and communicate.

Table 2. Activity evaluation (N/%).

Statements	Like	Partly like	Don't like	PI	SD
Searching for information on the Internet	615/46.0	524/39.2	199/14.9	0.65	0.35
Excursions based on environmental / nature studies	510/38.1	584/43.6	244/18.2	0.60	0.36
Different observations and experiments	427/31.9	716/53.5	195/14.6	0.58	0.32
Lab works	482/36.0	540/40.4	316/23.6	0.56	0.38
Research activities involving other students	433/32.4	555/41.5	350/26.2	0.53	0.38
Exploring nature	372/27.8	611/45.7	355/26.5	0.50	0.36
Presentations of conducted investigations and findings	214/16.0	490/36.6	634/47.4	0.35	0.36
Searching for information in reference books, dictionaries, encyclopaedias etc.	202/15.1	505/37.7	631/47.2	0.34	0.36
Conducting different experiments on chemistry at home	227/17.0	423/31.6	688/51.4	0.32	0.37
Preparing different environmental / nature projects	156/11.7	457/34.2	725/54.2	0.28	0.34
Describing the obtained results of the conducted experiments and findings	91/6.8	406/30.3	841/62.9	0.22	0.30

However, the respondents avoid such activity as preparing different environmental/nature projects (PI=0.28), conducting different experiments on chemistry at home (PI=0.32) and so on. It has been stated, that girls like more excursions based on environmental/nature studies (42.6%) than boys (33.0%). Such difference is statistically significant (χ^2=20.39, df=2, p<0.000). Also, girls like exploring nature more (31.6%) than boys (23.5%). The differences are statistically significant (χ^2=21.31, df=2, p<0.000). However, it is interesting, that conducting different experiments on chemistry at home boys like more (20.3%) than girls (14.0%). The differences based on this variable are also statistically significant (χ^2=10.20, df=2, p=0.006).

The respondents' personal research activity ability evaluation is presented in table 3.

Table 3. Respondents' personal research activity ability evaluation (N/%).

Research activity abilities	Good	Average	Weak	PI	SD
Conducting research	464/34.7	624/46.6	250/18.7	0.58	0.35
Planning research	250/18.7	765/57.2	323/24.1	0.47	0.32
Choosing an appropriate research technique (method)	269/20.1	685/51.2	384/28.7	0.45	0.34

Research activity abilities	Good	Average	Weak	PI	SD
Dissemination (presentation) of findings	305/22.8	594/44.4	439/32.8	0.45	0.36
Describing research (preparing a report)	237/17.7	672/50.2	429/32.1	0.42	0.34
Defining a problem of research	161/12.0	686/51.3	491/36.7	0.37	0.32

In the third table we can see, that the respondents value research abilities as average or lower than average, in fact. Only conducting research is evaluated better (PI=0.58), though the index itself is not high. Defining a problem of research the respondents mentioned as the weakest. One can think, that research works conducted at school are poorly oriented into education of research abilities, conducting a research is considered as a satisfactory teaching activity and not much attention is paid to all scientific phenomenon research stages: starting with defining a problem, formulating of the topic, and ending with processing and presenting research data.

Analysed data show how the respondents value scientific, researcher's activity. The results are presented in table 4.

Table 4. Scientific, researcher's activity evaluation (N/%).

Statements	Agree	Partly agree	Don't agree	PI	SD
9. Scientific discoveries play an important role for public welfare	898/67.1	354/26.5	86/6.4	0.80	0.30
10. Participation in research activity helps with practical knowledge acquisition and evaluation	751/56.1	503/37.6	84/6.3	0.75	0.30
3. Participation in scientific research activity at school helps with further preparation for further studies	713/53.3	504/37.7	121/9.0	0.72	0.32
18. Scientists are important knowledgeable people	674/50.4	535/40.0	129/9.6	0.70	0.32
21. Research activity is useful for learning in order to achieve better results	576/43.0	627/46.9	135/10.1	0.67	0.32
8. Participation in research activity creates conditions for demonstrating different hobbies and abilities	573/42.8	601/44.9	164/12.3	0.65	0.33
2. Participation in research activity creates conditions for gaining self-knowledge	553/41.3	626/46.8	159/11.9	0.64	0.33
11. Research activity stimulates creativity	537/40.1	603/45.1	198/14.8	0.63	0.34
1. Research activity at school is a meaningful occupation	473/35.4	730/54.6	135/10.1	0.62	0.31
14. Research activity raises young-man self confidence and willingness to seek new challenges in science	494/36.9	684/51.1	160/12.0	0.62	0.32
16. Scientist is a way of life	520/38.9	579/43.3	239/17.9	0.61	0.36
19. Research activity is useful for practical daily life	454/33.9	705/52.7	179/13.4	0.61	0.32
7. Research activity is a good opportunity for self-realization	441/33.0	713/53.3	184/13.8	0.60	0.34
15. Scientists are a very respectful part of our society	471/35.2	651/48.7	216/16.1	0.60	0.32
13. Research activity encourages searching, analyzing, experiencing the joy of life	470/35.1	661/49.4	207/15.5	0,59	0,34
4. Research scientist is a very prestigious profession	407/30,4	692/51,7	239/17,9	0.56	0.34
17. Scientist's wages are rather high	416/31.1	664/49.6	258/19.3	0.56	0.35

Statements	Agree	Partly agree	Don‘t agree	PI	SD
6. Research activity at school is excellent employment and meaningful leisure time	427/31.9	643/48.1	268/20.0	0.55	0.35
5. Research activity at school is student appreciation and certain evaluation	333/24.9	736/55.0	269/20.1	0.52	0.33
20. Research activity is more appropriate for different centres, clubs and other establishments rather than for school	341/25.5	572/42.8	425/31.8	0.46	0.37
12. Research activity can be accepted after school only	307/22.9	586/43.8	445/33.3	0.45	0.37

The results show, that the respondents understand, that scientific discoveries play an important role for public welfare (PI=0.80). Participation in research activity helps practical knowledge acquisition and evaluation (PI=0.75), and also helps with further preparation for further studies (PI=0.72). However, research scientist's profession evaluation is rather low. The respondents don't think research scientist is a very prestigious profession (PI=0.56). The respondents don't want to agree that research activity at school is excellent employment and meaningful leisure time. We can make an assumption that this kind of activity does not raise big interest in pupils. According to respondents, research activity at school is not student appreciation and certain evaluation.

Rather negative evaluations can be related with the fact, that pupils at school are not sufficiently encouraged to take part in scientific research activity, do not have experience in such an activity; therefore very often they have never experienced the joy of discovery. The results presented in table 5 show that more than one third of teachers and parents do not encourage pupils to take up such an activity.

Table 5. Teachers and parents' role encouraging pupils' participation in scientific research activity (N/%).

Encouragers	Level	Sex		Total	Chi square test
		Female	*Male*		
Teachers	*Encourage*	101/14.2	118/18.9	219/16.4	χ^2 =9.28; df=2; p=0.010
	Partly encourage	382/53.6	287/45.9	669/50.0	
	Don't encourage	230/32.3	220/35.2	450/33.6	
Parents (foster parents)	*Encourage*	70/9.8	103/16.5	173/12.9	χ^2 =13.18; df=2; p=0.001
	Partly encourage	263/36.9	210/33.6	473/35.4	
	Don't encourage	380/53.3	312/49.9	692/51.7	

The results show that only 16.4 % of teachers and 12.9 % of parents encourage their children to take part in such kind of activity. It is clearly seen, that parents encourage less than teachers. This is a rather logical result, because teachers in one way or another directly participate in teaching/learning process. In both cases statistically significant differences are fixed. Boys more favourably (positively) value this parameter than girls. There is a direct correlation link between these two variables (Spearmen ρ=0.31, p<0.000).

In table 6 general results about the sources, which provide most information about research scientist's activity (profession) peculiarities are presented.

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Table 6. Information source evaluation about scientist's activity peculiarities (N/%/SI).

Statements	Agree	Partly agree	Don't agree	SI	SD
TV helps to find out about scientist's activity (profession) peculiarities	511/38.2	619/46.3	208/15.5	0.61	0.34
Teachers constantly provide information	461/34.5	629/47.0	248/18.5	0.58	0.36
Professional information and consultation specialists	373/27.9	692//51.7	273/20.4	0.53	0.34
Reading books helps to find out about scientist's activity (profession) peculiarities.	385/28.8	617/46.1	336/25.1	0.51	0.36
School professional information and consultation specialist	339/25.3	619/46.3	380/28.4	0.48	0.36
Have sufficient knowledge about scientist's activity (profession) peculiarities	189/14.1	645/48.2	504/37.7	0.38	0.34
Scientific activity peculiarities are often discussed during the lessons	194/14.5	576/43.0	568/42.5	0.36	0.35
School social pedagogue	201/15.0	524/39.2	613/45.8	0.34	0.35
School psychologist	203/15.2	484/36.2	651/48.7	0.33	0.36

In the table we can see, that watching TV pupils get most information (SI=0.61). School social pedagogues and psychologists practically do not provide such information. It is understandable, that the second information source according to significance is teachers (SI=0.58). On the other hand, during the lessons such information is not presented, in fact. The results allow us to claim, that obtaining such information is the matter of a pupil himself.

Factor Analysis Results

21 statements' factor analysis about scientific research activity was carried out. The five factors were extracted based on real values (the Eigen Value Statistics). All these five factors accounts for 46,68% of variance.

Table 6. Factor analysis results of the statements about scientific research activity (SI – significance index, SD – standard deviation).

	FACTOR 1 Scientific research avtivity influence on personality education	Factor loadings	Significance index SI and Std. Deviation
11.	Research activity stimulates creativity	0.67	
13.	Research activity encourages searching, analyzing, experiencing the joy of life	0.65	
14.	Research activity raises young-man self confidence and willingness to seek new challenges in science	0.60	SI=0.61;
8.	Participation in research activity creates conditions for demonstrating different hobbies and abilities	0.54	SD=0.21
7.	Research activity is a good opportunity for self-realisation	0.51	
6.	Research activity at school is excellent employment and meaningful leisure time	0.45	
19.	Research activity is useful for practical daily life	0.42	
21.	Research activity is useful for learning in order to achieve better results	0.41	

	FACTOR 2 Scientific research activity influence on pupil's status in school society	Factor loadings	Significance index SI and Std. Deviation
5.	Research activity at school is student appreciation and certain evaluation	0.65	
1.	Research activity is a meaningful occupation	0.60	
2.	Participation in research activity creates conditions for gaining self-knowledge	0.59	SI=0.58
6.	Research activity at school is excellent employment and meaningful leisure time	0.53	SD=0.22
4.	Research scientist is a very prestigious profession	0.51	
7.	Research activity is a good opportunity for self-realization	0.43	
	FACTOR 3 The importance of scientific research activity to career	**Factor loadings**	**Significance index SI and Std. Deviation**
9.	Scientific discoveries play an important role for public	0.71	
10.	Participation in research activity helps with practical knowledge acquisition and evaluation	0.69	SI=0.74
3.	Participation in scientific research activity at school helps with further preparation for further studies	0.59	SD=0.22
18.	Scientists are important knowledgeable people	0.43	
	FACTOR 4 Scientist's social status in society	**Factor loadings**	**Significance index SI and Std. Deviation**
15.	Scientists are a very respectful part of our society	0.73	
17.	Scientist's wages are rather high	0.70	SI=0.60
16.	Scientist is a way of life	0.50	SD=0.22
18.	Scientists are important knowledgeable people	0.44	
4.	Research scientist is a very prestigious profession	0.44	
	FACTOR 5 Scientific research activity organization context	**Factor loadings**	**Significance index SI and Std. Deviation**
20.	Research activity is more appropriate for different centres, clubs and other establishments rather than for school	0.79	SI=0.45 SD=0.29
12.	Research activity can be accepted after school only	0.75	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a Rotation converged in 8 iterations.

Looking at Table 6, it is observed that there are 8 statements under the first factor (13.38 % of total variance), 6 statements under the 2nd factor (11.64% of total variance), 4 statements under the 3rd factor (10.14% of total variance), 5 statements under the 4th factor (9.20% of total variance and 2 statements under the 5th factor (6.38% of total variance). Some factors were ascribed to two factors, taking into consideration their factor loadings. The obtained result shows, that the third factor has the strongest expression "The importance of scientific research activity to career" (SI=0.74). The least expressed is the fifth factor "Scientific research activity organization context" (SI=0.45). Significant indexes of all factors are bigger than 0.5, except the fifth factor. We can basically claim that scientific research activity organization context (e.g. formal and non formal organization and other) is not an essential thing developing such an activity. The most important thing is that this activity is meaningful for person's further career. The first factor (SI=0.61) shows that scientific research activity has positive influence on personality education (encourages creativity, develops abilities, guarantees self-realisation and other).

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Statistically significant differences have been analysed in terms of grades. One-way ANOVA analysis was applied for this. The results will be presented in table 7.

Table 7. Factor significance indexes according to grade.

	Grade							
	9		10		11		12	
	SI	SD	SI	SD	SI	SD	SI	SD
Factor 1	0.62	0.20	0.61	0.21	0.61	0.21	0.61	0.22
Factor 2	0.59	0.21	0.59	0.21	0.56	0.21	0.57	0.24
Factor 3	0.74	0.22	0.74	0.23	0.74	0.22	0.73	0.22
Factor 4	0.62	0.21	0.63	0.22	0.58	0.22	0.56	0.22
Factor 5	0.46	0.30	0.45	0.29	0.46	0.29	0.44	0.29

In table 7 we can see, that the third factor "The importance of scientific research activity to career" is the most significant for all grade pupils. The least significant for all pupils is the fifth factor "Scientific research activity organization context". It is believed, that there are statistically significant deviations between different pupils' groups in terms of factors. ANOVA test results will be presented in table 8.

Table 8. One-way ANOVA results between factors depending on grade.

		Sum of Squares	df	Mean Square	F	Sig.
FACTOR 1	Between Groups	2,538E-02	3	8,460E-03	0.181	0.910
	Within Groups	62,464	1334	4,682E-02		
	Total	62,490	1337			
FACTOR 2	Between Groups	0,188	3	6,262E-02	1.272	0.282
	Within Groups	65,650	1334	4,921E-02		
	Total	65,838	1337			
FACTOR 3	Between Groups	5,350E-02	3	1,783E-02	0.346	0.792
	Within Groups	68,811	1334	5,158E-02		
	Total	68,864	1337			
FACTOR 4	Between Groups	0,882	3	0,294	5.987	0.000
	Within Groups	65,493	1334	4,909E-02		
	Total	66,374	1337			
FACTOR 5	Between Groups	7,768E-02	3	2,589E-02	0.288	0.834
	Within Groups	119,870	1334	8,986E-02		
	Total	119,948	1337			

The one-way analysis of variance (One-way ANOVA) uses Fisher criterion. The one-way analysis is used to determine whether there are any significant differences between means in different populations. If the obtained F value is much more than 1, then it is likely that means differ, if it is close to 1, the differences between means are small. In this case, it can be observed, that only Factor 4 F value is significantly greater than 1, thus, we can basically claim, that means differ. Though ANOVA doesn't fix between which populations' differences exist, however, it gives a grounded answer whether statistically significant differences exist between means of analysed populations. We can think, that Factor 4

"Scientist's social status in society" is much more significant for younger than for senior gymnasium students. This is probably because upper secondary school students have clearer understanding about the career and much more information about scientist's career and have sufficiently fully formed professional career vision.

All factor significance analysis was carried out according to students' sex. The results are presented in table 9.

Table 9. Factor significance indexes according to respondent sex.

	Sex			
	Girls		Boys	
	SI	SD	SI	SD
Factor 1	0.64	0.20	0.58	0.22
Factor 2	0.60	0.21	0.56	0.23
Factor 3	0.78	0.19	0.70	0.25
Factor 4	0.62	0.20	0.57	0.24
Factor 5	0.44	0.30	0.47	0.29

In table 9 we can see that both for girls and boys the most significant is the third factor "The importance of scientific research activity to career", and the least significant is the fifth factor "Scientific research activity organisation context".

Using Stjudent criterion, applicable for two independent samples, we get that statistically significant differences are fixed depending on sex.

Table 10. Stjudent criterion application results.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
FACTOR 1	Equal variances assumed	3,042	0.081	5.020	1336	0.000	5,893E-02	1,174E-02	3,590E-02	8,196E-02
	Equal variances not assumed			4.983	1262,413	0.000	5,893E-02	1,183E-02	3,573E-02	8,213E-02
FACTOR 2	Equal variances assumed	1,991	0.158	3.944	1336	0.000	4,769E-02	1,209E-02	2,397E-02	7,142E-02
	Equal variances not assumed			3.921	1275,832	0.000	4,769E-02	1,216E-02	2,383E-02	7,156E-02

FACTOR 3	Equal variances assumed	42,073	0.000	6.749	1336	0.000	8,256E-02	1,223E-02	5,856E-02	,1066
	Equal variances not assumed			6.640	1171,641	0.000	8,256E-02	1,243E-02	5,816E-02	,1070
FACTOR 4	Equal variances assumed	12,063	0.001	4.012	1336	0.000	4,871E-02	1,214E-02	2,489E-02	7,253E-02
	Equal variances not assumed			3.969	1230,129	0.000	4,871E-02	1,227E-02	2,463E-02	7,279E-02
FACTOR 5	Equal variances assumed	5,251	0.022	-2.277	1336	0.023	-3,7306E-02	1,639E-02	-6,9453E-02	-5,1593E-03
	Equal variances not assumed			-2.280	1320,247	0.023	-3,7306E-02	1,636E-02	-6,9405E-02	-5,2069E-03

Looking at table 10 we can observe, that a statistically significant deviation in terms of sexes has been obtained. On the basis of the rule when p≤α (α=0.05), there is a statistically significant difference between pairs of means, therefore, the null hypothesis H_0 is rejected. In this case, factor significance indexes according to sex are statistically significantly different. The first four factors are more significant for girls than boys. The fifth factor "Scientific research activity organization context" is more significant for boys than girls.

Discussion

The science today is perceived in a broad way. It is treated as a part of culture and business basis, satisfying material and spiritual human needs. Today it is universally acknowledged that in this modern world technological progress, innovations, knowledge economy are the basis of country's economy and culture development. An obvious connection is noticed between the country development level and knowledge economy part in general economy. Country future depends on rapid development of science and technologies, especially of those countries whose natural resources are not abundant and the main product is produced owing to intellect. A rapid change of labour market needs and knowledge becoming the main condition of success in the market economy based on competition raises new requirements to the abilities of its subjects as well, to acquire such knowledge, which would allow not only to survive, but also to overcome in the competitive fight. Today the essential abilities in the knowledge society become research abilities, thanks to which fundamental or applied type of knowledge is obtained. Therefore, today every society raises new education purposes, seeks to reconstruct its education system so that it could govern innovations influenced by globalization and could prepare the young generation to live in globalized world and act in competition based market economy. In modern world not only to master knowledge but also to create and take part in society and world changes himself becomes especially important ability. Therefore, a lot of attention should be paid to pupils' scientific research work ability formation, critical thinking, creativity and productive self-expression education. However, lately the decrease of youth wishing to relate their life and activity with the scientist's career has been noticed, the number wishing to study natural sciences is diminishing. Therefore, a great role falls to comprehensive school educating students' cognitive abilities, forming scientific research activity knowledge and abilities and a positive attitude towards scientist's career. A carried out research showed that little attention is paid to scientific research activity at school, in fact. On the other hand, if a pupil is interested in such an activity and gets support at school, this is a proper encouragement for his further professional activity. The other authors' carried out research showed that learning in an authentic research environment assisted through cognitive apprenticeships with mentor scientists can provide a powerful method to prepare students for the high performance future workplace (Erdosne, 1996). The accomplished research showed, that a minority of respondents would like to have researcher scientist's job in future. Statistically significant differences according to sex are not fixed, and it means that both boys and girls think in a similar way. The research works conducted earlier by other authors reveal that boys are more oriented to science than girls - boys had more positive attitudes to science and greater levels of participation in scientific extra-curricular activities (Breakwell, Beardsell, 1992). The research shows that French high school students, as in other countries, opt out of scientific tracks in the 6th and 7th grades, often selecting scientific courses simply to increase their chances of being accepted at prestigious universities (OECD Programme..., 2006). It is obvious, that teacher's support, help arousing pupils' curiosity in scientific research activity is especially important. The research showed that more than one-third of teachers do not encourage pupils to take part in such an activity. The other authors' research just show that teachers' role in this sphere is very important (Clark, 2006; Picciarelli, Stella, 2010). Scientific research activity development at school improves understanding of natural sciences, deeper cognition of natural phenomena, and also strengthens motivation, attitudes toward natural sciences, stimulating effective learning and sound epistemological appreciation of the different disciplines (Etkina, Van Huvelen, Brookes, Mills, 2002; Picciarelli, Stella, 2010). Similar influence is observed as well, when pupils take part in non formal education related with scientific research activity. The carried out research confirmed, that pupils basically are interested in such an activity, they like it, and not a small part of pupils in one way or another relate their future career with scientific activity. Similar tendencies are discussed with the other researchers, when it is fixed, that pupils' interest in scientific research exhibited a positive change and their knowledge about the nature of science increased (van Rens, van Muijlwijk, Beishuizen, & van der Schee, 2011). It is possible groundedly assert that pupils' encouragement to take part in scientific research activity is an important and necessary element of school education process.

Conclusions

It has been stated, that upper secondary school students do not want to have researcher's job in future. It is considered to be not perspective and of low prestige. Both boys and girls are of this position. Also, it can be seen that upper secondary school students do not tend to take up scientific research activity, unless it is related to ICT. It has been stated, that girls more than boys like excursions based on environmental/nature studies. It is interesting, that girls more than boys like to research nature, whereas boys more than girls like making various tests and experiments at home. Pupils' research abilities are evaluated as average or lower than average. The ability to identify and formulate a research problem has the weakest expression. Pupils understand, that, in general, scientific activity is important to society, that such an activity helps to apply the acquired knowledge in practice, makes a positive influence on personality development, helps to prepare for further studies at university, however they are pessimistic in respect of scientist-researcher's profession (career). It has been stated, that though pupils both in terms of age (grade) and sex understand the significance of scientific research activity to career, however they think that research activity at school is not excellent employment and meaningful leisure time. From the point of view of respondents, research activity at school is not student appreciation and certain evaluation . In pupils' opinion, context has the least significance in organising scientific research activity. It has been stated, that both teachers and parents insufficiently encourage pupils to take up scientific research activity, besides parents encourage less than teachers. This situation might be conditioned by common attitude prevailing in our society to scientific research activity and to scientist's career in general. The results allow us to claim that schools, in fact, do not provide information about scientist's profession. Pupils get most information on this question on TV, sometimes from teachers and also reading this field literature.

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