

## COMPARATIVE ANALYSIS OF IT SUBJECTS' TEACHING QUALITY IN HIGH SCHOOLS

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### **Abstract:**

*Paper presents the research which authors conducted in the school year 2016/17. The research sample included 1504 pupils from 10 different educational profiles: 4 in high schools (natural mathematics, informatics, mathematics, computer science) and 6 in secondary vocational schools from which 4 were electrical professions (computer technician, multimedia engineer, computer network administrator and electrical engineer of information technology) and 2 mechanical professions (machine technician for computer engineering and computer control technician). Results have shown that there was significant difference between profiles in teaching quality of IT subjects. Future work is related to analysis of current IT knowledge in high schools.*

**Keywords:** research, high schools, IT knowledge

### **1. INTRODUCTION**

Contemporary education in Serbia directs its users to get grades and finish the class in the most efficient way. Later on, they attempt to find a job as quickly as possible and try to solve the problem of existence. It is necessary for education system to be reformed once and for all so that users develop critical opinions, interests and creative abilities, and to be motivated to continue their education.

In Lisbon in 2000, the European Union adopted the Lisbon Development Strategy [1]. As knowledge is one of the basic resources of progress and development, education has become one of the central themes of the Lisbon Strategy, so the Lisbon Strategy implies greater investment in education and professional development, scientific and technological research and innovation [2].

In 2006, the European Union defined eight key competences of the Lifelong Learning Concept [3]. Today they are widely accepted in most European countries and play an important role in educational reforms. The need for improving the quality and importance of skills and competences is further emphasized by the

current situation in which Europe faces a high unemployment rate, which is often due to skills mismatch [4].

Digital competencies, as one of those 8 key competences, include managing basic IT skills:

- Safe and critical use of electronic media at work, in leisure and communication;
- Connection with logical and critical thinking, high level of information management skills and well-developed communication skills and
- At the lowest level, the use of multimedia technology for finding, receiving, storing, producing, presenting and sharing information and communication and use in the Internet.

In Serbia, over the past fifteen years, the reform of primary and secondary education has been implemented separately from the reform of higher education. The reform of primary and secondary education is carried out more centrally, while higher education reform is implemented by the higher education institutions themselves. The Government of the Republic of Serbia adopted in 2012 the Strategy for the Development of Education in Serbia

until 2020 [5]. The strategy is defined so that the education system should provide the basic foundation of life and development of each individual, society and state based on knowledge. The Action Plan for the implementation of the Strategy for the Development of Education in Serbia by 2020 specifies individual actions and as one of the key parts of this plan is the Strategy for the Development of Primary and Secondary Education.

It's long ago that the literate man is just the one who uses the computer and runs the computer. It is therefore essential that students at the end of elementary education be informally/digitally literate. It is also essential that students acquire appropriate knowledge at the end of secondary education which will enable them to independently learn and use new technologies in accordance with their evolution during the whole working life. Bearing in mind the continuation of technological development and the potential lack of qualified IT experts, the lack of adequate access to their education can have very adverse consequences.

Information technology is being taught in all analyzed secondary schools, through one or more subjects, and it should provide knowledge to students in three dimensions - on the conceptual plan and acquired skills. Depending on the educational profile, there is more or less IT content in appropriate subjects, with more or less practice.

There are many related researches about analyzing quality of teaching [6, 7, 8], but few of them analyzed IT subjects and comparative analysis of pupils.

In this paper, the evaluation of high school pupils and secondary vocational schools has done in order to analyze difference between profiles in teaching quality of IT subjects, which is goal of research.

## 2. METHODOLOGY

Research was done in in the school year 2016/17. The research sample included 1504 pupils from 10 different educational profiles: 4 in high schools (natural mathematics, informatics, mathematics, computer science) and 6 in secondary vocational schools from which 4 were electrical professions (computer technician, multimedia engineer, computer

network administrator and electrical engineer of information technology) and 2 mechanical professions (machine technician for computer engineering and computer control technician).

For the purpose of this particular research authors chosen to analyse and compare teaching quality in IT subjects in several highschoools in Serbia. Following types of highschoools were analyzed:

- 1 - Electrotechnical school;
- 2 - Electrical-traffic technical school
- 3 - Highschool
- 4 - Machine traffic school
- 5 - Mechanical-electrical engineering
- 6 - Mechanical-technical school
- 7 - Technical school
- 8 - ITHS (Highschool for IT)

Hypothesis of this research was defined in the following manner: "Pupils in different types of highschoools have different teaching quality from IT subjects."

Research tasks were set in the following order:

1. Choosing a sample;
2. Creating a questionnaire;
3. Conducting the research and
4. Analyzing the results.

## 3. RESULTS AND DISCUSSION

In order to get results about characteristics of different groups one factor of variance analysis was performed (ANOVA).

Table 1 shows data about every group (every school). The table shows number of participants in every school, mean, standard deviation, standard error, confidence interval for mean and min, max.

*Table 1. Descriptives*

	N	Me-an	Std. Devia-tion	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	527	3.83	1.083	.047	3.73	3.92	1	5
2	46	3.91	1.132	.167	3.58	4.25	1	5
3	399	3.95	1.097	.055	3.84	4.06	1	5
4	34	3.94	1.071	.184	3.57	4.32	1	5
5	72	3.72	1.213	.143	3.44	4.01	1	5
6	84	3.96	1.124	.123	3.72	4.21	1	5
7	576	3.93	1.120	.047	3.84	4.02	1	5
8	56	4.41	0.565	.075	4.26	4.56	3	5
<b>Total</b>	<b>1794</b>	<b>3.91</b>	<b>1.098</b>	<b>.026</b>	<b>3.86</b>	<b>3.96</b>	<b>1</b>	<b>5</b>

Table 2 gives sum of squares, number of degrees of freedom... The column Sig. is the

most significant. In the research Sig. is less than 0,05 which means that there is significant difference between groups.

**Table 2. Anova**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21.261	7	3.037	2.535	.013
Within Groups	2139.647	1786	1.198		
<b>Total</b>	<b>2160.908</b>	<b>1793</b>			

Table 3 present test of homogeneity of variance and for Levene test Sig. is higher than 0.05, so the the assumption about the homogeneity of variance has not been violated.

**Table 3. Test of Homogeneity of Variances**

Levene Statistic	df1	df2	Sig.
1.985	7	1786	.054

Table 4 present exact difference between group. According to Table 4 there are significant difference between these groups: 1 and 8; 5 and 8; 1 and 7; 7 and 8.

**Table 4. Multiple Comparisons**

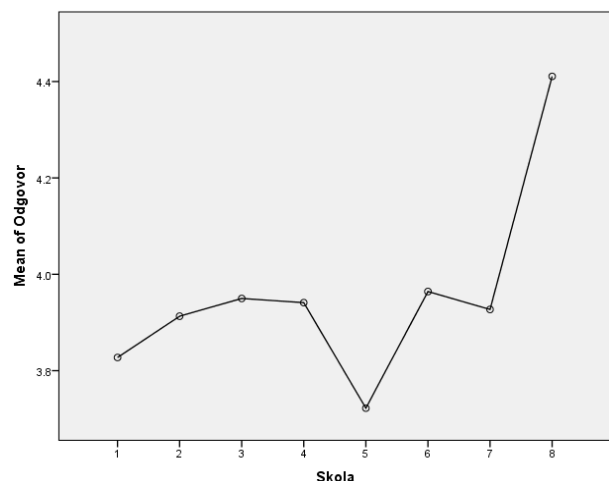
Dependent Variable: Odgovor  
Tukey HSD

(I) Skola	(J) Skola	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-.086	.168	1.000	-.42	.60
	3	-.123	.073	.696	-.34	.10
	4	-.114	.194	.999	-.70	.47
	5	.105	.138	.995	-.31	.52
	6	-.137	.129	.964	-.53	.25
	7	-.100	.066	.801	-.30	.10
	8	-.583*	.154	.004	-1.05	-.12
2	1	.086	.168	1.000	-.42	.60
	3	-.037	.170	1.000	-.55	.48
	4	-.028	.248	1.000	-.78	.72
	5	.191	.207	.984	-.44	.82
	6	-.051	.201	1.000	-.66	.56
	7	-.014	.168	1.000	-.52	.49
	8	-.498	.218	.302	-1.16	.16
3	1	.123	.073	.696	-.10	.34
	2	.037	.170	1.000	-.48	.55
	4	.009	.196	1.000	-.58	.60
	5	.228	.140	.736	-.20	.65
	6	-.014	.131	1.000	-.41	.38
	7	.023	.071	1.000	-.19	.24
	8	-.461	.156	.064	-.93	.01
4	1	.114	.194	.999	-.47	.70
	2	.028	.248	1.000	-.72	.78
	3	-.009	.196	1.000	-.60	.58
	5	.219	.228	.980	-.47	.91
	6	-.023	.222	1.000	-.70	.65
	7	.014	.193	1.000	-.57	.60
	8	-.470	.238	.500	-1.19	.25

5	1	-.105	.138	.995	-.52	.31
	2	-.191	.207	.984	-.82	.44
	3	-.228	.140	.736	-.65	.20
	4	-.219	.228	.980	-.91	.47
	6	-.242	.176	.868	-.78	.29
	7	-.205	.137	.809	-.62	.21
	8	-.688*	.195	.010	-1.28	-.10
6	1	.137	.129	.964	-.25	.53
	2	.051	.201	1.000	-.56	.66
	3	.014	.131	1.000	-.38	.41
	4	.023	.222	1.000	-.65	.70
	5	.242	.176	.868	-.29	.78
	7	.037	.128	1.000	-.35	.43
	8	-.446	.189	.260	-1.02	.13
7	1	.100	.066	.801	-.10	.30
	2	.014	.168	1.000	-.49	.52
	3	-.023	.071	1.000	-.24	.19
	4	-.014	.193	1.000	-.60	.57
	5	.205	.137	.809	-.21	.62
	6	-.037	.128	1.000	-.43	.35
	8	-.484*	.153	.035	-.95	-.02
8	1	.583*	.154	.004	.12	1.05
	2	.498	.218	.302	-.16	1.16
	3	.461	.156	.064	-.01	.93
	4	.470	.238	.500	-.25	1.19
	5	.688*	.195	.010	.10	1.28
	6	.446	.189	.260	-.13	1.02
	7	.484*	.153	.035	.02	.95

\*. The mean difference is significant at the 0.05 level.

Diagram for means for different groups (schools) is presented in Figure 1. Diagram shows that school 8 has the best rated quality of informatics subjects, while the school 5 has the lowest rates regarding quality of informatics subjects.



**Figure 1. Diagram of means**

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#### 4. CONCLUSION

Bearing in mind the presented results of this research, it can be concluded in different directions:

- About the possibility of applying ANOVA technique in retracing the quality of teaching from a certain group of subjects – IT subjects in the case of this research. The mentioned technique determined a significant statistical difference, as specific groups between which there were differences.
- The study on the quality of teaching gives the opportunity to improve it, especially in schools 1 and 5

The future work relates to the analysis of the same issue, from the teaching aspect, through the answers obtained from teacher education in the same schools.

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