The Impact of the Thinking Style on Teaching Methods and Academic Achievement

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Abstract
        Thinking style is an area of interest for researchers. It influences the decision-making of individuals in every aspect of their life. Does thinking style influence the choice of learning methods? What about academic performance? This research paper's objective is to study the impact of thinking styles on the methods of teaching and academic achievement. There are 186 Albanian university students who participated in the study. The questionnaires were distributed online during the second semester of the 2016-2017 academic year. SPSS 20 and JASP 0.8.1.2 were used for data analysis. The statistical analyses utilized are as follows: distribution table, crossed tabulation, Pearson correlation coefficient, One-Way ANOVA, comparison of means, regression analysis.
The study concluded that thinking style has an impact on academic achievement and not on teaching methods. The largest number of students belong to the concrete-sequential category. An additional conclusion is that students who apply different types of thinking rate the hybrid learning as most effective.

Keywords: Thinking style, online learning, hybrid learning, traditional learning, academic achievement

Introduction
        Technological advancements have considerably improved education. The evolution of technology has helped increase the quality and professionalism of teaching in universities. Its impacts are multifold. Nowadays, there exist three types of instruction: the online learning, the

hybrid learning, and the traditional learning. Researchers have focused their efforts in studying these teaching methods. They argue that of the three teaching methods, the most advantageous methods to be used in continuation are the hybrid and online learning (Anderson, Boyles, & Rainie, 2012; Güzera & Canera, 2014; Dziuban, Graham, & Picciano, 2014). It is the student's responsibility to choose a preferred teaching method to study. Does the thinking style impact in the selection of a teaching method? Does it impact academic achievement? The purpose of this study is to provide answers to the questions above. The objective of this research is to analyze the impact of thinking styles on the teaching methods and academic achievement.

Literature Review

Teaching methodology is an area of interest for researchers. According to researchers, the hybrid learning is more effective than the other two, the online and traditional learning (Promsurin & Vitayapirak, 2015; Dziuban, Graham, & Picciano, 2014; Jasim, Sherbiny, & Guirguis, 2015; Stockwell, Stockwell, Cennamo, & Elise, 2015). Additionally, a number of empirical studies have concluded that students who pursued courses through the hybrid learning were more satisfied than students who learned through the other two teaching methods (Castle & McGuire, 2010; Collopy & Arnold, 2009; Farley, Jain, & Thomson, 2011; Martinez-Caro & Campuzano-Bolarin, 2011; Owston, Garrison, & Cook, 2006; Schuhmann & Skopek, 2009; Woltering, Herrler, Spitzer, & Spreckelsen, 2009). The introduction of new teaching methods in the learning process has a positive impact on the students' academic performance (Fitzgerald & Li, 2015; Morris, 2010; Owston, York, & Murtha, 2013). Moreover, they have an impact on the development of decision-making skills (Amador, Miles, & Peters, 2006). The utilization of contemporary teaching methods has an impact on the development of the student's personality, new skills, and the improvement of academic performance (Smith, Cavanaugh, Jones, Venn, & Wilson, 2006).

Thinking style is different for every student. Students apply their skills in different ways. The application of skills in various ways is called a thinking style. Considerable research has been conducted in this field, however, more work is needed in order to explain certain aspects. The ways in which the human brain functions are yet to be explained. However, there exist ways in which to determine thinking styles (Sternberg, Grigorenko, & Zhang, 2008; Sternberg, Thinking styles, 1997; Zhang & Sternberg, 2005; Gregorc, 2017). One of the researchers to have contributed in the field is Anthony Gregorc, who developed in 1984 the concept of the mind style. According to Gregorc (2017) mind styles are divided in two groups:

perceptual abilities and ordering abilities. Perceptual abilities are divided into concrete (the five senses) and abstract (understanding ideas and qualities which cannot be seen). This research will use the Gregorc (2017) classification, which consists of four categories: concrete-sequential, concrete random, abstract-sequential, abstract-random. Students who belong to the concrete-sequential manage information following a step after step logical sequence, they prefer working within a solitary and structured environment, and following directions and procedures. Students belonging to the concrete-random prefer risk, experimenting, use their intuition and solve problems independently. Students belonging to abstract-sequential prefer applying detailed analysis before making a decision or acting, uses logic in order to solve problems and likes their opinion to be heard. Students belonging to the abstract-random, prefers focusing on issues at hand, work in group activities, likes to listen to others and establish harmonious relationships with colleagues. According to Al Maghraby and Alshami (2013) the existing correlations between the teaching methods and thinking styles are insignificant. Thinking styles have an impact on academic achievement (Zhang L. , 2002).

The research questions are:

1. Which thinking styles are preferred by students?

2. Which teaching method is valued most by students?

3. Does thinking style have an impact on teaching methods and academic achievement?

Research hypotheses are:

• H1: Students have the same evaluation of teaching methods regardless of thinking style (α=0.05).

• H2: Elements of teaching methods are evaluated the same regardless of thinking style (α=0.05).

• H3: All three teaching methods are evaluated effective the same by students regardless thinking style (α=0.05).

• H4: Students have the same academic achievement regardless of thinking style (α=0.05).

• H5: Academic achievement do not have an impact on student perception of teaching methods (α=0.05).

This study employs the following conceptual model:
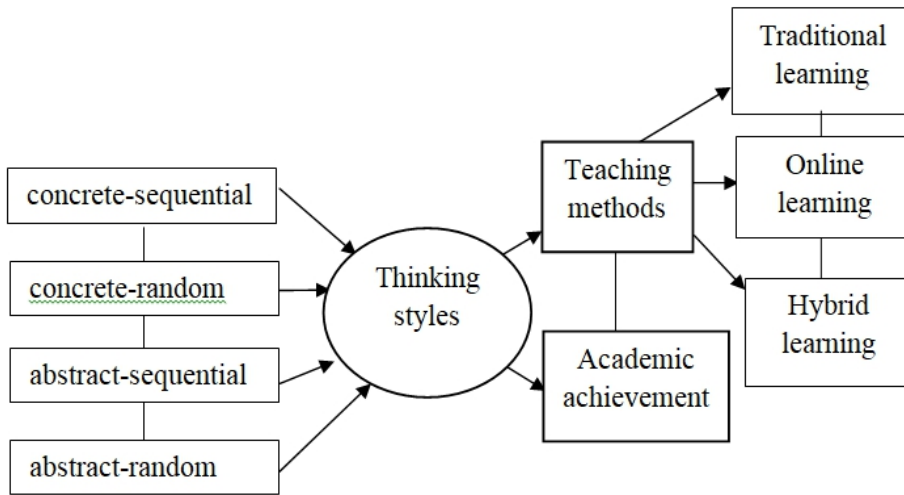
Methodology

The descriptive method and the quantitative analysis have been utilized in this study. The questionnaire was employed for the collection of data (Gregorc, 2017; O'Malley & McCraw, 2001), which was distributed online. The questionnaire consists of 12 questions divided into three sections. The first part contains questions with alternatives on thinking styles. The second part contains a 6-point Likert scale survey, ranging from "Not Applicable" to "Strongly Agree". The third part contains demographic questions. The study was conducted during the second semester of the 2016-2017 year. 186 Albanian university students participated in this study. The response return rate was 90%. The data from the study sample are reflected in the graphs below.

Graph 1: Study area
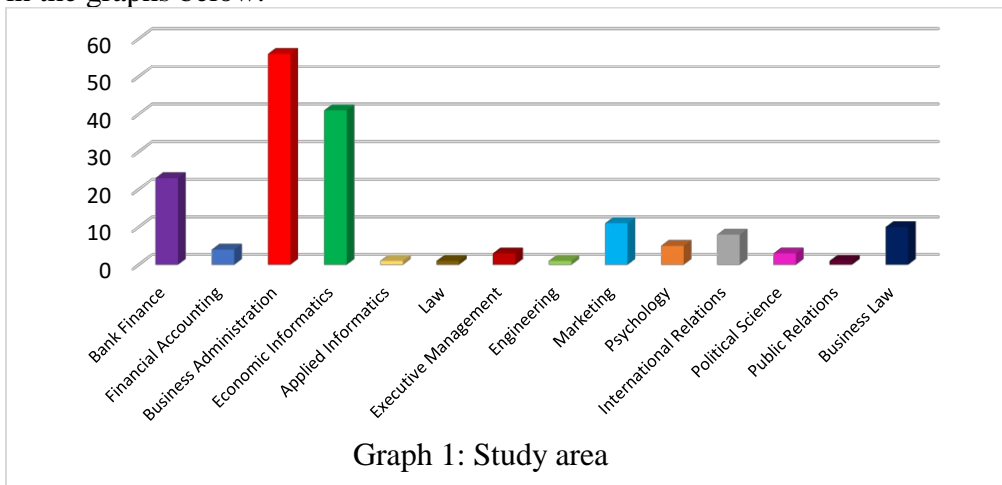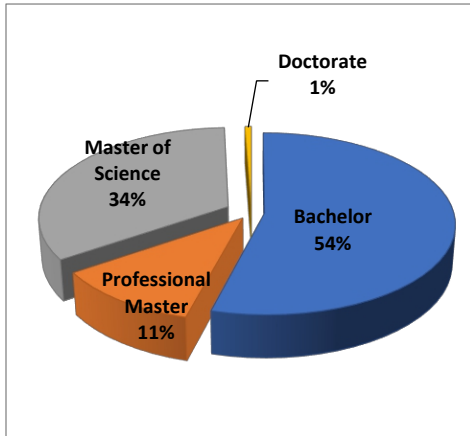
Graph 2: Study level
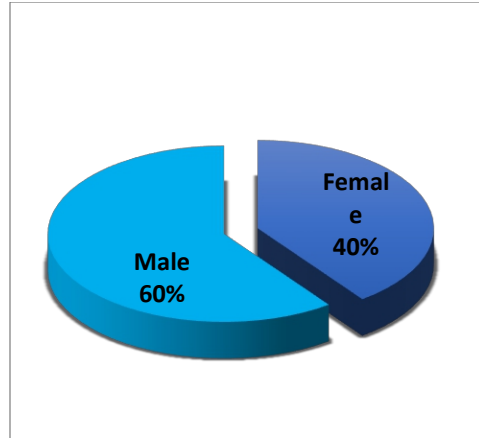
Graph 3: Gender
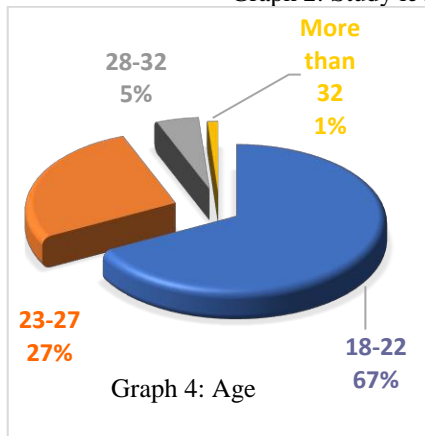
Graph 4: Age
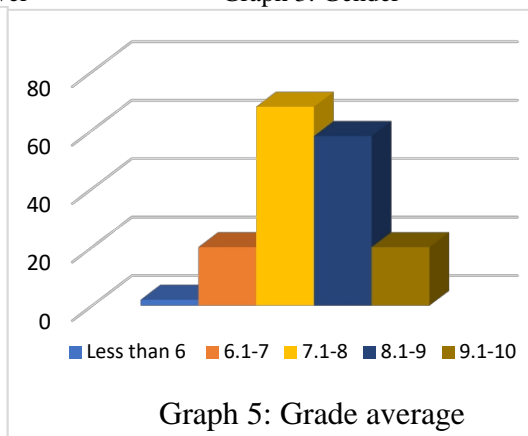
Graph 5: Grade average

The data was analyzed with SPSS 20 and JASP-0.8.1.2. The value of the reliability coefficient Cronbach's α is 0.825. This shows the obtained data are valid for research purposes. Table 2 provides the coefficient's values of the three variables.

Table 1: Reliability coefficient

	Cronbach's α
scale	0.825

Note. Of the observations, 168 were used, 0 were excluded list-wise, and 168 were provided.

Table 2: Reliability coefficient of each variable

	If item dropped
	Cronbach's α
Teaching method	0.818
Thinking style	0.836
Academic achievement	0.829

Empirical Analysis

Descriptive statistics provides detailed information with respect to variables. Table 3 data shows that the hybrid learning has the highest mean. Whereas the online learning has the lowest standard deviation. It must be noted that the values of standard deviation are low. This conveys that the data are distributed around the mean.

Table 3: Descriptive data

	Traditional learning	Online learning	Hybrid learning	Thinking style	Academic achievement
Valid	168	168	168	168	168
Missing	0	0	0	0	0
Mean	4.196	3.946	4.280	2.161	3.440
Std. Error of Mean	0.06608	0.05926	0.06536	0.08909	0.06896
Std. Deviation	0.8565	0.7681	0.8472	1.155	0.8938
Minimum	2.000	1.000	1.000	1.000	1.000
Maximum	6.000	6.000	6.000	4.000	5.000

Which thinking styles are preferred by students?

According to the data from Table 4, most students identify with the concrete-sequential. The number of students using concrete-random is the same with students who use abstract-sequential. Last, there are students who belong to the abstract-random.

Table 4: Preferences of thinking styles

	Frequency	Percent	Valid Percent	Cumulative Percent
concrete-sequential	69	41.1	41.1	41.1
concrete random	34	20.2	20.2	61.3
abstract-sequential	34	20.2	20.2	81.5
abstract-random	31	18.5	18.5	100.0
Total	168	100.0	100.0	
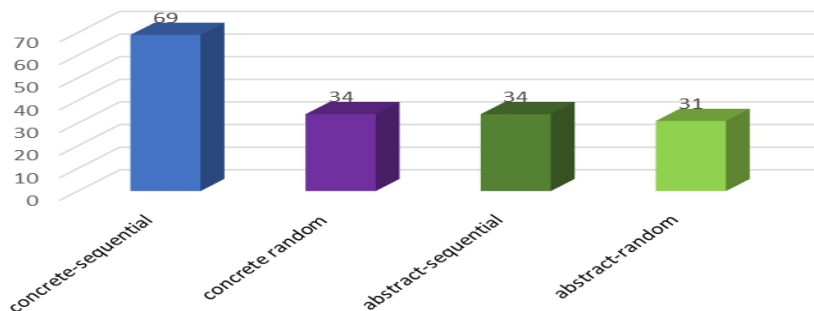
Graph 6: Thinking style

Concrete-sequential is most used by both genders, however, preference changes in the case of other thinking styles. The thinking style

least used by male students is abstract-random while the thinking style least used by female students is concrete-random. The value of the test chi-square ($p=0.047 < p=0.05$) shows that student gender has an impact on thinking style. Table 5 provides detailed information.

Table 5: Thinking style and gender

Thinking style	Gender:		Total
	Female	Male	
concrete-sequential	36	33	69
concrete random	9	25	34
abstract-sequential	11	23	34
abstract-random	11	20	31
Total	67	101	168

Chi-Squared Tests	Value	df	p
X^2	7.953	3	0.047

The preferences of students on thinking styles differ from one area to the other. A large number of students belong to the concrete-sequential and abstract-sequential (Table 6). It must be noted that concrete-sequential thinking style is first. Study area has an impact on thinking style as shown by value of p, which is less than 0.05.

Table 6: Thinking style and study area

Area	Thinking style					Total
	Concrete sequential	Concrete random	Abstract sequential	Abstract random		
Bank Finance	7	5	7	4	23	
Financial Accounting	0	2	1	1	4	
Business Administration	11	16	19	10	56	
Economic Informatics	28	5	3	5	41	
Applied Informatics	1	0	0	0	1	
Law	0	0	0	1	1	
Executive Management	3	0	0	0	3	
Engineering	0	0	0	1	1	
Marketing	3	4	0	4	11	
Psychology	4	0	0	1	5	
International Relations	6	0	1	1	8	
Political Science	2	1	0	0	3	
Public Relations	1	0	0	0	1	
Business Law	3	1	3	3	10	
Total	69	34	34	31	168	

Chi-Squared Tests

	Value	df	p
X^2	65.83	39	0.005

The greatest part of the surveyed students belongs to 18-22 age band. The concrete-sequential is used most by students. Age does not have an impact on thinking style since the value of p=0.144 is greater than 0.05. Table 7 shows students' preferences on thinking styles based on age.

Table 7: Thinking style and age

Thinking style	Age				Total
	18-22	23-27	28-32	Over 32	
concrete-sequential	40	26	2	1	69
concrete random	23	9	2	0	34
abstract-sequential	29	4	1	0	34
abstract-random	21	6	3	1	31
Total	113	45	8	2	168

Chi-Squared Tests			
	Value	df	p
X^2	13.42	9	0.144

The concrete-sequential is ranked first by all students regardless of academic performance. The following ranking of the other thinking styles differs in accordance with academic achievement. Based on the conclusions of the study the concrete-sequential is preferred most by students. Table 8 provides detailed rankings in accordance with academic achievement.

Table 8: Thinking style and academic achievement

Thinking style	Academic achievement					Total
	Less than 6	6.1-7	7.1-8	8.1-9	9.1-10	
concrete-sequential	1	9	27	20	12	69
concrete random	0	2	16	14	2	34
abstract-sequential	1	6	14	10	3	34
abstract-random	0	3	11	14	3	31
Total	2	20	68	58	20	168

Which teaching method is valued most by students?

The hybrid learning scores highest among students with grade average 4.280 (Table 9). It is followed by the traditional learning with grade average 4.196 and the online learning with average 3.946. The online learning received the lowest evaluation.

Table 9: Teaching methods

	N	Mean	SD	SE
Traditional learning	168.0	4.196	0.857	0.066
Online learning	168.0	3.946	0.768	0.059
Hybrid learning	168.0	4.280	0.847	0.065

Does thinking style have an impact on teaching methods and academic achievement?

It is concluded through the values of the Pearson correlation coefficient in Table 10, that thinking styles do not have an impact on teaching methods, however they impact academic achievement. Thinking style has an insignificant negative correlation to teaching methods where p =0.329 (-0.076). Between thinking styles and academic achievement there exist a significant statistical correlation with correlation coefficient 0.205 and p=0.008. Thus, the analysis concludes that thinking style impacts only academic achievement.

Table 10: Pearson Correlations

		Thinking styles	Teaching methods	Academic achievement
Thinking styles	Pearson's r	—	-0.076	0.205**
	p-value	—	0.329	0.008
Teaching methods	Pearson's r		—	-0.163*
	p-value		—	0.035
Academic achievement	Pearson's r			—
	p-value			—

* p < .05, ** p < .01, *** p < .001

H1: Students have the same evaluation of teaching methods regardless of thinking style (α=0.05).

In Table 11 the values of Sig are greater than α=0.05. This conveys that there do not exist differences in the evaluations of students, as a result hypothesis H1 is supported with confidence interval 95%.

Table 11- One- Way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Traditional learning	Between Groups	1.660	3	.553	.751	.523
	Within Groups	120.858	164	.737		
	Total	122.518	167			
Online learning	Between Groups	3.661	3	1.220	2.110	.101
	Within Groups	94.857	164	.578		
	Total	98.518	167			
Hybrid learning	Between Groups	5.266	3	1.755	2.512	.060
	Within Groups	114.586	164	.699		
	Total	119.851	167			

H2: Elements of teaching methods are evaluated the same regardless of thinking style (α=0.05).

Thinking style does not have an impact on the evaluation of teaching methods. Values of Sig of the three teaching methods are higher than

α=0.05. Therefore, it is concluded that hypothesis H2 is supported with confidence interval 95%.

Table 12- One- Way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Traditional learning	Between Groups	2.381	3	.794	.817	.486
	Within Groups	159.327	164	.972		
	Total	161.708	167			
Online learning	Between Groups	1.508	3	.503	.607	.612
	Within Groups	135.897	164	.829		
	Total	137.405	167			
Hybrid learning	Between Groups	4.067	3	1.356	1.861	.138
	Within Groups	119.451	164	.728		
	Total	123.518	167			

H3: All three teaching methods are evaluated effective the same by students regardless thinking style (α=0.05).

Students evaluate the hybrid learning as the most effective method of the three teaching methods. Students belonging to different styles of thinking have different evaluations of teaching methods. Value of Sig of the hybrid learning is 0.039, thus less than α=0.05. With respect to the other two teaching methods, there do not exist significant differences (Sig =0.288 and 0.447). The analysis concludes that hypothesis H3 is rejected.

Table 13- One- Way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Traditional learning	Between Groups	3.553	3	1.184	1.266	.288
	Within Groups	153.393	164	.935		
	Total	156.946	167			
Online learning	Between Groups	1.977	3	.659	.891	.447
	Within Groups	121.356	164	.740		
	Total	123.333	167			
Hybrid learning	Between Groups	7.655	3	2.552	2.861	.039
	Within Groups	146.250	164	.892		
	Total	153.905	167			

H4: Students have the same academic achievement regardless of thinking style (α=0.05).

Students who belong to abstract-random have the highest academic achievement with a mean value = 3.55. Second place, is concrete-sequential with a mean of 3.48. Third place, is concrete-random with mean 3.47. Last, is abstract-sequential with mean 3.24. It is inferred from the values that there exist differences in the mean value between thinking styles thus, hypothesis H4 is rejected.

Table 13: Comparison of means

Thinking styles	Mean	N	Std. Deviation	Std. Error of Mean	% of Total Sum
concrete-sequential	3.48	69	.979	.118	41.5%
concrete random	3.47	34	.706	.121	20.4%
abstract-sequential	3.24	34	.955	.164	19.0%
abstract-random	3.55	31	.810	.145	19.0%
Total	3.44	168	.894	.069	100.0%

H5: Academic achievement do not have an impact on student perception of teaching methods (α=0.05).

The regression analysis shown in Table 14 concludes that academic achievement explain 33.3% of the variance of the perception of teaching methods, where Adjusted R^2=0.333, F=84.32 and p<0.001. Academic achievement have an impact on students' perception of teaching methods. Between the two variables there exists a strong positive and significant correlation with coefficient Beta =0.580, t=9.183 and p<0.001 (Table 15). Hypothesis H5 is rejected.

Table 14: Regression analysis

Model	R	R²	Adjusted R²	RMSE	R² Change	F Change	df1	df2	p
1	0.580	0.337	0.333	0.478	0.337	84.32	1	166	< .001

Table 15: Regression analysis between academic achievement and the perception of learning methods

Model		Unstandardized β	Standard Error	Standardized β	t	p
1	(Constant)	2.121	0.224		9.477	< .001
	Academic achievement	0.489	0.053	0.580	9.183	< .001

Conclusion and Recommendations

-In this study there are four categories of thinking style: 1-Concrete-sequential thinking style, 2-Concrete random thinking style, 3-Abstract-sequential thinking style, 4-Abstract-random thinking style. Students use most the first thinking style, namely Concrete-sequential thinking style. The other thinking styles are also used by students.

-The chi-square test score ($p=0.047<0.05$) indicates that the student's gender have an impact on the thinking style. The study area have an impact on thinking styles referring to the value of $p=0.005$, which is less than 0.05.

-Thinking style does not have an impact in the selection of teaching methods, however it has an impact on academic achievement. This conclusion is in the same line with the conclusions reached by other researchers. Students belonging to different thinking styles have the same perception of teaching methods and the elements of these teaching methods. -The next conclusion is that the evaluation on effectiveness of teaching methods is not the same.

-The hybrid learning is evaluated as more effective than the other two teaching methods.

-Students who use abstract-random have better academic performance compared to students who use other thinking styles.

-Academic achievement explain 33.3% of the variance of perception of teaching methods.

-Universities need to start planning on how to apply contemporary teaching methods, like online learning and hybrid learning.

-Another recommendation is to implement classes in accordance to thinking style (where classes are specialized with modern logistic) in order for the learning process to be more effective.

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