Macrothink Institute™

International Research in Education
ISSN 2327-5499
2023, Vol. 11, No. 1

Investigating the Relationship between Primary School Teachers' Knowledge of Differentiated Instruction and the Frequency of its Implementation to Students with Learning Difficulties

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Received: December 21, 2022 Accepted: April 6, 2023 Published: April 11, 2023

doi: 10.5296/ire.v11i1.20897 URL: https://doi.org/10.5296/ire.v11i1.20897

Abstract

The main purpose of this study is to investigate the perceptions of primary school teachers in the Dodecanese (Greece) regarding the relationship between their knowledge of differentiated instruction and the frequency of its implementation to students with learning difficulties. The research was conducted through quantitative approach using an anonymous electronic questionnaire on a sample of 174 primary school teachers of all specialties in the Dodecanese, during the period from February 13, 2021 to April 28, 2021. The correlation analysis (Spearman's rho) revealed that there is a positive correlation between teachers' knowledge of differentiated instruction and the frequency of its implementation to students with learning difficulties. Therefore, it was found that as the teachers' knowledge of differentiated instruction practices increases, the frequency of their implementation increases.

Keywords: differentiated instruction, learning difficulties, primary education

1. Introduction

Differentiated instruction contributes to improved academic achievement (Tomlinson et al., 1997; Campbell et al., 1999; Koeze, 2006; Kiley, 2011), while its absence in many classrooms makes it more difficult for students who do not learn in the same ways as their peers to succeed (Robinson, 2013).This is because differentiated instruction meets effectively to students' differences (Strogilos et al., 2017).

Specifically, the use of differentiated instruction is imperative for students with learning difficulties considering that teaching and assessment in different ways are perfectly suited to the characteristics of these students (Bellou, 2019). However, differentiated instruction does not seem to be frequently used (Tomlinson, 2003; Kiley, 2011) as it requires more preparation time and its implementation in the classroom is quite time-consuming (Papadakis & Ziskos, 2015). In addition, the literature on differentiation suggests that teachers are reluctant to implement differentiation in their practice and that few teachers are able to meet the learning needs of their students due to their limited understanding of differentiation and their lack of training (Kovtiuh, 2017).

Consequently, the investigation of the knowledge and implementation of differentiated instruction by primary school teachers in Greece for students with learning difficulties is considered necessary in order to draw useful conclusions about the relationship of teachers with this form of instruction in this particular group of students.

From the study of the relevant research literature regarding the knowledge and implementation of differentiated instruction to students with learning difficulties, specific findings emerge, which are presented below. Specifically, from the study of the Greek and international literature, it appears that in the field of differentiated instruction, issues related mainly to attitudes (Rontou, 2012; Mavroudi, 2016; Tatsioka, 2016; Mengistie, 2020), opinions, perceptions (Roiha, 2014; Tatsioka, 2016; Fotopoulou, 2017; Filippatou & Vendista, 2017; Davis, 2020; Moutlas, 2021) and teachers' intentions (Argyropoulou, 2018) regarding the implementation of differentiated instruction have been investigated.

Also, a relatively small number of studies examined the implementation of differentiated instruction practices and the frequency of their use (Siam & Al-Natour, 2016; Psarianou, 2019; Papadopoulou, 2019; Tadesse, 2020), while other studies examined the level of understanding of the differentiated instruction practices compared to the degree of their implementation (Ismajli & Imami-Morina, 2018; Bellou, 2019; Mengistie, 2020; Yetnayet, 2020; Moutlas, 2021), the factors that prevent the implementation of differentiated instruction (Roiha, 2014; Siam & Al-Natour, 2016; Mavroudi, 2016; Psarianou, 2019; Bellou, 2019; Papadopoulou, 2019; Mengistie, 2020; Yetnayet, 2020; Moutlas, 2021), the factors that strengthen it (Valianti, 2015; Fotopoulou, 2017; Argyropoulou, 2018) and the effects of differentiated instruction on students (Valianti, 2015; Papadopoulou, 2019). Additionally, research was identified that examined the understanding of the term differentiated instruction (Strogilos et al., 2017) and teachers' perceptions of some educational software designed for differentiated instruction (Cannon, 2017).

Finally, the levels of education in which the issues of differentiated instruction were studied are, mainly, primary education (Roiha, 2014; Valianti, 2015; Mavroudi, 2016; Siam & Al-Natour, 2016; Cannon, 2017; Ismajli & Imami-Morina , 2018; Dinaki, 2019; Bellou, 2019; Papadopoulou, 2019; Davis, 2020; Mengistie, 2020; Tadesse, 2020; Yetnayet, 2020; Moutlas, 2021), followed by secondary education (Rontou, 2012; Filippatou & Vendista, 2017; Argyropoulou, 2018), primary intercultural education (Fotopoulou, 2017) and primary and secondary intercultural education (Tatsioka, 2016).

Based on the major findings of the relevant research literature regarding the relationship between knowledge and the use of differentiated instruction, it is concluded that there is a positive correlation (Roiha, 2014; Moutlas, 2021), but a difference is identified between the understanding of differentiated instraction practices and their implementation, as while it seems that teachers are aware of practices they do not implement them as often (Fotopoulou, 2017; Bellou, 2019) or implement them partially (Psarianou, 2019), and there are cases where they are implemented in a flexible way (Roiha, 2014). However, in most studies, differentiated instruction practices are not implemented frequently (Siam & Al-Natour, 2016; Filippatou & Ventista, 2017;Ismajli & Imami-Morina, 2018; Mengistie, 2020; Yetnayet, 2020).

Furthermore, there is a significant divergence between beliefs and practices, which proves that theory diverges significantly from practice and therefore theoretical knowledge from practical implementation (Wang et al., 2008; Sakellariou et al., 2018). This research aims to study the relationship between knowledge and implementation of differentiated instruction.

2. Theoretical Framework

There are many approaches, methods and models that can be used to educate students with learning difficulties. Differentiated instruction is an appropriate method as it takes into account the specific characteristics of students and focuses on identifying students' readiness, interests and learning styles. Students' readiness, interests, and learning styles are adapted by differentiating content, process, and product. Furthermore, adaptation to learning materials enhances students' critical thinking in the learning process. Therefore, differentiated instruction provides significant help to students with learning difficulties (Panteliadou, 2008), and furthermore, it allows them to achieve outstanding academic achievement in the classroom (Dapa, 2017).

Tomlinson (2001) highlights five guidelines for implementing successful differentiated instruction in inclusive classrooms. These are: (a) clarifying all key concepts and generalizations, (b) using assessment as a teaching tool for extension rather than just as a measurement, (c) making critical and creative thinking a goal of lesson planning, (d) engaging every student in learning, and (e) having a balance between teacher-assigned and student-chosen tasks.

According to Carolan and Guinn (2007), many teachers hesitate to implement differentiated instruction practices in the classroom because they believe they lack time, administrative

support, and necessary resources for professional development, while some teachers see differentiated instruction as another bureaucratic mandate heaped onto their already burgeoning workloads.

In addition, the literature notes that there are misconceptions regarding the differentiated instruction (Tatsioka, 2016; Argyropoulou, 2018) and it is not implemented despite the fact that the need for its use is recognized (Tatsiouka, 2016), because it has positive effect on all students (Valianti, 2015), it improves their performance (Dinaki, 2019), and it creates a collaborative climate in which students are all treated equally (Papadopoulou, 2019). In order for teachers to implement it more systematically, it is necessary to gain a greater awareness of its nature (Roiha, 2014). Specifically, in terms of its understanding in the context of inclusive education, differentiated instruction is perceived as an activity that gravitates towards the child's deficit rather than a framework for all students (Strogilos et al., 2017).

In general, differentiated instruction is considered an important but complex teaching skill that many teachers have not mastered and feel unprepared to implement (van Geel et al., 2019). Therefore, it can be a daunting task for teachers as it requires a new way of thinking about curriculum and teaching (Tobin & Tippett, 2014).

3. Methodology

3.1 Purpose and Research Questions

The main purpose of this paper is to investigate the perceptions of primary school teachers of all specialties in the Dodecanese regarding:

a) teachers' knowledge of use of suggested differentiated instruction practices,

b) teachers' frequency of use of suggested differentiated instruction practices in their classroom,

c) relationship between teachers' knowledge and frequency of suggested differentiated instruction practices.

This paper attempts to answer the following research questions:

1st: To what extent teachers know suggested differentiated instruction practices?

2nd: How often do teachers use suggested differentiated instruction practices in their class?

3nd: How does teachers' knowledge of suggested differentiated practices relate to the frequency of their implementation?

3.2 Sample

The sample of the study consisted of 174 primary school teachers. Table 1 presents the number of primary school teachers in the Dodecanese based on the records of the Directorate of Primary Education of the Dodecanese. Kindergarten teachers and special education teachers are not included in the table because they are not part of the population from which

our sample was selected.

Table 1. Table of primary school teachers of Dodecanese

Code of Specialty	Main specialty	Total
PE05	French teachers	17
PE06	English teachers	100
PE07	German teachers	20
PE08	Art teachers	44
PE11	Physical Education teachers	108
PE70	Teachers	1.022
PE79.01	Music teachers	42
PE86	Computer teachers	45
PE91.01	Theater teachers	28
PE91.01	Drama teachers	3
Total of all specialties		1.412

Approximately 12.3% of the total number of primary school teachers of the Dodecanese are used for this study. Specifically, about 15.4% of teachers, about 8% of English teachers, about 13.3% of computer teachers, about 3.8% of theater teachers, approximately 0.9% of physical education teachers, and about 2.3% of art teachers responded.

3.3. Research Process

The survey is quantitative and an anonymous electronic questionnaire was used. Analytically, a pilot survey was conducted from Jan. 25 to Feb. 1, 2021, in which seven teachers from different specialties participated to ensure that the questionnaire was clear and understandable, and then the electronic distribution of the questionnaire to schools via email began. In addition, the questionnaire was also posted on social media sites of primary school teachers. The survey was conducted from February 13, 2021 to April 28, 2021.

3.4. Research Tool: Formulation of the Questionnaire

The questionnaire consisted of three groups of variables: The first group of variables included the demographic characteristics of the respondents, that is the independent variables. In particular, questions with two or more alternative answers and an open-ended question with a short answer were used.

The second group of variables consisted of a three-point Likert scale (1=I am not familiar with this differentiated instruction practice (Never), (2=I am somewhat familiar with this differentiated instruction practice) (Partially), (3=I am very familiar with this differentiated instruction practice) (Fully), and measured the knowledge of suggested differentiated instruction practices. The second group of variables of Yetnayet's (2020) questionnaire, which consists of 9 Likert-scale questions was used. The validity and reliability of Yetnayet's (2020) questionnaire were tested. Specifically, the Cronbach's alpha value for the questionnaire items related to the knowledge of suggested differentiated instruction practices was 0.712, and

values above 0.70 are considered reliable.

The third group of variables consisted of a four-point Likert scale (1=Never, 2=Sometimes, 3=Frequently, 4=Always), and measured the frequency of implementation of suggested differentiated instruction practices related to content, process, product, assessment and learning environment. The third group of variables of Yetnayet's (2020) questionnaire, which consists of 25 Likert-scale questions was used. The validity and reliability of Yetnayet's (2020) questionnaire were tested. Specifically, the Cronbach's alpha value for the questionnaire items related to the content is 0.871, for the items related to the process is 0.855, for the items related to the product is 0.790, for the items related to the assessment is 0.729 and finally, for the items related to the learning environment is 0.913. All values are considered reliable because they are above 0.70.

Furthermore, the groups of variables of Yetnayet's (2020) questionnaire were translated into Greek by the researchers and then given to an English teacher who make all the necessary corrections and improvements, and a back translation was done. Finally, all the necessary adjustments were made to be used in this research.

3.5 Data Collection and Analysis

Data were collected using a questionnaire distributed through Google Forms. The responses to the questionnaire were processed using Microsoft Excel and IBM SPSS Statistics 20, performing descriptive and inductive statistics.

More specifically, we applied Kolmogorov-Smirnov to our data, since our sample size was (N=174) and our data did not follow the normal distribution, we applied non-parametric statistical criteria. We also used a significance level of α=0.05 (5%) to test differences. Finally, Spearman's rho analysis was used to test whether and to what extent teachers' knowledge of differentiated instruction is related to the frequency of its implementation.

4. Results

4.1 Participant Characteristics

Regarding the composition of the sample of teachers who participated in the research, the following can be noted:

The highest percentage of participants work in schools located in urban areas (45.6%), while fewer teachers work in semi-urban and rural areas (36.8% and 17.2% respectively).

Regarding gender, the sample is not evenly distributed as 2/3 of all participants are female teachers (69.5%), while 30.5% are male teachers. Regarding age, not all age categories are equally represented in the sample of the present study. The highest percentage (34.5%) is in the 31-40 age group, followed by the 41-50 age group (32.8%), the 30 and younger age group (27%) and finally, the 51 and 60 age group (5.7%).

Regarding the total number of years of teaching experience in education, the percentages

were higher in the categories 0-10 years (51.1%) and 11-20 years (42.5%), while the smallest percentage (6.3%) included teachers with 21-30 years of teaching experience. Regarding specialty, it is noted that the highest percentage (90.2%) is related to teacher specialty, and this is reasonable since this particular specialty covers the largest percentage in primary education, followed by English teacher specialty (4.6%), while the percentages of participation in other specialties are also very low, such as computer teachers (3.4%), art teachers (0.6%), drama teachers (0.6%) and physical education teachers (0.6%).

Regarding school's organization, the highest percentage (60.3%) of teachers in the sample work in schools with 7-12 classes, followed by 36.2% who work in schools with 4-6 classes, and finally, only 3.4% work in schools with 1-3 classes. Regarding the employment status, the highest percentage (55.2%) is substitute teachers, followed by teachers who have a permanent teaching position (39.1%), and seconded teachers (5.7%). In terms of qualifications, it can be noted that 8% of teachers have an additional college degree, 29.9% of teachers have a master's degree, while only 1% of teachers have a doctoral degree.

As for training in the field of special education, a very high percentage (86.2%) had training in the field of special education. Finally, regarding training on differentiated instruction, a high percentage (69%) had trained on differentiated instruction.

4.2 Teachers' Knowledge of Use of Suggested Differentiated Instruction Practices (1st Research Question)

Table 2 shows the results of the research on the teachers' knowledge of use of suggested differentiated instruction practices.

Table 2. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Knowledge of Use of Suggested Differentiated Instruction Practices

	Differentiated Instruction Practices	Never (1)	Partially (2)	Fully (3)	M	SD
1	Agreement between student and teacher where freedoms are put in a place for designing and completing work	23 13.2%	84 48.3%	67 38.5%	2.25	0.675
2	Provision of multiple assignments to different students at the same time that are related to the same concept or topic but differ in complexity.	18 10.3%	72 41.4%	84 48.3%	2.38	0.667
3	Teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management.	14 8.0%	58 33.3%	102 58.6%	2.51	0.643
4	Pretesting of students before a unit and then eliminating instruction in the areas of competence.	12 6.9%	63 36.2%	99 56.9%	2.50	0.625
5	A collection of materials where students explore topics or practice a set of skills.	15 8.6%	76 43.7%	83 47.7%	2.39	0.643
6	Utilization of varied subject materials according to student readiness, interest, or other areas of student difference.	15 8.6%	75 43.1%	84 48.3%	2.40	0.643
7	Provision of students with a choice of content,	18	67	89	2.41	0.672

	process, product, and learning environment.	10.3%	38.5%	51.1%		
8	Grouping of students for completion of instruction, specific task or assignments and the group changes as needed based on students‟ abilities, interests, and readiness.	18 10.3%	70 40.2%	86 49.4	2.39	0.669
9	Variation of the sorts of questions posed to learners in the discussion and on tests, based on their readiness, interests, and learning styles.	11 6.3%	67 38.5%	96 55.2%	2.49	0.615

4.3 Teachers' Frequency of Use of Suggested Differentiated Instruction Practices in Their Classroom (2nd Research Question)

Table 3 shows the results of the research on the teachers' frequency of implementation of suggested differentiated instruction practices regarding content.

Table 3. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Frequency of Implementation of Differentiated Instruction Practices Regarding Content

	Content	Never (1)	Sometimes (2)	Frequently (3)	Always (4)	M	SD
1	I use a variety of material for students with learning difficulties.	13 7.5%	61 35.1%	77 44.3%	23 13.2%	2.63	0.806
2	I provide additional material to students with learning difficulties who struggle to understand the course material easily.	25 14.4%	60 34.5%	76 43.7%	13 7.5%	2.44	0.829
3	I use examples that meet experiences or interests of students with learning difficulties when I present course content.	23 13.2%	54 31.0%	72 41.4%	25 14.4%	2.57	0.895
4	I provide more advanced options for students with learning difficulties who effortlessly master the course material.	26 14.9%	59 33.9%	69 39.7%	20 11.5%	2.48	0.885
5	I assign enrichment assignments to high performing students with learning difficulties.	27 15.5%	62 35.6%	71 40.8%	14 8.0%	2.41	0.847
6	I choose the most crucial assignments for underachieving students with learning difficulties.	17 9.8%	46 26.4%	72 41.4%	39 22.4%	2.76	0.910

Table 4 shows the results of the research on the frequency of implementation of suggested differentiated instruction practices regarding process.

Table 4. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Frequency of Implementation of Differentiated Instruction Practices Regarding Process

	Process	Never (1)	Sometimes (2)	Frequently (3)	Always (4)	M	SD
7	I create assignments that allow students with learning difficulties to interact one another and understand the course content.	27 15.5%	51 29.3%	71 40.8%	25 14.4%	2.54	0.922
8	I adjust the pace of instruction to each student's needs with learning difficulties.	10 5.7%	37 21.3%	73 42.0%	54 31.0%	2.98	0.870
9	I put students with learning difficulties in readiness based groups with other students.	29 16.7%	44 25.3%	75 43.1%	26 14.9%	2.56	0.940
10	I put students with learning difficulties in groups with other students based on what they are interested in.	31 17.8%	48 27.6%	67 38.5%	28 16.1%	2.53	0.966
11	I put students with learning difficulties in learning style appropriate groups with other students.	43 24.7%	46 26.4%	63 36.2%	22 12.6%	2.37	0.993
12	I use a variety of flexible grouping practices for students with learning difficulties in class.	16 9.2%	51 29.3%	74 42.5%	33 19.0%	2.71	0.879
13	I design assignments using alternative formats for students with learning difficulties.	13 7.5%	51 29.3%	69 39.7%	41 23.6%	2.79	0.888

Table 5 shows the results of the research on the frequency of implementation of suggested differentiated instruction practices regarding product.

Table 5. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Frequency of Implementation of Differentiated Instruction Practices Regarding Product

	Product	Never (1)	Sometimes (2)	Frequently (3)	Always (4)	M	SD
14	I permit students with learning difficulties	9 5.2%	47 27.0%	77 44.3%	41 23.6%	2.86	0.835

	to present their products in writing.						
15	I permit students with learning difficulties to present their products orally.	5 2.9%	42 24.1%	76 43.7%	51 29.3%	2.99	0.808
16	I offer extra support to students with learning difficulties who have difficulty finishing assignments.	4 2.3%	37 21.3%	62 35.6%	71 40.8%	3.15	0.833

Table 6 presents the results of the research concern the frequency of implementation of suggested differentiated instruction practices regarding assessment.

Table 6. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Frequency of Implementation of Differentiated Instruction Practices Regarding Assessment

	Assessment	**Never (1)**	**Sometimes (2)**	**Frequently (3)**	**Always (4)**	**M**	**SD**
17	I give more time to students with learning difficulties to complete tasks or exams.	10 5.7%	28 16.1%	66 37.9%	70 40.2%	3.13	0.884
18	I use continuous and various assessments of students with learning difficulties.	14 8.0%	59 33.9%	65 37.4%	36 20.7%	2.71	0.887
19	I use three or more types of assessment to determine course grades.	8 4.6%	48 27.6%	68 39.1%	50 28.7%	2.92	0.863
20	I modify assignment deadlines regarding the requirements and/or circumstances of students with learning difficulties.	15 8.6%	41 23.6%	73 42.0%	45 25.9%	2.85	0.906
21	I pre-assess students with learning difficulties before the lesson starts.	25 14.4%	46 26.4%	68 39.1%	35 20.1%	2.65	0.961

Table 7 presents the results of the research concern the frequency of implementation of suggested differentiated instruction practices regarding learning environment.

Table 7. Distribution of Frequencies, Relative Percentages, Means and Standard Deviations of the Frequency of Implementation of Differentiated Instruction Practices Regarding

Learning Environment

	Learning Environment	Never (1)	Sometimes (2)	Frequently (3)	Always (4)	M	SD
22	I design assignments to foster a sense of community among students with and without learning difficulties.	10 5.7%	38 21.8%	75 43.1%	51 29.3%	2.96	0.863
23	I make a conscious effort to ensure each student with learning difficulties feels known, welcomed, and appreciated.	4 2.3%	23 13.2%	68 39.1%	79 45.4%	3.28	0.778
24	I make a conscious effort to ensure students with learning difficulties engage consistently and fairly in class.	3 1.7%	21 12.1%	69 39.7%	81 46.6%	3.31	0.750
25	I encourage students with learning difficulties to help each other with students without difficulties.	11 6.3%	35 20.1%	56 32.2%	72 41.4%	3.09	0.930

4.4 Relationship between Teachers' Knowledge and Frequency of Suggested Differentiated Instruction Practices (3rd Research Question)

Spearman's rho shows that there is a positive correlation between teachers' knowledge of specific suggested differentiated instruction practices and the frequency of their implementation, at the level of significance, p=.005. This means that as teachers' knowledge of differentiated instruction practices increases, the frequency of their implementation increases. Among some variables, there is a non-existent correlation i.e. with a value <=[+0.29], among others there is a low correlation i.e. with a value ranging between [+0.30]-[+0.49] and among others a moderate positive correlation i.e. with a value ranging between [+0.50]-[+0.69].

The variables that have a moderate positive correlation are presented below as no high correlation was found. Specifically, the variable related to knowledge of the following practice for differentiated instruction: "teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management", is positively correlated with a moderate correlation with the variables presented in Table 8.

Table 8. Variable Correlation: "teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management" with other variables

I provide more advanced options for students with learning difficulties who effortlessly master the course

material
r=0.502 p=.000
I create assignments that allow students with learning difficulties to interact one another and understand the course content
r=0.506 p=.000
I make a conscious effort to ensure students with learning difficulties engage consistently and fairly in class.
r=0.531 p=.000
I encourage students with learning difficulties to help each other with students without difficulties.
r=0.536 p=.000

The variable related to knowledge of the following practice for differentiated instruction: "a collection of materials where students explore topics or practice a set of skills", is positively correlated with a moderate correlation with the variables presented in Table 9.

Table 9. Variable Correlation: "A collection of materials where students explore topics or practice a set of skills" with other variables

I use examples that meet experiences or interests of students with learning difficulties when I present course content.
r=0.526 p=.000
I provide more advanced options for students with learning difficulties who effortlessly master the course material.
r=0.548 p=.000
I assign enrichment assignments to high performing students with learning difficulties.
r=0.525 p=.000
I put students with learning difficulties in groups with other students based on what they are interested in.
r=0.502 p=.000

The variable related to knowledge of the following practice for differentiated instruction: "utilization of varied subject materials according to student readiness, interest, or other areas of student difference", is positively correlated with a moderate correlation with the following variable presented in Table 10.

Table 10. Variable Correlation: "Utilization of varied subject materials according to student readiness, interest, or other areas of student difference" with other variable

I create assignments that allow students with learning difficulties to interact one another and understand the course content.	
r=0.520	p=.000

The variable related to the knowledge of the following practice for differentiated instruction: "provision of students with a choice of content, process, product, and learning environment", is positively correlated with a moderate correlation with the following variable presented in Table 11.

Table 11. Variable Correlation: "Provision of students with a choice of content, process, product, and learning environment", with other variable

I provide more advanced options for students with learning difficulties who effortlessly master the course material.	
r=0.504	p=.000

The variable related to knowledge of the following practice for differentiated instruction: "grouping of students for completion of instruction, specific task or assignments and the group changes as needed based on students' abilities, interests, and readiness", is positively correlated with a moderate correlation with the following variables presented in Table 12.

Table 12. Variable Correlation: "Grouping of students for completion of instruction, specific task or assignments and the group changes as needed based on students' abilities, interests, and readiness" with other variables

I use examples that meet experiences or interests of students with learning difficulties when I present course content.	
r=0.551	p=0.000
I provide more advanced options for students with learning difficulties who effortlessly master the course material	
r=0.544	p=0.000
I assign enrichment assignments to high performing students with learning difficulties.	
r=0.518	p=0.000
I create assignments that allow students with learning difficulties to interact one another and understand the course content.	

r=0.524	p=0.000
I put students with learning difficulties in readiness based groups with other students.	
r=0.516	p=0.000
I put students with learning difficulties in groups with other students based on what they are interested in.	
r=0.522	p=0.000
I put students with learning difficulties in learning style appropriate groups with other students.	
r=0.530	p=0.000
I use a variety of flexible grouping practices for students with learning difficulties in class.	
r=0.577	p=0.000

The variable related to knowledge of the following practice for differentiated instruction: "variation of the sorts of questions posed to learners in the discussion and on tests, based on their readiness, interests, and learning style", is positively correlated with a moderate correlation with the variables presented in Table 13.

Table 13. Variable Correlation: "Variation of the sorts of questions posed to learners in the discussion and on tests, based on their readiness, interests, and learning style" with other variables

I provide more advanced options for students with learning difficulties who effortlessly master the course material.	
r=0.515	p=0.000
I choose the most crucial assignments for underachieving students with learning difficulties.	
r=0.527	p=0.000

5. Discussion

5.1 Teachers' Knowledge of Use of Suggested Differentiated Instruction Practices (1st Research Question

The findings of this research show that teachers have a high level of knowledge of differentiated instruction practices. This finding agrees with Fotopoulou's (2017) study, which revealed that teachers are aware of the philosophy of differentiated instruction. Furthermore, Shareefa et al. (2019) in their study showed that teachers had good knowledge about differentiated instruction, and Heneghan's (2017) study also revealed that teachers seemed to understand differentiated instruction. In addition, Moutlas (2021) showed that teachers had knowledge about differentiated instruction and used it with students with specific learning

difficulties. Furthermore, Sakellariou et al. (2018) noted teachers' knowledge about the theoretical background and practical implementation of differentiated instruction. On the contrary, this finding contradicts the finding of the study of Ismajli and Imami-Morina (2018) that teachers' understanding of differentiated instruction did not seem to be sufficient. Furthermore, in Argyropoulou's (2018) study, it was found that teachers did not adequately understand the content of the concept and the ways in which differentiation can be implemented in the classroom.

Specifically, regarding the level of knowledge of suggested differentiated instruction practices, teachers are more familiar with the practice concerns teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management (M=2.51), followed by the practice of pretesting of students before a unit and then eliminating instruction in the areas of competence (M=2.50) and the practice concerns the variation of the sorts of questions posed to learners in the discussion and on tests, based on their readiness, interests, and learning styles (M=2.49). Teachers are less familiar with the practice concerns provision of students with a choice of content, process, product, and learning environment (M=2.41) and the practice concerns utilization of varied subject materials according to student readiness, interest, or other areas of student difference (M=2.40). Moreover, teachers are even less familiar with the practice concerns collection of materials where students explore topics or practice a set of skills (M=2.39), the practice concerns grouping of students for completion of instruction, specific task or assignments and the group changes as needed based on students' abilities, interests, and readiness (M=2.39), the practice concerns the provision of multiple assignments to different students at the same time that are related to the same concept or topic but differ in complexity (M=2.38), and finally, the practice concerns the agreement between student and teacher where freedoms are put in a place for designing and completing work (M=2.25).

5.2 Teachers' Frequency of Use of Suggested Differentiated Instruction Practices in their Classroom (2nd Research Question)

From the overall consideration of the individual findings, specific findings concerning the implementation of specific proposed differentiated instruction practices to students with learning difficulties in the class emerge, which are presented in more detail below.

More specifically, regarding "content differentiation", the respondents stated that they apply always to often, in order of priority, the following differentiated instruction practices in their class: they choose the most crucial assignments for underachieving students with learning difficulties (63.8%), they use a variety of material for students with learning difficulties (56.5%), they use examples that meet experiences or interests of students with learning difficulties when they present the course content (55.5%), they provide additional materials to students with learning difficulties who struggle to understand the course material easily (51.2 %), they provide more advanced options for students with learning difficulties who effortlessly master the course content (51.2%), and finally they assign high- performing students with learning difficulties with enrichment assignments (48.8%). For the second most

frequently applied practice, the findings of our research also agree with the findings of other related studies (Hobson, 2008; Adlam, 2007; Rodriguez, 2012; Bellou, 2019).

Also, regarding "process differentiation", the respondents stated that they apply always to often, in order of priority, the following practices of differentiated instruction in their class: they adjust the pace of instruction to each student's needs with learning difficulties (73%), they design assignments using alternative formats for students with learning difficulties (63.3%), they use a variety of flexible grouping practices for students with learning difficulties in class (61.5%), a practice which is used to the same extent in other studies (Adlam, 2007; Rodriguez, 2012; Bellou, 2019; Psarianou, 2019). Moreover, the respondents state that they put students with learning difficulties in readiness based groups with other students (58%), they create assignments that help students with learning difficulties to interact one another and understand the course content (55.2%), they put students with learning difficulties in learning style appropriate groups with other students (48.8%) and finally, they put students with learning difficulties with other students based on what they are interest in (48.6%). Regarding the most frequently applied practice, the findings of our study agree with the findings of another related study (Hobson, 2008).

In addition, regarding "product differentiation", the respondents stated that they apply always to often, in order of priority, the following practices of differentiated instruction in their class: they offer extra support to students with learning difficulties who have difficulty finishing assignments (76.4%), they permit students with learning difficulties to present their products orally (73%) and finally, they permit students with learning difficulties to present their products in writing (69.9%). Regarding the most frequently applied practice, the findings of our study agree with the findings of a relevant study (Bellou, 2019). Also, regarding the second and third most frequently applied practice, which refer to the way of presenting the product, the findings of the present study agree with the findings of other relevant studies (Bellou, 2019; Psarianou, 2019).

In relation to "assessment differentiation", the respondents stated that they apply always or often, in order of priority, the following differentiated instruction practices in their class: they give more time to students with learning difficulties to complete assessment tasks or exams (78.1%), they modify assignment deadlines regarding the requirements and/or circumstances of students with learning difficulties (67.9%), they use three or more types of assessment to determine course grades (67.8%). This finding of our study agrees with the findings of other relevant studies (Bellou, 2019; Psarianou, 2019). Less often compared to previous practices, teachers stated that they pre-assess students with learning difficulties before the lesson starts (59.2%), and finally, they use continuous and various assessments of students with learning difficulties (58.1%).

Finally, regarding "learning environment differentiation", the respondents stated that they apply always to often, in order of priority, the following differentiated instruction practices in their class: they make a conscious effort to ensure students with learning difficulties engage consistently and fairly in class (86.3%), they make a conscious effort to ensure each student with learning difficulties feels known, welcomed, and appreciated (74.5%), they encourage

students with learning difficulties to help each other with students without difficulties (73.6%), and finally, they design assignments to foster a sense of community among students with and without learning difficulties (72.4%). Motivation and encouragement for interaction and participation are practices that are confirmed by the findings of other relevant studies (Psarianou, 2019; Bellou, 2019).

5.3 Relationship between Teachers' Knowledge and Frequency of Suggested Differentiated Instruction Practices (3rd Research Question)

There is a positive correlation between teachers' knowledge of differentiated instruction and the frequency of its implementation, which means that as teachers' knowledge of differentiated instruction practices increases, the frequency of their implementation increases. These findings are in line with Moutla's (2021) findings, who examined primary school teachers' perceptions of differentiated instruction for students with specific learning difficulties and concluded that there is a positive correlation between teachers' knowledge and the use of differentiated instruction. Similar findings were also found in Yetnayet's (2020) study, which noted a positive correlation between teachers' knowledge and the practice of differentiated instruction in primary schools in the context of inclusive education.

In detail, there is a positive correlation between teachers' knowledge of differentiated instruction and the frequency of its implementation to students with learning difficulties. Therefore, it was found that as the teachers' knowledge of differentiated instruction practices increases, the frequency of their implementation increases.

Specifically, based on the results of the research regarding the variable related to knowledge of the practice: "teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practices: provision of more advanced options for students with learning difficulties who effortlessly master the course material (r=0.502, p=.000), creation of assignments that allow students with learning difficulties to interact one another and understand the course content (r=0.506, p=.000), conscious effort to ensure students with learning difficulties engage consistently and fairly in class (r=0.531, p=.000), and motivation of students with learning difficulties to help each other with students without difficulties (r=0.536, p=.000).

Regarding the variable related to knowledge of the practice: " a collection of materials where students explore topics or practice a set of skills", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practices: use of examples that meet experiences or interests of students with learning difficulties during the presentation of the course content (r=0.526, p=.000), provision of more advanced options for students with learning difficulties who effortlessly master the course material (r=0.548, p=.000), provision of enrichment assignments to high performing students with learning difficulties (r=0.525, p=.000), and grouping of students with learning difficulties with other students based on what they are interested in (r=0.502, p=.000).

Regarding the variable related to knowledge of the practice: "utilization of varied subject materials according to student readiness, interest, or other areas of student difference", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practice: creation of assignments that allow students with learning difficulties to interact one another and understand the course content (r=0.520, p=.000).

Regarding the variable related to knowledge of the practice: "provision of students with a choice of content, process, product, and learning environment", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practice: provision of more advanced options for students with learning difficulties who effortlessly master the course material (r=0.504, p=.000).

Regarding the variable related to knowledge of the practice: "grouping of students for completion of instruction, specific task or assignments and the group changes as needed based on students‟ abilities, interests, and readiness", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practices: use of examples that meet experiences or interests of students with learning difficulties during the presentation of the course content (r=0.551, p=.000), provision of more advanced options for students with learning difficulties who effortlessly master the course material (r=0.544, p=.000), provision of enrichment assignments to high performing students with learning difficulties (r=0.518, p=.000), creation of assignments that allow students with learning difficulties to interact one another and understand the course content (r=0.524, p=.000), grouping of students with learning difficulties with other students based on their readiness (r=0.516, p=.000), based on what they are interested in (r=0.522, p=.000) and based on their learning style (r=0.530, p=.000), and use of a variety of flexible grouping practices for students with learning difficulties in class (r=0.577, p=.000).

Finally, regarding the variable related to knowledge of the practice: "variation of the sorts of questions posed to learners in the discussion and on tests, based on their readiness, interests, and learning styles", it was found that it is positively correlated with a moderate correlation with the implementation of the following differentiated instruction practices: provision of more advanced options for students with learning difficulties who effortlessly master the course material (r=0.515, p=.000) and selection of the most crucial assignments for underachieving students with learning difficulties (r=0.527, p=.000)

On the other hand, the findings of the present study, are in contrast to the findings of other studies such as those of Bellou’s (2019) study, which examined the level of understanding and implementation of differentiated instruction practices of primary school teachers for students with learning difficulties and concluded that teachers seem to understand the practices more than they implement them. Furthermore, the findings of Fotopoulou’s (2017) study, which examined primary school teachers' views on the use of differentiated instruction in students with immigrant background and learning difficulties, showed that despite the fact that teachers are aware of differentiated instruction, they do not implement it in practice which contradicts the findings of this study because it was observed that knowledge implies

implementation of differentiated instruction.

6. Conclusion

Regarding the level of knowledge of suggested differentiated instruction practices, teachers are more familiar with the practice concerns teacher facilitation to systematically aid students in developing curiosity, pursuing topics that interest them, identifying intriguing questions, and time management, while among the other practices teachers are least familiar with the practice concerns agreement between student and teacher where freedoms are put in a place for designing and completing work.

Regarding the degree of implementation of suggested differentiated instruction practices in terms of "content differentiation", the highest percentages of respondents focus on the selection of the most crucial assignments for underachieving students with learning difficulties. Lower percentage of respondents stated that they use a variety of materials for students with learning difficulties, they use examples that meet interests or experiences of students with learning difficulties when they present course content, they provide additional material to students with learning difficulties who struggle to understand the course material easily, and provide more advanced options for students with learning difficulties who effortlessly master the course material. Finally, even lower percentages of teachers stated that they provide enrichment assignments to high-performing students with learning difficulties.

The majority of teachers regarding "process differentiation" highlight as the most frequently applied practice the adjustment of the pace of instruction based on the needs of each student with learning difficulties. To a significantly lesser extent teachers design assignments using alternative formats for students with learning difficulties, they use a variety of flexible grouping practices in class, they put students with learning difficulties in readiness based group with other students, and create assignments that allow students with learning difficulties to interact one another and understand the course content. Finally, to an even lesser extent teachers stated that they put students with learning difficulties in groups with other students based on what they are interested in.

The highest percentages of the teachers regarding "product differentiation" focus on the provision of extra support to students with learning difficulties who have difficulty finishing assignments, while the percentages of teachers who permit students with learning difficulties to present their products orally are lower and finally, the percentages concern the practice of enabling students with learning difficulties to present their products in writing are even lower.

According to "assessment differentiation" the highest percentages of respondents focus on the provision of more time for students with learning difficulties to complete tasks or exams. Significantly lower percentages of teachers modify assignment deadlines regarding the requirements and/or circumstances of students with learning difficulties, and they use three or more types of assessment to determine course grades, and finally even smaller percentages pre-assess students with learning difficulties before the lesson starts and use continuous and various assessments of students with learning difficulties.

Regarding "learning environment differentiation" the majority of teachers highlight as the most frequently used practice the conscious effort they make to ensure students with learning difficulties participate fairly and consistently in class. To a significantly lesser extent, teachers stated that they make a conscious effort to ensure each student with learning difficulties feels known, welcomed, and appreciated, encourage students with learning difficulties to help each other with students without difficulties, and finally, design assignments to foster a sense of community among students with and without learning difficulties.

Moreover, there is a positive correlation between teachers' knowledge of differentiated instruction and the frequency of its implementation to students with learning difficulties. Therefore, it was found that as the teachers' knowledge of differentiated instruction practices increases, the frequency of their implementation increases.

The discussion of the results of the present study highlighted aspects, which can be used for further research. In particular, the investigation of the perceptions of all those involved (teachers, students, educational leadership, parents, etc.) regarding the knowledge and the implementation of differentiated instruction practices to students with learning difficulties in the general classroom, at different levels of education, at a nationwide level and with the combined utilization of qualitative and quantitative research methods, constitutes a field of research open to researchers in the field, especially for the Greek educational reality.

Finally, the limitations of the present research include the use of a one-dimensional approach to the subject (use of only a quantitative method), the geographical limitation, the small sample, the very small participation of specialties and the inability to complete the questionnaire in person due to the pandemic of COVID-19.

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