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The Relationship between Learning Styles, GPA, School Level and Gender

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Abstract

In education it is important to celebrate all aspects of diversity, including different ways students learn. Addressing these diversities in the classroom is paramount for the success of every student. This research on learning styles may help in explaining the possible reasons for differences in students' achievement. The aim of this study was to investigate the learning style preferences based on gender, school level and students' GPA. A questionnaire was completed by 269 middle and high school students to determine if their learning style preferences are auditory, visual or tactile. The results showed that students' most preferred learning style is auditory on all three factors: gender, school level and their GPA, while there are certain differences when it comes to the second and third preferred learning style. Identification of the preferred learning styles may help instructors to differentiate the teaching process and may have positive impacts on obtaining and improving learning outcomes.

Keywords: learning styles, school level, gender, GPA, teaching process, achievement

1. Introduction

According to Cornett (1983), learning styles are overall patterns which provide directions to learning and teaching. Referring to Brown and Hyden (1980), they comprise a set of factors, behaviours, and attitudes that are used to facilitate learning of an individual in a given situation. Grasha (1996) defines learning styles as personal qualities that influence the ability of a student to acquire information, to interact with peers and teachers, and to participate in learning experiences. Furthermore, and with reference to Kemp, Morrison and Ross (1998), learning styles are traits that relate to the way individuals approach learning tasks and process information. Considering the above-mentioned definitions, it may be assumed that learning styles reflect a person's characteristic approach towards acquiring and using information in learning and solving problems.

Learning styles are influential elements that need to be taken into account when preparing and conducting lessons. Even though there are many ways of classifying learning styles, research by Dunn, Beaudry and Klavas (2002) implies that perceptual inclinations have an influence on three-fourths of all students at school. Therefore, this study focuses on the three most common learning styles, namely visual, auditory, and tactile. Students are unique individuals, which means that they all learn in their own personal ways that are influenced by their preferences (Delić,

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Bećirović, 2018). Some students learn visually, while others prefer auditory or tactile approaches. Even though students mostly use all of their sensory channels to take in information, they seem to favour one or the other approach when it comes to how they learn best. They respond to teaching methods differently and tend to achieve better using certain methods while other approaches are perceived to be less effective. Therefore, individuality has to take the centre stage in modern education of the 21st century. Personal approaches influence the way students learn, how teachers give instructions, and impact on the degree of interaction at school. According to Eisenberg (1991), pedagogues realise that students exhibit distinctive preferences for certain learning approaches over others. In addition, it is recognised that students' learning styles have an influence on their performance and learning achievement. Consequently, it is of utmost importance for teachers to know the differences in their students' learning styles. Thus, they often seek to explore varied teaching strategies in order to cater for the great diversity in students' needs (Polz, 2019). Being aware of the differences, pedagogues can adapt their teaching and create diverse learning activities that are tailored to their students' learning styles (Hedge, 2000). Furthermore, Ho (1999) suggests identifying students' learning style preferences at the beginning, so teachers can adequately proportion their tasks to facilitate the learning of all students.

Individuals should be encouraged to use their preferred learning styles. Hence, in order to be able to carry out appropriate tasks and activities and thus, enhance students' learning outcomes, it is essential that every teacher understands the differences and characteristics of learning styles as well as individual differences existing among the students, such as gender, age, grade level, grade point average and others, which have been shown to impact the learning process, the language learning process in particular (Bećirović, 2017; Delić et al., 2018), and the employment of different strategies likewise, learning strategies in general (Brdarević-Čeljo, Asotić, 2017) and reading strategies in particular (Bećirović et al., 2017; Bećirović et al., 2018), which, as research has indicated, also lead to more successful learning (Alexander, Jetton, 2000).

2. Literature review

Learning is a fundamental part of our life that is essentially based on personal experience, practice, abilities, and approaches (Bećirović, Sinanovic, 2016). Although it has long been recognised that the learning progress is greatly influenced by the learning style students apply, and that successful teachers utilise methods which correspond to the particular learning style of their students (Bećirović, 2017; Delić, Bećirović, 2018; Felder, Silverman, 1988), there is an ongoing debate on the determination and classification of learning styles.

One controversy alludes to the question whether an individual learning style is more or less stable or prone to change. According to Keefe (1979), a person's learning style may be defined as a comparatively consistent emotional and intellectual response to the learning setting. Similarly, Duda and Riley (2000) describe the concept of learning style as predominantly constant intellectual characteristics that affect the individual learning approach. In contrast, research conducted by Reid (1987) suggests that learning styles are subject to change in accordance with students' learning conditions and practice. In this context, Kolb and Kolb refer to the notion of an experiential learning cycle which they consider to be decisive for a student's choice of particular learning modalities and propose "that learning style is not a fixed psychological trait but a dynamic state resulting from synergistic transactions between the person and the environment" (2013, p. 9).

Another debate refers to the different aspects determining a learning style. The number and variety of approaches and inventories seem to imply countless possibilities of categorising learning styles. However, they all presume that learning styles are primarily influenced by aspects related to environment, personality, cognition, and senses. With reference to Myers (1962), personality is crucial for perceiving and processing information. Her inventory for identifying learning styles relates to C.G. Jung's analytical psychology, and distinguishes 16 personality types based on polarising dimensions on four levels, which are extraversion and introversion on the energy level, sensing and intuition at information level, thinking and feeling on the level of decision, as well as judging and perceiving on the level of lifestyle. According to this model, personality is made up of one of the contrasting traits on each level, which results in the distinction of 16 personality types and their various implications for learning and working. The currentness of the type-theory was substantiated by Felder, Felder and Dietz (2002) who conducted a longitudinal study with 116 students of engineering in which the outcomes were found to be conforming with the

anticipations of Myers-Briggs' theory. Felder and Silverman (1988) developed a model to distinguish learning styles of students that categorises learners with reference to five dichotomies, namely "sensory vs intuitive", "visual vs auditory", "inductive vs deductive", "active vs reflective", and "sequential vs global". Subsequently, they omitted the level "inductive vs deductive" and changed the visual-auditory dimension to visual-verbal (Felder, Spurlin, 2005). After centuries of research and adapting previously developed models, Kolb and Kolb (2013) elaborated a model of nine learning style types that are situated in four learning environments which they refer to as "active experimentation", "concrete experience", "reflective observation", and "abstract conceptualization". In regard to the ability of learners and based on the four learning environments, they describe nine learning styles as "initiating", "experiencing", "creating", "reflecting", "analysing", "thinking", "deciding", "acting", and "balancing" (Kolb, Kolb, 2013). The theory of multiple intelligences posed by Howard Gardner implies that learners perform best in certain domains. Originally, he distinguished seven intelligences, i.e., "linguistic", "logical-mathematical", "spatial", "musical", "bodily-kinaesthetic", "interpersonal", and "intrapersonal", and later added an eighth one, namely the "naturalistic" intelligence (Davis et al., 2011). Gardner supposes that potentially, every person is bestowed with all intelligences but uses them only to certain degrees, depending on their particular assets and deficiencies (Davis et al., 2011). Dunn and Dunn (1979) identify 18 components that shape learning styles including circumstantial, affective, collective, physical, and mental aspects. Their research suggests that the impact of these aspects greatly depends on the preferred learning modality. With reference to Dunn and Dunn (1979), more than one third of the students count as visual learners, approximately one third are found to be tactile learners, and slightly less than a third qualify as auditory learners. Referring to investigations by Price, Dunn and Sanders (1980), and in consonance with Reid (1987) and Kolb and Kolb (2013) it may be expected that learning styles develop and change with age and experience. When children start school, they are most likely to be tactile oriented, as their visual and auditory aptitudes gradually unfold (Price et al., 1980). This development may not only be due to young age but might be connected with the beginning of learning new matter and increasingly becoming more skilled. Research administered by Venkatesan (2015) on perceptual learning styles of students at an Indian nursing college supports the notion of dynamics in learning styles. Her findings suggest that students' preferred learning styles change with their experience.

With reference to the goal of the current study, the focus is on the visual, the auditory, and the tactile learner. Visual students learn best through what they see. Therefore, visual aids such as pictures, charts, films, body language, and demonstrations are essential for their learning success (Clarke et al., 2006). Moreover, adding symbols, colours, and graphics to notes is beneficial for this type of learners. Studies on learning styles and the application of visual aids affirm that at least 40 % of all students generally need support through visual material to successfully process and retain information (Adkins, Brown Syed, 2002; Clarke et al., 2006; Stoltz et al., 2001; Zywno, Waalen, 2002). With regard to brain functions, studies by Dunn et al. (2002) imply that visual learners are often left-hemisphere oriented and prefer conventional and rather formalistic learning environments. Auditory students favour acquiring information through listening. They interpret meaning through the tone of a sound as well as through the quickness and accentuation of speech (Gilakjani, 2012). It is recommended that those learners make sure that they can hear well, recite information, and have conversations for better memorisation. With reference to Reid (1987), students favouring auditory approaches can be expected in study fields such as medicine, business, and sciences. While some research focusing on sensory learning styles distinguishes between tactile learners and kinaesthetic learners or focus only on one of them (Asrining Tyas, Safitri, 2017; Felder, Silvermann, 1988; Felder, Spurlin, 2005; Erginer, 2014), others view them as one group (Dunn, Dunn, 1979; Gilakjani, 2012) or, as stated by Dunn et al. (2002), use both terms synonymously. For the current study, the tactile learner is defined as someone who enjoys creating things with their hands and makes sense of information through touch. Following Dunn et al. (2002) it may be taken into consideration that high school students who are tactile learners are often right-hemisphere oriented and prefer relaxed and sometimes unconventional learning settings with moderate lighting. Furthermore, writing, highlighting, underlining, labelling, and role-playing help this type of learner to retain information. The hypotheses tested by this study are as the following:

H1: There will be a significant influence of gender on the combined dependent variables of learning styles preferences. Furthermore, gender significantly affects the preferences of auditory, visual and tactile learning styles;

H2: There will be a significant effect of school level on the combined dependent variables of learning styles preferences. Likewise, school level significantly impacts the preferences of auditory, visual and tactile learning styles and

H3: There will be a significant influence of GPA on the combined dependent variables of learning styles preferences. Additionally, GPA significantly influences the preferences of auditory, visual and tactile learning styles.

3. Methodology

3.1. Participants

The research sample consists of 269 middle and high school students in Sarajevo, Bosnia and Herzegovina. The convenient sampling method was implemented. Students voluntarily completed the questionnaires at school premises. The sample includes 63 students from middle and 206 students from high schools; there are 128 female and 141 male students. As for the GPA, the sample includes four groups as follows: group 1 (12 students); group 2 (36 students); group 3 (119 students) and group 4 (102 students). There were no participants whose GPA fell within the group of GPA ranging between 1.6 and 2.4. The age of students ranges from 13 to 18 (M = 16.2, SD = 1.80). A detailed overview of the research sample is presented in Table 1.

Table 1. Demographic data of the participants

	Number	**Percent %**
Gender		
Male	128	52.4
Female	141	47.6
School level		
Middle school	63	23.4
Highschool	206	76.6
GPA		
Group 1 (1)	12	4.5
Group 2 (2.5-3.4)	36	13.4
Group 3 (3.5-4.4)	119	44.2
Group 4 (4.5-5)	102	37.9

3.2. Instrument and procedure

In order to collect data on learning styles, a questionnaire by University of California, Merced; Student Advising and Learning Center (2006) was used. The questionnaire consisted of 24 statements for which a 5-point Likert scale was used. Students could choose one out of five statements (never, rarely, sometimes, often, and always). The instrument included three subscales, namely visual (I prefer to see information written on the board and supplemented visual aids and assigned readings), auditory (I can tell if sounds match when presented with pairs of sounds), and tactile (I enjoy working with my hands or making things). Cronbach's alpha reliability analysis for 24 items of the questionnaire showed acceptable reliability $\alpha = .84$. As for the subscales, the results also showed acceptable reliability, namely visual $\alpha = .74$, auditory $\alpha = .67$ and tactile $\alpha = .63$.

With the purpose of determining the overall achievement, the students were asked to provide information on their GPA at the end of the previous semester. In the education system in Bosnia and Herzegovina, "1" means that the student has failed while "5" is the best grade.

The questionnaire was distributed to students in middle and secondary schools in Sarajevo Canton, Bosnia and Herzegovina. At the beginning, the participants were asked to read each statement carefully, to be honest, and to provide a response for all the statements in the questionnaire. The research took place at the premises of the schools. The participants needed approximately 15 minutes to fill out the questionnaire.

3.3. Data analysis

In order to analyze the data gathered from the participants, Statistical Package for the Social Sciences (SPSS), version 23.0 was used. Descriptive statistics in terms of means, standard deviations and frequencies were performed. The reliability analysis was performed by Cronbach's alpha. A one-way MANOVA was employed to determine the effect of gender, school level and GPA on students' learning style preferences. Tukey HSD post hoc test was used to determine differences between GPA groups.

4. Results

A one-way multivariate analysis of variance (MANOVA) was conducted to determine gender preferences towards the learning styles, namely visual, auditory and tactile. The MANOVA results show that gender has a statistically significant influence on the combined dependent variables of learning style preferences Wilk's $\Lambda = 0.963$, $F\ (3, 265) = 3{,}38$, $p < .019$; with the small effect size $\eta^2 = .037$. Furthermore, the results show that gender significantly affects the preferences of all three learning styles individually, namely visual style $F\ (1, 267) = 5.79$; $p < .017$; $\eta^2 = .021$; auditory $F\ (1, 267) = 9.01$; $p < .003$; $\eta^2 = .033$ and tactile $F\ (1, 267) = 5.57$; $p < .019$; $\eta^2 = .021$. The effect size was small with all three learning styles.

Table 2. Adjusted and Unadjusted Means for Visual, Auditory and Tactile Learning Styles by Gender

	VISUAL		AUDITORY		TACTILE	
	Adj. M	Unad. M	Adj. M	Unad. M	Adj. M	Unad. M
Male	3.36	3.36	3.48	3.48	3.17	3.17
Female	3.57	3.57	3.73	3.73	3.37	3.37

The most preferred learning style by all students is auditory $M = 3.60$, SD = .70 followed by visual $M = 3.46$, SD = .70 while tactile is the least preferred one $M = 3.27$, SD = .69. Likewise, females, in comparison to males, scored significantly higher in their preferences for all three learning styles. Visual learning style for females was $M = 3.57$; while males scored $M = 3.36$; auditory style preference for females was $M = 3.73$; while for males $M = 3.48$, and tactile learning style preference for females was $M = 3.37$ and for males M = 3.17 (Table 2).

The MANOVA results also show that school level significantly affects the combined dependent variables of learning style preferences, Wilk's $\Lambda = 0.750$, $F\ (3, 265\ ) = 29.41$, $p < .001$, with a large effect size $\eta^2 = .250$. Furthermore, the results show that school level significantly affects the preferences for all three learning styles individually, namely visual style $F\ (1, 267) = 24.16$; $p < .001$; with medium effect size $\eta^2 = .083$; auditory $F\ (1, 267) = 65.7$; $p < .001$; $\eta^2 = .20$; and tactile $F\ (1, 267) = 75.4$; $p < .001$; $\eta^2 = .22$. The effect size on visual and tactile learning style preference were large.

Table 3. Adjusted and Unadjusted Means for Visual, Auditory and Tactile Learning Styles by type of school

	VISUAL		AUDITORY		TACTILE	
	Adj. M	Unad. M	Adj. M	Unad. M	Adj. M	Unad. M
Middle school	33.82	33.82	44.16	44.16	33.86	33.86
Secondary school	33.35	33.35	33.42	33.42	33.09	33.09

Students studying in middle school showed significantly higher preferences for all three learning styles. Table 3 shows that the most preferred learning style in middle school is auditory $M = 4.16$; followed by tactile $M = 3.86$, while visual is the least preferred one $M = 3.82$. Whereas, in secondary school, the most preferred learning style is auditory $M = 3.42$; followed by visual $M = 3.35$, and the least preferred is tactile $M = 3.09$. Furthermore, at both levels the most preferred style is auditory. The difference, however, is in the other two learning styles. The second preferred learning style in middle school is tactile, while in secondary school it is visual. The least preferred style in middle school is visual, and in secondary school tactile (Table 3).

A one-way multivariate analysis of variance (MANOVA) showed a statistically significant effect of students' GPA on the combined dependent variables of their learning style preferences Wilk's $\Lambda = 0.864$, $F(9, 640) = 4.40$, $p < 001$; $\eta^2 = .048$. The effect size was medium. Furthermore, the results show that students' GPA significantly affects the preferences of all three learning styles individually: 1) visual style $F(3, 265) = 5.30$; $p = .001$; $\eta^2 = .057$; the Tukey HSD post hoc test showed that significant difference was between two highest GPA groups; 2) auditory $F(3, 265) = 7.93$; $p < .001$; $\eta^2 = .083$; according to Tukey HSD post hoc test there were significant differences between second and fourth GPA groups and 3) tactile $F(3, 265) = 8.78$; $p < .001$; $\eta^2 = .090$, Tukey HSD post hoc test again showed significant differences between the second and fourth GPA group.

Table 4. Adjusted and Unadjusted Means for Visual, Auditory and Tactile Learning Styles by GPA

	VISUAL		AUDITORY		TACTILE	
	Adj. M	Unad. M	Adj. M	Unad. M	Adj. M	Unad. M
First group (1)	3.12	3.11	3.73	3.73	3.27	3.27
Second group (2.5-3.4)	3.56	3.56	3.93	3.93	3.59	3.59
Third group (3.5-4.4)	3.31	3.31	3.38	3.38	3.05	3.05
Fourth group (4.5-5)	3.64	3.63	3.72	3.72	3.41	3.41

Table 4 shows that the most preferred learning style with all students is auditory. Furthermore, for students whose GPA is 4.5-5, auditory style is followed by the visual, and the least preferred style for them is tactile. Likewise, for students whose GPA is 3.5-4.4, auditory is followed by the visual style, and their least preferred style is also tactile. Contrary to them, for students whose GPA is 2.5-3.4 auditory is followed by tactile, while their least preferred style is visual. The same applies for students whose GPA is 1, auditory style is followed by the tactile, and the least preferred learning style is visual. The results show that students who prefer auditory and visual learning have better GPA and show better performance in class. On the other side, students whose

preferred styles are auditory followed by the tactile have lower GPA, which implies they show lower performance in class.

5. Discussion

Due to the pivotal role learning styles play in education, this study investigated students' preferences in perceptual learning styles regarding gender, school level, and GPA. Results have demonstrated that participants altogether showed a significant preference for auditory learning over visual and tactile approaches.

Referring to gender, female students scored significantly higher in their preference towards all learning styles than their male peers which is why the first hypothesis by which it was assumed that there is a significant difference in learning style preference based on gender is supported. These findings are in consonance with research by Lai (2001) who found that male and female students differ significantly in their approach to learning. They are particularly noteworthy as many studies on learning styles (for example, Dunn, Dunn, 1979; Felder, Spurlin, 2005; Gilakjani, 2012; Zywno, Waalen, 2002) do not take the influence of gender into account while others (Honigsfeld, 2000; Felder, Brent, 2005; Keri, 2002) do consider the factor of gender but focus on different categories of learning styles. In contrast to the study at hand, Reid's (1987) investigation revealed a strong preference of students for tactile and kinaesthetic learning and a low inclination towards group learning. Regarding gender, male students were found to favour visual and tactile learning significantly more than their female peers (Reid, 1987).

The second hypothesis supposed that there is a significant difference in learning style preference based on school level. Results have highlighted that school level significantly affects the preference for all three learning styles which is why the second hypothesis is supported. Generally, middle school students show significantly higher scores in their preference towards all learning styles. While auditory learning is most favoured by both school levels in focus, middle school students show a higher level of preference to tactile learning than high school students. On the other hand, middle school students' least preferred learning style, the visual one, still scored higher than secondary school students' most favoured learning style, the auditory approach. These findings are in line with the notion that the preference in learning style changes with age and experience (Kolb, Kolb, 2013). Similarly, Venkatesan's (2015) study revealed a difference in students' preferred learning style that changes with time. According to her research, approximately 39 % of learners at the beginning of their academic studies were kinaesthetic, while 33 % were auditory, and only circa 24 % were visual learners, with the remaining favouring a combination of two or three learning styles. In their fourth year of study, however, only 28 % of the students were identified as kinaesthetic oriented, another 28 % were auditory learners, and nearly 29 % turned out to be visual learners (Venkatesan, 2015). Investigations by Reid (1987) show opposite results. Her research on over 1300 students of English as a second language implies that undergraduate learners are significantly more auditory oriented while graduates demonstrate a preference for visual and tactile learning.

The third hypothesis suggested that there is a significant difference in learning style preference based on students' GPA. The outcomes supported this and revealed again that participating students favour auditory learning the most. Furthermore, results indicate that students with higher GPA tend to favour auditory and visual approaches while they show little inclination towards tactile approaches. In contrast to that, students with lower GPA tend to prefer a combination of auditory and tactile learning while they show comparatively little preference towards visual approaches. In this context and in order to maximise learning outcomes, Dunn et al. (2002) emphasise the importance of matching instructions to students' preferred learning styles. This postulation is supported by Aragon, Johnson and Shaik (2002) who investigated the effect of students' learning approach on their achievement. According to their findings, students can be successful regardless of the learning environment as long as instructions complement students' favoured learning styles. Referring to Friedel and Rudd (2006) it may be presumed that students' GPA corresponds with their preference in learning style. Regarding the current study, it is assumed that the participants prefer auditory learning, as they perceive listening to be crucial for their learning success.

6. Conclusion

In conclusion, the results of the study showed that the auditory learning style is the most preferred learning style for middle and high school students in Bosnia and Herzegovina. Referring to gender, female students scored significantly higher in their preference towards all learning styles than males. The results also showed that school level significantly affects the preference for all three learning styles. Generally, middle school students showed higher preference towards all learning styles. While auditory learning style is most favoured by both school levels, middle school students showed a higher level of preference to tactile learning than high school students. Whereas, middle school students' least preferred learning style, the visual one, still scored higher than secondary school students' most favoured learning style, the auditory approach. In addition, the results indicate that students with higher GPA tend to favour auditory and visual approaches over tactile, in contrast to that, students with lower GPA tend to prefer a combination of auditory and tactile learning, and they show comparatively little preference towards visual approaches. Thus, in order to create a conducive learning atmosphere, besides from providing an enhanced teaching procedure, it is also necessary for educators to pay attention to their students' preferred learning styles, and plan the lessons accordingly. Additionally, once students become aware of their learning styles, they will be able to assess their preferences and be more responsible for their own learning.

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