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Differentiated instruction effectiveness on the secondary stage students' reading comprehension proficiency level in Jordan

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ABSTRACT

Differentiated instruction (DI) is a teaching approach involves several strategies in which teachers adapt, modify, adjust and change instruction to respond to students' diverse individual needs in heterogeneous classrooms. The study aimed at exploring the effectiveness of DI on secondary stage students' proficiency level. The study followed the quantitative quasi-experimental design in which data were collected from the pre/post achievement tests administered at the initiation and the completion of the intervention. A total of 80 grade 11 students from both genders participated in the study. A number of (N=40) males and (N=40) females from four public schools in Jordan were distributed into (N=40) for the experimental group and another (N=40) from both genders for the control groups. The experimental group received education using DI strategies of homogeneous groups, tiered assignments and tiered instruction in the areas of content, process, product and learning environment. Conversely, the control groups received education through the one-size-fits-all method. Analysis of covariance (ANCOVA) results showed that DI affected reading comprehension scores positively, and the respondents of the experimental groups outperformed their counterparts of the control group. Moreover, the above-average respondents statistically outperformed the other proficiency levels. However, the findings indicated no statistically significant difference related to gender.

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1. INTRODUCTION

Differentiated instruction (DI) is a teaching strategy that teachers adapt to attend to student diversity in inclusive classrooms [1]. Differentiated instruction's definition is explained in association with three major sides: applying different strategies, meeting students' diversity, and improving students' learning. Setting students in mixed-ability classrooms and the increase of learners' diversity in inclusive education have led to the use of efficient and practical instructional strategies. Teachers hence try to implement diverse strategies in order to meet learners' characteristics like students' interests, readiness, abilities, development and attitudes. Differentiated instruction can be appeared in literature in many concepts like differentiated learning [2], differentiated education [3], separated education, distinguished learning [4], modified instruction [5], and differentiated teaching [6], [7].

Tomlinson [8] explained the model of differentiated instruction which offers a framework to facilitate the values of inclusion and modified learning. As described from the framework, differentiation can be divided into four components: content, process, product, and learning environments. Content is what the

teacher wants students to learn, and the resources or instruments through which the learning is achieved. Process describes the way the teachers teach, and the method which students learn. Product is the means through which students determine what they have learned in the lesson; it shows how students present their learnings. And lastly, the environment, whether the physical or psychological, is the atmosphere in which the teacher and students frequently cultivate in respect and consideration for one another while establishing a substantial community of learning. To enable effective and suitable differentiation, it is required that teachers should recognize and understand students' levels of readiness, interests, and learning profile [9]. Readiness is the student's ability to achieve a given task in relation to their present understanding level [10]. Interest is what attracts students' attention in the classroom, and what students desire to learn [11]. Finally, the learning profile is the way students learn best, like whether students are kinesthetic, visual, auditory, interpersonal, intrapersonal, musical, logical or natural learners [12].

Differentiated learning is a well-known and proven approach that replies efficiently to the diverse needs of students, so one-size-does not fit all [13]. Within differentiated instruction researches, there is much evidence to support this approach [14], [15]. There are positive effects on students' achievements due to DI implementation especially in reading comprehension and reading fluency [16], [17]. From literature, a current concern rises in the education research about the effectiveness of differentiated instruction on the secondary level in heterogeneous classrooms. Most researches were conducted on the elementary stage or kindergarten, even on the gifted or disabled students, and there is a body of research to support the effectiveness of differentiated learning in elementary or pre-schooling education, but literature lacks the sufficient data about whether modified learning affects the secondary stage in Jordan. The current study is needed to expand knowledge about DI implementation and its effectiveness on the secondary stage in Jordan. The findings may provide insight for teachers so that they can meet the diverse needs of their students.

Differentiated instruction though it is a new term, it is not a new philosophy or approach of teaching. It has roots to Vygotsky's zone of proximal development (ZPD) which is defined as the distance between what students can do independently, and what they can do with the help of an adult [18]. Both differentiated instruction and ZPD depend on scaffolding where teachers can give support to students in a way to help them progress by themselves. Both urges teachers to teach students based on their interests and development. In addition, DI is linked heavily to Tomlinson's model of differentiated learning [2]. Since the 1990s, Tomlinson has developed differentiated model to address students' development like Vygotsky's ZPD [18]. However, Tomlinson's model focuses on addressing students' needs in modern classroom setting. Tomlinson built on ZPD by supplying applied definition to DI and outlined instructional guidelines necessary for teachers to adopt in order to meet students' diverse needs in the classroom [19].

Tomlinson constructed the model of modified learning on Vygotsky's ZPD by acknowledging students' differences and responding to learners' needs in the situation of what they are equipped to learn next [4]. Whereas Vygotsky addressed learners through the eyes of psychology, Tomlinson's model did so through the lens of a contemporary educator. Moreover, Gardner's multiple intelligences theory [20] can be linked to separated learning. Gardner identified eight areas of intelligence where individuals can learn best to solve problems, create products and shape individual profiles [14], [21]. These profiles acknowledge the distinguishing characteristics of students like differentiated instruction [22]. Combined, the ideas of Vygotsky, Tomlinson's differentiation model and multiple intelligence theory formed the theoretical and conceptual framework of the current study.

Aimed to discover the efficiency of differentiated teaching on growth and proficiency level, Scott [23] investigated DI effectiveness on elementary classes. The results showed no statistically significant difference related to gender. However, the above-average respondents outperformed the other groups, and they benefited more from DI implementation. In Iranian mixed-ability classrooms, Aliakbari and Haghighi [24] steered the efficiency of differentiated teaching compared to the conventional based teaching on reading comprehension. The sample consisted of four levels, three levels in the elementary stage, grades 4, 5, and 7 and another level of the secondary stage which is grade 11. The results showed statistically significant differences between the experimental and the control groups in all the elementary stage levels, but also showed no statistically meaningful results on grade 11 students. Similarly, Valiandes [15] explored the effectiveness of DI in elementary mixed-ability classrooms. The researcher discovered that in classrooms where teachers applied differentiated teaching, students recorded higher scores in reading comprehension and literacy than those in classrooms without differentiation.

Förster, Kawohl, and Souvignier [25] reached similar findings when investigated DI effects on learning. The students of the experimental group, who received modified instruction, showed higher achievement than those of control group. The results signposted that the students with below-average reading skills benefited more from the experiment than the other proficiency levels. Similarly, Kotob and Abadi [26] explored the effect of distinguished teaching on the academic accomplishment of the below-average and the above-average in a mixed-ability classroom. The findings indicated an increase in the class average score.

Moreover, the results revealed a noticeable enhancement in the below-averages' scores while the mean scores for the above-averages remain somehow the same.

In another study to investigate the effectiveness of separated teaching on the elementary stage in Jordan, Magableh and Abdullah [7] experimented, in quasi-experimental research, the differentiated education effectiveness on grade 8 students' achievement. The results showed that DI strategies significantly improved the experimental groups scores compared to the one-size-fits-all method with a huge effect-size. Ramos and Lasaten [27] explored through a descriptive study the effectiveness of modified instruction in students' English performance and engagement. The results showed that there is a strong correlation between implementing DI on secondary stage and increasing engagement and students' accomplishment.

There is a gap in literature in relation to research problem. Although, some research about differentiated teaching is implemented on students and teachers in the elementary stage, few studies have scrutinized its effectiveness on the secondary stage from one hand, and even fewer explored its effectiveness on proficiency level on the other hand. In addition, studies documented a gap in DI implementation on the secondary stage [24] and have recommended to explore its effect on this specific stage. Differentiated teaching from literature seems to be effective for the elementary stage, but will it be effective for the secondary stage, knowing that the characteristics of learners are different and learners are more independent?

The study results will be helpful documented resource to add to literature about this research problem. The problem addressed in this research was insufficient research to explore the effectiveness of differentiated instruction on the secondary stage students' proficiency levels in heterogeneous classrooms. Jordan, where the experiment was taken place, depends on the mixed-ability classrooms where all learners of the same age group are set in one class. You can find different heterogeneous learners in ability, home support, proficiency level, interests, and learning styles in one class. So, it is a call that teachers should implement differentiated instruction strategies in order to deal with such diversity.

A study [28] showed that DI is barely applied in Jordanian classes. Previous research [7] approved the effectiveness of DI in Jordanian context on elementary stage and on bridging the gap among elementary learners, but will it help Jordanian secondary stage as well? This study will be different from previous studies in that it takes secondary stage as the sample and does not only seek to experiment the effect of DI on the experimental group, but it will also discover its effects between and within groups; it will study its effects on the three levels of the experimental group. To achieve the aims of the study, the researchers asked these three questions: i) Is there a statistically significant difference between the experimental group and the control group due to differentiated instruction implementation on the secondary stage students' reading comprehension achievement in Jordan? ii) Is there any statistically significant difference between posttest's mean scores of the experimental group based on gender? iii) Is there any statistically significant difference of differentiated instruction in the posttest's scores of the experimental group based on English reading comprehension proficiency level?

2. RESEARCH METHOD

2.1. Design

The researchers followed the quantitative, quasi-experimental pre-test/post-test two equivalent group design. The participants were exposed to two achieving tests, at the beginning and at the end of the intervention. Creswell [29] described the design: RE O_1 X_1 O_2 and RC O_3 X_2 O_4 (RE is the randomly experimental group; RC is the randomly control group; O_1 and O_3 are the pre-tests and O_2 and O_4 are the post-tests; X_1 is the experiment (differentiated instruction) and X_2 is the traditional method, one-size-fits-all).

2.2. Participants

The sample of the study consisted of 80 respondents of grade eleven of both genders from four different public secondary schools in Irbid district. A total of 80 respondents participated in the study. Based on previous studies [30], [31], a number of 30 participants in experimental studies will be enough for results validity. There were (n=40) male respondents, 20 for the experimental group and another 20 for the control group. Moreover, there were (n=40) female respondents distributed as 20 respondents for the experimental group and 20 for the control group. The respondents were 17 years old on average, and they were taught English from grade 1 and were living in the same districts but in different neighborhoods. The respondents were randomly selected from four public schools, two male schools and other two female schools. One class from each school was randomly chosen to be included in the study using the simple random sampling method. The four school did not apply differentiated instruction in a formal systematic way before the experiment, and the whole class instruction is the dominant way to teach. Four experienced teachers participated in the experiment; two male and two female teachers. The male teachers are holding B.A degrees with 17- and 19-years' experience and the female teachers also hold B.A degrees with 22- and 16-years'

experience. For ethical consideration, the investigators took the district's consent as well as the school administrations and the teachers' written approvals to be part of the study.

The experimental group teachers were instructed to teach using DI strategies. So, the researchers conducted six one-hour workshops to train them before the beginning of the treatment to familiarize them with DI strategies and another three sessions while teaching. The control group teachers were also informed that they were participating in a comparative study and instructed to use the traditional method which they were using anyway.

2.3. Instrument

The instrument is the achievement pre-test/post-test which was steered to both groups. The researchers and the treatment group teachers administered the pre-test at the onset of the study and after 10 weeks of instruction and upon the completion of the treatment, the post-tests were administered. Before the beginning of the study, the researchers ensured the test's validity and reliability. To ensure validity, the test was given to a panel of referees consisted of three instructors from Education and Curriculum Faculty of Yarmouk University, three English supervisors, and four English teachers of grade 11. The panel was kindly requested to give their opinions regarding test quality, complexity, grammar, relatedness to material and suitability to grade 11. The researchers followed the panel's recommendations and did the amendments as they asked. To ensure reliability, the investigators followed the test/retest process. The test was directed twice to a pilot sample of a whole class of grade 11 consisted of 20 male students and another class of 20 females from the population but outside the study sample. Pearson's correlation coefficient was found to be 0.87. Correlation coefficient ranges between -1 and 1 and is regarded to be adequate if it is 0.6 and above [30]. The researchers considered the correlation coefficient robust, adequate and reliable to conduct this research.

2.4. Material

The main course book for English which was provided for both groups of the study was action pack 11. Action pack is a series which has been taught in Jordan for all grades 1 to 12 in public schools since 2013. Action pack 11 consisted of a student book, work book, teacher's guide, and compact disk (CDs) for Audio. In addition to the usual content, the experimental group was supported with Jordan Ministry of Education (MoE) approved external materials of reading comprehension texts taken from teacher's guide and the schools' libraries. Besides, they were given extra leveled short stories to read and tiered assignments as well as electronic materials to do at home.

2.5. Procedures

The experiment was conducted two sessions a week over 10 weeks from the beginning of October till the middle of December 2020, making a number of 20 sessions excluding the pre-test and the post-test sessions. The researchers used last year's marks to classify the students into three levels of ability and to identify the reading comprehension proficiency level. A pre-test was steered to all groups and data were utilized to indicate homogeneity and normality. Using data, the experimental group teachers provided DI of tiered instruction and tiered assignments to homogeneous groups in the areas of content, process, product and learning environment. Conversely, control group teachers delivered teaching based on one-size-fits-all where all students received the same content, process, and product. The experimental group students were divided into three levels, the below-average, average, and above-average and received reading comprehension texts based on their proficiency levels. Leveled activities, tiered tasks and different leveled texts were provided for the three levels of the experimental group. In addition, four periods of the experimental groups were done in the resource room where station education was delivered as differentiating the learning environment. To differentiate students' product, a choice of different activities was provided like power point, poster, drawing, poem, speech delivery or writing to showcase their learning. However, the control group had to present posters. The researchers administered the post-test upon the completion of the experiment to find out the effect, and ANCOVA was used to interpret the findings.

2.6. Data collection

The results of the post-tests were analyzed using analysis of covariance (ANCOVA) where the results of the pre-test were used as the covariate. The use of ANCOVA enables us to explore variances between groups while controlling another variable called covariate that might influence the dependent variable [32]. ANCOVA allows us to control the effect of the pre-test or the covariate. So, in this way, we consider any variation on the dependent variable (the post-test scores) is due to the dependent variable (method of teaching which is DI for the experimental group and the one-size-fits-all for the control group). Then, normal ANOVA (Tukey) test was used on the corrected or adjusted scores to indicate which proficiency level statistically outweighed the other groups.

3. RESULTS AND DISCUSSION

To ensure normality and homogeneity of data, regression slope was conducted. Table 1 shows that regression slope is F (26.003), P=(0.341) which is higher than P=0.05. It shows that the results are insignificant. This indicates that the two groups are homogeneous at the commencement of the study. Since, the experimental and the control group are homogeneous at the inception of the treatment, it is safe to conduct ANCOVA to reveal the difference in the post-tests. To show whether there are differences between the two groups, descriptive statistics and ANCOVA are used. Descriptive statistics revealed differences between the pre-tests and post-tests of experimental and control group as shown in Table 2. The experimental group mean score on the post-test was 34.2 and the control group was 21.82. Table 2 shows descriptive statistics on achievement tests.

To discover whether these differences are statistically significant, one-way between group ANCOVA was conducted. Table 3 shows the ANCOVA results. The table shows that after adjusting the covariate, statistically significant differences existed between the experimental group and the control group. F (242.621), P=0.000 and partial eta squared of 0.696 shows a very large effect-size, which means that 696% of the variance between the two groups can be explained by the independent variable. The null hypothesis therefore was rejected and the alternative hypothesis was accepted. The experimental group students outweighed their peers of the comparison group which indicated that modified teaching affected grade 11 reading comprehension attainment. To show whether differentiated instruction affected gender, analysis of covariance (ANCOVA) was utilized. Table 4 shows ANCOVA results on gender.

Table 1. Tests of between-subjects effects: Regression slope of both groups

Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Noncent. parameter	Observed power
Corrected model	8533.125[a]	3	2844.375	156.731	.000	.817	470.193	1.000
Intercept	4730.123	1	4730.123	260.640	.000	.713	260.640	1.000
GRP	2676.361	1	2676.361	147.473	.000	.584	147.473	1.000
PRTEST	2545.875	1	2545.875	140.283	.000	.572	140.283	1.000
GRP * PRTEST	506.200	1	506.200	26.003	.341	.011	28.003	.999
Error	1905.554	76	18.148					
Total	84748.00	80						
Corrected total	10438.67	79						

Table 2. Descriptive statistics on the achievement test

Group	Test	N	Mean	SD
Control	Pre	40	20.2	8.64
	Post		21.82	8.09
Experimental	Pre	40	21.86	8.26
	Post		34.2	5.15

Table 3. ANCOVA results of experimental and control group post-test

Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Noncent. parameter	Observed power[b]
Corrected model	8024.924[a]	2	4012.462	176.207	.000	.769	352.414	1.000
Intercept	4950.396	1	4950.396	217.397	.000	.672	217.397	1.000
PRTEST	2386.988	1	2386.988	104.825	.000	.497	104.825	1.000
GRP	5524.784	1	5524.784	242.621	.000	.696	242.621	1.000
Error	2413.754	77	22.771					
Total	84748.000	80						
Corrected total	10438.679	79						

Table 4 shows that there are no significant differences of the experiment on gender, F (0.76) and P=0.784 and partial eta squared value of 0.001. P of 0.784 is insignificant since it is larger than the alpha significant level P=0.05. Besides, there was very small partial eta squared which indicates a very limited and small effect-size on gender. Thus, the study failed to reject the null hypothesis. Insignificant difference was found between the male and female scores when taught using DI after controlling the effect of the covariate which was the pre-test. It was concluded that modified instruction did not have overall effect on gender.

The 3rd question is to find the effect of differentiated education inside the experimental group, to see which proficiency level got the most benefit from its implementation, the below-average, the average or the above-average. To indicate whether differentiated learning affected grade 11 reading comprehension proficiency level, ANCOVA was conducted. Table 5 shows that there is a significant difference among the three proficiency levels, F (6.381) P=.003. Partial eta squared 0.197 shows a substantial and large effect-size.

With P=0.003, which is less than the significant level alpha P<0.05, the null hypothesis was rejected and an alternative hypothesis was adopted to state that there is a statistically significant difference of differentiated education on the three proficiency levels of reading comprehension achievement. But from this analysis, the researchers do not know which group outperforms the others. Further analysis is needed.

Table 4. ANCOVA results of experimental group gender on post-test

Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Noncent. parameter	Observed power[b]
Corrected model	424.366[a]	2	212.183	7.817	.001	.231	15.633	.940
Intercept	7673.295	1	7673.295	282.674	.000	.845	282.674	1.000
PRTES	422.815	1	422.815	15.576	.000	.230	15.576	.972
gen	2.067	1	2.067	.076	.784	.001	.076	.058
Error	1411.561	77	27.145					

Table 5. Test of between subjects-effects post-test proficiency levels

Group	Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Experimental group	Corrected model	361.809[a]	2	180.904	6.381	.003	.197
	Intercept	55021.826	1	55021.86	1940.912	.000	.974
	PROF	361.809	2	180.904	6.381	.003	.197
	Error	1474.119	37	28.348			
	Total	62592.000	40				

Multiple comparison among the group was carried out to determine where the difference lies using Tukey test [32]. Multiple comparison shows that there is a meaningful significant difference between above-average and below-average, above-average and average. However, there is no significance between below-average and average. Table 6 shows multiple comparison among the three proficiency levels, above-average, average and below-average.

In order to see which group outperforms the others, ANOVA was used to display the results. Table 7 shows which subgroup got the most benefit from differentiated instruction. The table of the subset indicates that below-average and average are not significantly different because they are in the same column. The above-average occupies a different column from the two which indicates that there is a significant difference between above-average and the other two levels, the below-average and the average.

Differentiated instruction has positive effect on grade 11 reading comprehension achievement. The experimental group which received reading comprehension based on DI outperformed their counterparts of the control group which received education based on one-size-fits-all with huge effect-size. However, no statistically significant difference existed regarding gender variable. Differentiated teaching affects gender of grade 11 at the same level. Regarding the proficiency level, statistically significant differences existed favoring the above-average. The above-average students know how to deal with differentiated instruction texts independently. They are challenged when using DI and improved their progress. In fact, all levels of the experimental groups benefited from differentiated instruction strategies, but the above-average got the highest benefit as the results indicated.

Table 6. Multiple comparison among the three proficiency levels

Group	(I) Proficiency level	(J) Proficiency level	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Experimental group Tukey HSD	Below average	Average	-2.37	1.620	.317	-6.28	1.54
		Above average	-7.01*	1.971	*.002	-11.77	-2.26
	Average	Below average	2.37	1.620	.317	-1.54	6.28
		Above average	-4.64	2.100	*.009	-9.71	.42
	Above average	Below average	7.01*	1.971	*.002	2.26	11.77
		Average	4.64	2.100	*.009	-.42	9.71

Table 7. The subset groups

	Proficiency level	N	Subset 1	Subset 2
Tukey HSD[a,b,c]	Below average	13	31.19	
	Average	17	33.56	
	Above average	10		38.20
	Sig.		.434	1.000

Differentiated instruction improved secondary education students' reading comprehension because it supplied them with methods to reinforce their independence and to be more responsible for their own learning. Moreover, having the choice to showcase students' final products led to distinguish the outcomes and to reinforce accomplishment. One more important observation on the findings is the standard deviation of the experimental group on the post-test. The standard deviation on the pre-test was 8.26 and reduced after DI implementation to 5.15, which means that DI reduced classroom diversity regarding ability and turned it to be more homogeneous.

The study finding is in line with Scott's [23] that the above-average benefited the most from DI, and in that DI has no favor effects on gender. The results of the study are similar to Förster, Kawohl, and Souvignier [25] that DI has positive effect on reading comprehension, but opposes with it in that the students with below-average reading skills benefited more from the experiment than the other proficiency levels. Similarly, the results are consistent with previous studies [7], [27] regarding DI's positive effects on reading comprehension. However, the findings of the current study contradict with Aliakbari and Haghighi [24], in their study that discovered DI did not affect grade 11 reading comprehension in Iran and the current study proved its effectiveness in Jordanian contexts. Moreover, the study findings contradict Kotob and Abadi [26] research that the below-average outperformed the above-average.

4. CONCLUSION

The study was steered to discover the effect of differentiated learning on the secondary stage students' proficiency level in Jordan. Over 10 weeks, students of experimental group received reading comprehension through differentiated teaching strategies of homogeneous group, tiered assignments and tiered instruction in the areas of content, product, process and learning environment. The control group learned reading comprehension following the traditional method. Results indicated the effectiveness of differentiated instruction on enhancing the reading comprehension scores of grade 11 students as a whole but had insignificant effect on gender variable. The findings also indicated that DI had different effects on reading comprehension proficiency level, and the above-average got the highest effect.

The results of the study have implications on the field of education in that when applying DI, students' scores of reading comprehension increase. Reading comprehension is always considered difficult to improve in English as foreign language or English as second language students. Therefore, DI helps facilitate it to students, since it deals with their abilities. Moreover, the study adds contributions to the literature existed about DI's positive effects on secondary stage as the elementary stage.

In line with the results, the researchers recommend further studies over longer period to have more reliable results. Moreover, the researchers recommend conducting more studies to compare whether DI has various influence in different learning environments. This study is limited to the small number of participants. The larger the sample is, the more reliable the results will be. In addition, the results are limited due to the context of the study. It was one educational district. If further studies take sample from different districts, the generalizability will be more valid. The study is also limited to one instrument and to one design. If more instruments are used in more than one design like the quantitative and the qualitative, then the results will be more reliable.

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