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Learning styles, teaching strategies and academic achievement in higher education: A cross-sectional investigation

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Abstract

This study aims at comparing two groups of pre-service teachers (with Educational Sciences and Economic Sciences major) in order to identify their learning style preferences, the most effective teaching strategies for each learning style and some possible differences between their academic achievements ($N=182$). A between subject design was used to analyze the data collected through a survey method. Significant differences between the two categories of students have emerged in relation with the most effective teaching strategies corresponding to each learning style category.

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Keywords: teaching strategies; learning styles; academic achievement; pre-service teachers.

1. Introduction

Effective teaching requires flexibility, creativity and responsibility in order to provide an instructional environment able to respond to the learner's individual needs. As Tomlinson (2001) puts it, beyond the experiential evidence that pervasive uniformity in teaching fails many learners, there is reason in both theory and research to support a movement towards an instruction attentive to students' variance manifested in at least three areas: the student's readiness, interest, and learning profile. One of the ongoing challenges the university teachers are facing is related to matching the teaching strategies with the students' learning styles in order to improve the academic achievement. Starting from this issue, at

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least two essential questions are asking for an answer: Could it be that matching the teaching strategies with the students' learning styles enhances their academic achievement? If the answer is affirmative, how can we identify the most appropriate teaching strategies for each learning style?

In order to answer the first question, a considerable amount of research has confirmed that congruence between teaching strategies and learning styles has have a positive impact on the academic achievement (Arthurs, 2007; Beck, 2001; Felder & Brent, 2005; Ford & Chen, 2001; Rogers, 2009; Shaugnessy, 1998), motivation (Bell, 2007; Tulbure, 2010; Zhang, 2006) and attitudes toward learning (Beck, 2001; Felder, 1993; Marshall, 1991). Despite this evidence, we have to take into account other studies showing that disagreement between teaching strategies and preferred learning style would have some beneficial effects on learning outcomes (Baker & Cooke, 1988; Kowoser & Berman, 1996). However, another set of studies revealed that the matches between students' learning styles and instructional strategies did not affect the students' learning performance (Akdemir & Koszalka, 2008; Massa & Mayer, 2006). Considering the variety of the existent data, we could only say that this issue is controversial. Therefore, our first question is still open and needs further investigation. The task concerning the development of a universal recipe for all categories of learners is daunting and contrary to the underlying assumption of individualizing the learning environment. Consequently, in this study, we propose a specific investigation for pre-service teachers enrolled within two fields of study: Educational Sciences and Economic Sciences.

In an attempt to answer the second question, we have found, in the specialty literature, some recommendations regarding the most appropriate teaching strategies corresponding to each learning style (Anderson, 2007; Arthurs, 2007; Nilson, 2010; Tomlinson, 1999). For example, Nilson (2010) makes some relevant suggestions to adapting the teaching strategies to the four learning styles described by Kolb (2005): assimilator, converger, diverger and accommodator. Beyond these suggestions regarding the most effective teaching strategies appropriate to each learning styles, we consider that by comparing the group of pre-service teachers attending the Educational Sciences with the group of those attending the department of Economic Sciences, we can investigate the possible differences between the teaching strategies that best suit students having the same learning styles.

2. The objective and the research hypothesis

The main objective of this study is to compare pre-service teachers having two different majors (i.e., Educational Sciences and Economic Sciences) in order to identify their learning style preferences, the most effective teaching strategies for each learning style, and the differences concerning their academic achievement. In other words, our study investigates the possible differences between the academic achievements obtained by the two groups of students, when instructed with various teaching strategies. We hypothesize that the same teaching strategies will lead to different academic achievement across the students belonging to the two groups who have the same learning style.

3. The Method

3.1. The Procedure

The learning style of each participant was identified using a self-report questionnaire. Along one semester, two lecturers implemented five categories of teaching strategies: the graphical organization of information, the cooperative learning, the investigation, the debate and the problem solving. Each strategy was implemented during about four hours within the same course (i.e., Basis of Pedagogy). At the end of each four-hour interval, the students' academic achievement was evaluated through a summative assessment test.

3.2. The Participants

A total of 182 pre-service teachers from two faculties of a Romanian University participated in the study. There were 85 Educational Sciences pre-service teachers (47%) and 97 Economic Sciences pre-service teachers (53%). The age range for the whole sample was 18-51 ($M=20.60$; $SD=5.37$). The participants' selection was based on willingness to take part in the study. Two lecturers from the Educational Sciences Department were also involved in the study.

3.3. The Measures

Kolb's self-report Learning Style Inventory (adapted by Lussier, 1990) was used in order to establish the students' preferred learning styles. The students were divided into four categories: assimilators; convergers; divergers; accommodators (as proposed by Kolb, 2005). The academic achievement scores of the students are represented by the grades obtained on the five summative assessment tests, which were applied after a certain category of teaching strategies was implemented. The official grading system at the Romanian universities is that of using scores ranging from 1 (the lowest) to 10 (the highest).

4. The Results

4.1. The students' learning styles

According to our results, 31% of the Educational Sciences pre-service teachers were classified as assimilator learners ($N=26$) and 28% as diverger learners ($N=24$). Approximately 23% of them were mainly convergers ($N=20$), while only 18% were classified as accommodator learners ($N=15$). As for the students attending Economics, 36% of them were identified as convergers ($N=36$), 25% as assimilators ($N=24$), 20% as divergers ($N=19$) and only 19% as accommodators ($N=18$).

4.2. Between group comparisons

Descriptive statistics of the academic achievement scores obtained after each teaching strategy was implemented in the instructional process are presented in Table 1.

Table 1 Means and standard deviation of academic achievement scores

Learning style	Group	N	Achievement scores after applying each teaching strategy				
			<i>Graphical org. of information</i> Mean (std.dev.)	<i>Cooperative learning</i> Mean (std.dev.)	<i>Investigation</i> Mean (std.dev.)	<i>Debate</i> Mean (std.dev.)	<i>Problem solving</i> Mean (std.dev.)
Assimilator	Educ. sciences	26	8.58 (1.10)	7.12 (1.30)	7.00 (0.98)	6.92 (1.05)	7.46 (0.94)
	Economics	24	8.17 (1.31)	6.88 (1.19)	6.96 (1.12)	6.92 (1.35)	7.33 (1.27)
Converger	Educ. sciences	20	7.05 (1.46)	7.95 (1.46)	7.95 (1.39)	7.65 (1.18)	7.80 (1.19)
	Economics	36	7.08 (1.23)	6.83 (1.13)	8.50 (0.97)	7.11 (1.09)	8.44 (1.21)
Diverger	Educ. sciences	24	7.25 (1.67)	6.75 (1.35)	7.00 (1.18)	7.83 (1.37)	7.63 (1.20)
	Economics	19	7.26 (1.19)	8.79 (0.92)	7.37 (1.26)	7.58 (1.12)	7.42 (1.17)
Accommodator	Educ. sciences	15	7.20 (1.14)	7.00 (1.13)	7.53 (0.99)	8.20 (1.01)	8.73 (1.03)
	Economics	18	7.33 (1.28)	7.22 (1.17)	8.67 (1.33)	7.44 (1.38)	7.44 (1.29)

We hypothesized that the same teaching strategies will lead to different academic achievement among students with different majors having the same learning style. We performed an independent samples t-

test analysis in order to determine the differences between the groups. The students' achievement scores obtained after applying the five teaching strategies were treated as dependent variables.

Table 2. Comparisons between the academic achievements of students with Educational Sciences major and Economic Sciences major

Learning style	Educational Sciences vs Economic Sciences									
	<i>Graphical org. of information</i>		<i>Cooperative learning</i>		<i>Investigation</i>		<i>Debate</i>		<i>Problem solving</i>	
	t	p	t	p	t	p	t	p	t	p
Assimilator	1.20	.23	0.67	.50	0.14	.88	0.01	.98	0.40	.68
Converger	-0.09	.92	3.17**	.00	-1.73	.08	1.72	.09	-1.92	.06
Diverger	-0.02	.97	-5.60**	.00	-0.98	.32	0.65	.51	0.55	.58
Accommodator	-0.31	.75	-0.55	.58	-2.72*	.01	1.75	.08	3.11**	.00

*significant at $p < .05$; ** significant at $p < .01$

As shown in Table 2, some statistically significant mean differences between the achievement scores obtained by three categories of learners (convergers, divergers and accommodators) were found. More precisely, a highly significant difference emerged after the Cooperative learning strategy was implemented. The fact seems to suggest that the cooperative learning represents an effective strategy for Educational Sciences convergers ($t=3.17$; $p<.01$) and a strongly productive one for the Economics divergers ($t=-5.60$; $p<.01$). Another important effect is related to the Problem solving strategy which seems more appropriate for the Educational Sciences accommodators than for the Economics accommodators ($t=3.11$; $p<.01$). Accommodators with Economics major scored significantly higher than their Educational Sciences colleagues ($t=-2.72$; $p<.05$) when the Investigation strategy was used. Considering the fact that no significant mean differences between the two groups of assimilators were found, we can admit that our hypothesis was only partially confirmed.

5. Discussion and conclusion

The aim of this research was to compare two groups of pre-service teachers belonging to different fields of study in order to match the most effective teaching strategies with the students' learning styles within each faculty profile. Our assumption was that when comparing the students in Educational Sciences with the students attending Economics, certain teaching strategies will lead to some different academic achievement for students having a similar learning style. Although our hypothesis was only partially confirmed, the results are partially supported by the literature. More precisely, we have found that both Educational Sciences and Economics *assimilators* performed academically better when they were instructed based on a teaching strategy that involves the *Graphical organization of information*. These results are in line with a previous study showing that assimilators respond better to the information presented in an organized, logical fashion (Felder & Brent, 2005). In our study, Educational Sciences students with a predominant *converger* learning style seem to achieve higher results than the students in Economics when *Cooperative learning* strategy is used. Our results are not in line with the general characterization of convergers who are often seen as asocial and unemotional, preferring to work with things rather than people (Nilson, 2010). We believe that this is the point where differences consequent to various areas of study occur, because, as our results demonstrated, *Cooperative learning* is effective for the *diverger* learners of Economics. These results are only partially sustained by the literature in the field, as according to previous studies, *divergers* respond best to group projects and all types of discussion, but they tend to move towards Service fields, Arts, and Social Sciences (Nilson, 2010). The Educational Sciences *accommodators* achieved the best scores when working with a *Problem solving* based strategy, but their Economic major colleagues performed better when the *Investigation* strategy was used. Taking

into account the results got by the students in Educational Sciences, our study seems to be in line with that of other researchers who concluded that accommodators like to apply the course material to new situations in order to solve real problems (Felder & Brent, 2005).

Overall, our results sustain the idea that matching teaching strategies with learning style preferences remains a controversial research issue. Further study should be applied on greater numbers of students coming from various profiles in order to find out the consistent differences among these categories of students. The results of such studies might be useful for both university researchers and teachers who aim at reevaluating the learning differences in order to improve the students' academic achievement.

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