Using Differentiated Instruction to Teach Vocabulary in Mixed Ability Classes with a Focus on Multiple Intelligences and Learning Styles

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Abstract

The current study sought to investigates the possible effects on vocabulary learning of the implementation of differentiated instruction (in the light of learners' multiple intelligences and learning styles). The research was carried out in the Iran Language Institute (ILI) in Urmia, with 80 Iranian intermediate female learners. Successive to homogenizing the groups, a total of 60 learners were found to enjoy the conditions for the rest of the research, and hence two 30-member groups were formed. These learners, then, sat the pretest (a vocabulary achievement test), and based on the results of multiple intelligences and learning styles questionnaires, which were administered later, the learners were divided into five separate categories termed visual-spatial (V), linguistic-auditory (L), kinesthetic-bodily (K), interpersonal (Inter), and intrapersonal (Intra). Next the learners in the experimental group were instructed based on their unique intelligence and learning styles types, whereas the other class was taught in the traditional way with no differentiation. Subsequent to the administration of posttest, the results were analyzed through the use of independent samples T-test and ANOVA. In line with the findings of the research, a significant amount of difference was found between the performances of two groups and in favor of the experimental group. Further, the performance of different learners with various intelligences and learning style was shown to vary significantly.

Key Words: differentiated instruction, learning styles, mixed ability classes, multiple intelligences, vocabulary learning

1. Introduction

1.1 Background

Though the belief that learners learn differently has now turned to a commonsensical view, notions such as one-size-fits-all instruction based on age-grade groupings, whole-class lecture teaching, and lockstep progress continue to be regarded as the norm even in today's revolutionized pedagogical world (Hess, 1999; Sizer, 1999). Nonetheless, as a glance through a typical classroom setting reveals, invisible diversities of learning characteristics and preferences dominate the ELT practices all over the globe. Some students come to school with little support and encouragements from home, while others commence the learning process, with skills and knowledge years beyond grade level expectations (Tomlinson, 1999). As Caine and Caine (1990) note, "There can be up to a five-year difference in maturation between any two 'average' children" (p. 2).

Teachers and educators all over the globe have long reached consensus over the fact that learners in any given class are characterized by a wide variety of individual differences. Yet, the mere belief in these differences is not adequate and what the teachers need to do is to adjust their instructional and evaluative endeavors to these different learner needs and preferences. As Tomlinson (2000b, p.1) contends, "Students who are the same age differ in their readiness to learn, their interests, their styles of learning, their experiences, and their life circumstances." Learner differences can be separated into two broad categories: demographic differences and individual learning differences.

As a brief glance through the literature helps reveal, throughout the last two decades, many educational researchers have explored individual differences in learning, creating theories of thinking, learning, and teaching (Brooks & Brooks, 1999; Caine & Caine, 1990; Duckworth, 1996; Dunn, 2001; Guild, 1994; McCombs, 2001; Powell, 2000; Silver, Strong, & Perini, 1997; Sylwester, 1994).

Out of the manifold researchers' endeavors aimed at gauging the concept of learner differences, emerged the now-prevalent theory of differentiated instruction (Tomlinson, 1999, 2001, 2009a/b, 2010a/b), which intends to set forth a methodology for dealing with the so called learning differences (Hess, 1999). Thus, differentiated instruction was primarily given birth through the attempts by various researchers to address the diverse needs of learners in heterogeneous classroom settings (Westberg & Archambault, 1997). As Willis and Mann (2000, p.1) put it, "Differentiated instruction is a teaching philosophy based on the premise that teachers should adapt instruction to student differences…. teachers should modify their instruction to meet students' varying readiness levels, learning preferences, and interests." Also, as Stradling and Saunders (1993) maintain, differentiated instruction is "the process of matching learning targets, tasks, activities, resources, and learning support to individual learners' needs, styles, and rates of learning" (p. 129). Finally, to adopt Valiande, Kyriakides, and Koutselini's (2011) words,

> Differentiation constitutes an innovating, constant reflective procedure of effective teaching and learning that cannot be met by readymade lesson plans. The planning and the instructional choices of a lesson plan based on differentiation can only be used effectively when chosen by the teacher, according to students' needs and other personal characteristics (p. 3).

1.2 Statement of the Problem and Purpose of the Study

Teaching vocabulary as one of the major categories of language learning is a broad area in which the learners' different learning characteristics play an important role. It goes without saying that learners learn the vocabulary differently by resorting to the differential, personalized styles and strategies they possess; thus, to be able to implement a practical method of teaching vocabulary, teachers need to be aware of their learners' current skill levels, strengths and challenges, interests and preferences, and needs and goals. The challenge is for teachers to ensure that the needs of all learners are equally valued and attended to.

The purpose of this study is to see if using differentiated instruction would have a positive effect on students' vocabulary learning in mixed ability classes. When first starting to design differentiated instruction, it is important that all teachers and support staff be willing to devote the time, energy, and resources to design and implement a successful program. Roles need to be clearly defined, schedules need to be made in advance and adhered to as much as possible, and collaboration/cooperation needs to replace competition at all levels. In the beginning, redesigning curriculum and teacher roles for differentiated instruction is very intensive labor. However, using technology, future planning can be streamlined, teachers can use what was successful in the past and adjust activities that may need more clarity, and spend more time on the instruction of each student according to her/his needs.

1.3 Significance of and Justifications for the Study

Being involved with the teaching career as colleagues since long, the researchers had been pondering over the idea of different learning styles for years, especially as facing those learners whose learning styles are so clear that can be readily recognized by the instructor. Perhaps the first trigger for the current study came from their sensitivity toward the age-old premise that a typical class is really made up of learners who enjoy a range of varied proficiency levels, and come from different backgrounds.

Today's classrooms are becoming more academically diverse. Many, if not most, classrooms contain students representing both gender and multiple cultures and generally contain students with a range of exceptionalities and markedly different experiential backgrounds. These students almost certainly work at differing readiness levels, have varying interests, and learn in a variety of ways. In order to create a kind of educational space which is beneficial for all students with different intelligences and styles, the teaching methods are to be changed to fit all the students. Though the domains of learning styles and multiple intelligences have long made their ways into the field of applied linguistics and an assortment of varied research projects have been targeted toward these partially novel areas of investigation, it seems that scant attention has been paid to the possible effect of differentiated instruction via paying due heed to these two variables on learning vocabulary.

Thus, the current study intends to investigate this partly untouched area in a brand new context, i.e. for Iranian intermediate EFL learners.

1.4 Research Questions

In tandem with the principal axioms of the current investigation, the following questions were set forth:

1. Does differentiated instruction have any impact on Iranian EFL learners' vocabulary learning?
2. Is there any significant difference between the performance of learners with different learning styles (auditory, visual, and kinesthetic) on the vocabulary posttest?
3. Is there any significant difference between the performance of learners with different multiple intelligences (spatial, linguistic, bodily-kinesthetic, interpersonal, and intrapersonal) on the vocabulary posttest?

2. Literature review

2.1 Why Differentiated Instruction?

Diversification and metamorphosis in today's revolutionized educational system is an inevitable verity, which has partly emanated from the avant-garde socio-cultural requirements of ultramodern societies. In the current state of affairs, we are no more faced with the conventional sameness (in terms of learners' abilities, preferences, needs, traits, and the like), which once used to dominate the mainstream educational arenas. Indeed, our present-day didactic endeavors are characterized by intricacies germane to intragroup diversities, in the sense that individuals with whom we are currently dealing are no more the uni-dimensional beings of, say, 1800s, as Tomlinson (1999) contends; rather than resemblances which constituted the commonsensical norm in primordial pedagogical enterprise, it is the notion of disparities that has been and is to be given more heed in the modern practice of teaching and learning.

Nevertheless, the main challenge for current pedagogy is not the mere confession to the prevalence of differences in the learning context. Awareness of such variations and endorsement of learner differences can just feature as the springboard for a more critical stage, which is the implementation of sound approaches and methods aimed at addressing the complicated needs of modern pedagogy. Though a plethora of attempts have, thus far, been set in place by a multitude of educationalists, practitioners, and theoreticians, a great deal still remains to be done toward the diversification of instructional/evaluative materials and techniques, in keeping with the demands of today's diversified learning environments.

In the campaign targeted toward the reappraisal of teaching/learning practices with the aim of meeting individual learning differences, later on being referred to by the neologism differentiated instruction, perhaps it was Gardner (1983, 1991, 1993) who initially brought the notion of instructional diversification to the foreground of attention via the establishment of his ground-breaking theory of multiple intelligences. Another line of theories concerning the notion of differentiation in instruction seems to have been configured out of the attempt by several prominent researchers in the field of learning styles (e.g. Chislett & Chapman, 2005; Dunn, 2000, 2001; Dunn & Dunn, 1992a/b; Honey & Mumford, 2006; Kolb, 1985).

2.2 Empirical Research on Differentiated Instruction

Literature is replete with the research projects reporting on the positive outcomes resulting from the use of differentiated instruction. Yet, owing to the partial novelty of the concept of differentiation in instruction, more time might be required on the part of (novice) teachers and learners to come into terms with the underlying tenets of this groundbreaking theory. An early case study of one middle school's experience with differentiated instruction by Tomlinson (1995), for instance, came up with the conclusion that there was a need to investigate teacher resistance to new models catering for academic diversity, as well as considering teachers' perception of classroom management in the light of these changes.

It is, therefore, mostly the case that teachers who experience early successes with differentiation are more prone to adaptation in this respect. In a study investigating the impact of differentiated instruction on student scores on standardized tests, Hodge (1997) found that students who were prepared for tests using differentiated techniques showed a gain in their mathematics scores, but there were no comparable gains in reading scores. However, teachers' perceptions of being able to meet the needs of diverse learners, as reported in this investigation, did not appear to be affected by the use of either traditional or differentiated instructional techniques.

In another study, Tomlinson, Moon and Callahan (1998) investigated the nature of instructional practice among middle school populations, considering the degree to which teachers respond appropriately to academic diversity, using differentiation. This study indicated that very few teachers take students' interests, learning profile or cultural differences into account when they plan lessons. As the findings of this study revealed, though some of the teachers who used varied instructional strategies partly succeeded in creating more flexible classroom settings, most teachers expressed frustration about attempting to deal with learner variance.

A word of warning is to be made, at this juncture, regarding some teachers' misconception regarding the real practice of differentiated instruction, as it is sometimes the case that, on the face of it, the teacher claims to be dealing with differentiation, whereas in actuality s(he) does nothing more than tracking the traditional approach. This is evident in a study by Blozowich (2001) who found that teachers used a variety of techniques but continued to prepare lessons as they would for a tracked classroom. This researcher, then, came to the conclusion that teachers implementing differentiated instruction are in dire need of incessant and consistent professional development, along with intensive discussion about how these techniques are to be put to use in the classroom.

Among the other supportive claims in favor of the privileges of differentiated instruction, reference can be made to McAdamis' (2001) work, which pointed to significant performance enhancement among the students in the Rockwood School District (Missouri), successive to the implementation of differentiated instruction. Planning, mentoring, professional development, doing action research and holding workshops are highlighted in this study as the principal measures to be taken with the aim of lessening teachers' initial resistance toward differentiation in education.

In another study concerning the repercussions of adopting differentiated syllabi for teachers, Affholder (2003) found that teachers who made an intensive use of these strategies developed a better individual perception and assumed greater responsibility for student growth. Furthermore, in line with the results of this study, teachers who were characterized by a more frequent utilization of differentiated techniques in their classes came up with higher levels of self-efficacy as well as willingness to try new instructional approaches. Yet, as the results revealed, those enjoying seniority and higher experience were found to be at a more privileged position in this respect. Working with the unique community of undergraduate teachers, Johnsen (2003) concluded that the use of differentiated techniques proved to be a beneficial tool in keeping the individuals' interested and, consequently, the implemented techniques were said to have provided the undergraduate teachers with a highly gratifying experience.

Despite the great body of work carried out on varied gains resulting from the implementation of differentiated instruction, Robison (2004) calls for further research into the utilization of differentiated instruction techniques, mainly owing to the fact that teachers are still reluctant to pursue the axioms of differentiation, due to an assortment of reasons like the problem with setting time constraints for the productive use of such techniques in classes.

Nevertheless, evidence for mounting (renewed) interest in and attention toward the importance of differentiated instruction might be gathered via a fleeting glimpse through the recent probes allotted to this area of research, among which mention can be made of McQuarrie, and McRae's (2010) project which reports on the outcomes of a Western Canadian research review regarding the effective practices supporting differentiated instruction. Based on the findings of the study, these researchers claim that "addressing student diversity and providing the best learning opportunities for all children across Kindergarten to Grade 12 schools requires recognition that differentiation requires time, training, intentional planning and long-term commitment on the part of educators, government and wider school communities" (McQuarrie, and McRae's, 2010, p. 1)

Finally, in a more recent investigation aimed at the practical implementation of differentiated instruction, Valiande, Kyriakides, and Koutselini (2011) organized a probe into "a) the effects of differentiated instruction on students achievement in mixed ability classrooms and b) the dimensions of quality and equity effectiveness of differentiated instruction, implemented by Cypriot teachers in order to improve their effectiveness" (p. 6). As they continue to aver, in line with the gained upshots, they were successful in providing strong "evidence to support the theory of differentiation, its basic principles and presuppositions, and confirm its effectiveness in mixed ability classrooms" (Valiande, Kyriakides, and Koutselini, 2011, p. 13).

3. Methodology

3.1 Participants

Sixty Iranian female learners studying at the ILI (Iran Language Institute) in Urmia, participated in this study. They were all intermediate students and their age ranged between 15 and 20. Actually these sixty participants were in two separate classes, with each class including thirty participants. In order to group them according to their type of intelligences and learning styles, a multiple intelligences test and a learning styles test were initially undertaken.

Though, based on the institute's placement procedures, all the participants were supposed to enjoy roughly the same level of proficiency, to ascertain the homogeneity of the group, a standardized test entitled Preliminary English Test (PET) was used to ascertain the homogeneity of participants at the outset of the study. The participants were selected out of a pool of 80 learners according to their performance on the PET. Through considering the normal distribution of the participants' scores on proficiency test, merely those whose scores were one standard deviation above and one standard deviation below the mean ($M = 40.56$) of the normal distribution curve were chosen for the study. Consequently, 60 of them were found to be homogenous and were chosen for the purpose of the current study.

3.2 Instruments

To commence the study, the Preliminary English Test (PET), a second level Cambridge ESOL exam for intermediate level learners, was administered to ensure the homogeneity of the subjects in terms of language proficiency. The test included four sections of Reading, Writing, Listening, and Speaking. Those whose scores fell one standard deviation above and below the mean (i.e., between 44.40 and 36.72 out of 50) participated in the study.

Furthermore, to obtain the objectives of this study, the participants (in both experimental and control groups) were given an intermediate vocabulary test (used both as pre-test and post-test), which was adopted from the test book designed particularly for this level at the institute where they studied. The test consisted of 50 multiple choice questions and was utilized to test whether differentiated instruction had any impact on the participants' vocabulary learning or not.

Moreover, to determine the participants' types of intelligences, a multiple intelligences test (based on Howard Gardner's MI Model) was given to them. The test consisted of 34 questions which were scored on the scale of 1 to 4. VAK Learning Styles self-assessment questionnaire was the other test given to the participants in order to determine their learning styles. The questionnaire consisted of 30 multiple choice questions indicating visual, auditory and kinesthetic learning styles.

3.3 Design and Procedure

As the present research involved selecting one group upon which a variable was tested without any random pre-selection processes and included a treatment on the experimental group, the design was quasi-experimental and included pretest/posttest to evaluate whether there were significant differences in the vocabulary achievement of the participants.

As stated previously, at the outset of the study, the Preliminary English Test (PET) was administered to learners to ascertain the homogeneity of participants in terms of language proficiency. Then, the selected participants were given the pretest before the application of any differentiated instruction and the obtained scores in both classes were collected for later analysis. In order to apply differentiation, the determination of the participants' intelligences and learning styles types was required. Therefore, the multiple intelligences test and the learning styles questionnaire were given to the participants. In both classes the participants were grouped based on their type of intelligences and learning styles.

Next, one of the classes was randomly selected to undertake differentiated instruction in which different groups of participants enjoying the same kind of intelligences and learning styles were instructed according to their special type of intelligences and learning styles for about seventeen sessions. As a consequence of this kind of grouping applied for the experimental group participants, five distinct groups were formed (with each group encompassing 6 participants.

These subgroups were termed visual-spatial, linguistic (auditory), bodily-kinesthetic, intrapersonal and interpersonal, in accordance with the intelligences and learning styles they possessed.

Thus, each group was instructed based on the mentioned types of intelligence and learning style for a matter of about 17 sessions. Each session lasted for about 90 minutes. The other class was just instructed in the traditional way without any differentiation. At the end of the course a post test encompassing 50 multiple-choice vocabulary items was given to the participants to test whether the use of the differentiated instructions had a positive impact on the participants' learning or not. The obtained scores from the two tests (pre-test and post-test) were collected for the data analysis section in the study. The researcher assigned the learners' scores into 5 different groups (as mentioned above) based on their type of intelligence and learning style.

3.4 Data Collection and Analysis

The current study set out with the aim of gauging the possible impact of the application of differentiated instruction on Iranian EFL learners' vocabulary learning, with a focus on learners' multiple intelligences as well as their learning styles. To this end, four types of data were collected: 1) the data showing the results of the Pet Test to homogenize the participants, 2) the data indicating the participants' unique intelligences and learning styles, 3) the participants' scores on the two tests (pretest and posttest), and 4) the data showing the performance of each group of learning styles and multiple intelligences on the tests.

As stated earlier, the same 50-item test was utilized as both pretest and post-test. Each question carried 2 points, and hence the total score of the test was 100. The control participants' scores on the pretest ranged between 60 and 90, and on the posttest, their scores were between 70 and 90. Yet, the experimental participants' scores on the pretest were between 60 and 95, and on the posttest, their scores ranged between 80 and 100. The data obtained were mainly processed and analyzed through the use of t-test and ANOVA.

4. Results

4.1 Descriptive Statistics for PET

The main purpose of utilizing PET as a standard test was to homogenize the participants and select intermediate learners. Table 1 presents the descriptive statistics concerning the learners' performance on this test. Regarding the results, the mean of the scores for 80 participants came out to be 40.56 and the standard deviation turned out to be 3.84. So, to homogenize the participants, those whose scores fell one standard deviation above and below the mean (i.e., between 44.40 and 36.72 out of 50) participated in the study.

4.2 Results Gained for Research Question One

1. Does differentiated instruction have any impact on Iranian EFL learners' vocabulary learning?
Table 2 represents the information relevant to the performance of control group. As the table reveals, the mean score of the participants who took the pretest in the control group (PRT1) equaled 79.5, and their mean score on the posttest (POT1) was 82.5.

Table 3 shows the findings obtained regarding the performance of experimental group. As is seen, the mean score of the participants who took the pretest in the experimental group (PRT2) was 81.5, and their mean score on the posttest (POT2) equaled 89.3.

The comparison between the two mean scores of each class can be utilized as an insight toward the rejection of the first null hypothesis claiming no difference between the performances of two groups as a result of the treatment applied. The slight difference between the mean scores of the PRT1 and POT1 in comparison with the noticeable difference between the mean scores of the PRT2 and POT2 can be taken as evidence in favor of the claim that the application of the differentiated instruction in the second class (the experimental group) has been effective. Yet, to make a stronger claim, more robust evidence is called for; as the data presented in Table 4 help reveal (df = 29, $p = 0.00$), a significant amount of difference is witnessed with regard to the performance of two groups. Thus, it can be concluded that differentiated instruction has had a positive effect on the students' vocabulary learning and the first hypothesis is, therefore, prone to rejection. Moreover, Figure 1 helps shed further light on the claim that the difference between the mean scores of POT1 and POT2 is indicative of the noticeable change in the participants' performance in the experimental class.

4.3 Results Gained for Research Question Two

2. Is there any significant difference between the performance of learners with different learning styles (auditory, visual, and kinesthetic) on the vocabulary posttest?

As stated earlier, to come up with a firm basis for performing the groupings within the experimental group, use was made of the results gained through the implementation of both learning styles inventory and multiple intelligences test. Altogether, five categories of learners were constituted drawing on the test results, and were alternatively termed: visual-spatial (V), linguistic-auditory (L), kinesthetic-bodily (K), interpersonal (Inter), and intrapersonal (Intra). Yet, the more convenient type of grouping for the sake of data analysis was thought to be the one which assigned learners to different categories, based on their learning styles or multiple intelligences separately.

Table 5 depicts the descriptive statistics gained for the performance of learners with different learning styles. As can be inferred from the table, the mean of visual learning style scores on the posttest of vocabulary achievement test is the highest among the three types of learning styles; yet its Std. deviation is the lowest in comparison with the other two groups.

Also, drawing on the findings presented in Table 6 (df = 5, $p = 0.00$), it can be concluded that there is a significant amount of difference among the performance of learners possessing different learning styles (auditory, kinesthetic and visual), and hence the second hypothesis claiming no difference between the three groups of learning styles can be disconfirmed.

4.4 Results Gained for Research Question Three

3. Is there any significant difference between the performance of learners with different multiple intelligences (spatial, linguistic, bodily-kinesthetic, interpersonal, and intrapersonal) on the vocabulary posttest?

To analyze the third research question of the study, the main grouping of the study with five subcategories was employed, but with a number of different labels. Hence, the five categories on which the analysis was carried out were spatial (S), linguistic (L), bodily-kinesthetic (K), interpersonal (inter), and intrapersonal (intra). As the data in Table 7 help reveal, among the five groups of intelligences, the highest and lowest posttest means belonged to spatial (M = 89.1667) and interpersonal (M = 80.421) intelligences, respectively; yet, the greatest and lowest amounts of standard deviation were gained for linguistic (SD = 14.12002) and spatial (SD = 5.84523) types of intelligence, respectively.

As it is shown in Table 8, (df = 5, $p = .000$), the difference among the performance of five different groups of multiple intelligences is statistically significant, and, therefore, the third null hypothesis postulating the non-existence of difference among the performance of various intelligence types on the vocabulary posttest can be nullified. Figure 2 gives out a more lucid view of this significant difference, showing that spatial intelligence group had the best performance in terms of vocabulary achievement test.

5. Discussion

The main objective of this study was to investigate the effect of Differentiated Instruction on the students' vocabulary learning. According to the results of the study relevant to the first research question, the researchers concluded that the application of differentiation had a positive impact on the learners' performance, and these findings were in line with some previous research done by Affholder (2003), Gartin, Murdick, Imbeau, and Perner, (2002), Hodge (1997), Johnsen (2003), and McAdamis (2001).

Gartin et al. (2002) conducted a study in which differentiated instruction was a method for developing curriculum for successful learning and instruction and supported the application of the differentiated instruction. Johnsen (2003) carried out an investigation using differentiated instruction with undergraduate teachers to suit different ability levels. Student teachers in this context were encouraged to differentiate content and process, using learning centers, different reading materials and different strategies. Based on the gained upshots, the implemented techniques were found to have provided the undergraduate teachers with a highly gratifying experience

McAdamis (2001), on the other hand, reported significant improvement in the test scores of low-scoring students in the Rockwood School District (Missouri), following the use of differentiated instruction.

Hodge's (1997) study revealed that students who were prepared for tests using differentiated techniques showed a gain in their mathematics scores. Finally, Affholder (2003) found that teachers who used differentiated instruction strategies more intensively showed improved individual perception and adopted greater responsibility for student growth.

As to the second and third research questions, which sought to investigate the possible differences among the performance of different groups of learning styles and multiple intelligences, and substantiated the significant difference in this respect, no support or counterevidence was encountered within the previous body of literature, mainly owing to the fact that the researchers were not able to find any relevant research addressing the issue of learner differences compliant with the perspective taken in the current study.

6. Pedagogical implications of the Study

The findings of this study are thought to be of great importance for the teachers who are interested in the kind of instruction which caters for the varying needs of different learners. With its insights concerning the significance of taking note of learner differences, the current study can act as a source of great encouragement for the teachers to come into terms with the basic tenets of differentiated instruction. The obtained findings of the study further help teachers, researchers, and educationalists gain a better grasp of the paramountcy of differentiation in pedagogy and its varied positive impacts on the process of learning. Thus, the present study is thought to add to the body of available literature regarding the philosophy behind the creation and implementation of a differentiated classroom. Although there are many challenges that exist in this approach to teaching, it is absolutely a worthwhile endeavor. Finally, the result of the current research can be used in different academic/educational arenas such as private sector English language Institutes, ministry of education and higher education.

7. Concluding Remarks

The current study applied Differentiated Instruction to teaching vocabulary in mixed ability classes with a focus on the learners' learning styles and multiple intelligences, and, by way of doing so, investigated the effect of differentiated instruction on learners' vocabulary learning. As far as the difference between the two kinds of instruction, i.e. differentiated and traditional, are concerned, the results indicated that the class in which differentiated instruction was conducted, had a significantly better performance on the post-test and consequently it was concluded that the application of differentiated instruction had a positive effect on the process of learning. Furthermore, with regard to the second and third research questions, which probed the viable differences among different groups of learners possessing different learning styles and multiple intelligences, significant differences were found to be at work. Finally, another intriguing piece of finding gained in the current study was the observation that participants in the experimental group felt more comfortable and confident with regard to their capability for achievement; in other words, differentiated instruction and having students work in small groups really helped them become more empowered learners.

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Table 1 Descriptive Statistics for Pet Scores

	N	Minimum	Maximum	Mean	Std. Deviation
Pet test	80	3200	50.00	40.56	3.84
Valid N listwise	80				

Table 2 Descriptive Statistics for Pretest and Posttest in the Control Group

GROUP	N	Mean	Mean difference
PRT1	30	79.5	-3.0
POT1	30	82.5	

Table 3 Descriptive Statistics for Pretest and Posttest in the Experimental Class

GROUP	N	Mean	Mean difference
PRT2	30	81.5	-7.8
POT2	30	89.3	

Table 4 Independent Samples T-test for experimental group in PRT2 and POT2

	t	df	Sig (2-tailed)	Mean Difference	95 % confidence interval of Difference	
					Lower	Upper
Control	54.65	29	0.00	81.55	73.541	83.64
Experimental	40.51	29	0.00	85.50	74.231	99.12

Table 5 Descriptive Statistics Relevant to the Performance of Three learning styles

Group	N	Mean	Std. Deviation	Std. Error Mean
A	6	86.2500	14.12002	5.76447
V	6	89.1667	5.84523	2.38630
K	6	82.9167	7.14435	2.91667

Table 6 ANOVA Results for Different Learning Styles

Group	t	df	Sig(2-tailed)	Mean Difference	95 % confidence interval of Difference	
					Lower	Upper
A	14.962	5	.000	86.2500	71.4319	101.0681
K	37.366	5	.000	89.1667	83.0325	95.3009
V	28.429	5	.000	82.9167	75.4191	90.4142

Table 7 Descriptive Statistics Relevant to the Performance of Five Intelligence Types

Group	N	Mean	Std. Deviation	Std. Error Mean
L	6	86.2500	14.12002	5.76447
S	6	89.1667	5.84523	2.38630
K	6	82.9167	7.14435	2.91667
Intra	6	88.801	6.102327	2.51092
Inter	6	80.421	10.80123	6.79021

Table 8 ANOVA Results for Different Intelligence Types

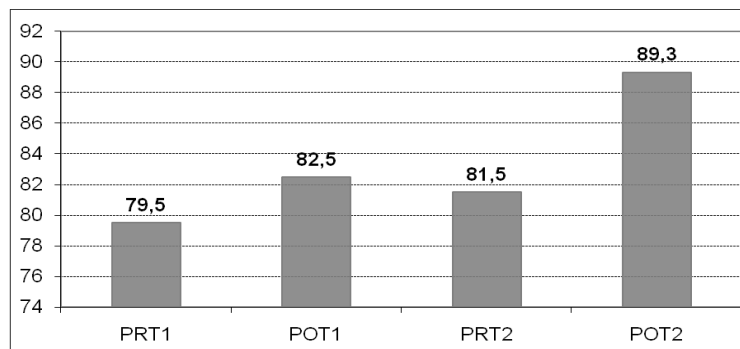| Group	t	df	Sig(2-tailed)	Mean Difference	95 % confidence interval of Difference	
					Lower	Upper
L	14.962	5	.000	86.2500	71.4319	101.0681
S	37.366	5	.000	89.1667	83.0325	95.3009
K	28.429	5	.000	82.9167	75.4191	90.4142
Intra	34.574	5	.000	88.801	76.0520	92.4582
Inter	26.601	5	.000	80.421	73.812	90.1270

Figure 1 The investigation of the mean scores in two classes
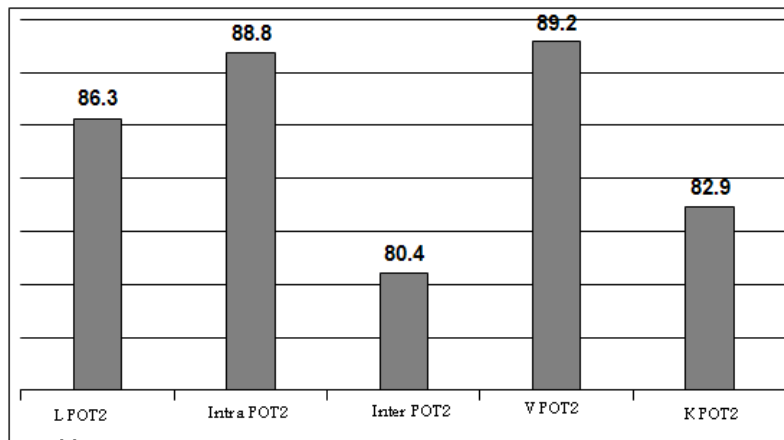

Figure 2 The investigation of the mean scores of the five different groups of multiple intelligences