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RELATIONSHIP BETWEEN LEARNING STYLES GRAMMAR STUDENTS AND SCHOOL ACHIEVEMENT

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Abstract

The research focuses on identifying learning styles of students using Experiential Learning Theory. The paper explores the connection between the preferred learning styles of students with academic achievement and gender differences. The findings indicate that assimilating learning style most preferred by students. Furthermore, the study shows that there are significant differences in learning styles of students in terms of gender differences of students. The results suggest that within the school context in Serbia such teaching strategies are applied that encourage the development of the assimilating style – lectures through which a number of information systematized in a logical structure are transferred to students. Also, most of the students who have excellent school achievements actually prefer the assimilating learning style. This finding can be explained by the assumption that students develop their own learning styles in accordance with teachers' expectations.

Key words: learning styles, experiential learning theory, students, gender differences, cultural differences.

ПОВЕЗАНОСТ СТИЛОВА УЧЕЊА УЧЕНИКА ГИМНАЗИЈЕ СА ШКОЛСКИМ УСПЕХОМ

Апстракт

Средиште овог истраживања је идентификација стилова учења ученика примењујући теорију искуственог учења. У раду се испитује повезаност преферираних стилова учења ученика са школским успехом и полом ученика. Налази указују да је асимилирајући стил учења најомиљенији од стране ученика. Даље, добијени резултати показују да не постоје значајне разлике у стиловима учења између ученика мушког и женског пола. Резултати упућују на закључак да се унутар школског контекста у Србији примењују такве наставне стратегије које подстичу развој асимилирајућег стила – предавања којим се износи велики број информација организованих у логичну структуру. Осим што ученици уопштено гледано најрадије би-

рају асимилирајући стил, највећи број ученика који имају одличан успех најрадије бира асимилирајући стил учења. Ова појава би могла бити објашњена претпоставком да ученици развијају сопствене стилове учења у складу са очекивањима наставника.

Кључне речи: стилови учења, теорија искуственог учења, ученици, полне разлике, културне разлике.

INTRODUCTION

The results obtained in previous studies in the field of learning styles considering individual differences of pupils in terms of the most effective ways of learning and/or teaching consistently indicate the fact that knowing and respecting individual differences results in a high quality of a teaching activity (Felder & Brent, 2005; Husarić, 2011, Kazu, 2009) and better individualization of instructions in terms of choosing more efficient forms of a learning activity while recognizing pupils´ individual differences (Stojaković, 2000). This study was motivated by the results of previous studies conducted, dealing with the problem of learning styles in the school context, their relation to the school achievement, cultural and gender differences, as well as very limited references in Serbian language. Aimed at evaluating the relation between the pupils' learning styles and their school success, the paper first identifies the preferred learning styles, and then studies their relationship with the pupils' school success and gender.

Efforts to explain and understand individual differences between pupils and with the aim of increasing the quality of the teaching process have resulted in a number of theories and models of learning styles. Jung's personality typology leads to the emergence of one of frequently used instruments for assessing pupils´ learning styles – the Myers-Briggs Type Indicator (Stojaković, 2000). According to the Dunn and Dunn Learning Style Model, learning styles can vary depending on pupils' physiological inclination, their emotional, social and psychological preferences, as well as learning environment (Dunn et al., 2009). Felder and Silverman (1988) have developed a model of learning styles (The Felder-Silverman learning style model) according to which people differ in their preferred modes of perceiving, processing, organizing and understanding information. The authors agree that Kolb's Experiential Learning Theory is one of the most influential theories of experiential learning, which is also the most widely used instrument (Kayes, 2005; Henson & Hwang, 2002). Accordingly, this study identifies pupils' preferred learning styles using the Kolb Learning Styles Inventory – Version 3.1 (2005), translated into Serbian.

THEORETICAL FRAMEWORK

Experiential learning theory relies on the work of prominent scientists – John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung and others – whose theories revolve around the concept of experience. In experiential learning theory, learning is defined as the process of acquiring knowledge through transformation of experience. Knowledge emerges through the acquisition and transformation of experience (Kolb, 1984; according to: Kolb & Kolb 2005b). Thus, the learning process depends on two bipolar dimensions: the dimension of observation, consisting of the phase of concrete experience (CE) and the phase of abstract conceptualization (AC), and dimension of transformation of information, consisting of the phase of reflective observation (RO) and the phase of active experimentation (AE). Thus, depending on the mode of perceiving and transforming information, pupils prefer one of four learning styles: diverging, assimilating, converging, and accommodating (Kolb & Kolb, 2005a). The experiential learning cycle and learning styles arising from it are shown in Figure 1.

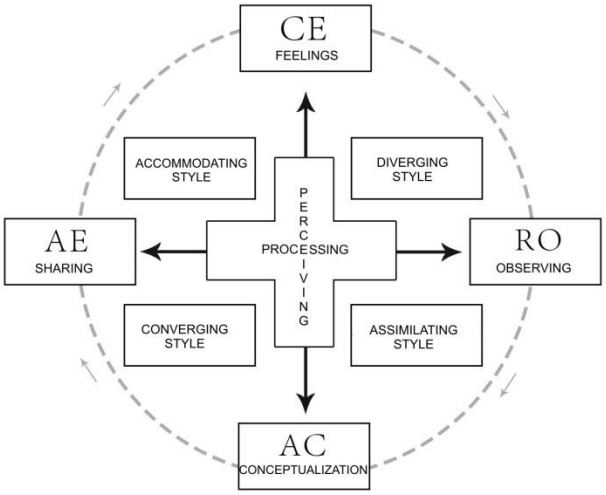

Figure 1. The experiential learning cycle
(adapted from http://www.businessballs.com/kolblearningstyles.htm)

The author identifies the following features of pupils who prefer one of four learning styles (Kolb & Kolb, 2005a):

1. Individuals preferring the *diverging style* are characterized by learning through concrete experience (CE) and reflective observation (RO). These individuals are very good in analyzing situation from different perspectives. They approach the situation

through observing rather than acting. People with this style enjoy situations where they can generate a wide range of different ideas, such as brainstorming. They are imaginative and emotionally sensitive individuals with broad cultural interests and like to be informed. In formal learning situations, these individuals like to attract attention and receive feedback on their work. They prefer group work and listening.

2. Individuals with the *assimilating style* primarily learn through abstract conceptualization (AC) and reflective observation (RO). They are good in understanding and organizing a wide range of information in a logical structure. They are less focused on people and more interested in abstract ideas and concepts. Generally they find it more important that a theory has logical soundness than practical value. They prefer individual work. They do not make premature decisions, but prefer detailed and careful pondering. In formal learning situations they prefer lectures, readings and having time to reflect.
3. Individuals with the *converging style* learn directly through abstract conceptualization (AC) and active experimentation (AE). These individuals are best at finding practical application for ideas and theories. They prefer solving problems and making decisions based on logical solutions. Also, they prefer solving practical tasks and problems rather than dealing with social and interpersonal issues. They may feel uncomfortable in unfamiliar situations. In formal learning situations they prefer experimenting with new ideas, simulations, laboratory assignments, and practical applications.
4. Individuals with the *accommodating style* are characterized by active experimentation (AE) and concrete experience (SE). They have the ability to learn from direct experience and work well in confusing and uncertain situations. They enjoy achieving goals and facing new challenging experiences. They have a tendency of acting based on intuition rather than on logical analysis. In solving problems, individuals with this learning style rely more on other people for information than on their own analysis. They may seem disorganized and impulsive. In formal learning situations they prefer working with other people and doing fieldwork.

The review of Previous Research

A large number of studies dealing with the problem of learning styles are focused on identifying learning styles and differences in preferred learning styles depending on preferred scientific disciplines or subjects, demographic characteristics such as respondents' gender, age, place of

residence and cultural differences. Research findings indicate that pupils prefer assimilating learning style (Miller, 2005; Yamazaki, 2005; Cagiltay, 2008; Hargrove, Wheatland, Ding, & Brown, 2008). While some authors indicate that there are some gender-based differences between the preferred learning styles of respondents (Heffler, 2001), others refer to studies that have not revealed gender-based differences (Brew, 2002; Hargrove, Wheatland, Ding, & Brown, 2008).

The researchers are particularly focused on examining the preferred learning styles depending on the scientific discipline studied. Based on the extensive literature it can be concluded that the learning styles of pupils is highly affected by the nature of their scientific discipline (D. Kolb, 1981; Prosser & Willcoxson, 1996; Kolb & Kolb, 2005a). As indicated by research results, the assimilating style is preferred by pupils of engineering (Cagiltay, 2008; Kolb & Kolb, 2005a) and pupils of natural sciences and mathematics (Jones, Reichard, & Mokhtari, 2003; Kolb & Kolb, 2005a; Orhun, 2013), while those studying arts, but whose field of interest is psychology and sociology prefer divergent learning style. The authors report that the accommodating style is usually preferred by individuals focused on professions in the field of education, while the converging style is characteristic of those interested in medicine and economics (Kolb & Kolb, 2005a).

Furthermore, researchers focus their attention on the question whether there are differences in the preferred learning styles depending on the different contextual conditions in which the specific learning styles are being identified, i.e. on cultural environment and heritage. The authors agree that the preferred learning styles are conditioned by cultural differences (Yamazaki, 2005; Joy & Kolb, 2009). Thus, differences were identified in preferred learning styles between pupils with different cultural backgrounds, i.e. those coming from different countries. However, differences in preferred learning styles have also been documented between pupils coming from the same cultural environment, but who study different scientific disciplines. For example, the pupils from Turkey educated for future designers prefer the converging learning style (Demirbas & Demirkan, 2007), while the pupils of mathematics are inclined towards the assimilating learning style (Orhun, 2013). This conclusion highlights the complex and synergistic impact of scientific discipline and cultural environment.

Recent studies are focused on examining the most appropriate teaching materials for pupils who prefer different learning styles (Yang & Wu, 2009; Sahabudin & Ali, 2013). Findings of some authors suggest that textual teaching materials are best suited for pupils with diverging and converging learning styles, while video teaching materials are suited for pupils with assimilating and accommodating learning styles (Sahabudin & Ali, 2013).

Understanding pupils´ learning style offers a wide range of possible applications in education, including knowing priorities during learning procedure and identifying potential problems at the early stage of learning in order to chose the appropriate teaching method (Slaats, Lodewijks, & van der Sanden, 1999). Studies aimed at explaining the relationship between learning styles and teaching styles (Towns, 2001) show that discrepancy between these variables negatively affects pupils' academic success. Some authors (Cassidy, 2004) state that better understanding the relationship between learning styles and pupils' satisfaction when their learning style are respected by teachers affect the increase of the level of pupils´ achievement. Namely, when pupils use their preferred learning style, they learn more successfully, easier and faster, and they have better results than pupils who adapt their learning style to the subject or their teachers' teaching style (Agosino & His, 1995; Kramer-Koehler, Tooney & Beke, 1995; Blackmoore, 1996; Montgomery & Groat, 2000; O'Connor, 2000: according to: Tubić, 2003). Teachers who respect their pupils' learning style make the teaching process more meaningful and decisive (Husarić, 2011), strengthening pupils' motivation, and reducing breach of discipline (Dunn, 1971; Fisco, 1982: according to Stojaković, 2000).

Taking into account that identifying determinants of achievement precedes the efforts to improve teaching process (Slaats, Lodewijks, & van der Sanden, 1999), this paper is conceived in order to make the first step and gain an insight into pupils' preferred learning styles. Adjusting teaching style to each pupil individually in the teaching process is clearly infeasible (Felder & Brent, 2005). The obtained results can be implemented into the educational process in terms of opting for adequate teaching methods and materials in order to adapt teaching procedure to the needs of pupils only after identifying their learning styles.

RESEARCH METHOD

Problem and Subject

The insights originating from the framework of individualized teaching are concerning the necessity of taking into account individual differences of pupils regarding the learning and teaching methods which are the most effective for them. Knowing pupils' learning styles provides teachers with insight into their specific characteristics and represents the starting point for realization of individualized educational tasks. Accordingly, this study is focused on identifying pupils' learning styles and their relation with school achievement.

Research Aims and Hypotheses

The aim of this research is to identify the preferred learning styles of grammar school pupils and their relation with school success and gender.

Based on theoretical and empirical findings of previous studies, the paper starts from the following hypotheses: (1) the assimilating learning style is the most preferred learning style of pupils; (2) there are differences in the preferred learning styles as a function of academic success; (3) there are gender–based differences in preferred learning styles between pupils.

Research Variables and Instrument

The research variables are: the preferred learning style, gender and school success. Gender and school success were determined as declared by the respondents (by ticking the letter before the answer that corresponds with the right answer).

The preferred learning style of each respondent was determined using the Kolb's learning style inventory-Version 3.1 (LSI, Kolb, 2010) which is derived from the theory of experiential learning. The questionnaire consisted of 12 items which were evaluated by ranking the offered answers in terms of how well they describe the individual learning style (1 – the least applies to the respondent, 4 – the most applies to the respondent). Each of the responses to a single item represents one of four phases of experiential learning: SE, AS, AE, RO. The next step, based on the results of the respondents' self-assessment, was to determine the preferred learning style as one of four learning styles: assimilating, accommodating, converging or diverging. According to the author's statement, the coefficient of reliability of internal consistency of the instrument (Cronbach's alpha) is 0.70 (Kolb & Kolb, 2005a).

Research Sample and Procedure

The sample included 501 respondents, of which 265 were second and 236 third grade pupils coming from seven grammar schools situated in large or small municipal towns (Novi Sad, Sremska Mitrovica, Stara Pazova and Becej). The sample consisted of 40.7% male and 58.7% female pupils aged 16 - 17 years.

Before conducting the research the necessary consent of the school master and teachers was obtained to implement research. The pupils filled the applied instrument in school, during the instructions in 2013/14 school year. They were informed in advance about the purpose of the research, anonymity, option to give up participation, and absence of negative consequences due to unwillingness to completely fill the instrument.

Data Processing

The applied inventory provides continuous variables which describe the preferred phases of the learning cycle, so that data processing procedure required continuous variables to be transformed into categorical variables in order to determine the preferred learning styles. In addition to calculating the

descriptive indicators and the coefficients of correlation, the data analysis included determining the distribution of learning styles and testing differences between groups using the t-test for independent samples and the chi-square test. The statistical analysis was performed using the IBM SPSS (version 21) software package.

RESULTS

Correlation between the LSI Scales

Correlations between the obtained scores across the basic phases of experiential learning cycle (CE, AC, RO and AE) and scores across the combined scales (AC-CE, AE-RO) were determined by calculating the Pearson's linear correlation coefficients (Table 1).

Table 1. Pearson's linear correlation coefficients between the measured values of the basic and combined scales within the LSI

	CE	AC	AE	RO	AC-CE	AE-RO
CE	1	-.48**	-.18**	-.34**	-.86**	.11*
AC		1	-.33**	-.21**	.86**	-.06
AE			1	-.42**	-.09*	.83**
RO				1	.08	-.85**
AC-CE					1	-.10

**p< .01 ; *p< .05

In accordance with the hypothesis of the experiential learning theory according to which there are bipolar dimensions, the AC scale should be negatively correlated with the CE scale, as well as the AE scale with the RO scale. As shown in Table 1, the mean negative correlation between the dialectical poles of the dimension of observation (AC and CE: r = -.48, p <.01) and information processing (AE and RO: r = -.42, p < .01) was calculated. The obtained values are consistent with the findings of previous research (Willcoxson & Prosser, 1996; Demirbas & Demirkan, 2007). Since the learning cycle consists of two bipolar dimensions: the dimension of observation, measured by combining the items AC-CE and the dimension of processing measured by combining the items AE-RO, both dimensions are assumed to be essentially independent of each other (Demirbas & Demirkan, 2007). As expected and based on the theoretical starting point, the values shown in Table 1 indicate that the correlation between these items is statistically insignificant. Similar values were obtained in previous studies (Willcoxson & Prosser, 1996; Demirbas & Demirkan, 2007).

There is a hypothesis (Smith & Kolb, 1996) that dialectical poles of one dimension should not be correlated with another dimension. More specifically, values across the CE and AC scales should not correlate with

those across AE-RO, that AE and the RO should not be correlated with the AS-SE. As it can be seen in Table 1, CE is in low positive correlation with AE-RO ($r = .11$, $p < .05$), while the correlation between AS and AE-RO is statistically insignificant. AE is in a low negative correlation with AC-CE ($r = -.09$, $p < .05$), and correlation between RO and AC-CE is statistically insignificant.

Presence of Learning Styles

The descriptive characteristics of basic and combined subscales of the LSI questionnaire (AE, CE, RO, AC, AC-CE and AE-RO) were determined by calculating the arithmetic mean (M), standard deviation (SD), minimum (Min), maximum (Max), and indicators of skewness and kurtosis (Table 2).

Table 2. Descriptive indicators of scales of the LSI questionnaire

Subscale	M	SD	Min	Max	Skewness	Kurtosis
CE	24.23	4.68	15	44	0.87	0.21
RO	30.93	4.81	17	62	0.15	0.85
AC	34.13	4.67	18	46	-0.11	-0.93
AE	30.79	4.45	14	44	-0.25	0.19
AC-CE	9.90	8.05	-26	28	-0.56	0.85
AE-RO	-0.14	7.79	-28	20	-0.27	0.18

The obtained values of indicators of skewness and kurtosis are in the range of -1 to +1, indicating normal distribution of the results on each subscale. The distribution of learning styles of pupils is determined based on the values of AC-CE and AE-RO for each pupil covered by the sample (Figure 2).

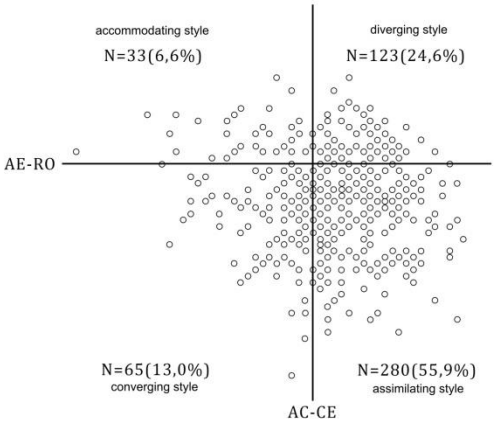

Figure 2. Distribution of pupils' preferred learning styles

As indicated by the results, more than half of the pupils preferred assimilating style, a quarter of them diverging style, while converging and accommodating styles were preferred by a much lower number of pupils. This distribution of learning styles was tested using the chi-square test, which resulted in a statistically significant difference of $\chi^2(3, N = 501) = 288.17$, $p < .01$, indicating that learning styles are unevenly distributed.

Learning Styles in Function of School Success

Based on the variable *school success* pupils were classified into four groups (excellent, very good, good and sufficient) and for each of them the preferred distribution of learning styles was determined (Table 3). In each of the groups the largest number of pupils preferred the assimilating style. The largest differences were observed when investigating the converging style – the largest number of pupils who preferred the converging learning style were excellent in school achievements.

Table 3. Presence of learning styles as a function of school success

Learning style	School success f (%)				
	Excellent	Very Good	Good	Sufficient	Total
Accommodating	21 (4.2)	11 (2.2)	1 (0.2)	0 (0.0)	33 (6.7)
Diverging	44 (8.9)	58 (11.7)	17 (3.4)	1 (0.2)	120 (24.2)
Converging	46 (9.3)	17 (3.4)	2 (0.4)	0 (0.0)	65 (13.1)
Assimilating	170 (34.3)	84 (17.0)	21 (4.2)	2 (0.4)	277 (56.0)
Total	281 (56.8)	170 (34.3)	41 (8.3)	3 (0.6)	495 (100.0)

The resulting distribution of the preferred learning styles as a function of school success prevented the application of the chi-square test, so this variable was re-coded in a new grouping variable that distinguishes two groups of pupils: a group of pupils with excellent school success, and another group of pupils with very good, good and sufficient success. The chi-square test was applied on the transformed variable *school success* and variable *learning styles*, whereby a significant correlation of $\chi^2(3, N = 495) = 27.98$, $p < .00$ was found. Namely, as indicated by the results, pupils with different learning styles have different school achievements.

Presence of Learning Styles as a Function of Gender

Statistical significance of the differences in the preferred phases of the learning cycle as a function of the respondents' gender was tested using the t-test for independent samples (Table 4). Three pupils have failed to declare their gender identity, so that the analysis included 498 pupils.

Table 4. Results of t-test for independent samples as a function of gender

Subscale	Gender	M	SD	t	df	p
CE	male	24.41	4.45	0.73	496	.46
	female	24.10	4.85			
AC	male	34.44	4.79	1.25	496	.21
	female	33.90	4.56			
AE	male	30.57	4.52	-0.94	496	.35
	female	30.90	4.37			
RO	male	30.63	4.60	-1.16	496	.24
	female	31.14	4.95			
AC-CE	male	10.02	8.03	0.30	496	.76
	female	9.81	8.06			
AE-RO	male	-0.06	7.89	0.18	496	.85
	female	-0.19	7.73			

The results indicate that no gender based statistically significant differences were found in scores measured by the scales CE, AC, AE, and RO, as well as across the dimensions of information processing and reception. Then the distribution of the preferred learning styles as a function of gender was determined (Table 5), and the differences were tested using the chi-square test.

Table 5. Presence of learning styles as a function of gender

Learning styles	Males		Females	
	N	%	N	%
Accommodating	14	6.9	18	6.1
Diverging	51	25.0	72	24.5
Converging	23	11.3	42	14.3
Assimilating	116	56.8	162	55.1
Total	204	100.0	294	100.0

As indicated by the data, 56.8% of male and 55.1% female pupils prefer the assimilating learning style; 25% of males and 24.5% females prefer the diverging learning style. The third place is occupied by the converging learning style, which is preferred by 11.3% of male and 14.3% of female pupils. The accommodating learning style is the least preferred – 6.9% of male and 6.1% of female pupils opted for it. These frequencies of learning styles do not reach statistical significance of $\chi^2(3, N = 498) = 1.02$ at the level of 0.05 reliability. Thus, it is confirmed that there are no differences between male and female pupils in the preferred learning styles.

DISCUSSION

This research used Kolb's learning styles inventory, one of the most popular tools for describing learning styles (Dangwal & Mitra, 1999; Henson & Hwang, 2002 Demirbas & Demirkan, 2007). The data obtained show that more than half of the pupils prefer the assimilating learning style. The second place belongs to the diverging learning style, with the converging and assimilating learning styles being the least present. Findings clearly show that learning styles are unevenly distributed among pupil population. A similar distribution of learning styles was obtained in an earlier research conducted also on a sample of grammar school pupils in Serbia (Bjekić & Dunjić-Mandić, 2007). Also, findings of other studies show that learning styles are concentrated around the assimilating style (Miller, 2005; Yamazaki, 2005; Hargrove, Wheatland, Ding, & Brown, 2008; Cagiltay, 2008).

One possible explanation for the fact that more than half of the pupils prefer the assimilating learning style comes from the framework of the theory experiential learning. Namely, in addition to the fact that learning styles include cognitive, affective and physiological components, they are also characterized by adaptability (Stojakovic, 2000). Immediate activities, such as current assignments and demands shape the individual's learning style (Kolb & Kolb, 2005a). This clearly suggests that during the teaching process, the demands faced by the pupils affect the formation of individual learning styles. Predominantly frontal teaching activity, which is related to traditional teaching procedure and prevails in our schools (Popov & Jukić, 2006), reduces the teacher´s role on a transparent and systematic presentation of educational content to pupils. It is the teaching style that suits pupils who prefer assimilating style learning style (Kolb & Kolb, 2005a). In other words, the demands placed on pupils contribute to the formation of assimilating learning style which is adaptive in formal learning situations, and which is based on listening to lectures, reading, and reflecting about the teaching contents.

Reasons for the low presence of the accommodating learning style should be sought also in teachers' approach to teaching activity which encourages or discourages this style. The best suited teaching activity for pupils who prefer the accommodating learning style is the one that fosters the possibility to explore the problem by themselves (Felder & Brent, 2005) and present their understanding of the problem (Towns, 2001). In problem solving, pupils who prefer the accommodating learning style mostly rely on their intuition and solve the problem by trial and error (Kolb & Kolb, 2005b). All these features are insufficiently supported by the teaching process in schools.

Before proceeding to the discussion of the obtained results on the basis of the variable *school success,* it should be explained how the variable was defined. Namely, as indicators of school success a number of values

were taken which correspond to the average grades in all subjects at the end of the term of school year in which the study was conducted. Maksić and Đurišić-Bojanović (2004) believe that these grades are more reliable and more realistically show pupils' knowledge than those at the end of the school year. When considering pupils in relation to their school success, the first thing that draws attention is the extremely large number of pupils who have excellent school achievement. Specifically, more than half of the pupils (56.77%) have excellent school achievement, about one third of them (34.34%) have very good success, 28.8% of them are good, and only 0.61% (or 3 of the 495 respondents) of them show sufficient school achievement. Although this paper is focused on learning styles, the data on school success still need some attention. Namely, the data on the secondary school success can be interpreted in two ways. One way is that pupils in the educational system are able to master the teaching content with great success, that the system is well organized, and is adapted to the age of pupils. On the other hand, there is a possible lack of adequate criteria, which leads to unrealistic assessment, but this rarely can be heard from both the employees and the media. This is a question that remains open and should be analyzed in other studies. Returning to the focus of this paper and school success with preferred learning styles, it can be seen that the largest number of pupils with excellent school achievement prefer assimilating learning style. It can be explained by the same opinion that during their schooling pupils develop learning style and adapt to the teaching style whose characteristics are most appreciated by teachers themselves, which results in higher school achievement.

The results obtained in this study showed no significant gender-based differences neither in the phases of the learning cycle nor the learning styles. In this sense, these results are congruent with findings of previous research (Brew, 2002; Kayes, 2005; Demirbas & Demirkan, 2007; Hargrove, Wheatland, Ding, & Brown, 2008; Metin Yilmaz, Salih, & Kerem, 2011) where no gender-based differences were identified in learning styles and in dimensions of the learning cycle. In the opinion of some authors, there *are* gender-based differences between the preferred learning styles (Heffler 2001; Kolb & Kolb, 2005a), but the obtained findings should be interpreted carefully, avoiding generalization (Kolb & Kolb, 2005a). Namely, some authors (Smith & Kolb, 1996; according to: Demirbas & Demirkan, 2007) state that female pupils prefer concrete experience (CE), while male pupils are prone to abstract thinking (AC-CE), but there are no differences in the AE-RO. Other authors (Kolb & Kolb, 2005a) proved that male respondents achieved higher scores in the dimension of observation (AC-CE), while female respondents achieved higher scores in the dimension of information processing (AE-RO).

An interesting finding, although it is not of primary interest for this study but still draws attention, is that the preferred learning styles of

pupils from Serbia do not coincide with preferences of pupils from other countries. This result can be explained from the perspective of the aforementioned findings that preferred learning styles, among the other things, are conditioned also by cultural differences (Yamazaki, 2005, Joy & Kolb, 2009). Inserting the findings of this research in the diagram (Joy & Kolb, 2009) which shows the preferred learning styles of pupils from different cultural backgrounds, it can be clearly seen that pupils in the framework of our educational system are developing a way of learning which is dominated by reflective observation and conceptualization (Figure 3).

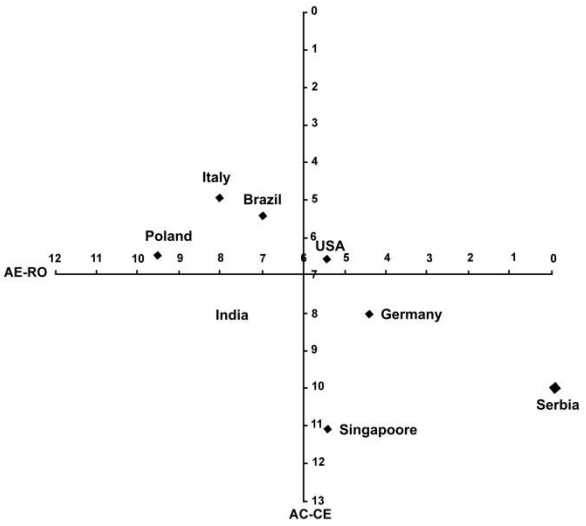

Figure 3. Preferred learning styles as a function of cultural differences (adapted from Joy & Kolb, 2009)

Although the mechanism by which the cultural environment influences the preferred learning styles is not fully elucidated, results of previous comparative studies indicate an existing relationship between learning styles and dimension of national culture – avoidance of uncertainty (Yamazaki, 2005) which is present in our national culture (Mojić, 2011). Avoidance of uncertainty indicates a degree of discomfort of members of a culture when faced with unstructured and unfamiliar situations. In this sense, there is a conceptual relation between low levels of risk taking and avoidance of uncertainty on one hand, and learning through reflective observation on the other (Yamazaki, 2005).

CONCLUSION

The most important finding of this research is the one that confirms that there is a relationship between the preferred learning styles of pupils and their school success. The results show that the highest numbers of pupils with secondary school success prefer the assimilating learning style. In other words, pupils with the highest school achievement are good in understanding and organizing a wide range of information in a logical structure, and prefer lectures, which are an integral part of the teaching process in our schools. This finding suggests that pupils during their schooling are developing a learning style and adapting to the teaching style whose characteristics are most appreciated by the teachers themselves. One of the factors contributing to this, according to the results of the current research, is the fact that most of the pupils prefer assimilating learning style. Furthermore, the results obtained show that there are no significant gender-based differences in the preferred learning styles which can be the result of equal expectations of teachers towards pupils of both gender.

Finally, it should be added that the scope of generalization of the results of the presented research is limited by both the sample size and the fact that the sample included only second and third grade grammar school pupils. Generalizing the results requires collecting data on a sample consisting of the first, the second, the third and the fourth grade pupils from the entire territory of the country, and depending on the purpose of research it is possible to expand the sample to pupils of all secondary schools.

ЛИТЕРАТУРА

Bjekić, D., & Dunjić-Mandić, K. (2007). Stilovi učenja i profesionalne preferencije maturanata gimnazije. *Pedagogija, 62*(1), 48–59. [Styles of Learning and Professional Preferences of High School Graduates]

Brew, C. R. (2002). Kolb's learning style instrument: sensitive to gender. *Educational and Psychological Measurement, 62*(2), 373-390. DOI: 10.1177/0013164402062002011

Cagiltay, N. E. (2008). Using learning styles theory in engineering education. *European Journal of Engineering Education, 33*(4), 415-424. DOI: 10.1080/03043790802253541

Cassidy, S. (2004). Learning styles: An overview of theories, models, and measures. *Educational Psychology, 24*(4), 419-444. DOI: 10.1080/0144341042000228834

Dangwal, R., & Mitra, S. (1999). Learning styles and perceptions of self. *International education journal, 1*(1), 61-71.

Demirbas, O. O., & Demirkan, H. (2007). Learning styles of design students and the relationship of academic performance and gender in design education. *Learning and* Instruction, 17(3), 345-359. DOI:10.1016/j.learninstruc.2007.02.007

Dunn, R., Honigsfeld, A., Doolan, L. S., Bostrom, L., Russo, K., Schiering, M. S., Cun, B., & Tenedero, H. (2009). Impact of learning-style instructional strategies on students' achievement and attitudes: Perceptions of educators in diverse

institutions. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 82(3), 135-140. DOI:10.3200/TCHS.82.3.135-140

Felder, R. M., & Brent, R. (2005). Understanding student differences. *Journal of engineering education*, *94*(1), 57-72. DOI: 10.1002/j.2168-9830.2005.tb00829.x

Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering education*, 78(7), 674-681.

Hargrove, K. S., Wheatland, J. A., Ding, D., & Brown, C. M. (2008). The Effect of individual learning styles on student GPA in engineering education at morgan state university. *Journal of STEM Education: Innovations and Research*, *9*(3), 37-46.

Heffler, B. (2001). Individual learning style and the learning style inventory. *Educational studies*, *27*(3), 307-316. DOI: 10.1080/03055690120076583

Henson, R. K., & Hwang, D. Y. (2002). Variability and prediction of measurement error in Kolb's learning style inventory scores a reliability generalization study. *Educational and Psychological Measurement*, *62*(4), 712-727. DOI: 10.1177/0013164402062004011

Husarić, M. (2011). Važnost uvažavanja kognitivnih stilova i stilova učenja kod učenika u procesu poučavanja. *Metodički obzor, 6*(2), 143–151. [The Importance of Respecting Cognitive Styles and Learning Styles of Students in the Teaching Process]

Jones, C., Reichard, C., & Mokhtari, K. (2003). Are students' learning styles discipline specific? *Community College Journal of Research & Practice*, *27*(2), 363-375. DOI: 10.1080/10668920390128988

Joy, S., & Kolb, D. (2009). Are there cultural differences in learning style?. *International Journal of Intercultural Relations*, *33*(1), 69-85. DOI:10.1016/j.ijintrel.2008.11.002

Kayes, C. D. (2005). Internal validity and reliability of Kolb's learning style inventory version 3 (1999). *Journal of Business and Psychology*, *20*(2), 249-257. DOI: 10.1007/s10869-005-8262-4

Kazu, I. Y. (2009). The effect of learning styles on education and the teaching process. *Journal of Social Sciences*, *5*(2), 85-94. DOI **:** 10.3844/jssp.2009.85.94

Kolb, A., & Kolb, D. (2005b). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of management learning & education*, *4* (2), DOI:193-212.10.5465/AMLE.2005.17268566

Kolb, A., & Kolb, D. (2005a). *The Kolb learning style inventory–version 3.1 2005 technical specifications.* Boston MA: Hay Resource Direct.

Kolb, D. A. (1981). Experiential learning theory and the learning style inventory: A reply to Freedman and Stumpf. *Academy of Management Review*, *6*(2), 289-296.

Kolb, D. (2010). *Kolb learning style inventory (LSI workbook, version 3.1).* HayGroup.

Maksić, S. B., & Đurišić-Bojanović, M. (2004). Kreativnost, znanje i školski uspeh. *Zbornik Instituta za pedagoška istraživanja, 36*, 85–105. DOI:10.2298/ZIPI0436085M [Creativity, Knowledge and School Achievement]

Metin, M., Yilmaz, G. K., Salih, B., & Kerem, C. (2011). The investigating pre-service teachers' learning styles with respect to the gender and grade level variables. *Procedia-Social and Behavioral Sciences*, *15*, 2728-2732. DOI:10.1016/j.sbspro.2011.04.198

Miller, M. L. (2005). Using learning styles to evaluate computer-based instruction. *Computers in Human Behavior*, *21*(2), 287-306. DOI:10.1016/j.chb.2004.02.011

Mojić, D. (2011). Uticaj nacionalnih kulturnih vrednosti na organizacionu kulturu i poslovnu praksu. *Singidunum revija*, 8(2), 145–151. [The Influence of National Cultural Values on Organizational Culture and Business Practice]

Orhun, N. (2013). The effects of learning styles on high school students achievement on a mathematics course. *Educational Research and Reviews, 8*(14), 1158-1165. DOI: 10.5897/ERR2013.1478

Popov, S., & Jukić, S. (2006). *Pedagogija.* Novi Sad: CNTI, WILLY. [Pedagogy]

Sahabudin, N. A., & Ali, M. B. (2013). Personalized Learning and Learning Style among Upper Secondary School Students. *Procedia-Social and Behavioral Sciences, 103*, 710-716. DOI:10.1016/j.sbspro.2013.10.391

Slaats, A., Lodewijks, H. G., & van der Sanden, J. M. (1999). Learning styles in secondary vocational education: disciplinary differences. *Learning and instruction, 9*(5), 475-492. DOI:10.1016/S0959-4752(99)00007-9

Smith, D. M., & Kolb, D. A. (1996). *User's guide for the learning-style.* Boston: McBer and Company.

Стојаковић, П. (2000). *Когнитивни стилови и стилови учења*. Бања Лука: Филозофски факултет. [Cognitive Styles and Learning Styles]

Towns, M. H. (2001). Kolb for chemists: David A. Kolb and experiential learning theory. *Journal of chemical Education, 78*(8), 1107-1116. DOI**:** 10.1021/ed078p1107.7

Tubić, T. (2003). Socio-kognitivni činioci stilova učenja. *Norma, 9* (2-3), 241-251. [Socio-cognitive factors of learning styles]

Willcoxson, L., & Prosser, M. (1996). Kolb's Learning Style Inventory (1985): review and further study of validity and reliability. *British Journal of Educational Psychology, 66*(2), 247-257. DOI: 10.1111/j.2044-8279.1996.tb01193.x

Yamazaki, Y. (2005). Learning styles and typologies of cultural differences: A theoretical and empirical comparison. *International Journal of Intercultural Relations, 29*(5), 521-548. DOI:10.1016/j.ijintrel.2005.07.006

Yang, Y. J., & Wu, C. (2009). An attribute-based ant colony system for adaptive learning object recommendation. *Expert Systems with Applications, 36*(2), 3034-3047. DOI:10.1016/j.eswa.2008.01.066

http://www.businessballs.com/kolblearningstyles.htm (преузето јула 2014.)

ПОВЕЗАНОСТ СТИЛОВА УЧЕЊА УЧЕНИКА ГИМНАЗИЈЕ СА ШКОЛСКИМ УСПЕХОМ

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Резиме

У раду се полази од чињенице да уважавање индивидуалних разлика ученика у погледу начина учења и начина подучавања који су за њих најефикаснији води ка квалитетнијој индивидуализацији наставе, а самим тим и ефикаснијем напредовању ученика. Због врло скромног обима литературе која се бави овом проблематиком на српском говорном подручју, циљ овог рада била је идентификација стилова учења ученика, њихова повезаност са школским успехом и полним разликама. Теоријски оквир овог истраживања представља теорија искуственог учења Дејвида Колба. Према теорији искуственог учења, процес учења зависи од две биполарне димензије: димензије опажања коју чине фазе конкретног искуства (CE) и апстрактног размишљања (AC) и димензије трансформације информација коју

чине фазе активног експериментисања (AE) и рефлексивног посматрања (RO). Дакле, ученици у односу на начин опажања и трансформације информација преферирају један од четири стила учења: конвергентни, дивергентни, асимилирајући или акомодирајући стил. Из ове теорије је проистекао Колбов инвентар стилова учења, један од најпопуларнијих инструмената за описивање стилова учења који је примењен у овом раду на узорку од 501 ученика гимназије другог и трећег разреда.

Добијени подаци показују да више од половине испитиваних ученика преферира асимилирајући стил учења. На другом месту се издваја дивергентни стил учења, док су конвергентни и акомодирајући стилови учења најмање заступљени. Налази јасно указују да стилови учења нису равномерно распоређени у ученичкој популацији. Једно од могућих објашњења је чињеница да непосредна дешавања, као што су тренутни задаци и захтеви, обликују стил учења појединца. Претежно фронтални облик рада, који је доминантан у школама у Србији, улогу наставника своди на прегледно и систематско излагање наставних садржаја ученицима, а који одговара ученицима који преферирају асимилирајући стил. Даље, доводећи у везу школски успех и префериране стилове учења, запажа се да највећи број ученика који имају одличан школски успех преферира асимилирајући стил учења. Једно од могућих објашњења било би да су ученици током школовања развијали стил учења и прилагођавали се стилу подучавања наставника односно оном стилу који наставник највише цени.

Иако не постоји научни консезус о полним разлика у погледу стилова учења, резултати добијени у овом истраживању подржавају ауторе који су елаборирали непостојање разлика између ученика мушког и женског пола и префериранim стиловима учења. Поредећи стилове учења ученика из Србије и других држава, уочава се разлика у префериранim стиловима учења, што је још један показатељ утицаја културне средине и наслеђа.

Теоријско-апликативна релевантност овако постављеног истраживања је јасно препознатљива. Наиме, потребно је прво извшити идентификацију, након чега би се могли применити добијени налази у васпитно-образовној пракси у смислу избора адекватних наставних метода и облика рада.