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INVESTIGATING THE RELATIONSHIPS BETWEEN TEACHING STRATEGIES AND LEARNING STYLES IN HIGHER EDUCATION

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Abstract: Within this paper, we are focusing on the relationships between teaching strategies, learning styles, and the students' academic achievement in higher education. The main objective of this study is to compare three groups of pre-service teachers having different majors (i.e., Educational Sciences, Economic Sciences, and Foreign Languages) in order to identify the potential differences in their academic achievement. More precisely, we attempt to highlight the categories of teaching strategies that lead to the best academic achievement for students having the same learning style, and different fields of study. A sample of 269 pre-service teachers from three faculties belonging to Transilvania University of Braşov participated in the study. The data was collected through a survey method and the one-way analysis of variance was used to determine the differences among the groups. Significant differences among the three categories of students with different majors occurred in relation with the most effective teaching strategies corresponding to each learning style category.

Key words: teaching strategies, learning styles, academic achievement

1. Introduction

The term „learning style" has been defined in several ways by many authors, yet the most representative definitions refer to two essential aspects: a) the learning style represents an individual's preferred ways of responding (cognitively or behaviourally) to learning tasks which change depending on the environment or context (Peterson, et al., 2009), and b) the learning style refers to the idea that individuals differ in regard to what type of instruction is most effective for them (Pashler, et al., 2008). Starting from these two perspectives, we have noticed that the learning style represent a complex issue, both for students and teachers. From the students' perspective, the learning style indicates a general preference for learning and encompasses cognitive, affective, psychomotor, and physiological dimensions (Knowles, et al., 2005). On the other hand, taking into account the teachers' perspective, the fact that students have different leaning styles represents a constant challenge, because the optimal instruction presupposes diagnosing individuals' learning styles and tailoring instruction accordingly (Pashler et al., 2008).

Facing the various challenges of the effective learning issue, many researchers attempted to conceptually systematize the learning preferences by constructing explanatory models of learning styles. The present study is based on one of the most popular and influential models of learning styles, the one developed by David Kolb (1981). He defines learning as the process where knowledge is created through transformation of experience (Kolb, 1984). In essence, learning is not so much the acquisition or transmission of content, as it represents the interaction between content and experience, where each transforms the other. In this context, the teacher has not only to transmit new ideas but also to modify old ideas that may get in the way of new ones. According to the author, learning is conceived as a four-stage cycle representing the way individuals perceive, think, feel, and act when faced with new experiences. The four stages of this experiential learning cycle encompass actual experiencing, reflective observation, abstract conceptualization, and active experimentation (see Figure 1). Starting from this four-stage learning cycle, Kolb performed a closer examination of the model, and reached to the conclusion that there are two primary dimensions of the learning process:

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the preferred mode of perception (concrete or abstract) and the preferred mode of processing information (active experimentation or reflective observation). The combination of the four learning stages according to the main processes of learning (perceiving and processing information) led Kolb to distinguishing four categories of learners using different learning styles: *assimilators* (who use abstract conceptualization to perceive information and reflective observation to process it), *convergers* (who use abstract conceptualization to perceive information and then active experimentation to process it), *divergers* (who perceive information through concrete experience and process that through reflective observation), and *accommodators* (who perceive information through concrete experience and process it through active experimentation).

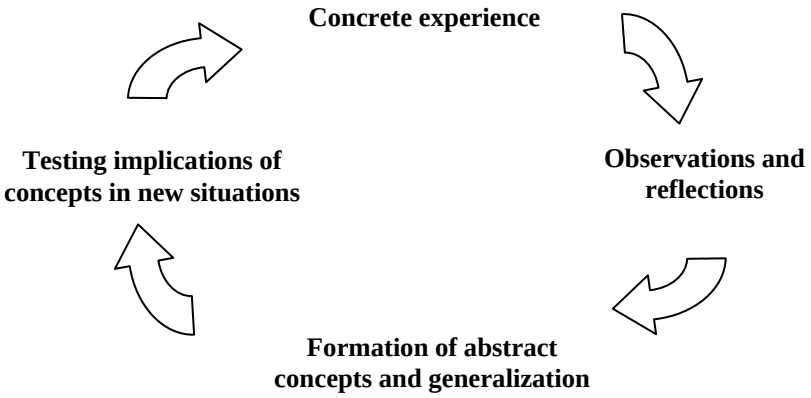

Figure 1. *The Experiential Learning Model* (Kolb, 1981)

When considering the learning style frameworks, an essential question for teachers and researchers is whether matching teaching strategies with students' learning styles will lead to higher academic achievement. For the past three decades, this has been the subject of a classical debate in the field of learning styles: the debate over the so-called "matching hypothesis" (Zhang et al., 2012). In this context, three different perspectives have emerged, each being supported by empirical studies. Thus, a first category of studies support the initial hypothesis and reveal the fact that the adjustment of instructional strategies according to the students' learning styles enhances the academic achievement (Arthurs, 2007; Beck, 2001; Felder and Brent, 2005; Ford and Chen, 2001; Fox and Bartholomae, 1999; Rogers, 2009; Tulbure, 2010). Designing and implementing teaching strategies that meet the learning needs of the students have positive effects on learning outcomes, attitudes toward course contents and learning motivation, and consequently, lead to higher academic achievement. The second category of studies shows that the disagreement between teaching strategies and preferred learning styles would have some beneficial effects on learning outcomes (Baker and Cooke, 1988; Cavanagh and Coffin, 1994; Kowoser and Berman, 1996). As Vaughn and Baker (2001) have argued, providing creative teaching-learning style mismatches which determine the students to experience the less dominant qualities of their learning style stimulates both learning and flexibility in learning. As the authors have underlined, an optimal instruction must involve a certain degree of tension and unbalance. Finally, a third category of studies reveal that the match between the students' learning styles and the instructional strategies did not affect the students' learning performance (Akdemir and Koszalka, 2008; Massa and Mayer, 2006). Pashler and colleagues (2008) have argued that there is no adequate empirical support to justify the incorporation of learning style assessments into the educational practice.

In trying to surpass these controversies, Zhang (2007) has analyzed the issue of teaching-learning style match and mismatch from a new perspective, and proposed that the concept of "style match" should be redefined. As the author puts it, a match between teaching and learning should not be interpreted as an absolute one-and-one match of styles between teacher and students, but rather as a situation in which the teachers' teaching style meet the learning or personality needs of the students. In this context, some students' needs might be met better through the one-and-one style match, but other

students would be more attracted to teaching styles that complement their learning and personality needs (Zhang, 2007).

We think that this approach brings up a new perspective upon the differentiation of the instructional activity. Thus, in our opinion, an efficient differentiation does not make reference only to a single criterion (e.g. the students' learning style), but in order to meet the learning needs of each student, differentiation may be nuanced by simultaneous reference to more criteria which have in view more of the students' characteristics (e.g. the profile of the attended faculty, the students' interests, the learning rhythm, etc.). Leaving from this approach, we will try, in our study, to identify the most adequate teaching strategies corresponding to every learning style, by taking into account another important difference between the students, namely the profile of their faculty. To accomplish that, we'll make reference to the studies in the literature that offer suggestions concerning the most appropriate instructional strategies according to the learners' preferences (Anderson, 2007; Arthurs, 2007; Knowles et al., 2005; Tomlinson, 2000; Nilson, 2010). Following this research line, our intention within this study is to move things forward by making a comparison between pre-service teachers studying Educational Sciences, Economic Sciences, and Foreign Languages, in order to find out the most appropriate teaching strategies for students with the same learning styles who attend different faculty profiles.

2. Objectives and Research Questions

In light of all the above, the present study has sought to achieve two main objectives:

Objective 1: To identify the learning style preferences for all the students involved in the study.

Objective 2: To compare groups of pre-service teachers with different majors (i.e., Educational Sciences, Economic Sciences, and Foreign Languages) in order to identify the potential differences concerning the academic achievement for each learning style category.

More precisely, a cross-sectional study was designed to answer the following questions: a) Are there differences between the teaching strategies that best suit students having the same learning style, and attending different faculty profiles? and b) What are the categories of teaching strategies that lead to the best academic achievement for students having the same learning style, and belonging to different fields of study?

3. Method

3.1. Procedure

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

3.2. Participants

The sample consisted of 269 pre-service teachers from three faculties belonging to Transilvania University. There were 85 Educational Sciences pre-service teachers (32%), 97 Economic Sciences pre-service teachers (36%), and 87 Foreign Languages pre-service teachers (32%). The age range for the whole sample was 18-51 (M=20.26; SD=4.54). The selection of the participants was based on willingness to take part in the study. Three lecturers from the Educational Sciences Department were also involved in the study.

3.3. Measures

Kolb's self-report Learning Style Inventory (adapted by Lussier, 1990) was used in order to identify participants' learning styles. According to the results, the pre-service teachers were divided into four categories: assimilators, convergers, divergers and accommodators (as proposed by Kolb & Kolb, 2005). Students' academic achievement scores (i.e. grades) were computed based on five summative assessment tests, each applied after implementing a specific teaching strategy. The official grading

system at the university is using scores ranging from 1 (the lowest) to 10 (the highest). The five different achievement scores (obtained by each student at the assessment tests) were analyzed according to different learning styles, teaching strategies, and faculty profiles.

4. Results

4.1. The students' learning styles

Synthesizing the results of the Learning Style Inventory, 71 (26.39%) pre-service teachers were assimilators, 80 (29.74%) were convergers, 69 (25.65%) were divergers, while only 49 (18.22%) were accommodator learners.

4.2. Analysis of variance (ANOVA) of achievement scores

The main objective of our research was to compare three groups of pre-service teachers with different majors (i.e., Educational Sciences, Economic Sciences, and Foreign Languages) in order to identify the differences concerning the academic achievement for each learning style category. Our objective is to investigate the categories of teaching strategies that lead to the best academic achievement for students having the same learning style, and belonging to different fields of study. Following this objective, we performed the one-way analysis of variance (ANOVA) for each category of learning styles, in order to determine the potential differences among the groups. The students' achievement scores, collected after each of the five teaching strategies, were treated as dependent variables.

To identify the specific differences in achievement scores among the three groups of students (i.e., Educational Sciences, Economic Sciences, and Foreign Languages) with a dominant learning style we used certain post-hoc comparison tests. According to Sava (2004), two criteria should be taken into account when selecting a post-hoc comparison test: the score variance and the number of participants in each compared group. Consequently, when Levene's test was not significant, we used Hochberg GT2 post-hoc multiple comparison test (which applies for unequal number of participants and equal variance assumed), and when the value of Levene's test was significant ($p<0.05$), we used Games-Howell as a post-hoc test (which applies for unequal number of participants and equal variance not assumed). We further present the results obtained by the four categories of learners: assimilators, convergers, divergers, and accommodators.

4.2.1. Assimilators

In order to investigate the possible differences among assimilator students with different majors, we performed the one-way analysis of variance (ANOVA). The mean and standard deviation of the assimilators' academic results are presented in Table 1. Significant differences were observed only for the problem solving strategy, the other four teaching strategies leading to similar results for all assimilators, no matter the faculty profile attended.

Table 1. Mean, standard deviation and one-way analysis of variance on achievement scores of assimilators

Teaching strategies	**Achievement scores**				
	Educational Sciences Mean (std.dev.)	*Economic Sciences* Mean (std.dev.)	*Foreign Languages* Mean (std.dev.)	*F*	*P*
Graphical organization of inf.	8.58 (1.10)	8.17 (1.30)	8.13 (0.98)	1.00	.37
Cooperative learning	7.12 (1.30)	6.88 (1.19)	6.62 (1.07)	0.99	.37
Investigation	7.00 (0.98)	6.96 (1.12)	7.19 (0.92)	0.32	.72
Debate	6.92 (1.05)	6.92 (1.34)	7.10 (1.09)	0.16	.84
Problem solving	7.46 (0.94)	7.33 (1.27)	6.67 (0.96)	3.53*	.03

*significant at $p < .05$

To identify the specific differences in achievement scores among the three categories of assimilators we used the post-hoc Hochberg GT2 comparison test. The Education Sciences assimilators obtained significantly better results that assimilators studying Foreign Languages when instructed with problem

solving strategies (see Table 2). A possible explanation for this result could be the more frequent usage of the learning tasks requesting some problem-situation solving at the Faculty of Education Sciences (e.g. case studies, systematic observation, solving some educational problems, etc.).

Table 2. Post-hoc comparisons on achievement scores of assimilators

(I) Learning style	**(J) Learning style**	**Mean Difference (MD) (I-J)**
		Problem solving (Hochberg GT2)
Educational sc.	Economic sc.	0.12
	Foreign lang.	0.79*
Economic sc.	Educational sc.	-0.12
	Foreign lang.	0.66
Foreign lang.	Educational sc.	-0.79*
	Economic sc.	-0.66

*significant at $p < .05$

4.2.2. Convergers

The academic achievement mean scores, standard deviation and ANOVA coefficients of convergers are shown in Table 3. Statistically significant differences were found for three instructional strategies: cooperative learning, investigation and problem solving.

Table 3. Mean, standard deviation and one-way analysis of variance on achievement scores of convergers

Teaching strategies	**Achievement scores**			*F*	*p*
	Educational Sciences Mean (std.dev.)	*Economic Sciences* Mean (std.dev.)	*Foreign Languages* Mean (std.dev.)		
Graphical organization of inf.	7.05 (1.46)	7.08 (1.22)	7.71 (1.04)	2.21	.11
Cooperative learning	7.95 (1.46)	6.83 (1.13)	8.58 (1.17)	15.26*	.00
Investigation	7.95 (1.39)	8.50 (0.97)	7.88 (0.85)	3.10*	.05
Debate	7.65 (1.18)	7.11 (1.09)	7.79 (1.14)	3.03	.05
Problem solving	7.80 (1.19)	8.44 (1.20)	7.54 (1.10)	4.69*	.01

*significant at $p < .05$

To identify the specific differences in achievement scores among the three categories of convergers we used Hochberg GT2 comparison test (for cooperative learning and problem solving) and Games-Howell test (for investigation). We have noticed that the converger students enrolled to Education Sciences and Foreign Languages obtain significantly better results than the ones attending Economic Sciences if they benefit from strategies based on cooperative learning (see Table 4). This difference may be due to the higher frequency of interactive, group strategies usage at the humanistic faculties, relative to the technical ones. It may be that the humanistic students are more familiarized with the cooperative learning methods, as they receive more group tasks both in classroom and as homework. As for the Economic Sciences convergers, they seem to obtain better results compared to their colleagues when they are instructed with investigation and problem solving strategies. We also think here that the differences may be explained by the specific learning tasks given in sciences, where problem solving and investigation are more frequently used than at the humanistic faculties.

Table 4. Post-hoc comparisons on achievement scores of convergers

(I) Learning style	(J) Learning style	Mean Difference (MD) (I-J)		
		Cooperative learning (Hochberg GT2)	*Investigation* (Games-Howell)	*Problem solving* (Hochberg GT2)
Educational sc.	Economic sc.	1.11*	-0.55	-0.64
	Foreign lang.	-0.63	0.07	0.25
Economic sc.	Educational sc.	-1.11*	0.55	0.64
	Foreign lang.	-1.75*	0.62*	0.90*
Foreign lang.	Educational sc.	0.63	-0.07	-0.25
	Economic sc.	1.75*	-0.62*	-0.90*

*significant at $p < .05$

4.2.3. Divergers

The academic achievement mean scores, standard deviation and ANOVA coefficients for divergers are presented in Table 5. Statistically significant differences emerged only when cooperative learning and investigation were used as instructional strategies.

Table 5. Mean, standard deviation and one-way analysis of variance on achievement scores of divergers

Teaching strategies	Achievement scores			*F*	*p*
	Educational Sciences Mean (std.dev.)	*Economic Sciences* Mean (std.dev.)	*Foreign Languages* Mean (std.dev.)		
Graphical organization of inf.	7.25 (1.67)	7.26 (1.19)	7.19 (1.02)	0.01	.98
Cooperative learning	6.75 (1.35)	8.79 (0.91)	6.81 (1.05)	21.42*	.00
Investigation	7.00 (1.18)	7.37 (1.25)	8.96 (0.95)	21.31*	.00
Debate	7.83 (1.37)	7.58 (1.12)	7.54 (0.81)	0.49	.61
Problem solving	7.63 (1.20)	7.42 (1.17)	8.08 (1.19)	1.82	.16

*significant at $p < .05$

The specific differences in divergers' achievement scores were investigated with Hochberg GT2 post-hoc comparison test. Table 6 indicates significantly better results obtained by the divergers attending Economic Sciences when compared with their colleagues, when all the students were instructed with a cooperative learning strategy. Moreover, the Foreign Languages divergers performed better than their colleagues when instructed with investigation-based strategies.

Table 6. Post-hoc comparisons on achievement scores of divergers

(I) Learning style	(J) Learning style	Mean Difference (MD) (I-J)	
		Cooperative learning (Hochberg GT2)	*Investigation* (Hochberg GT2)
Educational Sc.	Economic Sc.	-2.03*	-0.36
	Foreign Lang.	-0.05	-1.96*
Economic Sc.	Educational Sc.	2.03*	0.36
	Foreign Lang.	1.98*	-1.59*
Foreign Lang.	Educational Sc.	0.05	1.96*
	Economic Sc.	-1.98*	1.59*

*significant at $p < .05$

We consider those results important, as they underline very clearly the differences between students with different learning styles. More precisely, by comparing the convergers' results with those of the divergers, we may notice that they are pole opposites. The Foreign Languages convergers perform better when practicing the cooperative learning and those from Economic Sciences when practicing investigation. As for the divergers, the situation goes backward: those from Foreign Languages seem to obtain better results when using the investigation strategy and those from Economic Sciences when dealing with cooperative learning. Those results are bringing into attention the necessity to differentiate instruction not only with reference to only one criterion (e.g. learning style), but by taking into account more criteria (in our case the faculty profile proves to be a very important differentiating criterion).

4.2.4. Accommodators

The mean, standard deviation and results of the ANOVA analysis for the students having the accommodator learning style are shown in Table 7. We observe that statistically significant differences are registered when dealing with three types of instructional strategies: investigation, debate and problem solving.

Table 7. Mean, standard deviation and one-way analysis of variance on achievement scores of accommodators

Teaching strategies	**Achievement scores**			*F*	*p*
	Educational Sciences Mean (std.dev.)	*Economic Sciences* Mean (std.dev.)	*Foreign Languages* Mean (std.dev.)		
Graphical organization of inf.	7.20 (1.14)	7.33 (1.28)	7.13 (1.25)	0.12	.88
Cooperative learning	7.00 (1.13)	7.22 (1.16)	6.81 (0.91)	0.61	.54
Investigation	7.53 (0.99)	8.67 (1.32)	7.69 (1.13)	4.67*	.01
Debate	8.20 (1.01)	7.44 (1.38)	8.63 (0.71)	5.14*	.01
Problem solving	8.73 (1.03)	7.44 (1.29)	7.31 (0.79)	8.33*	.00

*significant at $p < .05$

To identify the specific differences in achievement scores among the three categories of students with accommodator learning style we used Hochberg GT2 post-hoc comparison test (for investigation and problem solving) and Games-Howell post-hoc test (for debate). According to the results in Table 8, the accommodators from Educational Sciences get much better results than their colleagues when instruction is based on problem solving.

Table 8. Post-hoc comparisons on achievement scores of accommodators

(I) Learning style	**(J) Learning style**	**Mean Difference (MD) (I-J)**		
		Investigation (Hochberg GT2)	*Debate* (Games-Howell)	*Problem solving* (Hochberg GT2)
Educational Sc.	Economic Sc.	-1.13*	0.75	1.28*
	Foreign Lang.	-0.15	-1.42	1.42*
Economic Sc.	Educational Sc.	1.13*	-0.75	-1.28*
	Foreign Lang.	0.97	-1.18*	0.13
Foreign Lang.	Educational Sc.	0.15	0.42	-0.42*
	Economic Sc.	-0.97	1.18*	-0.13

*significant at $p < .05$

As for the accommodators attending Economic Sciences, they express a tendency to perform better than the Education Sciences students when they work using investigation. We consider that the students from Economic Sciences use much more frequently the investigation methods both in classroom and at home, comparatively to their humanistic mates. As for the debate, it seems that this strategy strongly favours the Foreign Languages students, who obtain far better results than the Economic Sciences students when they use it. Once again, we consider that the differences between the academic disciplines and the learning tasks from the two profiles of study may explain the superiority of the academic results obtained by the Foreign Languages students consequently to the application of these instructional strategies. Certainly, by the nature of the studied disciplines, the latter are more familiarized with the debate, they engage in that more easily and use the oral communication with ease, in comparison with their colleagues involved in scientific fields of study.

5. Discussion and Conclusion

More than three decades ago, Dunn and colleagues (1981) declared: "We can no longer afford to assume that all students will learn through whichever strategy the teacher prefer to use" (p. 372). Up-to-date, one of the major concerns of the educational researchers is to find the best matching between instructional strategies and students' learning preferences in order to improve the academic outcome.

Following this research line, within this study we aimed to highlight the relationship between learning styles and teaching strategies used in higher education, and the impact of this relationship upon students' academic achievement. To this purpose, we analysed the academic results of 269 students coming from three faculties: Education Sciences, Economic Sciences and Foreign Languages. We analysed separately the academic achievement of assimilators, convergers, divergers, and accommodators in order to disentangle the underlying differences among different profiles. For *assimilators*, statistically significant differences were observed only after the problem solving strategy had been used. This instructional strategy seems to suits best the students with Educational Sciences major. Our results are partially in line with a previous study where assimilators seemed to prefer strategies based on data collection and problem solving demonstrations (Nilson, 2010). However, it was demonstrated that assimilators are comfortable with traditional instructional strategies used in most educational settings (Arthurs, 2007). The *convegers* from the three faculties obtain significantly different academic results when instructed using the following strategies: cooperative learning, investigation and problem solving. Previous studies (Knowles et al., 2005; Nilson, 2010) have shown that convergers seem to prefer many types of experiences, practice sessions, investigations, demonstrations, and problem solving. In our study, the Economic Sciences students performed better when investigation and problem solving strategies were used. The *divergers* showed profile differences when strategies based on cooperative learning and investigation were used. According to other studies (Arthurs, 2007; Knowles et al., 2005), the most effective strategies for divergers are the small group activities, simulations, group projects, discussions, and case studies. In our study, the cooperative learning strategy led to the best academic outcomes for the Economic Sciences divergers, and the investigation strategy determined the best results for Foreign Languages divergers. Finally, the *accommodators* obtained significantly higher academic results when instructed with investigation, debate, and problem solving strategies. As previous studies have shown (Nilson, 2010), the recommended instructional strategies for accommodators are projects, solving open-ended problems, investigations, simulations, role plays, and discussions. In our sample, the accommodators with Educational Sciences major registered the highest academic achievement when a problem solving strategy was used. The Economic Sciences' accommodators preferred the investigation strategy, while their Foreign Language colleagues performed best with the debate-based strategy.

These results may be of further usage to the educational research, as based on that, researchers may design and implement experimental investigation in order to observe the differentiated instruction of the students according to the personal learning style, on the purpose of improving the academic achievement. In addition, our study may be useful to other researchers, as comparative analyses among students with different majors could be further examined. Future studies may include a greater number of students and the possibility to use various types of teaching strategies for a longer time period in order to effectively validate the results. Furthermore, similar cross-sectional investigations could include not only the pre-service teachers, but also other categories of participants in order to

make relevant comparisons and inferences. Finally, the above-discussed research may be also useful to the university education practitioners, having in view the perspective of designing some instructional activities to adequately meet the various learning needs of the students.

References

[1] Akdemir, O., Koszalka, T. A. (2008), Investigating the relationships among instructional strategies and learning styles in online environments, *Computers and Education*, 50, 1451-1461.

[2] Anderson, K. M. (2007), Differentiated instruction to include all students, *Preventing School Failure*, 51 (3), 49-54.

[3] Arthurs, J. B. (2007), A juggling act in the classroom: Managing different learning styles, *Teaching and Learning in Nursing,* 2, 2-7.

[4] Baker, J. D., Cooke, J. E. (1988), Beyond career choice: the role of learning style analysis in residency training, *Medical Education*, 22 (6), 527-532.

[5] Beck, C. R. (2001), Matching teaching strategies to learning style preferences, *The Teacher Educator,* 37 (1), 1-15.

[6] Cavanagh, S. J., Coffin, D. A. (1994), Matching instructional preference and teaching styles: a review of the literature, *Nurse Education Today*, 14 (2), 106-110.

[7] Dunn, R., DeBello, T., Brennan, P., Krimsky, J., & Murrain, P. (1981), Learning style researchers define differences differently, *Educational Leadership*, 38, 372–375.

[8] Felder, R. M., Brent, R. (2005), Understanding student differences, *Journal of Engineering Education,* 94 (1), 57-72.

[9] Ford, N., Chen, S. Y. (2001), Matching/ mismatching revisited: an empirical study of learning and teaching styles, *British Journal of Educational Technology*, 32 (1), 5-22.

[10] Fox, J., Bartholomae, S. (1999), Student learning style and educational outcomes: evidence from a family financial management course, *Financial Services Review,* 8, 235-251.

[11] Knowles, M. S., Holton, E. F., III, Swanson, R. A. (2005), *The adult learner* (6th ed.), Boston: Elsevier.

[12] Kolb, D. A. (1981). Learning styles and disciplinary differences. In A. Chirckering (Ed.), *The modern American college* (pp.232-255), San Francisco, CA: Jossey-Bass Publishers.

[13] Kolb, D. A. (1984), *Experiential learning: Experience as the source of learning and development*, Englewood-Cliffs, NJ: Prentice-Hall.

[14] Kolb, A. Y., Kolb, D. A. (2005), Learning styles and learning spaces: Enhancing experiential learning in higher education, *Academy of Management Learning & Education,* 4 (2), 193-212.

[15] Kowoser, E., Berman, N. (1996), Comparison of paediatric resident and faculty learning styles: implications for medical education, *American Journal of Medical Science*, 312 (5), 214-218.

[16] Lussier, R. N. (1990), *Human relations in organizations. A skill-building approach*, Homewood, Boston: IRWIN.

[17] Massa, L. J., Mayer, R. E. (2006), Testing the ATI hypothesis: Should multimedia instruction accommodate verbalizer-visualizer cognitive style?, *Learning and Individual Differences,* 16, 321-336.

[18] Nilson, L. B. (2010), *Teaching at its best. A research-based resource for college instructors* (3rd ed.), San Francisco, CA: Jossey-Bass.

[19] Pashler, H., McDaniel, M., Rohrer, D., Bjork, R. (2008), Learning styles. Concepts and evidence, *Psychological Science in the Public Interest,* 9, 105-119.

[20] Peterson, E. R., Rayner, S. G., Armstrong, S. J. (2009), Researching the psychology of cognitive style and learning style: Is there really a future?, *Learning and Individual Differences*, 19, 518-523.

[21] Rogers, K. M. A. (2009), A preliminary investigation and analysis of student learning style preferences in further and higher education, *Journal of Further and Higher Education*, 33 (1), 13-21.

[22] Sava, F. (2004), *Analiza datelor în cercetarea psihologică. Metode statistice complementare (Data Analysis in psychological research. Complementary statistical methods)*, Cluj-Napoca: ASCR.

[23] Tomlinson, C. A. (2000), Differentiated instruction: Can it work?, *The Education Digest,* 25-31.

[24] Tulbure, C. (2010), *Determinanți psihopedagogici ai reuşitei academice (Psychological and educational predictors of academic achievement)*, Cluj-Napoca: Presa Universitara Clujeana.

[25] Vaughn, L., Baker, R. (2001), Teaching in the medical setting: balancing teaching styles, learning styles and teaching methods, *Medical Teacher*, 23 (6), 610-612.

[26] Zhang, L. F. (2007), From career personality types to preferences for teachers' teaching styles: A new perspective on style match, *Personality and Individual Differences*, 43, 1863-1874.

[27] Zhang, L. F., Sternberg, R. J., Rayner, S. (2012), *Handbook of intellectual styles. Preferences in cognition, learning, and thinking*, New York: Springer Publishing Company.

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