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“TEACHING MATHEMATICS TO STUDENTS WITH MILD INTELLECTUAL DISABILITY IN SECONDARY SCHOOL LEVEL”

For awarding a doctoral degree in professional field

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The term "mathematics education" includes both the field of practice that relates to all the practices that are developed in the context of teaching and learning mathematics, and the field of study of these practices in which the educational practices concerning in teaching and learning mathematics. In this way, the term refers, on the one hand, to all the practices of learning and teaching mathematics, which are developed in formally institutionalized and informal established contexts where mathematical thinking and communication take place (Valero, 2010).

On the other hand, the term refers to the set of practices carried out at the research level and relating to the study of the practices of teaching and learning mathematics. According to Dörfler (2003), the object of mathematical education is a specific area of human activity, the content, object, and purpose of which is mathematics at different levels and in different forms. Dörfler points out that this does not imply the existence of mathematics independently of the corresponding activities.

During the last century, three main theoretical approaches to learning have influenced educational research on learning and mathematics teaching: behaviourism, constructivism, and more recently socio-cultural approaches to learning. Then the main points of differentiation of the first two theories are presented and a detailed description of the most modern socio-cultural approaches for learning mathematics is given.

Each theoretical approach contributes to the view of the educational process in a different way, respectively dictating the aims, expectations, and content of the teaching and learning of mathematics. In this context, references are made to the learning and at the same time to the teaching of mathematics. Specifically, it describes how the nature of mathematics is determined according to the epistemological approach adopted, highlighting the importance of the teacher's beliefs for the educational practice and the corresponding conditions that are formed (Kuntz, & Carter, 2019).

1.1 From behaviorism to constructivism

In the context of behavioral theory, learning takes place through the creation of connections between stimuli and reactions, where the learning outcomes consist of changing the student's behavior. The student is asked to reproduce what the teacher teaches in small pre-planned steps. Obviously, the role of the teacher is decisive and dominant for the course and development of the lesson, providing immediate feedback to the student, reinforcing the desired behavior through rewards and reducing unwanted behavior through punishment. The emphasis is on the right result, while the wrong is not desirable. In case the student fails to achieve the goals, then the activities should be repeated until the desired knowledge is acquired. On the basis of behaviorism, teaching has been characterized as direct (direct instruction) or "explicit" teaching with special emphasis on practice (Erofeeva, et al., 2019).

In contrast to behaviorism, in the context of constructivism knowledge is actively constructed by the student and is not passively received from the environment. The construction of knowledge is based on the student's mental shapes which are internal mental structures representing the outside world and may relate to the student's beliefs, pre-existing perceptions, knowledge, and experiences. On this basis, learning is an active process of adaptation which is activated through cognitive conflict and if there is assimilation or conformity of new data to the existing mental shapes of the student then there is balance (learning). In conclusion, in terms of knowledge, whether it is new or expands a pre-existing one, it is dynamically constructed by the student and is not passively absorbed by the environment (Erofeeva, et al., 2019).

As far as learning is concerned, it is considered to have an adaptive character, where the students organize their experiential world, and do not discover a pre-existing reality independent of their own. Based on what has been described above, one can observe that a lot of students' mathematical knowledge is acquired in out-of-school settings. For this reason, it is argued that the teacher needs to know the pre-existing experiences, knowledge, and perceptions of the student in order to organize teaching and plan activities in a way that facilitates the construction of knowledge by the student.

The teacher assigns the responsibility of learning to the student, without being able to change the course of learning except to create conditions of cognitive conflict. The teacher is interested in the mistakes of students, considering the alternative ideas that he or she must take into account in the design of teaching (Erofeeva, et al., 2019).

1.2 Socio-cultural approaches

The latest approaches to learning focus on the socio-cultural factors that influence the learning of mathematics. The social constructivism approach argues that the personal construction of knowledge by the student is as important as the negotiation of mathematical meaning in the context of social interactions. Learning takes place in processes of continuous social interaction and is inextricably linked to the social and cultural experiences of the participants (Erofeeva, et al., 2019).

Socio-cultural approaches to learning are mainly based on the work of Lev Vygotsky who formulated a socio-historical approach to human mental activity. In this context, learning is not just an individual process of active construction of meaning, but is developed and shaped within historically and socially defined contexts. In particular, Vygotsky (1978: 57) argues that every function in cultural development (of the child) occurs twice: the first time at the social level and the second time at the individual. First between people (interpsychologically) and then internally of the child (intrapsychologically). All higher functions begin as real interactions among people. According to Vygotsky, the mental construction of knowledge is the result of the interaction between two types of learning experiences: on the one hand are the spontaneous, non-systematic experiences of the child which arise from his attempt to manipulate the physical and social world, while on the other hand are the child's experiences that come from the systematic influences of school, family, community, and a culture, transmitted through symbolic mediators such as writing and educational systems (Tzouriadou & Anagnostopoulou, 2011).

Vygotsky places great emphasis on the use of mediation tools to achieve learning. These tools can be handicrafts (pencils, geometric instruments, etc.), other people, or

socially shaped tools and symbolic representation systems, such as “language” or the decimal numbering system (Lemonidis & Theodorou, 2011). To understand how learning takes place and how people appropriate cultural tools we need to look at what Vygotsky meant by the Zone of Proximal Development. According to Vygotsky (1978: 86) ZPD is the distance between the actual developmental level, as determined by the independent solution of a problem, and the level of potential development, as determined by the solution of a problem under the guidance of an adult or in collaboration with more capable peers. In other words, ZPD is described as the distance between what the child can achieve on his own and what he can achieve with the help of someone else (Browder, et al., 2018). In this context, the help of the teacher or the competent peer is very important, who is called to “build scaffolding” so that the student can solve a problem, complete a project or achieve a goal (Tzouriadou & Anagnostopoulou, 2011).

The adoption of the socio-cultural approach to learning undoubtedly influences the teacher’s choices in terms of planning and implementation of teaching. On this basis, for example, the teacher during the design should take into account the various socio-cultural contexts that have meaning and significance for the student, but also during the implementation of the teaching to emphasize the interactions among students and between students and the teacher.

Vygotsky (1978: 118), referring to the teaching of language, describes that writing must “relate to everyday life (in the same way that we want mathematics to have it) ... it must make sense to children ... to be taught in a natural way ... to be cultivated and not to be imposed”. What Boaler (2002) points out is that when students construct and use knowledge they do so through their interactions with the wider social systems in which they participate. Continuing Vygotsky’s philosophy, Jean Lave (1988) pushed her findings into a situated learning approach to social practices. Lave and Wenger (1991), based on Vygotsky’s theory, considered learning as an integral part of social practice, and the acquisition of knowledge and skills as a path to full participation in this practice. They argued that knowledge is “established” in particular forms of experience, and

arises in the context of interaction between people, activities, and environments (Browder et al., 2018).

Researchers' interest has been focused on the use of cultural tools by different cultural and social groups to construct their mathematical ideas, and more specifically, De Abreu (2000) focuses on the ways in which different tools are logically organized. The ways that influence their mathematical thinking, the ways in which certain social practices restrict the use of certain tools, but also the ways in which these tools can be used in new contexts.

On this basis, the classroom is perceived as a "community of practice" where learning is understood as a process of achieving full participation in a socio-cultural practice. Understanding learning as a process of participating in classroom socio-cultural practices makes it difficult to clarify the boundaries between teaching and learning processes. On the other hand, the role of the teacher and the student are not very far apart, since both in the context of the interaction become each other's teacher, having both responsibility in case of failure of the learning process. At the core of socio-cultural approaches "a key proposition for teaching mathematics is the importance of involving children in a mathematical practice that will have the characteristics of everyday practice". In an effort to highlight its social dimension, supplemented their approach with interactionist theory for the development of mathematical knowledge.

Voigt (1995) analyzes the basic hypotheses of the interactive approach as follows: a) each problem of a mathematical discussion in the classroom can be interpreted in different ways by the student, who in order to make sense of it uses his pre-existing knowledge creating an appropriate framework for interpretation. These different ways of dealing with the mathematical problem are discussed among the members of the class who during social interactions negotiate their mathematical meanings; b) Social interaction is more than action and reaction. Specifically, each participant in the interaction determines his actions according to his personal assessment of the expectations of others, their background, etc. Respectively, the recipients of social

interaction interpret these actions according to their own subjective assessments of knowledge, expectations, etc. of the person acting. c) The teacher and the students do not "share knowledge" but the mathematical meanings are considered to be common (taken as shared) only when they are produced through negotiation. In this case, of course, they interact as if interpreting mathematical meaning in the same way, but without being sure that their subjective understandings are in agreement with the other participants (Root, & Browder, 2019).

Stathopoulou (2005) describes that in the classroom it seems that "a specific and special reality is formed" in the context of which the participants develop appropriate habits and behaviors about which they are not always clearly aware. More specifically, in trying to understand the microculture of the mathematics classroom, Cobb and Hodge (2002) used the term "cultural capital of the mathematics classroom", influenced by cultural capital of Bourdieu. In this context, they argued that the three basic dimensions of the classroom microculture are social norms, sociomathematical norms, and classroom mathematical practices. Specifically, the social norms of the classroom refer to structural elements of the students' participation in the classroom (e.g. how I declare that I agree or disagree with a point of view). Socio-mathematical norms refer to the normative / regulatory dimensions of action and interaction that take place through a set of values, rules, habits, and actions during math activities in the classroom (e.g. context of mathematical activities) (Bouck, et al., 2018).

1.3 The nature of mathematics

Mathematical practices in the mathematics classroom relate to the normative / regulatory ways of justification, argumentation, and symbolism that arise during the discussion of specific mathematical ideas. According to Nickson (1992), one of the biggest changes in mathematics education is the way we understand the nature of mathematics. Each philosophical-epistemological view of the nature of mathematical knowledge and practice contains and submits corresponding approaches to the learning and teaching of mathematics.

This view is reflected not only in the classroom, but also in all social practices of mathematical education, such as the choice of teacher education programs, the writing of textbooks, etc. The way we understand the nature and role of mathematics also has an impact on conducting and interpreting different research in mathematical education.

According to the "traditional" view of mathematics, mathematics is universal, objective, absolute, unchanging, indisputable and independent of the social, historical and cultural conditions in which they were developed and shaped. This approach is referred to as "absolutism", in which it is argued that mathematics exists independently of man and the student is called upon to discover it. According to the authoritarian concept, school mathematics consists of a set of predetermined mathematical knowledge referred to as the "curriculum", with the aim of acquiring the necessary mathematical knowledge by students, learning formulas, rules, and algorithms. Assignments given to students consist mainly of framed activities that require the implementation of a specific process in order for students to arrive at a single correct answer (Gargiulo, & Bouck, 2017).

In this context, the interaction between the student and the teacher is limited, as teaching involves the transfer of knowledge from the second to the first, and learning is the acquisition of knowledge and practice in specific exercises and problems. On the other hand, socio-cultural approaches have led to the view of mathematics as refutable, revisable, changeable, and emerging just like any other kind of knowledge and the result of social practices. This approach is often referred to as fallibilism, which is based on the notion that everyday mathematical knowledge appears in different forms from culture to culture, even within the culture itself (depending on the purpose for which it is used). This alternative view of school mathematics demonstrates mathematical knowledge as participation in social practices determined by social, cultural, and historical contexts. In this case the students are social subjects which are active in social contexts with specific characteristics, appropriated through their activity the mathematical knowledge and the mathematical forms of thinking.

1.4 The role of the teacher

Bishop (1985) highlights the important role of the teacher by stating that mathematics education in practice is, and should be, mediated by the teacher. The teacher has a very important role in the learning process as his choices in terms of planning, organization, and implementation of teaching affect the learning of mathematics by students. The personality traits and elements of the professional composition of the teacher play a very important role in mathematics education (Agaliotis, 2011).

Many researchers agree that it is very important to place more emphasis on the teacher belief system (Buehl & Beck, 2015). These beliefs act as a filter through which teachers make their decisions influencing the teaching practice itself. Specifically in mathematical education, teachers' usual beliefs relate to the nature of the subject matter, teaching, and learning. The social practices of mathematical education cannot be understood without taking into account the teacher's belief system in relation to the nature of mathematics, its teaching, and its learning.

Based on this, Ernest (2004) argues that whatever the teacher's beliefs about the nature of mathematics, the only sure thing is that they have many educational and pedagogical implications for the teacher's content choices, the organization, and the way of teaching implementation. For example, if a teacher perceives mathematics as a predetermined set of rules and procedures, then he or she will ask students to practice framed exercises in order to be able to solve them (Anderson & Östlund, 2017).

Grootenboer and Marshman (2016) argue that a change in the teacher belief system is not simply a matter of presenting new data. On the contrary, the central beliefs are quite strong and have arisen through experience, and any change needs to occur after experiencing new pleasant experiences in conjunction with reflection on these experiences. However, the teacher's practices in the classroom are not so easy to understand as they are not determined solely by the teacher's knowledge and beliefs about mathematics education. The teacher's beliefs can be activated at some point in the teaching practice, as the teacher's internal factors interact with various external variables of the social context, such as class, school, or national education policy (Buehl

& Beck, 2015). From a socio-cultural perspective, as teaching and learning are treated as framed in social practices, several factors are considered to influence the teacher's decision-making and teaching practices.

According to Handal (2003), there is a dialectical relationship between teacher beliefs and teaching practices, which is mediated by contextual factors (e.g. classroom or school culture). That is, the teacher's decisions and practices regarding mathematics education should be determined in relation to many different factors, such as the expectations of the school and the parents, the national education policy, the chances of teachers cooperating in school. In this way, the teacher forms his professional identity, which Collopy (2003: 289) defines as "the set of interconnected beliefs and knowledge about the subject, teaching, and learning, as well as and personal self-efficacy and orientation towards the profession and change". Van Zoest and Bohl (2005) also emphasize the individual knowledge, beliefs, intentions, and expectations of the teacher on the one hand, and the ways in which he or she has learned to think, act, and interact on the other side. There is a dialectical relationship between the teacher's professional identity and teaching practices, where professional identity emerges through the teaching practice, but at the same time identity influences the ways in which the teacher analyzes and interprets his teaching practices (Root et al., 2018).

The teacher needs specialized support and guidance to be as effective as possible in his educational work (Agaliotis, 2011). Significant emphasis needs to be placed on the training of preservice teachers as it greatly influences their subsequent teaching practices. For inservice teachers, the seminars or lectures used for their education seem to have little effect on teachers' core beliefs and do not lead to the use of theories taught in the classroom.

1.5 Rationale

Intellectual disabilities, also known as mental retardation, affect about 1% of the general population and, in fact, more boys than girls. This percentage indicates the frequency of occurrence of this condition, among others, in the classes of children and

adolescents. So, there is a significant number of students who belong to people with intellectual disabilities and, therefore, need special education and training support. The term “intellectual disability” now replaces the term “mental retardation” in the international literature. The adoption of this term reflects the recognition by the global scientific and pedagogical community of the right of persons with disabilities to equal opportunities in integration and self-realization. The modern efforts of the science of Special Education are now oriented towards the inclusion of the disabled. These people, through education, acquire the cognitive, professional and social skills that will allow them the greatest possible degree of autonomy in their lives. Determining what exactly happens to the cognitive process in people with mental retardation and what makes learning difficult is the subject of much research. Most conclude that these individuals constitute a heterogeneous whole with the common feature of reduced learning ability and slowness in obtaining, processing and retaining new information (Kuntz & Carter, 2019).

Intellectual disability is the result of genetic-biological or environmental factors or even a combination of them. Genetic-biological factors include monogenic-chromosomal abnormalities and inherent metabolic disorders. Environmental factors relate to infectious diseases, fetal alcohol syndrome, viruses, lead poisoning, complications during pregnancy, childbirth and childhood, e.g. malnutrition of the pregnant woman or child, radiation, injuries, etc. (Valero, 2010).

1.6 Characteristics of students with intellectual disabilities

Intellectual disability is a disorder which appears the development period and is also known as Intellectual Developmental Disorder. According to the American Psychiatric Association (2013), which published the Diagnostic and Statistical Manual of Mental Disorders, intellectual disability includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains. The etiologies of intellectual disability vary.

In the DSM-V the term “mental retardation” was replaced by the term “intellectual disability”. This term is equivalent with the term “intellectual development disorders”

which is used in the ICD-11 in the context of the increasing convergence observed between the two classification systems. The DSM-V describes a disorder that occurs in childhood and refers to both adaptive and mental deficits concerning conceptualization, socialization, as well as practical skills. The criteria that must be met in order to make the diagnosis according to the DSM-V are the following:

- Intellectual function deficits which are referred to skills such as abstract thinking, planning, reasoning, judgment, problem solving. In order to confirm these deficits, standardized intelligence tests as well as individual clinical assessment must be performed.
- Adaptive functioning deficits. These deficits refer to the weakness of the individual to meet developmental and social standards for its personal independence. These individuals need ongoing support in order to cope with everyday life activities such as independent living, social participation and communication.
- Intellectual and adaptive deficits at the developmental period. The level of the severity is defined on adaptive functioning basis rather than through IQ tests, as the level of support necessary is defined by adapting functioning in the areas of conceptualization, socialization, and practical skills.

Students, depending on the degree of their mental disability, according to Erofeeva, et al. (2019), belong to one of the following categories:

- Students with mild intellectual disability. These students, despite the slight delay in their perceptual and motor skills, can be integrated into society as adults and rehabilitate professionally.
- Students with moderate intellectual disability. These children are able to acquire the basic school and social skills they need in order to integrate satisfactorily into society. They can also work as unskilled or semi-skilled workers.

- Students with severe intellectual disabilities. These students are characterized by severe disabilities, poor speech and inadequate social skills. They manage to be partially self-sufficient, while their supervision is necessary during their adult life. They can work in a protected workshop, dealing with simple, repetitive tasks.
- Students with severe intellectual disability. These children are characterized by total language and motor retardation. Continuous social and medical care is considered necessary for their survival. The educational programs designed for these students aim at their social adaptation in a controlled environment.

1.7 Features related to learning process

Students with intellectual disabilities show reduced cognitive skills and, in many cases, reduced interest in learning. For all the people involved in their education (teachers, scientists and professionals, parents) it is very important to understand what are the characteristics that prevent these children from learning but also from being interested in learning. Only then will they be able to really help, both in terms of learning process and learning outcome. In short, they have to understand the way these students think, how they process information and how they experience small and large failures, which, unfortunately, begin for them from a very young age (Erofeeva, et al., 2019).

- Children with intellectual disabilities can perceive a situation (stimulus / problem), but are unable to pay due attention to the details of it.
- They can think, but their ability to organize information to produce thought has limited potential.
- Usually, the way they choose to react is the wrong way even though they clearly have the ability to react.
- The problems they face in understanding and using language make their cognitive, social and behavioral development difficult.
- Their memory, especially the short-term one, is obviously limited and that is why the many rehearsals help them to learn better.

- Finally, their failures at home and at school have shaken their interest in learning. Trying to avoid a new failure in any way, they stop fighting for success. They usually expect to fail, so they react passively ("I cannot", "I do not know"), they avoid in any way "difficult situations", they become defensive and invent many kinds of excuses ("my head hurts", "I am afraid"), react aggressively to the "threatening/dangerous situation" (kicking, biting, cursing, etc.).

That is why every person with a mental disorder should be treated as a separate and unique personality with particular interests, problems and needs. Their adaptive course, however, depends to a large extent on the requirements of the environment in which they live. A general school class is usually attended by children with mild mental retardation which is perceived in the first years of primary school due to learning difficulties or behavioral problems. With the appropriate guidance, support and supervision, however, these individuals are able to live independently in the community and adapt to a satisfactory degree to the requirements of the school environment (Browder et al., 2018).

Law 2817/2000 of Special Education in Greece clearly defines the categories of students with special needs and the obligation of the school and the state to implement special programs, methods and materials, in order to facilitate their education mainly in the context of general education. Additionally, the Pedagogical Institute in Greece has developed a Unified Interdisciplinary Framework and new Curricula. This effort was made to harmonize the Curricula of general education aligned with the new data of the information and knowledge society, the multiculturalism but also the recognition of the special educational needs of the students, as well as their rights for inclusion and equal education in a school. This view is in line of the study of Bouck et al. (2017).

For the first time in these programs there are several references to students with special needs. Nevertheless, while some favorable conditions are created in the general school, the students with special needs without appropriate adaptations or differentiated

Curricula, encounter huge obstacles in their education. There is of course the view that if a child with intellectual disabilities cannot benefit learning in the common classroom he or she can be educated outside it for as long as needed. Proponents of full inclusion, however, insist that the school's primary role should be to improve the social well-being of children and to change the attitudes of teachers and students towards all disadvantages.

The special educational needs of children with intellectual disabilities require special forms of learning and teaching. First of all, the teacher is called to evaluate the educational needs of the student in relation to the degree of his mental retardation and then to compile a special educational program which will correspond to his particularity. The aim here should not be the "quantity" but the "quality" of the transmitted knowledge. Learning in the mentally retarded child is characterized by rigidity, while its generalization and transfer is limited. Learning and the memorization and retrieval of information are facilitated when the person who wants to learn it discovers the relationship of internal organization and structure that this information has.

However, this requires not only special and specialized knowledge of the teacher but also special support material. Educational perceptions and attitudes do not change with laws or wishes or good intentions and advice. They change if the tools of the job change, the ones used by both teachers and students, the ones used by the teaching practice, such as textbooks and teaching materials (Jimenez, & Stanger, 2017).

1.8 Educational Intervention

The most well-known special educational units for children with mild and moderate mental disability are the special schools and the inclusion classes. The children with severe mental disabilities attend, in most cases, apprenticeship classes in a special professional or artistic workshop. As students of the special schools or the inclusion classes, the children are taught courses that are offered in the general school. However, they are imbued with bio-practical subjects. The greatest emphasis in the construction

of the school curriculum is given to the cultivation of social skills, to the teaching of basic school knowledge and, to the highest level, to vocational guidance and vocational training. A healthy learning environment is structured by designing the curriculum and setting short-term and long-term goals to be achieved. In addition, it is supported by adapting the teaching (strategies, techniques, tools and materials) to the needs of the students. Finally, it is optimized by creating the appropriate school climate (pedagogical, friendly, interpersonal conditions) so that students develop their social and academic skills to the maximum extent possible (Spooner, et al., 2019).

Regarding the learning goals we set for students with intellectual disabilities, we focus on the following areas:

- To become independent in terms of their personal needs and to be able to self-serve.
- Gain self-control and respect for others and participate in group life.
- To develop their language skills so that they are able to communicate with those around them.
- To acquire, to the best of their ability, the basic school skills.
- To use as much as possible their senses and perceptual ability in order to know their natural and social environment and to adapt to it.
- Learn to handle both their mobility (arms, legs) and various tools and materials, as they will cultivate habits useful in the field of employment / work.

1.9 Students with intellectual disabilities - characteristics in the period of secondary education

In recent years, there are more and more children with mental retardation who attend general and not special school. But is the general school able to offer these children everything they need for their education and development in the general classroom?

But let's start from the beginning. Children with mild or mild to moderate mental retardation are considered to be easier to develop and learn compared to children with severe and profound mental retardation. However, the difficulties that these children present, apart from the mental retardation, are also in the adaptive behavior. Thus, they find it difficult to have personal independence and social responsibility compared to their peers (Gargiulo, & Bouck, 2017).

Usually, at a young age, they show deficits in the development of behavioral skills such as sensory-motor skills, communication (speech, language), self-help and basic socialization (interaction with others). Later, in childhood and adolescence, deficits occur in the use of appropriate logic and in the development of social relationships, while in adulthood in professional and social responsibility.

In many cases, mental retardation can coexist with other diseases such as psychological problems (anxiety, depression, antisocial behavior, schizophrenia, autism, etc.) but also Attention Deficit Hyperactivity Disorder (ADHD). This further complicates the child's adaptive behavior and quality of life (Gargiulo, & Bouck, 2017).

Nowadays, most children with mild or mild mental retardation attend school in their neighborhood. Pedagogical treatment and intervention is now a matter for the general primary school. The class teacher with the help of the specialized teaching staff of the school unit, the principal but also in general of the teachers' association and the educational advisors are responsible for the pedagogical program that will be followed. It should be noted that the education of children with mild or mild mental retardation should start early, from their pre-school age (Root et al., 2018).

From that moment until the first school years, emphasis should be placed on the development of the readiness skills of the child, as well as on children with a normal IQ. Readiness, as mentioned in the teacher's book on learning readiness activities "is a multidimensional term that refers to all stages of a child's development". Learning readiness mainly includes the mental, emotional, social and physical readiness of the child to accept, process and utilize the stimuli of the environment. "School readiness

refers to the phase of preparation of the child to acquire knowledge and skills and to form attitudes that will help him to adapt smoothly to the school environment and to successfully meet the requirements of the curriculum".

Children with mild mental retardation as mentioned above face deficits in their adaptive behavior. For this reason, readiness skills can develop areas where these children are lagging behind. More specifically, a child with mild mental retardation should develop basic school skills such as language use (reading, reading mechanism, comprehension, speech production, writing) and mathematical thinking. These two learning skills are directly related to targeted learning readiness activities that cover developmental deficiencies in oral speech, psychomotor skills, mental abilities, and emotional organization (Root et al., 2018).

The psychomotor approach to writing is based on the movement of the body in the physical space, which causes kinetic experiences that are gradually internalized and transferred to the graphic space. The coordination of the hand, fingers and eye can be developed through painting, using a brush, cutting, sewing, carving, sculpture, etc.

Also important to the child with mild mental retardation are self-care skills such as tying shoes, using the toilet, dressing, etc. It is also necessary to acquire socialization and communication skills, through the implementation of appropriate modifications of curricula. The goal for the children is to engage in socially acceptable behaviors so that they can coexist smoothly with their peers.

In older grades, deficits begin to be more apparent in children with mild mental retardation. Understandably, as a child gets older, he or she will have to engage in higher learning processes that he or she is unable to complete. For this reason, the activities of such a specialized program should be shifted from the preparedness activities mentioned above to academic (school) subjects. Thus, emphasis should be placed on the use of language and specifically on the development of oral, written speech and reading skills. Logical-mathematical thinking should also be developed in the same way (Root, et al., 2018).

It is, therefore, clear that the effort that will be made in the context of inclusive education presupposes cooperation between the class teachers and the special teachers, in order to create a specialized pedagogical program with specific aims and objectives for the child. The purpose of the specialized pedagogical program that will be created, in any case, will be the comprehensive development of the student with slight mental retardation, in order to achieve the maximum of his potential by at some point living independently, as an equal member of society (Buehl & Beck, 2015).

Throughout this long period of the children attending the school in their neighborhood, the psychological and emotional support of themselves and their family will be necessary. Thus, through the constant communication of the school and the family but also the help of psychologists and social workers, the effort that will be made will be able to be targeted.

1.10 Learning characteristics

The characteristics of people with intellectual disabilities described in the previous chapter are associated, as a whole, with important aspects of school learning leading students with intellectual disabilities to slower learning rates compared to typically developing students (Algozzine & Ysseldyke, 2006). These basic characteristics result in students with intellectual disabilities to face various difficulties during the learning process, among which are the following (Vlachou-Balafouti, 2012; Westwood, 2009):

• Problems in generalizing and transferring specific knowledge

• Difficulties in the reversibility of thought (e.g. the student learns addition while having difficulty subtracting which is the inverse operation)

• Difficulties in processing information, drawing conclusions, shaping critical thinking, and understanding logical-mathematical concepts

• Difficulties at the mnemonic level

• Incomplete and short-term concentration

• Passivity

• Limited self-care skills

• Difficulties in organizing free time

• Difficulties in solving problems of everyday life

• Limitations in metacognitive skills that would allow them to think about the results of their actions.

However, the reporting and presentation of learning disabilities that students with intellectual disabilities are likely to face is done with particular care, taking into account that: a) not all students with intellectual disabilities have the same characteristics, simply because they have the same disability; and b) during the educational process we need to avoid the deficient teaching model, based on which the teacher emphasizes the weaknesses faced by the student with intellectual disability while ignoring his potential (Vlachou-Balafouti, 2004), while building teaching and learning solely on the basis of its difficulties. On the contrary, modern trends emphasize the emergence of opportunities as well as ways to enhance the potential of students with intellectual disabilities (Stavroussi, Papalexopoulos, & Vavougios, 2010).

The strengths and weaknesses of students with intellectual disabilities need to be assessed and taken into account in educational planning and the development of better learning conditions. In addition to the strengths and weaknesses, the assessment process needs to record, among others, the interests, preferences, experiences, and experiences of the student with a mental disability (Polychronopoulou, 2001; Patton, Polloway, & Smith, 2000). These data can be collected through the active participation of the student in the assessment process (Vlachou-Balafouti, 2012), as well as by utilizing parents as

an important source of information about the student's daily life (DiPipi-Hoy & Jitendra, 2004).

"Assessment for learning" is the process that is implemented to gather data for the design of educational programs for students with intellectual disabilities and is carried out with the ultimate goal of selecting the methods, strategies, and teaching materials that cover the learning needs of each student (Agaliotis, 2012). During the collection of information we are interested not only in the knowledge and skills of the student, but also in recording the conditions that favour the acquisition of knowledge, as well as the emotional factors that affect the student's effort. Specifically, it is useful to record data concerning the environmental parameters that determine the action of all participants in the learning process (Agaliotis, 2012). In addition, the student's difficulties related to the organizational and structural factors of the classroom need to be taken into account (Vlachou-Balafouti, 2012). The data resulting from this process are used by the teacher to create appropriate learning opportunities for the specific student in the specific school context that were evaluated (Vlachou-Balafouti, 2004; Stroggilos, 2011). In this way the cultivation of a continuous and mutual feedback pattern between the evaluation and the educational act is encouraged (Agaliotis, 2012).

1.11 Content of educational programs

The criterion of adaptive behaviour and functionality that refers to the conceptual definition of mental disability is a central point for the design of educational programs for students with mental disabilities. Based on this, education focuses in addition to the typical academic areas (e.g. reading, writing, arithmetic), on other important skills for the student to adapt to school, home, and community (Algozzine & Ysseldyke, 2006). According to Stavrousi (2007), educational programs aimed at students with intellectual disabilities need to emphasize not only academic content, but also the acquisition of functional skills, the acquisition of self-determination skills, and the preparation for the transition to adulthood.

Functional skills are those skills that enable the student with a disability to be functional in adulthood (for example, autonomous daily living skills, social, pre-professional and professional skills, etc.) (Cronin, 1996). The most commonly mentioned are functional academics, which include functional reading and functional mathematics (Algozzine & Ysseldyke, 2006). Functional reading is about recognizing specific frequently used words and using them in everyday life. Functional mathematics refers to the basic mathematical skills that are useful in everyday life, such as money and time management, etc. (Algozzine & Ysseldyke, 2006; Patton, Cronin, Bassett, & Koppel, 1997). Apart from language and mathematics, however, there are also functional social and communication skills, which refer to skills useful for social interaction and the autonomous living of students with intellectual disabilities.

According to Browder and Cooper-Duffy (2003) the choice of teaching objectives needs to be made on the basis of the "criterion of essential functionality", i.e. with the criterion of whether the skills are functional (i.e. useful in everyday life) and age-appropriate (i.e. based on chronological rather than developmental age) for students with intellectual disabilities. From the description of the criterion, two basic parameters emerge content of educational programs. On the one hand, an important element of the educational process of students with intellectual disabilities is the usefulness that can give a knowledge or skill in the daily life of students and not just the acquisition of some information (Agaliotis, 2012; Soulis, 2002). For example, the student may focus on recognizing numbers while implementing a recipe in the kitchen, or learn to read the words that make up his daily routine. On the other hand, the goals and activities of the curricula need to be age-appropriate, like those of other students of the same age (Browder, Flowers, Ahlgrim-Delzell, Karvonen, Spooner, & Algozzine, 2004; Brown, Mclean, Hamre-Nietupski, Pumpian, Certo, & Gruenewald, 1979; Storey & Miner, 2011).

On the other hand, the emphasis given in recent decades to inclusive education in the general class of students with intellectual disabilities, and in general of students with special educational needs and disabilities, has turned researchers' attention to the

possibility of access of all students to the general curriculum and therefore the teaching of academic skills (Courtade, Spooner, Browder, & Jimenez, 2012; Saunders, Bethune, Spooner, & Browder, 2013). With regard to educational programs with exclusively academic orientation, Stavroussi, et al. (2010) report that they do not promote the cognitive and social functionality of students with intellectual disabilities. At this point it needs to be clarified that in the present work the aim is not to support either integration education (general class with or without utilization of the integration department) or education in special schools of primary and secondary education. On the contrary, the conflict between inclusion and special education is primarily a political issue (Vlachou-Balafouti, 2012).

1.12 Organization of the space and Educational material

The organization of the classroom environment, whether general or special, needs to enhance the active learning and participation of students with intellectual disabilities in the educational process (Algozzine & Ysseldyke, 2006; Stroggilos, 2011). Stroggilos suggests emphasizing the creation of an environment that promotes interaction, thus reducing the passive behaviour that students with severe disabilities are likely to exhibit. At the same time, it is necessary to structure the environment and the careful placement of objects in the room in order to promote the active participation of students as well as their autonomous operation within the classroom (Lacey, Dunn, McCall, & Wilson, 2015; Stavrousi, 2007, Stroggilos, 2011).

According to Stroggilos (2011) the material used for the education of students with intellectual disabilities is not designed from the beginning, but is the same for all students making the appropriate adjustments according to the needs of each student (Conderman, Hedin, & Bresnahan, 2013). Lacey, Layton, Miller, Goldbart, and Lawson (2007) describe that teachers of students with severe learning disabilities use either conventional materials, such as books and pencils, or non-traditional materials during teaching (non-conventional), such as photos and videos. In any case, the materials used in the education of students with intellectual disabilities need to be familiar to students and come from their daily lives (Vlachou-Balafouti, 2012).

Also, for the education of students with intellectual disabilities, the use of both manipulatives (e.g. pocket calculators, etc.) and technology is recommended (Bouck et al., 2009; Waters & Boon, 2011), which contribute to the learning process. More specifically, computers (Computer-Assisted-Instruction, CAI) and various software programs can be useful educational materials for the acquisition of skills in the classroom. In addition, the use of technology is extended to the community through augmentative and alternative communication devices (Stavrousi, 2007; Stroggilos, 2011).

1.13 Interdisciplinary cooperation

The term interdisciplinary cooperation refers to the cooperation of scientists of different specialties in order to improve the education of students with disabilities (Strogilos & Xanthakou, 2007). The complexity of the needs of students with intellectual disabilities, combined with the complexity of the educational reality and the decisions that the teacher needs to make during the teaching process, leaves no room for a unilateral approach to the education of students with intellectual disabilities (Strogilos, 2011).

Secondary school teachers often teach students many lessons that look different from each other. It is important, in an effort to avoid the acquisition of individual knowledge and skills by students with intellectual disabilities, that teachers work together to present as much as possible a continuum and connection of different concepts (Porter & Lacey, 2005). In addition, teachers are specialized in a subject and there is no specialty that gathers all the knowledge needed to educate students with intellectual disabilities (Strogilos, 2011). Through interdisciplinary collaboration, teachers can have a holistic view of students' needs leading to better learning outcomes and more effective student education (Porter & Lacey, 2005; Strogilos & Xanthakou, 2007).

1.14 School and family cooperation

Students with intellectual disabilities, as is natural for all people, do not operate in isolation, but instead live in a family context, where everything that happens to one member affects the rest (Seligman & Darling, 2007). In this way the family is part of a

dynamic system that interacts with the school community, influencing student behaviour (Granlund & Roll-Pettersson, 2001). To understand this interaction it is useful to refer to the ecosystem approach.

2.0 Teaching Mathematics to students with intellectual disabilities

2.1 The role of Mathematics teachers in optimal organization of the teaching process for achieving the highest levels of students' academic results

At this point we will present some basic characteristics of the participants in the research, which were carried out with the aim of their mathematical education. One of the individual characteristics of the participants concerns the degree of difficulties they face in the context of their disability. Thus, the majority of participants had mild mental disability (Bouck et al., 2009; Cassel & Reid, 1996; Hayter, Scott, McLaughlin & Weber, 2007) or moderate mental disability (Denny & Test, 1995; Fletcher, Boon, & Cihak, 2010), while there are very few studies in which students with severe or severe mental disability participated.

Students with the highest degree of difficulty were trained mainly in the acquisition of functional skills, such as money transactions (Bouck, Satsangi, Bartlett, & Weng, 2012; Mechling, Pridgen, & Cronin, 2005), while students with mild intellectual disabilities were trained in more difficult tasks, such as solving speech problems (Jaspers & Van Lieshout, 1994; Mastropieri, Scruggs, & Shiah, 1997). It seems, therefore, that students who face greater difficulties have a need for systematic teaching of functional mathematical skills that will contribute to their autonomous living in adulthood.

In terms of student attendance, most of the research that focuses on teaching functional mathematics has been conducted in secondary school students (Ayres, Langone, Boon, & Norman, 2006; Burton, Anderson, Prater, & Dyches, 2013; Waters & Boon, 2011). In contrast, most students who have been trained in academic skills are in primary education (Miller, Hall, & Heward, 1995; Ortega-Tudela & Gomez-Ariza, 2006), while

fewer are in secondary education (Morin & Miller, 1998). ; Rao & Kane, 2009). Butler et al. (2001) characteristically stated that there is a need for more research with students in secondary education.

In recent years, more and more researchers are turning to teaching mathematics to high school students, as a large number of students with intellectual disabilities continue their education after primary school (Bouck et al., 2009; Hord & Bouck, 2012; Jimenez et al., 2008). Also, recognizing that people with intellectual disabilities continue to learn, as well as people with normal development, even after adulthood, there is an increase in interest in the educational process after the graduation of students from secondary education (Davies, Stock, & Wehmeyer, 2002; Hua et al., 2012; Hua et al., 2015; Neef, Nelles, Iwata, & Page, 2003).

2.2 Mathematical concepts and skills

A review of the research shows that before 1990 researchers focused on educating students with intellectual disabilities in very basic mathematical concepts. More specifically, the research interest was focused on the cultivation of basic functional skills, such as money management (Browder & Grasso, 1999), as well as other basic mathematical skills, such as accurate measurement, number recognition, and understanding of quantity (Browder et al., 2008).

Over the years, however, researchers' interest has shifted to teaching computational and verbal problem-solving skills (Butler et al., 2001; Hord & Bouck, 2012). This is in line with the inclusive approach to general education that has been promoted in recent decades. Thus, students need to acquire the necessary mathematical skills that will allow them to successfully integrate into the educational context. At the same time, researchers focused on teaching money and time management skills, which are useful in the daily lives of students with intellectual disabilities to facilitate their social integration (Birkan, 2005; Bouck et al., 2012; Cihak & Grim, 2008; Davies et al., 2002).

At this point it is useful to present in more detail some research in order to understand the content of the teaching interventions that took place. For example, Mastropieri et al. (1997) intervened in four primary school students (aged 8-11) with a mild mental disability to teach speech problem solving using a software program. The problems were presented graphically on the computer using various animation effects, for example in the case of addition the objects were grouped while in the case of subtraction they were deleted. The results of the intervention were positive in terms of the final performance of the four students using the computer. It also appeared that the intervention improved their attitude towards computer use. However, transferring their knowledge to a written test on paper was less successful and made it more difficult for students.

Hayter et al. (2007) used a set of twenty-two flashcards to teach the propaedia of number four to two students with mild mental disabilities attending general high school (ages 15 and 17, respectively). After eleven sessions, the researchers found that the use of multiplication and instant teaching cards increased the correct answers of both students and reduced their incorrect answers regarding the propaedia of four. Also, the didactic intervention resulted in the strengthening of the students' self-confidence and the creation of a strong motivation for the realization of other multiplication calculations.

On the other hand, research data on the teaching of algebraic or geometric concepts and skills are rare (Browder, Trela, Courtade, Jimenez, Knight, & Flowers, 2012; Jimenez et al., 2008; Parmar, Cawley & Miller, 1994) , as only two studies focused on algebraic concepts (Jimenez et al., 2008; Monari Martinez & Pellegrini, 2010) and one on geometric concepts (Hord & Xin, 2015). In particular, Jimenez et al. (2008) trained three high school students with moderate intellectual disabilities to solve a simple linear equation (eg $3 + x = 5$). The multifactorial intervention used included handwriting materials (number line, poster, wooden shapes, etc.), nine-step project analysis and systematic prompting students with time delay and fading. The results showed that all

three students in the sample were successfully taught to solve a linear equation at this stage (with handicrafts) of the CRA model (concrete, representational, abstract).

Monari Martinez and Pellegrini (2010) trained fifteen adolescents with Down syndrome (mild mental retardation with IQ 66-73) in fractions, percentages, and problem solving with a primary equation. The teaching approach used was direct instruction, with students being able to use pocket calculators and a propaedeutic board. The students improved their performance after the teaching intervention, without any differences based on the gender of the students.

In an even more recent study, Hord and Xin (2015) focused on training three high school students with mild mental disabilities to learn how to calculate the area and volume of geometric shapes. The researchers used the three stages of the CSA model (concrete, semiconcrete, abstract) 23 in combination with a conceptual model for problem solving (Model-Based Problem Solving, COMPS). The students were able to improve their performance on the geometric concepts they were taught.

In a study by Maccini and Gagnon (2002) on teacher practices, it appears that most typically teach arithmetic to students with special educational needs by reducing the amount of teaching time they spend in other areas of mathematics, such as algebra and geometry. Participants in the above research reported the lack of sufficient material to teach other modules in addition to basic computing skills.

Research in other mathematical areas, such as algebra and geometry, typically includes students with learning disabilities (Jitendra & Xin, 1997; Maccini, McNaughton, & Ruhl, 1999; Miller, Butler & Lee, 1998; Strickland & Maccini , 2010). However, even in this student population, research on geometry, for example, is minimal and further efforts are needed (Rivera, 1997). Maccini, Mulcahy, and Wilson (2007) reviewed international article writing from 1995 to 2006 to seek research on mathematics teaching interventions for students with learning disabilities in secondary education. The results of the review showed that seven studies focused on problem solving, six on fractions, five on algebraic concepts and skills, four on basic skills, three on decimals

and only one on geometry. Several researchers have noted the lack of research data on the teaching of algebraic or geometric concepts and skills to students with intellectual disabilities, while expressing the need for new data (Browder et al., 2012; Jimenez et al., 2008; Parmar et al., 1994). What has been less researched is whether this student population can cultivate other mathematical skills in addition to the basic ones typically taught in the general secondary curriculum (Jimenez et al., 2008). Although the research of Jimenez et al. (2008), and Hord and Xin (2015) show that students with intellectual disabilities can acquire mathematical knowledge and skills from other mathematical areas, more research needs to be done as based on the research data of this review nothing can be supported.

3.0 Methodology

3.1 Aims of the research

This thesis focuses on investigating the teaching techniques that educators use to teach mathematics to students with mild intellectual disabilities. Also, the research focuses only on the secondary school educators and students.

3.2 Research questions

Research hypotheses:

H1.0: The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are not affected by the level in which they teach learning strategies to their students.

H1.1: The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are affected by the level in which they teach learning strategies to their students.

H2.0: The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are not affected by the level in which they adjust their teaching based on the results of the students' assessment.

H2.1: The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are not affected by the level in which they adjust their teaching based on the results of the students' assessment.

According to the aim of the research, the following research questions are investigated:

- Are the teaching techniques used by participants to teach mathematics to students with mild intellectual disabilities affected by the level in which they teach learning strategies to their students?

- Are the teaching techniques used by participants to teach mathematics to students with mild intellectual disabilities affected by the level in which they adjust their teaching based on the results of the students' assessment?

3.3. Sample of the research

The sample of the research is consisted of 100 secondary education teachers, who teach mathematics to students with mild intellectual disabilities.

3.4 Research tool

In order to achieve the aims of the research, a questionnaire was chosen, consisted of 21 Likert type questions in total.

4.0 Data analysis

4.1 Descriptive statistics

The analysis took place in the statistical package SPSS v.25. In the descriptive statistics, percentages, frequencies, means and standard deviations are used to analyze all the variables of the questionnaire. Also, in order to reply to the research questions, the Chi-Square test (x^2) was used and the Crosstabulation analysis. All of the above are presented in proper tables and graphs, created either in SPSS or in Microsoft Excel.

In this research the 54% of the participants are male and 46% female. Moreover, the 41% of the participants have a permanent contract, while 59% of the participants have a temporary contract. The majority of the participants are between 30 and 50 years old. At the same time, they have experience between 6 and 15 years. Finally, the majority of the participants have at least a Master's degree.

The following chapter presents the teaching methods that the secondary education teachers use, in order to teach mathematics to their students with mild intellectual disabilities.

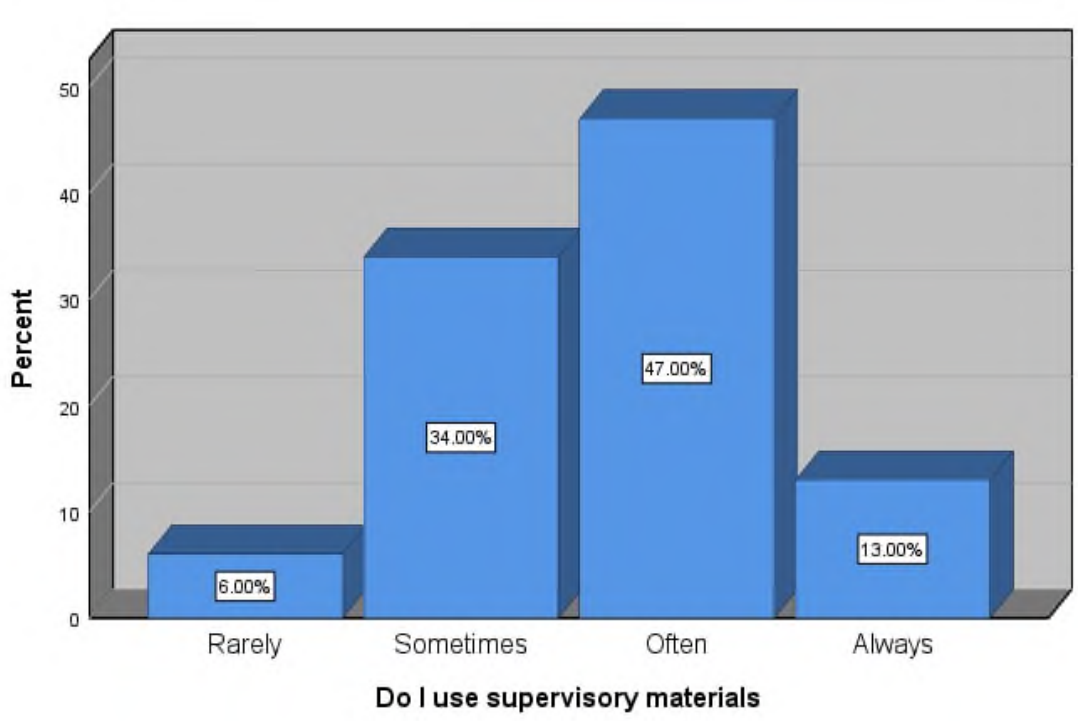
- In Table 1 and Graph 1, it seems that 47% of the participants often use supervisory materials, while 34% sometimes do so. Also, the participants who always prefer using supervisory materials reach 13% and 6% rarely chose this teaching technique to teach mathematics to their students with mild intellectual disabilities.

Table 1: Do I use supervisory materials

	Frequency	Valid Percent	Cumulative Percent

Valid	Rarely	6	6.0	6.0
	Sometimes	34	34.0	40.0
	Often	47	47.0	87.0
	Always	13	13.0	100.0
	Total	100	100.0	

Graph 1: Do I use supervisory materials



- In Table 2 and Graph 2, it is investigated whether the participants inform their students about the aim of the lesson at the beginning of the teaching. 47% of them always inform the participants about the aim of the lesson, 37% often do so, while 16% sometimes inform their students with mild intellectual disabilities.

- Table 3 and Graph 3, analyze the use of early organizers in teaching mathematics to students with mild intellectual disabilities. The educators who sometimes use early organizers reach 54%, 26% belongs to those who often use this technique and 20% rarely chooses this particular technique.

- As shown in Table 4 and Graph 4, it seems that 45% of the teachers sometimes use cognitive maps in the course of teaching, 30% often prefer them and 20% always use cognitive maps. As for the participants who rarely do so, they occupy 5% of the sample.

- In Table 5 and Graph 5, whether the participants summarize the main points at the end of each lesson, is investigated. The participants who always do so reach 35%, while 34% often use this method. As for the participants who sometimes summarize the main points at the end of the lessons, they occupy 31% of the sample.

- In Table 6 and Graph 6, it is analyzed the frequency in which the participants teach their students with mild intellectual disabilities learning strategies. 42% of the sample always teaches learning techniques, 37% often do so and 21% sometimes teach them such strategies.

- In Table 7 and Graph 7, it becomes clear that 44% of the participants often analyze the process of executing a project in steps and teach the students with mild intellectual disabilities to follow the proper hierarchy of the steps. The 32% f the educators sometimes use this technique, 13% always do so and 11% rarely prefer it.

- In Table 8 and Graph 8, it seems that 63% of the participants present aloud the course of thinking for them to get a reply acting exemplary as a model for their students. The participants who rarely prefer this technique reach 31%, while 6% often use it.

- In Table 9 and Graph 9, whether the participants give examples while teaching mathematics to their students with mild intellectual disabilities is investigated. The 42% of them often use examples, 31% always use examples, while 27% sometimes prefer to use examples in their teaching.

- Through Table 10 and Graph 10, it becomes obvious that 45% of the participants sometimes use counter-examples, while 32% often use them in their teaching of mathematics. As for the participants who rarely or always use counter-examples, they occupy 18% and 5% respectively.

- In Table 11 and Graph 11, it is analyzed whether the participants give opportunities to students for active participation during the teaching of mathematics. 40% of the participants often give such opportunities, 26% sometimes do so and 24% always offer opportunities for active participation. Furthermore, the rest 10% rarely offer such opportunities.

- In Table 12 and Graph 12, it seems that 42% of the participants rarely rate the previous knowledge of their students on to a new course. The participants who sometimes use this technique occupy 34%, while those who never or often use such a technique reach 12% each.

- In Table 13 and Graph 13, it seems that 55% of the educators sometimes use the previous knowledge of students to a new course. The participants who often do so reach 24%, 13% belongs to those who always use previous knowledge to a new course and 8% rarely use this teaching strategy.

- In Table 14 and Graph 14, the frequency in which the participants formulate questions in the teaching to create dialogue is analyzed. 57% of them sometimes use this teaching method, 27% rarely use it and 16% often prefer it to teach students with mild intellectual disabilities.

- In Table 15 and Graph 15, it is analyzed whether the teachers integrate the students' responses and comments in their teaching. The 39% of the participants always use this technique to teach mathematics to students with mild intellectual disabilities, while 32% often do so. As for the participants who sometimes use this method, occupy 29%.

- In Table 16 and Graph 16, it is clear that 44% of the teachers always emphasize the practical training while teaching students with mild intellectual disabilities. The participants who often emphasize the practical training reach 36% and 20% belongs to those who sometimes prefer this teaching technique.

- In Table 17 and Graph 17, it is analyzed whether the participants assign tasks that lead to a product that can be hung on the classroom wall. The participants who sometimes use this method occupy 51%, those who rarely use it reach 32% and 12% belongs to the educators who often use it. As for the participants who never assign tasks to later hang a product on the classroom wall, reach 5%.

- In Table 18 and Graph 18, it is revealed that 48% of the participants rarely give feedback directly to their students with mild intellectual disabilities. Also, 29% sometimes give direct feedback, 10% never do so while the participants who always or often give direct feedback occupy 7% and % respectively.

- Furthermore, in Table 19 and Graph 19, it is obvious that 47% of the teachers sometimes commend or provide a reward after a good performance, while 29% of the participants rarely use this teaching method. As for those who often offer rewards to their students with mild intellectual disabilities after a good performance, they occupy the 24% of the sample.

- In Table 20 and Graph 20, it is clear that 48% of the participants evaluate systematically the performance of their students with mild intellectual disabilities. The participants who often use this technique reach 31% and 21% belongs to those who sometimes evaluate systematically the students' performance.

- Table 21 and Graph 21 investigate whether the participants adjust their teaching based on the results of the students' assessments. 43% of the participants always adjust their teaching, 31% often do so, while the participants who sometimes adjust their teaching occupy the rest 26% of the sample.

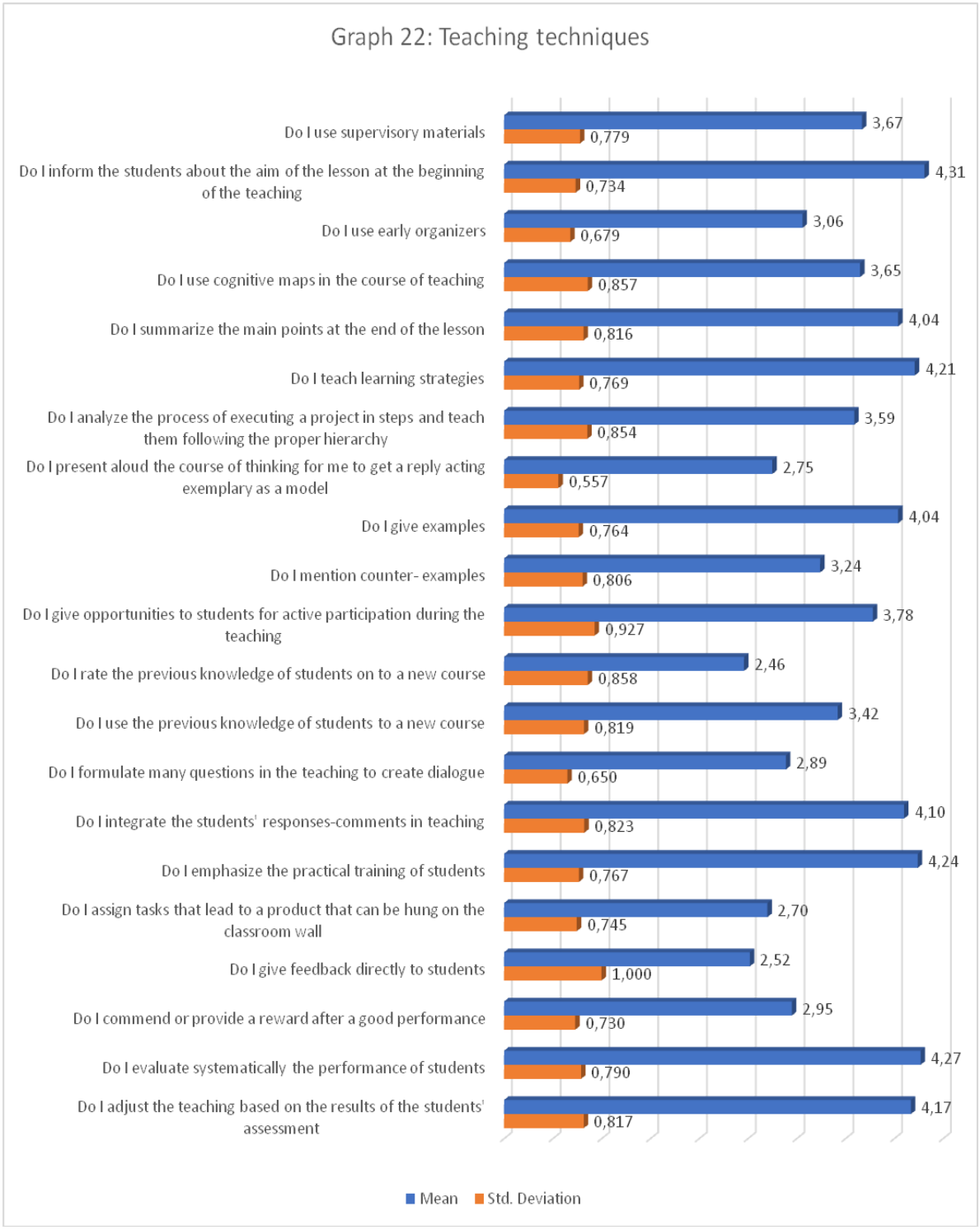
In Table 22 and Graph 22 of the descriptive statistics, the teaching techniques that the participants use are presented, using means and standard deviations. The answers accept values from 1 to 5 (1-Never, 2-Rarely, 3-Sometimes, 4-Often, 5-Always) and the higher the mean is, the more the participants use each teaching method. Between the answers "Often" and "Always", the participants are placed about informing the students about the aim of the lesson at the beginning of the teaching (4.31) and evaluating systematically the students' performance (4.27). Also, they often emphasize the practical training (4.24), teach learning strategies (4.21), adjust the teaching based on the students' assessments (4.17), integrate the students' comments in their teaching (4.10) and summarize the main points at the end of a lesson (4.04). Also, they often give examples (4.04) and opportunities for active participation during teaching (3.78). Between the answers "Sometimes" and "Often", leaning to the second one, the participants appear to be about using supervisory materials (3.67), cognitive maps in the course of teaching (3.65) and analyzing the process of executing a project in steps and teach the students how to follow the proper hierarchy of the steps (3.59). In the same scale, but leaning more to the answer "Sometimes", they place the use of previous knowledge to a new course (3.42), while they sometimes mention counter examples (3.24), use early organizers (3.06) and provide rewards for good performance (2.95). Also, sometimes the participants formulate many questions in the teaching to create dialogues (2.89) and present aloud the course of thinking to get a reply acting exemplary

as a model (2.75). Continuing, it seems that between the answers “Rarely” and “Sometimes”, with a lean to the second, the participants place the frequency in which they assign tasks that lead to a product that can be hung on the classroom wall (2.70) and give feedback directly to the students (2.52). Lastly, in the same scale, but leaning more to the answer “Rarely”, they seem to rate the previous knowledge of their students on to a new course (2.46).

Table 22: Teaching techniques

	Mean	Std. Deviation
Do I use supervisory materials	3.67	0.779
Do I inform the students about the aim of the lesson at the beginning of the teaching	4.31	0.734
Do I use early organizers	3.06	0.679
Do I use cognitive maps in the course of teaching	3.65	0.857
Do I summarize the main points at the end of the lesson	4.04	0.816
Do I teach learning strategies	4.21	0.769
Do I analyze the process of executing a project in steps and teach them following the proper hierarchy	3.59	0.854
Do I present aloud the course of thinking for me to get a reply acting exemplary as a model	2.75	0.557

Do I give examples	4.04	0.764
Do I mention counter- examples	3.24	0.806
Do I give opportunities to students for active participation during the teaching	3.78	0.927
Do I rate the previous knowledge of students on to a new course	2.46	0.858
Do I use the previous knowledge of students to a new course	3.42	0.819
Do I formulate many questions in the teaching to create dialogue	2.89	0.650
Do I integrate the students' responses-comments in teaching	4.10	0.823
Do I emphasize the practical training of students	4.24	0.767
Do I assign tasks that lead to a product that can be hung on the classroom wall	2.70	0.745
Do I give feedback directly to students	2.52	1.000
Do I commend or provide a reward after a good performance	2.95	0.730
Do I evaluate systematically the performance of students	4.27	0.790
Do I adjust the teaching based on the results of the students' assessment	4.17	0.817


Graph 22: Teaching techniques
Do I use supervisory materials
3,67
0,779
Do I inform the students about the aim of the lesson at the beginning of the teaching
4,31
0,734
Do I use early organizers
3,06
0,679
Do I use cognitive maps in the course of teaching
3,65
0,857
Do I summarize the main points at the end of the lesson
4,04
0,816
Do I teach learning strategies
4,21
0,769
Do I analyze the process of executing a project in steps and teach them following the proper hierarchy
3,59
0,854
Do I present aloud the course of thinking for me to get a reply acting exemplary as a model
2,75
0,557
Do I give examples
4,04
0,764
Do I mention counter- examples
3,24
0,806
Do I give opportunities to students for active participation during the teaching
3,78
0,927
Do I rate the previous knowledge of students on to a new course
2,46
0,858
Do I use the previous knowledge of students to a new course
3,42
0,819
Do I formulate many questions in the teaching to create dialogue
2,89
0,650
Do I integrate the students' responses-comments in teaching
4,10
0,823
Do I emphasize the practical training of students
4,24
0,767
Do I assign tasks that lead to a product that can be hung on the classroom wall
2,70
0,745
Do I give feedback directly to students
2,52
1,000
Do I commend or provide a reward after a good performance
2,95
0,730
Do I evaluate systematically the performance of students
4,27
0,790
Do I adjust the teaching based on the results of the students' assessment
4,17
0,817
Mean
Std. Deviation

Inductive statistics

The following chapter, is dedicated in investigating the research questions which are the following ones:

- The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are affected of the level in which they teach learning strategies to their students?

- The teaching techniques that the participants use to teach mathematics to students with mild intellectual disabilities are affected of the level in which they adjust their teaching based on the results of the students' assessment?

To reply to the research questions, Chi-square (x^2) test was used in order to reveal significant dependencies among the variables. This test is non parametric and extracts 2 main tables. The first contains a crosstabulation matrix which splits the data as for both studied variables and calculates the percentages in each case. Additionally, the second table contains the Pearson's Chi-square and p-value, which determines whether the 2 studied variables are independent ($p>0.05$) or not ($p<0.05$).

In Table 23 the p-values of the Chi-Square tests are presented, from which are revealed 16 statistically significant dependencies.

Table 23: Chi-Square as for the level in which the educators teach learning strategies

	Do I teach learning strategies
Do I use supervisory materials	0.000

Do I inform the students about the aim of the lesson at the beginning of the teaching	0.000
Do I use early organizers	0.055
Do I use cognitive maps in the course of teaching	0.000
Do I summarize the main points at the end of the lesson	0.000
Do I analyze the process of executing a project in steps and teach them following the proper hierarchy	0.002
Do I present aloud the course of thinking for me to get a reply acting exemplary as a model	0.001
Do I give examples	0.833
Do I mention counter- examples	0.000
Do I give opportunities to students for active participation during the teaching	0.000
Do I rate the previous knowledge of students on to a new course	0.000
Do I use the previous knowledge of students to a new course	0.413
Do I formulate many questions in the teaching to create dialogue	0.025
Do I integrate the students' responses-comments in teaching	0.302

Do I emphasize the practical training of students	0.001
Do I assign tasks that lead to a product that can be hung on the classroom wall	0.000
Do I give feedback directly to students	0.022
Do I commend or provide a reward after a good performance	0.000
Do I evaluate systematically the performance of students	0.012
Do I adjust the teaching based on the results of the students' assessment	0.039

Crosstabs

- In Table 24, it seems that the participants who sometimes teach learning techniques, also sometimes use supervisory materials in teaching mathematics to students with mild intellectual disabilities. Also, the participants who often or always teach learning techniques, often use supervisory materials.

- In Table 25, it is revealed that the participants who sometimes or often teach learning strategies, often inform the students about the aim of the lesson at the beginning of the teaching. However, the educators who always teach learning strategies, also always inform the students about the aims of the lesson at the beginning of the teaching.

- In Table 26, it seems that most of the participants that sometimes or often teach learning strategies, sometimes use cognitive maps. However, the participants who always teach learning strategies, use cognitive maps mostly often.

- Through Table 27, it is revealed that the majority of the participants that only sometimes or even often teach learning strategies, sometimes summarize the main points at the end of the lesson. Continuing, most of the participants who always teach their students with mild intellectual disabilities learning strategies about mathematics, often summarize the main points at the end of the lesson.

- In Table 28, it is revealed that the majority of the participants who sometimes or often teach learning techniques to their students, sometimes analyze the process of executing a project in steps and teach them to follow the hierarchy of those steps. Also, the participants who always teach learning techniques, more often use this particular teaching methods while teaching mathematics to students with mild intellectual disabilities.

- In Table 29, it seems that the biggest part of the participants who often teach learning strategies, rarely present aloud the course of thinking to get a reply acting exemplary as a model, while the rest of the participants sometimes use the said method.

- In Table 30, it is revealed that most of the participants who sometimes or often teach learning strategies to their students with mild intellectual disabilities, sometimes use counter-examples in their teaching. In the contrary, the majority of the participants that always teach learning strategies, often mention counter-examples.

- In Table 31, it becomes clear that the participants who sometimes or often teach learning techniques, also sometimes or often give opportunities for active participation during the teaching. However, the participants who always teach their students learning strategies, more often give such opportunities.

- Through Table 32, it is visible that most of the participants that sometimes or often teach learning strategies to their students with mild intellectual disabilities, rarely rate the previous knowledge of students on the new courses,

while the participants who always teach them learning strategies, sometimes rate the previous knowledge.

- Table 33, makes it clear that most of the participants who often teach learning strategies to their students, rarely formulate many questions in the teaching to create dialogue, with the rest of the participants sometimes using this technique.

- In the following Table 34, it is revealed that the more the participants teach learning strategies to their students with mild intellectual disabilities, the more they emphasize the practical training while teaching mathematics.

- Through Table 35, it is revealed that the participants who sometimes or always teach learning strategies to their students, mostly sometimes assign tasks that lead to a product that can be hung on the classroom wall. However, the rest of the participants rarely assign such kind of tasks.

- In Table 36, it can be noticed that most of the participants that sometimes or always teach learning strategies to their children, rarely give direct feedback to their students. However, the participants who often teach learning techniques, sometimes give feedback directly to their students.

- In Table 37, it seems that the participants who often teach learning strategies, also often provide a reward to their students after a good performance, while the rest of the participants sometimes use such a teaching method.

- Through Table 38, it seems that the more often the participants teach their students with mild intellectual disabilities learning strategies while teaching mathematics, the more often they evaluate systematically the performance of students.

- In the last Table 39 of this research question, it is revealed that the higher the frequency in which the educators teach their students learning strategies, the

more often they also adjust their teaching, based on the results of the students' assessment.

- Table 40: Chi-Square as for the level in which the participants adjust the teaching based on the results of the students' assessment

	Do I adjust the teaching based on the results of the students' assessment
Do I use supervisory materials	0.000
Do I inform the students about the aim of the lesson at the beginning of the teaching	0.872
Do I use early organizers	0.000
Do I use cognitive maps in the course of teaching	0.001
Do I summarize the main points at the end of the lesson	0.000
Do I analyze the process of executing a project in steps and teach them following the proper hierarchy	0.000
Do I present aloud the course of thinking for me to get a reply acting exemplary as a model	0.004
Do I give examples	0.001
Do I mention counter- examples	0.000

Do I give opportunities to students for active participation during the teaching	0.000
Do I rate the previous knowledge of students on to a new course	0.000
Do I use the previous knowledge of students to a new course	0.000
Do I formulate many questions in the teaching to create dialogue	0.000
Do I integrate the students' responses-comments in teaching	0.021
Do I emphasize the practical training of students	0.000
Do I assign tasks that lead to a product that can be hung on the classroom wall	0.011
Do I give feedback directly to students	0.895
Do I commend or provide a reward after a good performance	0.063
Do I evaluate systematically the performance of students	0.000

- In Table 41, it seems that the participants who sometimes adjust their teaching according to the results of the students' assessment, sometimes use supervisory materials, while the rest of the participants often use such materials.

- Through the Table 42, it is revealed that the participants who often adjust the teaching based on the students' assessment, mostly rarely use early organizers, with the rest of the sample mostly using early organizes sometimes.

- Table 43 makes clear, that the majority of the participants sometimes use cognitive maps in the course of teaching, however the more often the participants adjust their teaching on the results of the students' assessment the more they use cognitive maps.

- In Table 44, it seems that the participants that sometimes adjust their teaching based on the students' assessment, mostly always summarize the main points at the end of the lesson. However, the rest of the participants only often summarize those points.

- In Table 45, it seems that the more the participants adjust their teaching based on the results of the students' assessment, the more often they analyze the process of executing a project in steps and then teach their students to follow those steps in a proper hierarchy.

- In Table 46, it becomes clear that most of the participants who sometimes or always adjust their teaching to the students' assessment, sometimes present aloud the course of thinking to get a reply acting exemplary as a model. As for the participants who often adjust their teaching on the assessments, rarely use the mentioned method of teaching.

- Through the Table 47, it is revealed that the participants who sometimes adjust the teaching based on the results of the students' assessments, only sometimes use examples in their teaching, while most of the rest of the participants often give examples.

- In Table 48, it becomes clear that most of the participants that often adjust their teaching based on the results of the students' assessment, rarely mention

encounter examples. As for the participants who sometimes adjust their teaching, mostly use counter example only sometimes. Lastly, the participants who always adjust their teaching according to their students' assessment often use counter examples when teaching students with mild intellectual disabilities mathematics.

- In Table 49, it becomes obvious that the majority of the educators that sometimes or often adjust their teaching to their students' assessments, sometimes give opportunities to students for active participation during the teaching. The rest of the participants often give such opportunities during the teaching.

- Through Table 50, it seems that the participants that sometimes or often adjust their teaching based on the students' assessments, rarely rate the previous knowledge of their students on to a new course. As for the participants who always adjust their teaching to the students' results, they sometimes rate previous knowledge on to a new course.

- In Table 51 it is clear that all of the participants mostly sometimes use the previous knowledge of students to a new course. However, a bigger part of the participants who sometimes adjust their teaching to the students' assessment use previous knowledge of students always.

- In Table 52, it is revealed that most of the participants who often adjust their teaching to the students' assessment, rarely formulate many questions in the teaching to create dialogue, while the rest of the participants sometimes use such a method while teaching mathematics to students with mild intellectual disabilities.

- In Table 53, it seems that most of the participants that often adjust the teaching based on the results of the students' assessment, sometimes integrate the students' responses and comments in their teaching. Also, the participants that

sometimes adjust their teaching often integrate the students' comments, while those who always adjust their teachings mostly always integrate the students' comments in their teaching.

- In Table 54, it seems that the majority of the participants that sometimes adjust their teaching on the results of the students' assessment, sometimes emphasize the practical training of students, while the rest of the sample often emphasizes the practical training.

- In Table 55, it is revealed that most of the participants that sometimes or often adjust their teaching according to the students' assessment, sometimes assign tasks that lead to a product that can be hung on the classroom wall. As for the participants who always adjust their teaching, they mostly use the said method rarely.

- In the last Table 56, it seems that most of the participants that sometimes adjust their teaching based on the results of the students' assessment, also sometimes evaluate systematically the performance of their students with mild intellectual disabilities, while the rest of the participants always use this method.

4.2 Conclusions

The above research investigated the teaching techniques used by secondary education teachers in order to teach mathematics to students with mild intellectual disabilities. The sample is consisted of a total of 100 secondary education teachers. As for the techniques that they mostly used, the participants more often seem to inform the students about the aim of the lesson at the beginning of the teaching and evaluate systematically the performance of students. Also, quite often they emphasize the practical training of students and teach learning strategies to their students with mild intellectual disabilities. However, less often they give direct feedback to the students about their performance and they rate the previous knowledge of students on to a new course.

Through the first research question it is revealed that most of the participants that always teach learning strategies to their students, more often use supervisory materials, inform the students about the aim of the lesson at the beginning of the teaching and summarize it at the end, use cognitive maps and analyze the process of executing a project in steps. Also, the majority of the participants who always teach students learning strategies, present aloud the course of thinking to get a reply acting exemplary as a model, mention counter-examples and give opportunities for active participation in a higher frequency than the rest of the participants. Furthermore, most of the participants that sometimes teach their students learning techniques, they more often rate the previous knowledge of students on to a new course. As for the participants that often teach their students with mild intellectual disabilities learning strategies, in a higher frequency they give feedback directly to students, commend or provide a reward after a good performance and evaluate systematically the performance of students. Lastly, the educators that always teach the students learning methods, they more often formulate many questions in the teaching to create dialogue, emphasize the practical training, assign tasks that lead to a product that can be hung on the classroom wall and adjust the teaching based on the results of the students' assessment.

In the second research question, it becomes obvious that the participants that always adjust their teaching based on the students' assessment, more often use supervisory materials, analyze the process of executing a project in steps, present aloud the course of thinking to get a reply acting exemplary as a model and mention counter- examples. Also, the teachers who always adjust their teaching, seem to give more frequently opportunities for active participation, rate and use the previous knowledge of students on to a new course, integrate the students' responses-comments in teaching and emphasize the practical training, compared to the rest of the educators. The participants that sometimes adjust their teaching to the students' assessment sometimes, in a higher frequency they use early organizers, cognitive maps, summarize the main points at the end of the lesson and formulate many questions in the teaching to create dialogue. As for the teachers that often adjust their teaching to the students' assessment, they more often give examples, assign tasks that lead to a product that can be hung on the

classroom wall and evaluate systematically the performance of students, in comparison to the rest of the sample.

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