

TAILORING INSTRUCTION ACCORDING TO STUDENTS' LEARNING STYLES

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Abstract: *The present study represents a continuation of a previous research in which we investigated the categories of teaching strategies that lead to the best academic achievement for students with specific learning styles. Based on the results obtained, we implemented an experimental investigation in order to determine the effects of learning-style-based instruction on the students' academic achievement. A sample of 66 participants was divided into an experimental group (N=34) and a control group (N=32). After the one-semester intervention, significant differences in academic achievement occurred at the level of the within subject design.*

Key words: *learning-styles-based instruction; teaching strategies; academic achievement.*

1. Introduction

During the last three decades, there has appeared a growing interest in researching the effects of matching or mismatching the instructional strategies with the students' learning styles as concerns the academic achievement [4], [7-9], [12], [13], [22], and [24]. In this respect, Dunn and colleagues [8] have declared: 'We can no longer afford to assume that all students will learn through whichever strategy the teacher prefer to use'. Therefore, the learning-styles-based instruction is complex and multifaceted, and raises at least two essential issues:

- (a) To what extent tailoring instruction according to students' learning styles has a positive effect on the academic achievement?
- (b) How can we design and implement the learning-styles-based instruction, in order to enhance students' academic

achievement? More precisely, what kind of teaching strategies are adequate to each learning styles category?

Regarding the first question, we may divide the results of the research studies into three categories:

- studies showing that the learning-styles-based instruction has led to superior academic achievement in comparison with the whole-class instruction [4], [6], [9-11];
- researches concluding that tailoring instruction according to students' learning preferences has had no effect upon the academic achievement [2], [18], [19];
- studies indicating that the mismatch between the instructional strategies and the learning styles would have some positive effects upon the learning process and, implicitly, upon the academic achievement [5], [7], [16], [27]. As we may see, the issue of learning-styles-based instruction is controversial and, as a consequence, it needs more empirical investigation.

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As for the design and implementation of the learning-styles-based instruction, the literature is offering various recommendations concerning the most adequate teaching strategies applicable to each learning style category [3], [14], [15], [20], [23].

Following the two above-mentioned research lines, the present study represents a carrying on of a previous research [25] in which we tried to identify the categories of teaching strategies that lead to the best academic achievement for students having specific learning styles.

2. Objectives and hypothesis

This study has sought to achieve three main objectives:

Objective no.1 - to establish the starting level of academic achievement for the experimental and the control groups;

Objective no.2 - to design and implement a learning-styles-based intervention aiming to improve students' academic achievement;

Objective no.3 - to evaluate the effects of the formative intervention on the academic achievement, at the level of within subject and between subject designs.

We hypothesized that those students who benefit from learning-styles-based instruction will achieve higher academic achievement than the students who receive the whole-class type of instruction.

3. Method

3.1. Procedure

According to the study objectives, the design used within the frame of the psycho-pedagogical experiment is one of a pretest-posttest type, it involves an experimental group and a group of control and two types of experimental designs: the within subject and the between subject designs. The experiment unfolded at the

seminaries in The Theory and Methodology of Educational Assessment, along one university semester. The pretest phase was performed at the beginning of the semester and it included the application of an initial evaluation testing in order to determine the starting level in academic achievement, according to the two groups (the experimental and the control one).

In order to implement the experimental intervention, two categories of results obtained with our previous study were used [25]. One first category of results made reference to the students' learning styles which were identified based on Kolb's self-report Learning Style Inventory, adapted by Lussier [17].

A second category of results lying at the basis of the implementation for the experimental intervention referred to the categories of teaching strategies that lead to the best academic achievement for students with specific learning styles. Consequently, as the results obtained in the previous study came from the same group of students, we included in the experimental intervention the teaching strategies that proved to be most efficient for every learning style. Therefore, during an entire semester, the learning-based instruction was applied at the level of the experimental group, a fact that presupposed some differentiated teaching according to the four learning styles:

- the Assimilators – received mainly learning tasks based on strategies of graphical organization of information;
- the Convergers – benefited from instruction that included extensively investigation-based strategies;
- the Divergers – generally received learning tasks that involve strategies based on debate;
- the Accommodators – were instructed by the usage of teaching strategies based on problem solving mainly.

The posttest phase took place at the end of the semester through a summative evaluation test applied to students belonging to both groups that participated in the study (the experimental and the control one).

3.2. Participants

Sixty-six (4 males and 62 females) second-year Educational Sciences pre-service teachers from a Romanian college, volunteered to participate in this experimental study. There were 34 pre-service teachers in the experimental group and 32 pre-service teachers in the control group. The age range for the experimental group was 21-50 ($M = 24.91$, $SD = 8.22$) and for the control group was 21-35 ($M = 22.15$, $SD = 2.95$).

3.3. Measures

During the pretest phase, the measuring of the academic achievement was accomplished using an initial evaluation test. The latter contained 6 items, which were structured according to Bloom's Taxonomy for the cognitive domain (one item for every cognitive capacity: knowledge, understanding, application, analysis, synthesis, evaluation). During the posttest, the academic success was measured by a summative evaluation test, also designed by using the structure of Bloom's Taxonomy.

4. Results

The results displayed are divided into two categories:

- results registered at the level of the within subject design, which reflects the separate evolution of the two groups (the experimental and the control one);
- results obtained at the level of the between groups design, in which we

compared the academic achievement registered by the two groups during the pretest and posttest phases.

The students' academic achievement was considered to be the dependent variable in the experiment, meanwhile the formative intervention was taken into account as the independent variable.

4.1. Results obtained at the level of the within subject design

As a first step, we performed paired sample *t*-test analyses in order to check up the differences registered between the results obtained during the pretest and the posttest phases by the experimental and the control groups. As shown in Table 1, there occurred significant differences between the pretest and the posttest academic achievement scores for the experimental group ($t = -2.41$, $p < .05$). As for the control group, no significant differences emerged between the means of academic achievement registered in pretest and posttest. We consider that the progress registered by the experimental group at the level of academic results is very likely to come as a consequence of the formative intervention implemented during one semester. In our opinion, the application of differentiated instruction upon the learning styles at seminaries gave students the possibility to assimilate information and to exercise capacities and skills in a way that was in agreement with their personal learning needs and preferences. Owing to this manner of approaching instruction, the students were more interested and motivated towards learning, as the solving of the learning tasks involved the usage of students' preferred modalities of perceiving and processing the information.

We hypothesized that those students who benefit from the learning-styles-based instruction will improve their academic achievement scores. According to the

results presented, when we take into consideration the within subject design, our hypothesis is statistically confirmed. These results are in line with some previous research findings, that indicate an

improvement in academic achievement after the learning-styles-based instruction was applied on the university students [1], [8], [10-12], [24].

Paired samples t-test for the experimental and control groups

Table 1

Dependent variable	Group	Experimental phases	N	M	<i>t</i>	p
Academic achievement	Experimental	Pretest	34	7.12	-2.41	< 0.05
		Posttest	34	7.38		
	Control	Pretest	32	7.27	-0.61	NS
		Posttest	32	7.30		

4.2. The results obtained at the level of the between subject design

The between subject design aimed at identifying the differences between the experimental and the control groups, both in pretest and posttest stages. As we can see in Table 2, during the pretest stage no statistically significant mean differences were found. According to these results, the two groups of students started from approximately the same level of academic achievement.

The data in Table 2 reveals the fact that at the end of a semester with experimental intervention there were no significant differences in means to be registered. Although the mean of the academic achievement for the experimental group registered a slight increase, that is not sufficiently high to generate a statistically

significant difference. According to those results, at the level of the between subject design, our hypothesis was not confirmed.

As a consequence, we do not possess sufficient empirical proof that may allow us to conclude that the leaning-styles-based instruction leads to higher academic results as compared to the whole-class instruction. Similar results were obtained by other researchers who, as a consequence of the empirical studies, have reached to the conclusion that adjusting the instructional strategies to the students learning styles has no impact upon the academic achievement [2], [18]. With the occasion of a previous empirical study which was concerned with this issues, we have faced a similar situation, in the sense that we could not get statistically significant results at the level of the between subject design [26].

Independent samples t-test (between group comparisons)

Table 2

Dependent variable	Group	N	PRETEST			POSTTEST		
			M	<i>t</i>	p	M	<i>t</i>	p
Academic achievement	Exp.	34	7.12	-0.28	NS	7.38	0.15	NS
	Control	32	7.27			7.30		

Having in view those results, we find ourselves in agreement with Pashler and his collaborators [21] who, consequently to a review in the literature, have found that

there is still not enough empirical proof to sustain the superiority of the learning-styles-based instruction as against the whole-class instruction.

5. Conclusions

The main objective of this study has been that of evaluating the effects of the learning-styles-based intervention on the academic achievement, at the levels of within subject and between subject designs.

According to the statistical analysis, some statistically significant improvement was noticed at the level of academic achievement after the one semester experimental intervention, when using the within subject design.

In relation with the aspect of the between subject design, the results of the posttest stage showed that our formative intervention didn't lead to obtaining some higher academic results for students belonging to the experimental group in comparison with those in the control group.

We may hope that further empirical research will find data to demonstrate that the learning-styles-based instruction lead to superior academic achievement as against the whole-class instruction in higher education. We think that the involvement in investigation of a larger number of participants and the application of the experimental intervention along a greater period of time could arrive to more conclusive statistical results.

Acknowledgements

This work was supported by the strategic grant POSDRU/89/1.5/S/62259, the project entitled 'Applied social, human and political sciences. Postdoctoral training and postdoctoral fellowships in social, human and political sciences', co-financed by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007-2013.

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