

# The Implementation of the Differentiated Instruction in Higher Education: A Research Review

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## Abstract

Meeting the diverse and various needs of learners, who come from different cultural and social environments, imposes changes in a modern education system through the implementation of new teaching approaches and practices, such as differentiated instruction. This literature review examines 16 studies regarding differentiated instruction in higher education which have taken place during the last decade. The results of the research revealed that differentiated instruction contributes to mobilizing preservice teachers, improving their performance and developing positive attitudes and beliefs of trainees and educators in higher education. There is also a need for further research regarding the effectiveness of the implementation of differentiated instruction in higher education, especially in Greece, where no relevant research has been conducted, compared to the international field.

**Keywords:** differentiated instruction; higher education; basic teacher education

## 1. Introduction

In a modern educational system, educators are asked to address the diverse and various needs of learners who come from different cultural and social environments. Differentiated instruction is a teaching practice that focuses on learners and aims to mitigate inequalities and differences between them as they have different abilities, skills and learning styles (Chamberlin & Powers, 2010).

In particular, according to Tomlinson (2001), differentiated instruction is an approach to organizing teaching that can offer learners a variety of learning choices that meet their different needs. Trainees can understand the content in different ways, process ideas and show what they have learned. The adoption of differentiated instruction incorporates a variety of approaches, principles, organization, teaching and assessment that allow educators to move away from the traditional way of teaching which focuses on teacher and frontline teaching and leads many learners to failure (Dosch & Zidon, 2014). Differentiated instruction modifies curricula, teaching methods, learning activities and assessments to maximize learning effectiveness (Subban, 2006; Tomlinson, 1999).

The implementation of differentiated instruction in higher education has been investigated in a limited number of studies, compared to the number of studies carried out in secondary and mainly in primary education (Dosch & Zidon, 2014; Tulbure, 2011), suggesting that many primary teachers use differentiated instruction, less in secondary and even fewer in higher education. The reasons for the limited implementation of this particular teaching approach in higher education are due to the large number of student divisions, the number of contact hours that are minimal as well as the time required to plan various ways of evaluating them which are time consuming and difficult for teachers who, in addition to teaching, are in charge of research tasks (Ernst & Ernst, 2005).

In these few studies, which were conducted to investigate the contribution of differentiated instruction in higher education, there was a significant academic performance among students who were taught differentiated instruction compared to those who were taught traditional teaching (Graham, 2009). However, further studies are needed to investigate the contribution of this educational approach to students' academic success.

Tulbure (2011) in her research on the relationship of differentiated instruction with students' learning styles in higher education, presents the quantitative empirical studies that she identified over 25 years (1985-2010) by grouping them according to results in three categories presented in Table 1.

**Table 1.** Empirical Studies Focusing on Differentiated Instruction, According to a Research by Tulbure (2011)

Categories of result	Empirical studies
Differentiating instruction upon personal learning styles leads to an improvement in the level of learning results	Abraham (1985)
	Bajraktarevic, Hall & Fullick (2003) Dunn et al. (1995)
	Easter (1994)
	Felder (1993)
	Ford & Chen (2001)
	Marshall (1991)
	Mickler and Zippert (1987)
	Nelson et al. (1993)
	Tulbure (2010)
Differentiating the strategies of instruction upon learning styles does not affect the level of learning	Akdemir & Koszalka (2008)
	Cook, Thompson, et al. (2009)
	Massa & Mayer (2006)
The lack of concordance between learning styles and didactic strategies stimulates and makes the learning process flexible	Baker et al. (1988)
	Cavanagh & Coffin (1994)
	Kowoser & Berman (1996)

## 2. Differentiated Instruction: A Theoretical Approach

Higher education curricula for future teachers are designed to develop the appropriate pedagogical skills and competencies to meet students' different classroom needs. However, this goal is not always achieved, as some preservice teachers still face serious problems in bridging the gap between theory and effective classroom practice, making it necessary for the University curricula to be adapted (Joseph, 2013). Achieving this adjustment requires the implementation of differentiated instruction which is an innovative educational strategy, based according to Tomlinson and Imbeau (2010) on the fact that students of the same age differ in their readiness to learn, their interests, how they learn, their experiences and living conditions. The differences between them are significant enough to greatly influence what they need to learn. Students will also learn better when they can make connections between the curriculum and their interests and life experiences, and finally the educational process aims to maximize each child's ability.

A key principle of differentiated instruction is the notification by the trainer to the trainees of what is necessary for them to learn about a subject in order to link curriculum and teaching with assessment. In a differentiated classroom, evaluation is ongoing and serves to feedback the teaching. Teachers also accept differences between learners and respond with the expectation that they will understand what they can do (Chamberlin & Powers, 2010). Students can participate in teamwork that cultivates their critical thinking and fosters their personal development through collaboration with each other as well as with educators. The

latter form various groups flexibly and direct discussions throughout the classroom. Trainees work in these groups based on their readiness, interests, or learning profiles. Teaching is also organized to address learners' different preferences by making appropriate use of space, time and logistical infrastructure (Chamberlin & Powers, 2010).

The design of differentiated instruction is centered on the student and the curriculum (Panteliadou, 2008). The first axis, which focuses on the particular needs of each student, is distinguished by readiness, interest and learning style (Tomlinson, 2001). In more detail, readiness reflects the cognitive level of each student, who by making appropriate use of his / her abilities, skills and inclinations, can, with the implementation of differentiated instruction, move to the next level of knowledge (Kosivaki, 2002), according to the theory of zone of proximal development by Vygotsky (1986). Also, the interests of the student through differentiated instruction are more activated by his motivation due to his active involvement in learning. The learning style characterizes the student's learning style and according to Gardner (1993) relates to his type of intelligence.

The second axis focuses on the teaching that is defined by the curriculum and includes the content, its process, the final product and the learning environment. By varying the content, teachers modify or adjust students' access to educational material to facilitate their acquisition of knowledge and encourage them to learn at their own pace within set deadlines. Process differentiation involves providing students with a variety of activities that are offered to help students understand what they need to learn (Tomlinson, 2001). The process is the way with which the content or curriculum is taught and the different ways that students are invited to learn. By differentiating the final product, students can demonstrate or present what they have learned in a variety of ways which match their learning abilities and interests (Anderson, 2007). The differentiation of the environment in which a student learns must be adapted to the individual learning styles, preferences and needs of students.

Differentiated instruction has many benefits for both the learner and the educator. This teaching practice enhances collegiality and cooperation, provides motivations and facilitates students to link theory to practice. With this connection students improve their knowledge and discover new interests (Santangelo & Tomlinson, 2009). With differentiated instruction, students are at the center of the teaching process, their needs and preferred ways of learning are met and their success is assured (Tulbure, 2011). In addition, differentiated instruction enables educators to respond rather than react to students' unique and individual personalities, backgrounds, and abilities (Anderson, 2007).

However, in some studies obstacles appear as far as the implementation of differentiated instruction is concerned. These include lack of administrative support (Hertberg-Davis & Brighton, 2006), fear of lowering student scores (Tieso, 2004), lack of time to design differentiated instruction (Hertberg-Davis & Brighton, 2006) and uncertainty about students' reaction to it (Knopper & Fertig, 2005). Despite these difficulties, differentiation becomes more effective when teachers are motivated and provided with the appropriate conditions to implement differentiated instruction (Tomlinson, 2005).

### 3. Purpose and Research Questions

The main purpose of the present study is to investigate the effectiveness of the implementation of differentiated instruction on the continuous improvement of the basic education of preservice teachers in higher education through the analysis of 16 studies from the international field conducted over the last decade (2008-2018). In particular, the contribution of differentiated instruction in mobilizing and improving the performance of preservice teachers, the attitudes and beliefs of preservice teachers as well as their educators about the use of this particular teaching approach, the advantages, disadvantages and its effective implementation in teacher basic education are examined.

Indicative questions put to the investigation and which the research will attempt to answer are the following:

1<sup>st</sup>: Is there a mobilization of preservice teachers in achieving specific goals and improving their performance as a result of implementing differentiated instruction?

2<sup>nd</sup>: Do preservice teachers and their educators form more positive beliefs and attitudes as a result of implementation of differentiated instruction?

3<sup>rd</sup>: Are there advantages from the implementation of differentiated instruction?

4<sup>th</sup>: Are there difficulties in implementing differentiated instruction to influence the intention of preservice teachers to use it? If so, which ones?

5<sup>th</sup>: What are the conditions and procedures for effective implementation of differentiated instruction?

6<sup>th</sup>: What is the methodological design used in the studies under consideration?

7<sup>th</sup>: In which subjects was differentiated instruction implemented in higher education and what was its purpose?

### 4. Method

For the purposes of the present study, the literature review was conducted via search engines in databases: google scholar, ERIC, Taylor & Francis with the keywords: differentiated instruction in higher education. These databases were selected because of their accessibility and therefore their selection is a limitation for the present research. The bibliographic review includes 16 research articles and doctoral theses, published over the last decade (2008 - 2018) in the international field and related to our research questions. Greek literature has identified a research carried out in Cyprus.

### 5. Results of the Research

The results of the research initially include data regarding the number of studies examined per year, their country of origin, the type and size of the sample. The results of the present

study are then presented in detail by research question.

Table 2 summarizes the main results of the literature review of researches as far as the implementation of differentiated instruction in higher education is concerned.

**Table 2.** Main Results of the Literature Review of Researches on the Implementation of Differentiated Instruction in Higher Education

Researchers Year Country	Purpose	Type of research Sample size Lesson	Research results
Bianchini & Brenner 2009 USA	Exploring the support or limitation of novice teachers' efforts to teach Science and Mathematics through differentiated instruction.	Qualitative 2 Mathematics Science	Novice teachers felt that this program contributed little to their learning to teach differentiated instruction in Science and Mathematics .
Santangelo & Tomlinson 2009 USA	To examine the nature and impact of using differentiated instruction in an introductory-level graduate course.	self-study research 25 Education and Psychology of Exceptional Learners	Differentiation had a positive and meaningful impact on student learning. Students' class performance and their reflections on the experience indicated that students were appropriately challenged and were able to find meaning and relevance in the course content and activities
Butler & Van Lowe 2010 USA	Investigation of using differentiated instruction in Mathematics education for preservice teachers.	Mixed 39 Mathematics	Students who participated in the differentiated lesson performed better than those who followed traditional teaching, but not all were satisfied with the differentiation. Many of the students who made positive comments about differentiation pointed to the increased interest of the

Chamberlin & Powers 2010 USA	Investigation of using differentiated instruction in an undergraduate Mathematics course for addressing such concerns and there by improving students' mathematical learning	Mixed 224 students & 7 educators Mathematics	teacher, which influenced them positively, while others thought that differentiation was a waste of time. Students receiving differentiated instruction experienced greater gains in their mathematical understandings
Goodnough 2010 Canada	Investigation of students perceptions of differentiated instruction of the Science course.	Action research 32 Science	Students understand the potentials and difficulties of implementing differentiated instruction, which requires time, effort, careful planning, knowledge of differentiated instruction, and flexibility on the part of the teacher.
Symeonidou & Kyriakides 2010 Cyprus	Investigating the degree of students' ability in planning and adapting lessons by implementing differentiated instruction.	Teaching 94 School Experience	There are significant shortcomings in the implementation of differentiated instruction and improvement in the organization and content of undergraduate students teaching is needed to overcome the difficulties of differentiation and to know how to successfully implement it.
Williams-Black, Bailey & Lawson 2010 USA	Investigating how university professors are differentiating instruction in their undergraduate and graduate level reading courses.	Qualitative 6 Reading	The study identified various methods for how teachers differentiated content, process, product and environment in the graduate program and undergraduate courses.

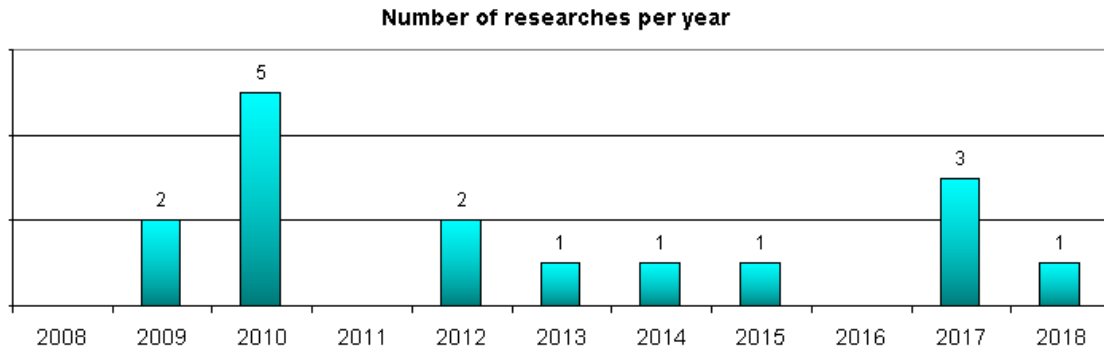
Mok 2012 Singapore	Investigating the implementation of differentiated instruction with lab exercises in an undergraduate programming course of Computer science and recording students perceptions of them.	Mixed 267 Computer science	Findings reveal that these tiered exercises are generally very well received by the students and preferred over their traditional “one size fits all” counterparts. Although the study does not show that tiered exercises have improved proficiency or scores, it does seem to indicate higher student engagement and motivation levels.
Tricarico & Yendol Hoppey 2012 USA	– Investigating teachers' ability to design and implement differentiated instruction.	Qualitative 3 Alternative Certification Programs	Some teachers are more capable of reflecting and taking immediate initiatives in their classrooms, especially as they appear to be able to monitor learners' behavior, while others show insecurity in taking action.
Joseph 2013 Trinidad	Investigating what preservice and in service trained teachers understand about differentiated instruction and the extent to which they practiced it in their classrooms.	Mixed 379 No lesson reported	58% of respondents understood the concept of differentiated instruction. However, the majority of teachers did not differentiate content and product in their classrooms. The study also highlighted various difficulties in implementing differentiated instruction, such as lack of time for planning, limited space for teamwork, and lack of administrative support.
Dosch & Zidon 2014	Investigating the effectiveness of the implementation of differentiated	Quantitative 77	The team that implemented differentiated instruction perceived its methods as beneficial to their learning,



USA	instruction in higher education.	Educational Psychology		and this team performed better than the traditional teaching team on assignments and exams.
Dack 2015 USA	Investigating how novice teachers implement the model of Tomlinson's differentiated instruction to a teacher preparation lesson.	Qualitative 2	Language Arts, Mathematics	The trainers gained new knowledge to differentiated instruction as they deepened their holistic understanding of the model and resolved their misunderstandings. Differentiation is important for the professional and academic success of future students.
Evans-Hellman & Haney 2017 USA	Research to record students' familiarity and perceptions of differentiation and their intention to use it in their future classroom teaching.	Quantitative 218 No lesson reported		Students' familiarity with differentiated instruction over time increases within the curricula, but there are differences between the programs.
Jackson & Evans 2017 USA	Investigating the teaching experiences and expectations of two teachers who shaped their philosophy and practices of differentiated instruction in teacher education programs.	Qualitative 2 No lesson reported		It is clear from the reflection of the two teachers that differentiated instruction is focused on the student who is actively involved, is interrelated with the assessment and is required in teacher preparation programs.
Turner, Solis & Kincade 2017 USA	Research for the instructors' understanding of differentiated instruction and their perceptions of the challenges of implementing it to large classes	Qualitative 20	Arts, Humanities, Social and Human Sciences.	Differentiated instruction in large classes at a research university is challenging. Moreover, instructors teaching large classes need a better understanding of differentiated instructional strategies and how to implement them.

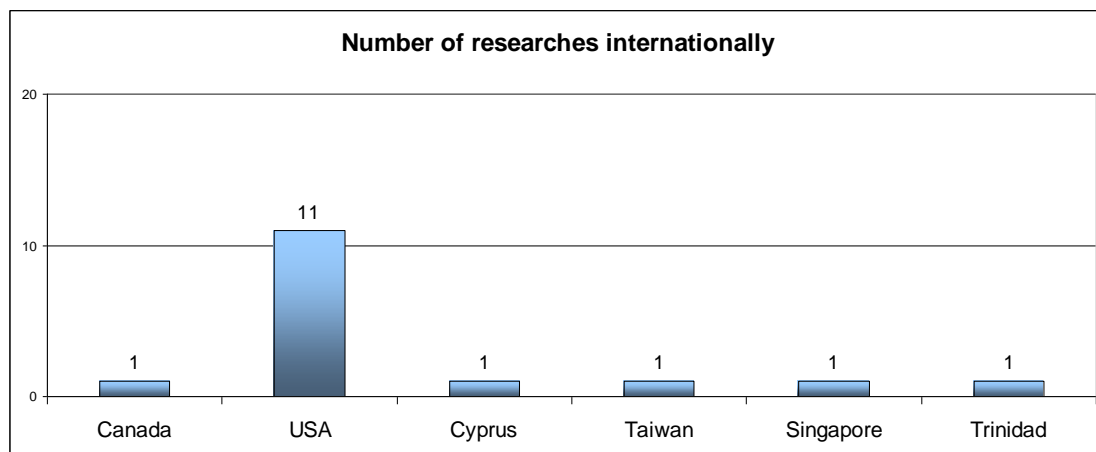
Chen & Chen 2018 Taiwan	Research on students' motivations, academic achievements, attitudes and perceptions about differentiated instruction within a calculus curriculum.	Quasi-experimental 60 Mathematics	Differentiation improved mathematical achievement, student learning motivation and teaching effectiveness. The results supported the effectiveness of differentiated instruction in the curriculum.
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Figure 1 shows the number of researches per year.



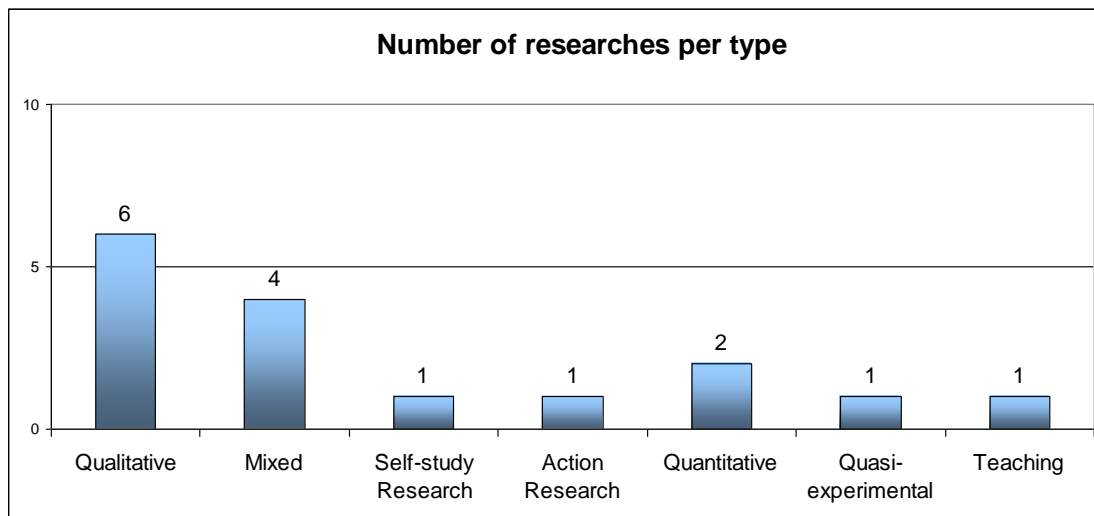
**Figure 1.** Number of Researches per Year

Figure 2 shows the number of researches internationally.



**Figure 2.** Number of Researches Internationally

Figure 3 shows the number of researches per type.



**Figure 3.** Number of Researches per Type

1st Research question: Is there a mobilization of preservice teachers in achieving specific goals and improving their performance as a result of implementing differentiated instruction?

As shown in Table 2, several researches (37.5%, N = 6) show that the implementation of differentiated instruction mobilizes preservice teachers to achieve specific goals and improve their performance (Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Chamberlin & Powers, 2010; Dosch & Zidon, 2014; Dack, 2015; Chen & Chen, 2018). More specifically, students reported that differentiation had a positive and meaningful impact on their learning, performed better than those who followed traditional teaching and benefited the most. However, one study was found (6.25%), which showed that while differentiated instruction provided students with incentives to learn, there was no improvement in their grades (Mok, 2012).

2nd Research question: Do preservice teachers and their educators form more positive beliefs and attitudes as a result of implementation of differentiated instruction?

According to the results of the research (Table 2) in some surveys (25%, N = 4) preservice teachers participating in the implementation of differentiated instruction formed more positive beliefs and attitudes (Santangelo & Tomlinson, 2009; Joseph, 2013; Evans-Hellman & Haney, 2017; Chen & Chen, 2018). In particular, students understood better the concept of differentiated instruction and by increasing their motivation for learning as well as through reflection they supported the effectiveness of differentiated instruction in their curriculum. However, there are two researches (12.5%), with the first recording that novice teachers felt that the program they participated in had little contribution to their learning to teach with differentiated instruction Science and Mathematics (Bianchini & Brenner, 2009) and in second, not all students were satisfied with the implementation of differentiated instruction. Most of the students who made positive comments about differentiation pointed to the increased interest of the teacher, which influenced them positively, while others thought that

differentiation was a waste of time (Butler & Van Lowe, 2010).

Regarding the development of more positive beliefs and attitudes of preservice teachers educators, two studies (12.5%) were identified, where the first found that educators gained new knowledge about teaching differentiation as they deepened their holistic understanding of the model and resolved their misunderstandings (Dack, 2015), while in the second differentiated instruction has been a challenge for educators as they need to better understand its educational strategies and ways of implementing them (Turner et al., 2017).

3rd Research question: Are there advantages from the implementation of differentiated instruction?

As shown in Table 2, most researches (50%, N = 8) refer to the advantages of implementing differentiated instruction (Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Williams-Black et al., 2010; Tricarico & Yendol-Hoppey, 2012; Dosch & Zidon, 2014; Dack, 2015; Jackson & Evans, 2017; Chen & Chen, 2018). Specifically, the benefits of differentiated instruction include focusing on the learner who is actively engaged in teaching, reflection, through which some teachers take direct initiatives in their classrooms, the increased interest of the teacher, the different methods in which teachers differentiate content, process, product and environment, effectiveness of teaching and the professional and academic success of preservice teachers.

4th Research question: Are there difficulties in implementing differentiated instruction to influence the intention of preservice teachers to use it? If so, which ones?

According to the research results (Table 2) in some surveys (31.25%, N = 5), difficulties in implementing differentiated instruction are recorded (Butler & Van Lowe, 2010; Goodnough, 2010; Symeonidou & Kyriakides, 2010; Tricarico & Yendol - Hoppey, 2012; Joseph, 2013; Turner et al., 2017). The most important difficulties are the large number of classroom learners, the lack of time for careful planning of teaching, the limited space for teamwork, the difficulties in organizing and teaching content, the insecurity of taking initiatives and some administrative support.

5th Research question: What are the conditions and procedures for effective implementation of differentiated instruction?

Based on the results of the research (Table 2) in a few surveys (18.75%, N = 3) the conditions and procedures for effective implementation of differentiated instruction are recorded (Goodnough, 2010; Symeonidou & Kyriakides, 2010; Joseph, 2013). More specifically, in these researches careful planning and organization of teaching, knowledge of differentiated instruction, availability of time, flexibility on the part of the teacher, and support from the administration are recorded as basic requirements and procedures for effective implementation of differentiated instruction.

6th Research question: What is the methodological design used in the studies under consideration?

The following table 3 presents the methodological design (type of survey, number and

corresponding percentage of specific researches) of this study.

**Table 3.** Methodological Design

Type of researches	Researches	Percentages
Qualitative	4	25%
Mixed	4	25%
Quantitative	2	12,5%
Action Research	1	6,25%
Quasi-experimental	1	6,25%
Self-study research	1	6,25%
Teaching	1	6,25%

Regarding the sample size, as shown in Table 4, most researches used a sample consisting of fewer than 50 individuals. Three researches using a sample ranging from 50-100 individuals were also identified and four researches using a sample of 100 individuals and more.

**Table 4.** Sample Size

Sample size	Researches	Percentages
Less than 50 people	9	56,25%
From 50 to 100 people	3	18,75%
More than 100 people	4	25%

7th Research question: In which subjects was differentiated instruction implemented in higher education and what was its purpose?

Regarding the cognitive subjects on which differentiated instruction was implemented, as shown in Table 5, it is observed that most researches have been implemented to the Mathematics course (Bianchini & Brenner, 2009; Butler & Van Lowe, 2010; Chamberlin & Powers, 2010; Dack, 2015; Chen & Chen, 2018), followed by other courses such as Science (Bianchini & Brenner, 2009; Goodnough, 2010), the Education and Psychology of Excellent Students (Santangelo & Tomlinson, 2009), School Experience (Symeonidou & Kyriakides, 2010), Reading (Williams-Black et al., 2010), Computer Science (Mok, 2012), Teacher Certification Programs (Tricarico & Yendol - Hoppey, 2012), Educational Psychology (Dosch & Zidon, 2014), Language Arts (Dack, 2015), Humanities and Social Sciences (Turner et al., 2017), Arts (Turner et al., 2017). Finally, there are three researches that do not mention the cognitive subjects in which differentiated instruction was implemented (Joseph, 2013; Evans-Hellman & Haney, 2017; Jackson & Evans, 2017).

**Table 5.** Cognitive Subjects

Cognitive subjects	Number of researches	Percentages
Mathematics	5	31,25%
Science	2	12,5%
Education and Psychology of Excellent Students	1	6,25%
School Experience	1	6,25%
Reading	1	6,25%
Computer Science	1	6,25%
Teacher Certification Programs	1	6,25%
Educational Psychology	1	6,25%
Language Arts	1	6,25%
Humanities	1	6,25%
Social Sciences	1	6,25%
Arts	1	6,25%
Do not mention the cognitive subject	3	18,75%

Regarding the purpose of implementing differentiated instruction it appears that studies have investigated the effectiveness of implementing differentiated instruction in higher education (Bianchini & Brenner, 2009; Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Tricarico & Yendol - Hoppey, 2012; Dosch & Zidon, 2014). More specifically, several studies focused on the perceptions of participating preservice teachers and their educators (Goodnough, 2010; Mok, 2012; Evans-Hellman & Haney, 2017), while others examined the extent to which preservice teachers were familiar with the implementation of this particular teaching practice and the benefits they gained (Chamberlin & Powers, 2010; Symeonidou & Kyriakides, 2010; Williams-Black et al., 2010; Joseph, 2013).

## 6. Discussion of Research Results

Overall the average research per year from 2008-2018 is 1.6. All researches have been conducted internationally and the largest number of them have been conducted in the US (n = 11), with the smallest number being carried out in other countries. In Greece, no research has been found on differentiated instruction in higher education.

Regarding the contribution of differentiated instruction in the mobilization of preservice teachers for the achievement of specific goals pursued and the improvement of their performance in higher education (first research question), the results of the present study show that differentiated instruction contributes to the mobilization of preservice teachers in achieving specific goals pursued and in improving their performance in higher education internationally (Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Chamberlin & Powers, 2010; Dosch & Zidon, 2014; Dack, 2015; Chen & Chen, 2018). More specifically, the larger number of studies show that differentiation had a positive and significant impact on students' learning, as they benefited more and performed better than those students who

followed traditional teaching. However, a study was found that showed that while differentiated instruction provided students with incentives to learn, there was no improvement in their grades (Mok, 2012). Mobilization of learners in achieving specific goals and improving their performance by implementing differentiated instruction is confirmed by other researchers in international literature (Ford & Chen, 2001; Tomlinson et al., 2003).

Regarding the attitudes and beliefs of preservice teachers and their educators about the contribution of differentiated instruction in improving the effectiveness of internships (second research question), few studies have been identified internationally, where preservice teachers developed more positive beliefs and attitudes by participating in the implementation of differentiated instruction they (Santangelo & Tomlinson, 2009; Joseph, 2013; Evans-Hellman & Haney, 2017; Chen & Chen, 2018). In particular, students were better aware of the concept of differentiated instruction and by increasing their learning motivation and through reflection they supported the effectiveness of differentiated instruction in their curriculum. However, there are two studies the first of which states that novice teachers felt that the program they took part in had little contribution to their learning to teach with differentiated instruction Science and Mathematics (Bianchini & Brenner, 2009) and the second that they were not all students satisfied with the implementation of differentiated instruction. Most of the students who made positive comments about differentiation pointed to the increased interest of the teacher, which influenced them positively, while others thought that differentiation was a waste of time (Butler & Van Lowe, 2010).

Also, as far as the attitudes and beliefs about the differentiated instruction of educators of preservice teachers in higher education are concerned, a small number of studies were found, which pointed out that the educators gained new knowledge about the differentiation of teaching as they deepened their holistic understanding of the model and resolved their misunderstandings (Dack, 2015). In addition, differentiated instruction has been a challenge for educators as they need to better understand its educational strategies and how they are implemented (Turner et al., 2017). The formulation of more positive beliefs and attitudes of preservice teachers and their educators as a result of the implementation of differentiated instruction is also demonstrated by other researchers (Tulbure, 2011).

Regarding the advantages of implementing differentiated instruction in higher education (third research question) several researches have been examined internationally (Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Williams-Black et al., 2010; Tricarico & Yendol-Hoppey, 2012; Dosch & Zidon, 2014; Dack, 2015; Jackson & Evans, 2017; Chen & Chen, 2018). More specifically, as advantages of differentiated instruction focusing on the learner who is actively involved in teaching, reflection, through which some teachers take direct initiatives in their classrooms, the increased interest of teachers, the various methods in which teachers differentiate the content, process, product and environment, the effectiveness of teaching and the professional and academic success of preservice teachers are recorded. These findings are also confirmed by other researchers (Tulbure, 2011).

Regarding the difficulties in implementing differentiated instruction in higher education

(fourth research question), a small number of studies have been identified internationally (Butler & Van Lowe, 2010; Goodnough, 2010; Symeonidou & Kyriakides, 2010; Tricarico & Yendol – Hoppey, 2012; Joseph, 2013; Turner et al., 2017). As major difficulties the large number of classroom learners, the lack of time for careful planning of teaching, the limited space for teamwork, the difficulties in organizing and teaching content, the insecurity of taking initiatives by some teachers and the lack of administrative support are mentioned. These findings are in line with the results of other researchers (Ernst & Ernst, 2005; Tulbure, 2011).

Concerning the conditions and procedures for the effective implementation of differentiated instruction in higher education (fifth research question), few researches have been examined internationally (Goodnough, 2010; Symeonidou & Kyriakides, 2010; Joseph, 2013). As the most important prerequisites for effective implementation of differentiated instruction careful planning and organization of teaching, knowledge of differentiated instruction, availability of time, flexibility on the part of the teacher and support from the administration are recorded. These findings are also documented in other relevant researches (Buck & Cordes, 2005).

Regarding the methodological design used in the examined studies on differentiated instruction in higher education internationally (sixth research question) most researches implemented qualitative research (Bianchini & Brenner, 2009; Williams-Black et al., 2010; Tricarico & Yendol - Hoppey, 2012; Dack, 2015; Jackson & Evans, 2017; Turner et al., 2017) and the mixed method (Butler & Van Lowe, 2010; Chamberlin & Powers, 2010; Mok, 2012; Joseph, 2013), while less the quantitative method (Dosch & Zidon, 2014; Evans-Hellman & Haney, 2017) and even less Action Research (Goodnough, 2010), Quasi-experimental (Chen & Chen, 2018), Self-study research (Santangelo & Tomlinson, 2009) and Teaching (Symeonidou & Kyriakides, 2010). Regarding the sample size, most researches used a sample consisting of fewer than 50 individuals. Three researches using a sample ranging from 50-100 individuals were also identified and four researches using a sample of more than one hundred individuals.

Concerning the cognitive subjects in which differentiated instruction has been implemented in higher education internationally, and the purpose of its implementation, (seventh research question), it is observed that most researches have been implemented on the Mathematics course (Bianchini & Brenner, 2009; Butler & Van Lowe, 2010; Chamberlin & Powers, 2010; Dack, 2015; Chen & Chen, 2018), followed by other courses such as Science (Bianchini & Brenner, 2009; Goodnough, 2010), the Education and Psychology of Excellent Student (Santangelo & Tomlinson, 2009), School Experience (Symeonidou & Kyriakides, 2010), Reading (Williams-Black et al., 2010), Computer Science (Mok, 2012), Teacher Certification Programs (Tricarico & Yendol - Hoppey, 2012), Educational Psychology (Dosch & Zidon, 2014), Language Arts (Dack, 2015), Humanities and Social Sciences (Turner et al., 2017) and the Arts (Turner et al., 2017). Finally, there are three studies that do not mention the cognitive subjects in which differentiated instruction was implemented (Joseph, 2013; Evans-Hellman & Haney, 2017; Jackson & Evans, 2017).

Regarding the purpose of implementing differentiated instruction it appears that the studies



have investigated the effectiveness of implementing differentiated instruction in higher education (Bianchini & Brenner, 2009; Santangelo & Tomlinson, 2009; Butler & Van Lowe, 2010; Tricarico & Yendol - Hoppey, 2012; Dosch & Zidon, 2014). More specifically, several studies have focused on the perceptions of participating preservice teachers and their educators (Goodnough, 2010; Mok, 2012; Evans-Hellman & Haney, 2017) and some have examined the extent to which preservice teachers are familiar with the implementation of specific teaching practice and the benefits they gained (Chamberlin & Powers, 2010; Symeonidou & Kyriakides, 2010; Williams-Black et al., 2010; Joseph, 2013).

## 7. Conclusions

The review of the researches studied in the last decade, results in an average 1.6 per year with most of them being conducted in the US, while none in Greece.

In particular, regarding the mobilization of preservice teachers in achieving specific goals and improving their performance, it appears that differentiation had a positive and significant impact on student learning as they benefited more and performed better than those students who attended traditional teaching. However, a study was found that showed that while differentiated instruction provided students with incentives to learn, there was no improvement in their grades. It also appears that a small number of researches have been identified in this field in higher education internationally, while no research has been conducted in Greece. Consequently, there is a need for further exploration of this variable in the international field and in Greece and in more teaching subjects.

Regarding the attitudes and beliefs of preservice teachers in differentiated instruction few researches have been found internationally while in Greece no research was found. Moreover, from the researches that have been examined the positive beliefs and attitudes of preservice teachers are shown, as they better understand the concept of differentiated instruction and by increasing their learning motivation as well as through reflection they supported the effectiveness of their differentiated instruction in their curriculum. However, two studies were identified, with the first recording that the novice teachers felt that the program they took part in had little contribution in their learning to teach Science and Mathematics with differentiated instruction, and the second that not all students were satisfied from the implementation of differentiated instruction. Most of the students who made positive comments about differentiation noted the increased interest of the teacher, which influenced them positively, while others thought that differentiation was a waste of time.

Also, regarding the attitudes and beliefs of preservice teachers educators in higher education, the number of researches identified and examined is very small, while no research has been found in Greece. As a result, there is a need for more investigation of this issue in Greece and internationally. Furthermore, from the researches which have been examined, the development of positive beliefs and attitudes of teachers towards acquiring new knowledge for teaching differentiation as they deepened their holistic understanding of the model and resolved their misunderstandings is shown. Also, differentiated instruction has been a

challenge for educators as they need to better understand its educational strategies and how to implement them.

Concerning the advantages of implementing differentiated instruction in higher education, several studies have been identified in the international field and none in Greece. Therefore, in exploring the benefits of implementing differentiated instruction, there is a need for further research, particularly in the Greek field.

The most important advantages of implementing differentiated instruction are the focus on the learner who is actively involved in teaching, the reflection through which some teachers take direct initiatives in their classrooms, the increased interest of the teacher, the various methods in which teachers differentiate the content, process, product and environment, the effectiveness of teaching and the professional and academic success of preservice teachers.

About the difficulties arising from the implementation of differentiated instruction in higher education, a small number of studies were identified internationally, while no research was conducted in Greece. Consequently, there is a need for further research in the international as well as in the Greek field in exploring the difficulties in implementing differentiated instruction.

The most important difficulties mentioned in implementing differentiated instruction by preservice teachers are the large number of trainees in the classroom, the lack of time for careful planning of teaching, the limited space for teamwork, the difficulties in organizing and teaching content, the insecurity of taking initiatives by some teachers and lack of administrative support.

Concerning the conditions and procedures for the effective implementation of differentiated instruction in higher education, few researches have been examined internationally, and no research has been examined in Greece. Therefore, there is a need for further investigation of this issue mainly in Greece but also internationally. The most important prerequisites for effective implementation of differentiated instruction include careful planning and organization of teaching, knowledge of differentiated instruction, availability of time, flexibility on the part of the teacher and support from the administration.

Regarding the methodological design used in the examined studies on the implementation of differentiated instruction in higher education internationally, most researches implemented the qualitative and the mixed method, while less the quantitative and even less the Action Research, Quasi-experimental research, Self-Study research and Teaching. Regarding the sample size, most researches used a sample consisting of fewer than 50 individuals. Three researches using a sample ranging from 50-100 individuals were also found and four researches using a sample of more than one hundred individuals.

Concerning the cognitive subjects in which differentiated instruction has been implemented in higher education internationally and the purpose of its implementation, it is observed that most researches have been implemented in the Mathematics course followed by other courses such as Science, Education and Psychology of Excellent Students, School Experience, Reading, Computer Science, Teacher Certification Programs, Educational Psychology,

Language Arts, Humanities and Social Sciences and the Arts.

Regarding the purpose of implementing differentiated instruction, it appears that the studies have investigated the effectiveness of implementing differentiated instruction in higher education. More specifically, several studies have focused on the perceptions of participating preservice teachers and their educators and some have examined the extent to which preservice teachers were familiar with the implementation of the specific teaching practice and the benefits they gained.

## 8. Restrictions

The constraints of this research include the small number of studies under consideration, the search for specific databases, and the focus on specific issues of the differentiated instruction in higher education.

## 9. Suggestions

Suggestions for further research could be the theoretical and practical exploration of other issues related to the differentiated instruction, such as teachers' training needs regarding its implementation. Furthermore, by conducting comparative researches at various levels of education in the educational system of Greece on the results of its implementation and its impact on learners and teachers, valuable conclusions will be drawn on the mobilization and improvement of trainees' performance, on the attitudes and beliefs of trainees and educators, as well as on the advantages and the difficulties, as well as the conditions for effective implementation of the differentiated instruction.

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