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Original Research Article

Developmentally Appropriate Programs and Differentiated Teaching and Learning in Preschool Education: A Research Study

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Abstract: The social and cultural pluralism of modern reality has highlighted the different manifestations of student potential in terms of readiness, interests, experiences, culture, needs and learning capabilities, making the traditional, one-dimensional way of teaching and learning inadequate. Based on this logic, it seems that Differentiated Teaching and Learning constitutes a modern teaching perspective, which, through the utilization of Developmentally Appropriate Programs, is capable of responding to the complexity of the multi-level activation of the psycho-spiritual potential of each student, in the acquisition of skills, in their active involvement in the teaching process and in the development of motivation for the construction of new knowledge. The purpose of this research is to determine the degree of enhancement of the quality of the teaching provided, through the implementation of an annual educational intervention program with the implementation of Developmentally Appropriate Programs within the framework of Differentiated Teaching and Learning in kindergartens. The research was implemented in the academic year 2023-2024 in four (N:4) kindergartens in the Epirus region, of which two constituted the experimental groups and two the control groups. A structured questionnaire with open and closed-ended questions was used to collect the research data. The findings of the research highlighted the importance of utilizing Developmentally Appropriate Programs within the framework of Differentiated Teaching and Learning in providing high-quality education in preschool.

Keywords: Developmentally Appropriate Programs, Differentiated Teaching and Learning, preschool education.

1. DEVELOPMENTALLY APPROPRIATE PROGRAMS AND DIFFERENTIATED TEACHING AND LEARNING IN PRESCHOOL EDUCATION

In the modern educational reality, the complexity, differentiation and rapid redefinition of knowledge urgently call for distancing from established teaching practices as they seem unable to respond in a multifaceted and effective manner to the newly created needs of a heterogeneous student population and strongly raise the need for the provision of high-quality education and care. Developmentally Appropriate Programs seem to be the main representative of "best practices" in the field of preschool education, upgrading the quality provided in education (Jeone *et al*., 2020 · Cadima *et al*., 2019 · Ulfertsetal, 2019 Bredekamp & Copple, 2017. Sakelariou & Rentzou, 2013). Developmentally Appropriate Programs emphasize the all-round cultivation and development of the child (Brown, Feger, & Mowry, 2015), through active participation and interaction with subjects and objects and by using appropriate methods that respond to the learning profile, needs and developmental level of each child. They constitute a holistic approach that is based on the developmental course and the interactive process that takes place as children develop and learn (Doliopoulou, 2006: 121-122; Rentzou & Sakellariou, 2014: 58).

By the term "Developmentally Appropriate Programs" we refer to teaching that responds to the age, uniqueness, socioeconomic and cultural background of each child (Bredekamp & Copple, 2017; Sakellariou & Rentzou, 2013). At the center of the design and implementation of Differentiated Teaching and Learning is the child himself (Tomlinson, 2017). Therefore, in the forefront of teaching, where Developmentally Appropriate Programs are applied, the child himself plays a leading role, who develops and learns through active participation, interaction with classmates, the

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teacher, but also the materials and means available in the space (Mitsi, 2020; Sakellariou, Mitsi & Strati, 2021). According to Bredekamp and Copple (2019), Developmentally Appropriate Programs are characterized by four core principles: a) Development and learning are interconnected, b) Each child is unique, c) Children learn in multiple ways and at multiple rates, and d) Learning and development are influenced by the socio -cultural context. These principles are reflected in the practices of Developmentally Appropriate Programs, which include, among others, the active participation of children, the provision of opportunities for play and discovery, the integration of family and community, and the adaptation of practices to the individual needs and capabilities of children (NAEYC, 2020).

Differentiated Teaching and Learning is a modern teaching perspective capable of responding to the complexity of the multi-level activation of the psycho-spiritual potential of each student, in the acquisition of skills, in their active involvement in the teaching process and in the development of motivation for the construction of new knowledge (Tomlinson & Moon, 2014; Tomlinson, 2017; Valiandes & Neophytou, 2017; Sakellariou *et al*., 2024). Through Developmentally Appropriate Programs, the child takes initiatives, develops arguments, knows how to learn, seeks to successfully deal with conflicts and resolves possible emerging problems (Bredekamp & Copple, 2017; Sakellariou & Rentzou, 2013). Teaching based on Developmentally Appropriate Programs should be developmentally appropriate to the student's age, obey the principles of individualization and differentiation in terms of the needs and requirements of each child (Sakelariou & Rentzou , 2013), and take into account the life path of each child, coming from a different social, economic or cultural environment, a given which constitutes a basic principle in the philosophy of differentiation (Koutselini - Ioannidou & Pyrgiotakis , 2015).

Regarding Developmentally Appropriate Programs in the context of implementing Differentiated Teaching and Learning, the teacher must be very familiar with the learning profile, level of readiness and interests of each student in order to set realistic and achievable goals that will pursue his individual development (Tomlinson, 2017; Bredekamp & Copple, 2017; Mitsi, 2020). However, it is noted that Developmentally Appropriate Programs do not refer to an understandable teaching with simplified goals and simplified procedures (Bredekamp & Copple , 2017) and teaching based on differentiation is not understood only in the tactic of reducing or simplifying the material or even enriching it (Tomlinson, 2017), on the contrary, teaching is addressed to the learning needs and age-related development of each child, while the goals, activities and procedures are designed so as to achieve maximum learning outcomes based on individual progress and to arouse students' interest in learning (Bredekamp & Copple , 2017; Koutselinis - Ioannidou & Pyrgiotakis , 2015; Tomlinson , 2010; Valiantis & Neophytou, 2017). Good practices are not based on assumptions and predictions about teaching, learning and the student but on good knowledge of the child's developmental progress, the way knowledge is acquired and the formation of meaningful and effective teaching (Sakelariou & Rentzou, 2013; Rentzou, 2011; Bredekamp & Copple, 2017).

2. RESEARCH METHODOLOGY

2.1 Sample of the Research

The sample of our research consisted of four (N:4) kindergartens, two of which constituted the experimental groups and the other two the control groups from the region of Epirus. The kindergartens belonged to urban areas of the region of Epirus. In total, 80 kindergarten students participated, of which 39 kindergarten students attended the experimental classes and 41 students attended the control classes.

2.2 Research Period: The research was implemented in the 2023-2024 academic year and lasted the entire school year.

2.3 Research Tool

2.3.1 The Observation Key

The Observation Key is a useful tool that includes qualitative and quantitative criteria examining the basic teaching actions that the teacher should implement in order to meet the requirements of Developmentally Appropriate Programs and quality in the context of implementing Differentiated Teaching and Learning. The theoretical framework on which it is based has been validated using the Rasch model. The tool allows us to record the data that interests us in order to answer our questions and formulate suggestions for possible improvement of our practice and actions.

The Key followed the five-point scale an isosceles Likert -type scale of positions with ratings from 1 Not at all to 5 Very much, as well as, there were positions-questions in which the observer had to mark Yes, No or Not needed. While in the last question the observer had to choose one of the proposed answers for each question and there was the possibility to record some comments that concerned the teaching and would provide additional information.

The structure of the Observation Key includes in the initial information the following data: the name of the observer, the date, the group registration, whether it is experimental or control, the class, the school and finally the lesson. The Key was structured on the basis of the following seven (07) categories: a) Content Differentiation, b) Process and Activities Differentiation, c) Outcome Differentiation, d) Differentiated Teaching and Learning Environment, e) Assessment Differentiation, f) Differentiated Teaching and Student and finally g) Differentiated Teaching and Teacher.

In the first category, Content Differentiation, the observers record data regarding the degree of differentiation of the teaching content, i.e. what the student needs to learn and how he/she will be able to access basic information in the teaching of the teaching subject. In the second category, which concerns Process and Activity Differentiation, the observer records the extent to which the activities and processes in which students will be involved have been differentiated in order to understand the content and acquire new knowledge. In Outcome Differentiation, the observer will capture the ways in which students present the final product of their work and the ways in which students expressed what they gained from the teaching. In the next category, Differentiated Teaching and the Learning Environment, the observer explores the way in which the classroom is arranged and organized, so as to offer possibilities for choosing working methods, to provide the appropriate materials and means, as well as feelings of security and a friendly and pleasant learning environment. In Differentiated Assessment, the observer examines the ways in which the learning outcomes of the students are assessed, the time at which the assessment takes place in the teaching process, that is, whether an assessment is carried out before, after and during teaching. In the sixth category, Differentiated Teaching and the Student, the observer records data concerning the role that the student plays during the teaching process, the possibilities of choice that he has and the way in which he acquires knowledge. Finally, in the category Differentiated Teaching and the Teacher, the observer notes observations regarding the role of the teacher in the educational process, the teaching climate that he shapes, the way in which he treats students, that is, in general, the way in which he acts and behaves during the teaching of each learning subject.

In this observational key, our purpose was to examine most of the parameters related to the pedagogical and organizational differentiation of teaching and to record the frequency and degree to which elements of Differentiated Teaching and Learning are utilized in the teaching of a particular learning subject, both in experimental and control classes.

2.3.2 The ACEI (Global Guidelines Assessment) Assessment Scale

To evaluate the overall quality of care and education provided in the kindergartens that participated in the survey, the Greek translation of the ACEI Global evaluation scale was used. Guidelines Assessment – ACEI GGA (Association for Childhood Education International, 2006a. 2006b), which is completed by both the researcher and the research participant. It was therefore chosen to utilize this scale by the observer-researcher as well, as it is possible to provide important information regarding the quality of the education provided without and with the implementation of Developmentally Appropriate Practices in the context of Differentiated Teaching and Learning. The scale was completed every month in each class due to its scope but also based on the fact that it is possible to provide global results for the quality of education.

2.4 Methodological Approach

The present research study, which is based on an experimental design, includes pre-test and post -test, experimental groups as well as control groups (Vamvoukas, 2002). The research applied the experimental procedure with independent groups, ensuring that the experimental and control groups have similar characteristics and are comparable. Through random sampling, the selected groups are considered equivalent, which enhances the validity and reliability of the study, without requiring the prediction of the effects on the experimental variables (Cohen, Manion, & Morrison, 2008). In the experimental design, it was decided to follow the multi-methodological approach, with the use of quantitative and qualitative data (King, Keohane & Verba, 1994 ·Neumah, 2000 ·Yin, 2003). It was sought to obtain data using different and varied methods (Neumah, 2000; Yin, 2003).

2.5 The Timeline of the Collection of Research Material

In the research, the empirical material was collected from both the experimental classes and the corresponding control classes. An equal number of teachers and kindergarten departments participated in the research as control classes for the comparative study. The implementation of Developmentally Appropriate Programs within the framework of the differentiation of teaching and learning concerns all thematic areas and was carried out both in the morning and in the all-day program of the kindergartens in order to ensure continuity in the implementation. The teachers applied the Developmentally Appropriate Practices in their teaching within the framework of Differentiated Teaching in all the teaching subjects and learning areas respectively.

Teaching was planned, organized, conducted and evaluated on the basis of differentiation. The researcher was in constant communication and collaboration with the participating teachers in order to exchange views and express concerns. Regular meetings were also held with the participating teachers to plan and organize teaching within the framework of the intervention.

During the lessons, there were two observers who monitored the teaching and used research tools to evaluate the project.

2.6 Research Limitations

A key limitation of the research is the fact that the research was conducted in kindergartens belonging to a single region of the country. Furthermore, the research was implemented in preschool education, while it was appropriate to extend it to all levels of education.

2.7 Analysis Methods

The statistical package SPSS 25.0 for Windows was used for the analysis of quantitative data. The normality of quantitative variables was checked using the Kolmogorov - Smirnov test. Quantitative variables with a normal distribution were expressed as mean ± standard deviation. The paired sample t - test was used to calculate the differences before and after the intervention with a statistical significance level of p<0.001.

3. PRESENTATION OF RESULTS

3.1 Experimental Groups

In the measurements at the beginning and end of the experimental intervention, statistically significant differences are presented in all 8 dimensions, with higher values being presented in the experimental classes with the intervention. In all dimensions, the significance index p <0.001 indicates notable differences. Overall, the records per category of the key are presented in the table below:

Table 1: Comparison of mean values of experimental groups before and after the intervention based on the Observation Key

Observation key		Mean	Std. Deviation	Std. Error Mean	p-value
Differentiation of content and material	With intervention	3.0978	,79141	,11669	,000
	Without intervention	2.3913	,22914	,03379	
Process and Activity Differentiation	With intervention	12.8913	6.33589	,93418	,000
	Without intervention	7.4565	1.76013	,25952	
Result Differentiation	With intervention	10.7933	6.03569	,82318	,000
	Without intervention	6.4325	1.52368	,22679	
Differentiated Teaching and Learning Environment	With intervention	31.6957	1.60374	,23646	,000
	Without intervention	3.6739	,63436	,09353	
Evaluation differentiation	With intervention	9.0115	,63459	,09357	,001
	Without intervention	8.7967	,15325	,02259	
Teacher speaking time	With intervention	1.9130	1.31362	,19368	,00 0
	Without intervention	2.8174	,29762	,04388	
Differentiated teaching and student	With intervention	3.8678	,59876	,08828	,00 0
	Without intervention	1.6522	,94792	,13976	
Differentiated teaching and teacher	With intervention	3.3116	,15334	,02261	,00 0
	Without intervention	2.0739	,79371	,11703	

3.2 Control Classes

In the records of the observation key, before and after the implementation of the educational intervention in the experimental classes, statistically significant differences are presented in all 8 of its dimensions, with higher values being presented in the control classes after the intervention, i.e. at the end of the school year. In all dimensions, the significance index p <0.005 indicates notable differences.

Table 2: Comparison of control groups before and after the intervention based on the Observation Key

Observation key		Mean	Std. Deviation	Std. Error Mean	p - value
Differentiation of content and material	Before	2.2324	,23156	,02365	,000
	After	2.5354	,12365	,02153	
Process and Activity Differentiation	Before	8.5032	1.2064	,21578	,000
	After	9.3256	5.2135	,20139	
Result Differentiation	Before	7.2312	1.7369	,23546	,000
	After	8.9874	5.6159	,86491	
Differentiated Teaching and Learning Environment	Before	3.4632	, 56984	,24466	,000
	After	6.2315	1.53698	,19342	
Evaluation differentiation	Before	8.5627	,63164	,09642	,000
	After	8.8635	,36195	,03124	
Teacher speaking time	Before	2.9349	,23664	,04312	,000
	After	2.4362	,71456	,04325	
Differentiated teaching and student	Before	2.9632	,31534	,04657	,000
	After	3.6932	,51662	,08465	
Differentiated teaching and teacher	Before	2.0109	,73126	,12470	,000
	After	2.7236	,23548	,10390	

3.3 ACEI Rating Scale: Experimental and Control Group

Below we present a comparison table between the experimental and the control group that shows the records to the ACEI rating scale. The research data approve that the records are higher to the experimental group in comparison to the control group after the educational intervention.

Table 3: Comparison of experimental and control groups regarding the ACEI scale

ACEI rating scale					
Field 1 **Environment and Natural Space**		**Mean**	**Std. Deviation**	**Std. Error Mean**	**p -value**
Environment and natural space	Experimental	1.11	0.16	0.03	0.762
	Control	1.10	0.15	0.03	
Developmentally stimulating environment	Experimental	2.37	0.22	0.05	1
	Control	2.37	0.32	0.06	
Field 2 **Program Content and Pedagogy**		**Mean**	**Std. Deviation**	**Std. Error Mean**	**p -value**
The Curriculum	Experimental	2.38	0.30	0.06	0.825
	Control	2.35	0.35	0.07	
The content of the program	Experimental	2.63	0.42	0.09	0.833
	Control	2.65	0.49	0.10	
Pedagogical methods	Experimental	1.60	0.28	0.06	0.691
	Control	1.64	0.26	0.05	
Educational materials	Experimental	2.75	0.61	0.12	0.825
	Control	2.71	0.69	0.14	
Assessing children's progress	Experimental	1.93	0.25	0.05	0.781
	Control	1.95	0.27	0.05	
Evaluation of programs	Experimental	2.38	0.58	0.12	0.804
	Control	2.42	0.58	0.12	
Field 3 **Preschool Educators**		**Mean**	**Std. Deviation**	**Std. Error Mean**	**p -value**
Knowledge and performance	Experimental	1.75	0.15	0.03	0.555
	Control	1.78	0.17	0.04	
Personal and professional characteristics	Experimental	1.35	0.12	0.02	0.825
	Control	1.34	0.14	0.03	
Field 4 **Collaboration with Families and Communities**		**Mean**	**Std. Deviation**	**Std. Error Mean**	**p -value**
Moral/ethical dimensions	Experimental	1.00	,00000 [b]	0.00	-
	Control	1.00	,00000 [b]	0.00	
Program Policies/Teaching Philosophy	Experimental	2.67	0.41	0.08	1
	Control	2.67	0.38	0.08	
Communication with families	Experimental	2.56	0.37	0.08	0.589
	Control	2.63	0.42	0.09	
Ethical responsibilities and behaviors	Experimental	2.75	0.61	0.12	0.825
	Control	2.71	0.69	0.14	
Training and resources	Experimental	2.79	0.74	0.15	0.795
	Control	2.85	0.73	0.15	
Recognition/respect for diversity	Experimental	2.35	0.38	0.08	0.855
	Control	2.33	0.41	0.08	
The transition of children from home to the program	Experimental	2.78	0.38	0.08	1
	Control	2.78	0.35	0.07	
Opportunities for family and community involvement	Experimental	3.15	0.30	0.06	1
	Control	3.15	0.29	0.06	
Collaboration between various professionals-specialties	Experimental	2.75	0.61	0.12	0.825
	Control	2.71	0.69	0.14	
Field 5 **Young Children with Learning Difficulties and Low Performance**		**Mean**	**Std. Deviation**	**Std. Error Mean**	**p -value**
Access and equal opportunities for services	Experimental	2.15	0.21	0.04	0.891
	Control	2.16	0.20	0.04	
Shared philosophy and shared goal setting	Experimental	3.63	0.49	0.10	0.769

	Control	3.67	0.48	0.10	
Staff and specialists (psychologists, speech therapists, medical staff)	Experimental	1.69	0.29	0.06	0.804
	Control	1.71	0.29	0.06	
Service provision	Experimental	2.92	0.51	0.10	1
	Control	2.92	0.47	0.10	

4. DISCUSSION

The findings of this study document the enhancement of the quality of education through the implementation of Developmentally Appropriate Programs within the framework of Differentiated Teaching and Learning in mixed-ability classrooms at school age. Researchers argue that the use of Developmentally Appropriate Programs is associated with positive developmental outcomes for children (Jeon *et al*., 2020·Cadima *et al*., 2019· Ulfertsetal., 2019 Schachteretal., 2019). The study showed that through the implementation of Developmentally Appropriate Practices within the framework of Differentiated Teaching, both the structural and procedural characteristics that define, as research indicates, the quality of education are improved (Malik, & Hamel, 2017. Bredekamp & Copple, 2017 NAEYC, 2019). According to recent studies, Developmentally Appropriate Programs have proven to be particularly important for preschool education, as they contribute to the all-round development of children at the cognitive, socio -emotional, motor and language levels. Specifically, Developmentally Appropriate Programs enhance children's autonomy, self-confidence and self-regulation, while promoting the development of their social and emotional skills (Copple & Bredekamp, 2017; NAEYC, 2020). In addition, Developmentally Appropriate Programs favor all-round cognitive development, as they provide opportunities for active learning, problem solving and creative expression. Recent research has demonstrated the significant benefits of Developmentally Appropriate Programs in preschool education. Specifically, studies have shown that children who participate in programs that implement Developmentally Appropriate Programs perform better in cognitive, language, and socio -emotional domains, compared to children who participate in more traditional approaches. In addition, Developmentally Appropriate Programs have been shown to contribute to enhancing children's self-regulation, motor development, and creativity (Copple & Bredekamp, 2017; NAEYC, 2020).

When implementing Developmentally Appropriate Practices in the context of Differentiated Teaching and Learning, teaching was organized, adapted, and conducted to the learning profile of the students in the classroom (Tomlinson, 2017), although this practice has received strong negative criticism (Bannister, 2016). Research has found that this way of organizing and conducting teaching brought positive results to all members of the educational community. This element is in contrast to that of other research which claims that adapting teaching to learning styles does not contribute to maximizing learning outcomes (Riener, *et al*., 2010; Pashleretal., 2008; Coffield, *et al*., 2007).

Research has shown that in this way, teachers diagnosed the level of readiness of students and adapted the teaching objectives in order to be achieved by all students and to lead everyone to the maximum level of their potential (Coubergsetal, 2017; Dixonetal, 2019; Smit & Humpert, 2021; Tomlinson & Moon, 2013; Erotokritou -Stavrou, 2015). In contrast to the control classes and the experimental ones before the intervention, where the objectives for teaching the subject are specific and determined by the Curriculum without any deviations and without being adapted to the requirements of the specific student population but to a broader category of students who belong to the same age class with seemingly the same needs and the same point of learning readiness.

As recorded from the data of this study, there was no differentiation of the result in the control classes or in the experimental classes before the intervention. With the implementation of Developmentally Appropriate Practices in the context of Differentiated Teaching and Learning, students had the opportunity to choose the way to present their work, they could choose materials and means that were appropriate and interesting for them as well as various ways of expressing the result. Research has shown that the ability to choose materials and means by students in teaching is an important factor in more effective learning and maintaining students' interest (Kampezas, 2015; Deunk *et al*., 2018; Coubergsetal 2017; Dixone *et al*., 2019; Smit & Humpert, 2021; Karelou 2016).

During the intervention, a differentiation of the learning environment was observed with better and greater utilization of the available spaces, by enriching the learning environment with materials and means appropriate for the activities, needs and interests of the students. According to recent research, the creation of a supportive and flexible learning environment is a basic prerequisite for the effective implementation of differentiated teaching (Coubergs *et al*., 2017). Such an environment is characterized by the provision of a variety of learning experiences and resources, the enhancement of collaboration and interaction between students, as well as the support of students' autonomy and active involvement in the learning process (Coubergsetal, 2017).

Regarding the evaluation in the experimental classes, the research found that during teaching, teachers followed all forms of evaluation, the initial, the

intermediate and the final, in contrast to the control classes and the experimental classes before the intervention where the main form of evaluation applied was the final-summative. The basic principle of differentiation is the utilization of all forms of evaluation, the initial in order to determine the level at which the students are, to determine the starting point for each student, the formative evaluation which is continuous and is a key factor in adjusting or improving teaching with a feedback character, and the summative evaluation which evaluates the effectiveness of teaching (Tomlinson, 2001; 2014). Differentiated assessment must be continuous, support learning, and help teachers address real needs, identify students' strengths and weaknesses (Subban & Round, 2015).

In the experimental classes, from the data collection, both quantitative and qualitative, it was observed that the teachers were satisfied with the form of teaching that they planned and implemented. Through the implementation of Developmentally Appropriate Practices in the context of Differentiated Teaching and Learning, they were able to enrich their professional knowledge about the development, progress and learning of children, but also to apply in practice what they had acquired as theory. The transition from theory to practice cultivated skills in planning and implementing Differentiated Teaching as well as enhanced the self-confidence, satisfaction and enthusiasm of the teachers from maximizing learning outcomes (Stavrou Erotokritou & Koutselini, 2016). Teacher satisfaction is a determining factor for the quality of education provided to students. When teachers feel satisfied with their work, they are able to provide high-quality teaching, be more committed to their profession and contribute to improving student learning outcomes (Skaalvik & Skaalvik, 2017). In addition, the quality of the relationships that teachers develop with their students, as well as the feedback they receive from their parents and principals, are important factors contributing to their satisfaction. When teachers feel that they have positive relationships with their students and receive encouragement and feedback for their work, they experience higher levels of satisfaction (Veldman *et al*., 2020).

5. CONCLUSION

Preschool education is a foundation for the child's later academic and social development. One of the most important issues in preschool education is the creation and implementation of developmentally appropriate programs that should be designed based on the needs and developmental stages of preschool children. Differentiated Teaching and Learning with the use of developmentally appropriate programs is an important tool for promoting the all-round development of preschool children. Their implementation is essential for the creation of a quality and effective preschool education.

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