Professional Master's Degree

Teaching Mathematics in Pre-School and Primary School

tech global university

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Professional Master's Degree
Teaching Mathematics in Pre-School and Primary School

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/education/professional-master-degree/master-teaching-mathematics-pre-school-primary-school**

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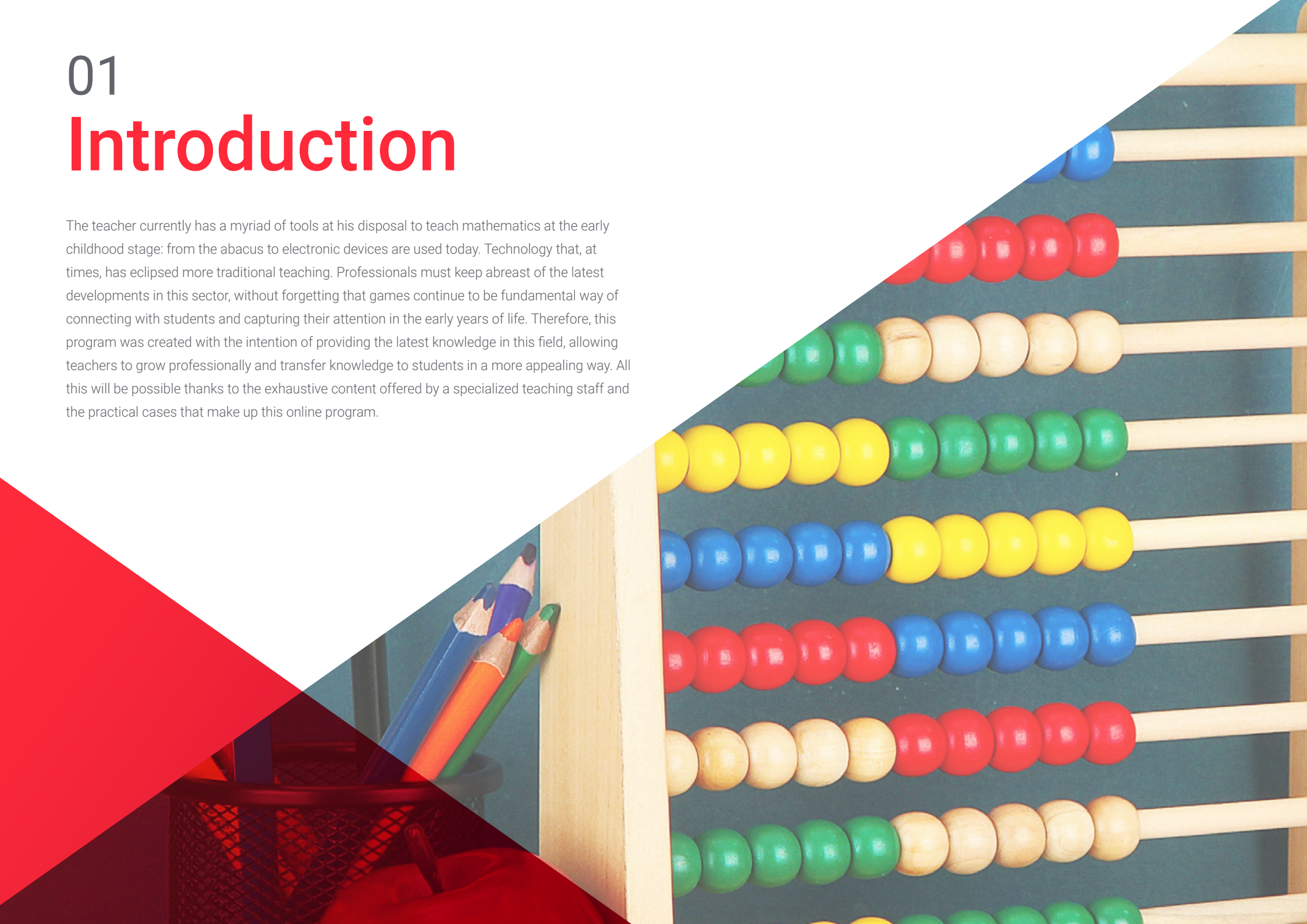
01

Introduction

The teacher currently has a myriad of tools at his disposal to teach mathematics at the early childhood stage: from the abacus to electronic devices are used today. Technology that, at times, has eclipsed more traditional teaching. Professionals must keep abreast of the latest developments in this sector, without forgetting that games continue to be fundamental way of connecting with students and capturing their attention in the early years of life. Therefore, this program was created with the intention of providing the latest knowledge in this field, allowing teachers to grow professionally and transfer knowledge to students in a more appealing way. All this will be possible thanks to the exhaustive content offered by a specialized teaching staff and the practical cases that make up this online program.



Thanks to this 100% online Professional Master's Degree you will get an advanced and agile knowledge about Mathematics Didactics through gamification".

Mathematics is key for human beings to understand their environment and progress within it. In addition, new career opportunities indicate that this subject is of utmost importance to perform jobs in the digital and industrial fields. Technological advances have also reached the classroom, so today's teacher must not only have extensive knowledge of the subject to be taught, but of all the educational tools and techniques available to them.

The inclusion of ICT in schools, even at an early age, goes hand in hand with an increasingly digitalized society. In this scenario, the professional must be able to design and implement traditional and interactive programs that enhance Logical-Mathematical Thinking or facilitate the acquisition of basic concepts of algebra, arithmetic or Mental Arithmetic.

Over 12 months, this Professional Master's Degree provides the most advanced and up-to-date information on Teaching Mathematics in Pre-School and Primary School, with the main objective of ensuring that students obtain the necessary knowledge to advance in educational field. For this purpose, a specialist faculty has prepared a theoretical-practical syllabus which examines the main teaching methodologies and resources that can be used to teach basic and initial mathematical concepts,.

In addition, the *Relearning* system, based on the repetition of content, will facilitate the acquisition of knowledge in a much more natural and progressive way. Furthermore, thanks to this method, students will reduce the long hours of study that are so common with other methodologies.

This is why teachers have an excellent opportunity to take a flexible university program that is compatible with their professional and work responsibilities. Therefore, to access the syllabus, they only need a computer or tablet from which to connect at any time of the day. With no classroom attendance or fixed class schedules, students also have the freedom to distribute the course load according to their needs. All this makes this program an ideal option for people who wish to obtain a Professional Master's Degree without neglecting other areas of their life.

This **Professional Master's Degree in Teaching Mathematics in Pre-School and Primary School** contains the most complete and up-to-date educational program on the market. The most important features include:

- The development of case studies presented by experts in Teaching Mathematics in Pre-School and Primary School
- The graphic, schematic and eminently practical contents with which it is conceived gather scientific and practical information on those disciplines that are indispensable for professional practice
- Practical exercises where self-assessment can be used to improve learning.
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

If you want to grow professionally, this Professional Master's Degree offers you all the educational resources you need for your classes. Enroll now"

This is an academic option that will show you the most commonly used board games to work on problems with children in pre-school and primary school"

A university program that will allow you to explore the counting principles of Piaget, Gelman and Gallistel's theory in a more dynamic way.

Gain 24-hour access to the most up-to-date content on Core Standards, EntusiasMat, JUMP Math and ABN methodologies.

The program's teaching staff includes professionals from the field who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the course. For this purpose, students will be assisted by an innovative interactive video system created by renowned and experienced experts.

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Objectives

At the end of this Professional Master's Degree, students will have gained more advanced knowledge of the main mathematics teaching methodologies for the early childhood stage. Thus, teachers will be able to accommodate different learning styles, plan games and activities to learn arithmetic, algebra or geometry, and enable their students to solve problems by applying different tools. The teaching faculty for this program will support educators in the achievement of these objectives.

Do you want to design truly engaging sessions for your students? This Professional Master's Degree shows you the wide range possibilities available today. Enroll now"

General Objectives

- Provide students with theoretical and practical knowledge that will allow them to acquire and develop essential competencies and skills for their role as teachers
- Design didactic games for learning mathematics
- Gamify the classroom, a new resource for motivation and learning applied to mathematics

This is a Professional Master's Degree that will allow you to learn about different educational materials and interactive resources that you can use to teach Logical-Mathematical Thinking"

Specific Objectives

Module 1. Logical-Mathematical Thinking in Pre-school Education

- Understand the development of Logical-Mathematical Thinking within the study plan of Pre-School and Primary School
- Ensure that the children learn to deduce logically, to argue and to draw conclusions from the situations they are presented with
- Learn to work with different learning techniques
- Learn mathematical concepts and vocabulary appropriate for a teaching unit

Module 2. Methodology and Classroom-Based Learning in Pre-school Education

- Know the basic concepts for the teaching of Mental Arithmetic in the classroom
- Develop materials and games to work on Mental Arithmetic in the classroom
- Learn about other resources available for the development of Mental Arithmetic in the Pre-School and Primary School classrooms
- Know and implement cooperative work in the mathematics classroom
- Identify the properties of objects and discover the relationships established between them through comparisons, classifications, serialization and sequencing

Module 3. Arithmetic, Algebra, Geometry and Measurement Games with Numbers

- Be able to plan different games and activities
- Participate with pleasure in different types of games and regulate their behavior and excitement to the action
- Help students learn to count, to become familiar with numbers, to distinguish cardinal and ordinal numbers
- Teach students to work with and learn the cardinal numbers in series through the manipulation of the appropriate material, to know how they are composed of and broken down into lower numbers

Module 4. Problem Solving and Mental Calculation

- Recognize situations in their usual environment for which the use of numbers is required
- Ensure that the children learn to deduce logically, to argue and to draw conclusions from the situations they are presented with
- Get the child to read and understand the problem statements
- Appreciate the usefulness of performing mediations to solve small everyday problems and become familiar with units of measurement of space and time

Module 5. Logical-Mathematical Thinking in Primary School

- Learn about Mathematical-Logical Thinking and the contributions of Psychology and Teaching
- Learn about problem solving through the development of Logical-Mathematical Thinking
- Learn to use logical-mathematical material resources

Module 6. Arithmetic, Algebra and Measurement Play

- Initiation in the concept of quantity, numerical expression and arithmetic operations, through manipulation and experimentation
- Design materials adapted to the learning of number, arithmetic, operations and algebra
- Know the natural number and the decimal numbering system
- Understand the additive, multiplicative and division structure and the possible difficulties and errors in applying it
- Understand the concept of decimal numbers within the Primary School Education curriculum, as well as their arrangement, comparison and basic operations
- Explore the measurement of magnitudes and difficulties in the measurement process

Module 7. Methodology and Classroom Based Learning in the Primary School Classroom Students with Adaptations

- Be able to use evaluation criteria
- Develop materials and resources to work on the problems in the classroom
- Become familiar with different methodologies such as Core Standards, EntusiasMat, JUMP Math and ABN.

Module 8. Mental Calculation and Problem Solving

- Know the concept of Mental Arithmetic and its importance in the Teaching of Mathematics
- Establish strategies to teach Mental Arithmetic
- Apply methodologies for problem solving through Mental Arithmetic

Module 9. Design and Development of Didactic Materials: Mathematics Workshop/Mathematics Games

- Know the basic principles for the elaboration of resources and teaching materials
- Design materials adapted to the learning of measurement quantities
- Design materials adapted to the learning of probability and statistics
- Design materials adapted to the learning of Geometry
- Relate the teaching of mathematics from other disciplines
- Create audiovisual resources for teaching mathematics
- Use comics as a didactic resource in the teaching of mathematics
- Create and implement practical workshops for the consolidation of mathematical concepts
- Understand geometry within the curricular framework of Pre-school and Primary School Education
- Learn about the contributions of Piaget, Duval and the Van Hiele couple to the field of geometry

Module 10. ICT in Pre-school and Primary Education. Development of Interactive Materials for the Classroom Workshops

- Understand the importance of the use of ICT in the Pre-school and Primary School Education classroom and the previous considerations to take into account
- Take into account the needs when implementing ICT in the classroom, both personal and material
- Become familiar with Bloom's Taxonomy, as well as its updating and digital application
- Create and design interactive content and resources for later use in the classroom

03

Skills

This Professional Master's Degree provides the mathematics teacher with the competencies and skills necessary to teach this subject in a much more fun and dynamic way, thanks to the use of various traditional and technological tools. Thus, at the end of this Professional Master's Degree, educators will have acquired a broad base of knowledge allowing them use everyday situations to teach students to interpret information using numeracy skills and basic operations. The video summaries and interactive diagrams for this Professional Master's Degree will significantly aid learning.

This Professional Master's Degree will allow you to introduce mathematical language and everyday situations to your classroom"

General Skills

- Spontaneously use, both personally and socially, mathematical elements and reasoning to interpret mathematical concepts and solve problems
- Integrate mathematical knowledge and language with other types of knowledge to better respond to life situations
- Be able to use and relate geometric shapes and contents, both to produce and interpret different types of information and to broaden knowledge about spatial aspects of reality and the possibility of intervening on it
- Identify everyday situations in which the use of numbers and basic operations serve both to produce and interpret different types of information
- Incorporate the essentials of mathematical language into habitual expression and the appropriate precision in its use

Enhance your competencies and skills in order to teach geometry and algebra to children using ICT"

Specific Skills

- Improve the ability to use and explain numbers, basic operations, symbols and forms of expression, and mathematical reasoning
- Understand logical texts that include mathematical language and be able to develop them in a mathematical context
- Be able to use mathematical thinking in its different forms, interpreting and describing reality and extrapolating it to everyday situations of daily life
- Develop skills in the use of numbers, as well as the incorporation of technological tools as didactic resources for the improvement of learning and problem solving
- Know how to relate the different types of mathematical language in order to link it to information processing
- Use the tools that mathematics provides us with to understand the information provided by mathematical supports and apply them to life in the classroom and in everyday life
- Be able to solve problems as a promoter of the development of autonomy and personal initiative through planning and management of available resources

04

Course Management

TECH remains committed to offering all its students an education that fulfills their needs and meets the standards of an institution at the forefront of the academic world. To this end, it carefully selects the teachers who deliver each of its programs. On this occasion it has brought together a management and teaching staff with extensive teaching experience, and whose knowledge is reflected in the syllabus for this Professional Master's Degree. In addition, this specialist team is available to answer any questions students may have about the content of this online program.

Advance your professional career with en experienced team of educational experts"

Management

Ms. Delgado Pérez, María José

- TPR and Mathematics teacher at Peñalar College
- Professor of Secondary and Baccalaureate Education
- Expert in management of educational centers
- Co-author of technology books with McGraw Hill Publishers
- Master's Degree in Educational Center Management and Administration
- Leadership and management in Elementary, Middle School and High School
- Graduate in teaching with a specialization in English
- Industrial Engineer

Professors

D. López Pajarón, Juan

- Secondary and High School Science Teacher at Montesclaros College Educare Group
- Coordinator and Head of Educational Projects in Secondary and Baccalaureate
- Technician at Tragsa
- Biologist with experience in the field of environmental conservation
- Professional Master's Degree in Direction and Management of Educational Centers by the University International of La Rioja

Ms. Vega, Isabel

- Specialized Teacher in teaching mathematics and learning disabilities
- Primary Education Teacher
- Primary School Education Cycle Coordinator
- Specialization in Special Education and Mathematics Didactics
- Graduate in Teaching

Ms. Hitos, María

- Early Childhood and Primary School Teacher Specialized in Mathematics
- Pre-school and Primary Education Teacher
- Child English Department Coordinator
- Language qualification in English by the Community of Madrid.

Ms. Iglesias Serranilla, Elena

- Teacher of Pre-school and Primary School Education, specialization in Music
- Primary School Education First Cycle Coordinator
- Training in New Learning Methodologies

Ms. Soriano de Antonio, Nuria

- Philologist Specialist in Spanish Language and Literature
- Master's Degree in High School Education and Vocational Training from the Alfonso X el Sabio University
- Master's Degree in Spanish for Foreigners
- Expert in Educational Center Management and Administration
- Expert in Didactics of Spanish
- Degree in Hispanic Philology from the Complutense University of Madrid

A unique, crucial and decisive learning experience to boost your professional development"

05

Structure and Content

TECH employs the latest teaching technology in its programs. Therefore, in this Professional Master's Degree program, students will find teaching resources in the form of video summaries, videos in detail or interactive diagrams. These tools are complemented by further reading and case studies, which will allow students to broaden their knowledge and bring them closer to situations that are directly applicable their classrooms. With all this, the professional will be able to further develop Logical-Mathematical Thinking in Pre-School, using a range of Mathematics teaching methodologies and ICT tools.

This online program shows you how to use the Japanese abacus, the flash method or GeoGebra to teach Mental Srithmetic to children in Pre-School and Primary School"

Module 1. Logical-Mathematical Thinking in Pre-School

1.1. Logical-Mathematical Thinking
- 1.1.1. What is Mathematical Logic?
- 1.1.2. How is Mathematical Knowledge Acquired?
- 1.1.3. The Formation of Logical-Mathematical Concepts at an Early Age
- 1.1.4. Mathematical Concepts
- 1.1.5. Characteristics of Logical-Mathematical Thinking

1.2. Training Logical-Mathematical Development Skills
- 1.2.1. Cognitive Development (Piaget)
- 1.2.2. Evolutionary Stages
- 1.2.3. Division of Thought in Knowledge (Piaget)
- 1.2.4. Evolution of Logical-Mathematical Knowledge
- 1.2.5. Physical Knowledge vs. Logical-Mathematical Knowledge
- 1.2.6. Knowledge of Space and Time

1.3. Development of Logical-Mathematical Thinking
- 1.3.1. Introduction
- 1.3.2. Knowledge and Reality
- 1.3.3. Development of Mathematical Knowledge
- 1.3.4. Development of Logical Thinking by Age
- 1.3.5. Components of Logical Development
- 1.3.6. Mathematical Language
- 1.3.7. Logical-Mathematical Development and Core Curriculum

1.4. Psychopedagogical Foundations in the Construction of Mathematical Knowledge
- 1.4.1. Sensorimotor Intelligence
- 1.4.2. Formation of Objective - Symbolic Thinking
- 1.4.3. Formation of Concrete-Logical Thinking
- 1.4.4. Reasoning and its Types
- 1.4.5. Bloom's Taxonomy in the Development of Logical-Mathematical Thinking

1.5. Logical-Mathematical Learning I
- 1.5.1. Introduction
- 1.5.2. Structuring of the Body Scheme
  - 1.5.2.1. Body Concept
  - 1.5.2.2. Body image
  - 1.5.2.3. Postural Adjustment
  - 1.5.2.4. Coordination

1.6. Notions of Order
- 1.6.1. Comparison
- 1.6.2. Correspondence
- 1.6.3. Quantifiers
- 1.6.4. Quantity Conservation
- 1.6.5. Sets or Groupings
- 1.6.6. Formation of Sets
- 1.6.7. Numerical Cardinality
- 1.6.8. The Number Concept
- 1.6.9. Comparison of Sets
- 1.6.10 Set Equivalence
- 1.6.11 Recognition of Natural Numbers
- 1.6.12 Ordinal Numbers
- 1.6.13 Mathematical Operations: Addition and Subtraction

1.7. Prenumerical Knowledge: Classification
- 1.7.1. What is Classification?
- 1.7.2. Processes
- 1.7.3. Types of Classification
- 1.7.4. Cross Classifications
- 1.7.5. Classification Games

1.8. Seriation Games
- 1.8.1. Importance of Making Series
- 1.8.2. Logical Operations in the Construction of Series
- 1.8.3. Types of Series
- 1.8.4. Seriation in Pre-school Education
- 1.8.5. Seriation Games

1.9. Prenumerical Knowledge: Enumeration
- 1.9.1. Conceptualization and Function of Enumeration
- 1.9.2. Logical Operations Involved in Enumeration
- 1.9.3. Enumeration in Pre-school Education Design of Activities
- 1.9.4. Design of Activities
- 1.9.5. Task-Based Achievements

1.10. Representation and Manipulative Mathematics
- 1.10.1. Development of Logical-Mathematical Thinking Through the Senses
- 1.10.2. Representation, Visualization and Reasoning
- 1.10.3. Design of Activities Supported by Representation
- 1.10.4. Manipulative Mathematics: Functions and Resources
- 1.10.5. Design of Activities that Rely on Manipulation

Module 2. Methodology and Classroom-Based Learning in Pre-school Education

2.1. Globalized Teaching in Pre-school Education
- 2.1.1. Cooperative Learning
- 2.1.2. Project Method
- 2.1.3. Play
- 2.1.4. Mathematics Corner
- 2.1.5. Daily Activities (Routines)
- 2.1.6. Workshops
- 2.1.7. Large Regulated Group Activities

2.2. Construction of Mathematical Knowledge in Pre-school Education
- 2.2.1. Introduction
- 2.2.2. Models in the Teaching-Learning of Mathematics
- 2.2.3. Specificity and Significance of Mathematical Knowledge
- 2.2.4. Learning and Management of Didactic Variables
- 2.2.5. Errors and Obstacles in Mathematical Learning

2.3. Mathematics Curriculum in Pre-school Education
- 2.3.1. Introduction
- 2.3.2. Didactic Transposition
- 2.3.3. General Considerations of the Mathematics Curriculum in Pre-school Education
- 2.3.4. NCTM Considerations
- 2.3.5. Curriculum and Inferential Relationships in Pre-school Education
- 2.3.6. Inferential Elements in Pre-school Education
- 2.3.7. School Mathematics Curriculum and Relationship Building
- 2.3.8. Argument and Mathematical Discourse in Pre-school Education

2.4. Creativity in Mathematics Intelligence Bits Method
- 2.4.1. Introduction
- 2.4.2. Main Creativity Theories
- 2.4.3. Principles of School Mathematics
- 2.4.4. Mathematics Standards
- 2.4.5. Intelligence Bits Method

2.5. Methodological Proposals for Students with Educational Needs
- 2.5.1. Introduction
- 2.5.2. Create a Learning Environment to Include Children's Diversity
- 2.5.3. Diversity of the Classroom in Today's Society
- 2.5.4. Inclusive Classroom Climate as an Educational Response to Diversity
- 2.5.5. Methodological Change
- 2.5.6. Mathematical Knowledge is Built From One's Own Experience
- 2.5.7. Mathematics Teaching
- 2.5.8. Fundamental Principles
- 2.5.9. Description of the Method

2.6. Principles of Didactic Methodology for the Teaching-Learning of Mathematics in Pre-School Education
- 2.6.1. Methodology
- 2.6.2. Basic Methodological Lines
- 2.6.3. Child Stimulation
- 2.6.4. Sequence of Learning
- 2.6.5. Characteristics of Learning Assessment
- 2.6.6. Evaluation Tools

2.7. Didactic Situations Theory
- 2.7.1. Introduction
- 2.7.2. Didactic Contract
- 2.7.3. TDS-Based Learning
- 2.7.4. Analysis of Real Situations
- 2.7.5. Variables and their Management

2.8. Teaching Resources and Activities
- 2.8.1. Main Principles of Mathematical Learning
- 2.8.2. Strategies that Create a Favorable Predisposition Toward Mathematics
- 2.8.3. Logical-Mathematical Materials and Resources Utilities
- 2.8.4. Non-Material Resources
- 2.8.5. Mathematical Activities Suitable for Pre-school
- 2.8.6. Constructive Logical-Mathematical Activities

2.9. Analysis of Objectives, Contents and Evaluation Criteria
- 2.9.1. Analysis of Objectives (First Cycle)
- 2.9.2. Analysis of Objectives (Second Cycle)
- 2.9.3. Content Analysis
- 2.9.4. Evaluation Criteria (First Cycle)
- 2.9.5. Criteria of Evaluation (Second Cycle)

2.10. Evaluation in Pre-school Education
- 2.10.1. Introduction
- 2.10.2. Characteristics of Pre-school Evaluation
- 2.10.3. Evaluation of Teaching in Pre-school Education
- 2.10.4. Evaluation of Learning in Pre-school Education
- 2.10.5. Regulatory Framework
- 2.10.6. Headings

Module 3. Arithmetic, Algebra, Geometry and Measurement Games with Numbers

3.1. Initiation to Number
- 3.1.1. Number Concept
- 3.1.2. Construction of the Number Structure
- 3.1.3. Numerical Development: Counting
  - 3.1.3.1. Phases in Learning the Numerical Sequence
    - 3.1.3.1.1. Rope or String Level
    - 3.1.3.1.2. Unbreakable Chain Level
    - 3.1.3.1.3. Breakable Chain Level
    - 3.1.3.1.4. Numerable Chain Level
    - 3.1.3.1.5. Bidirectional Chain Level
- 3.1.4. Counting Principles
  - 3.1.4.1. One-to-one Correspondence Principle
  - 3.1.4.2. Stable Order Principle
  - 3.1.4.3. Cardinality Principle
  - 3.1.4.4. Abstraction Principle
  - 3.1.4.5. Irrelevance of Order Principle
- 3.1.5. Procedures used by the Child in Counting
  - 3.1.5.1. Term to Term Correspondence
  - 3.1.5.2. Subset to Subset Correspondence
  - 3.1.5.3. Purely Visual Estimation
  - 3.1.5.4. Subitizing
  - 3.1.5.5. Count the Elements of a Collection
  - 3.1.5.6. Recount
  - 3.1.5.7. Discount
  - 3.1.5.8. Overcount
  - 3.1.5.9. Calculation Procedures
- 3.1.6. Fundamental Cardinal and Ordinal Situations
- 3.1.7. The Importance of Zero
- 3.1.8. Strategies to Enhance the Concept and Use of Number

3.2. Number Acquisition Process
- 3.2.1. Introduction
- 3.2.2. Number Concept
  - 3.2.2.1. Perception of General Quantities
  - 3.2.2.2. Distinguishing and Comparing Quantities of Objects
  - 3.2.2.3. Uniqueness Principle
  - 3.2.2.4. Generalization
  - 3.2.2.5. Summative Action
  - 3.2.2.6. Capture of Named Quantities
    - 3.2.2.6.1. Oral Numeric Series
    - 3.2.2.6.2. Counting Objects
    - 3.2.2.6.3. Cardinal Representation
    - 3.2.2.6.4. Compare Magnitudes
  - 3.2.2.7. Identification of the Name with its Representation
  - 3.2.2.8. Invariance of Named Quantities
- 3.2.3. From Experimental Psychology
  - 3.2.3.1. Distance Effect
  - 3.2.3.2. Size Effect
  - 3.2.3.3. Numerical Spatial Arrangement
- 3.2.4. From Developmental Psychology
  - 3.2.4.1. Behavioral, Cognitive and Constructivist Theory
    - 3.2.4.1.1. Exercise Law
    - 3.2.4.1.2. Law of Effect
- 3.2.5. Theories on the Process of Number Acquisition
- 3.2.6. Piaget
  - 3.2.6.1. Stages
  - 3.2.6.2. Requirements for the Understanding of the Notion of Number

3.2.7. Dienes
3.2.7.1. Principles
3.2.7.1.1. Dynamic Principle
3.2.7.1.2. Constructive Principle
3.2.7.1.3. Economic Variability Principle
3.2.7.1.4. Constructive Variability Principle
3.2.7.2. Stages
3.2.7.2.1. Free Play
3.2.7.2.2. Game with Rules
3.2.7.2.3. Isomorphic Games
3.2.7.2.4. Representation
3.2.7.2.5. Description
3.2.7.2.6. Deduction
3.2.8. Mialaret
3.2.8.1. Stages
3.2.8.1.1. Action Itself
3.2.8.1.2. Action Accompanied by Language
3.2.8.1.3. Conduct of the Narrative
3.2.8.1.4. Application of the Story to Real Situations
3.2.8.1.5. Graphical Expression of the Actions already Reported and Represented
3.2.8.1.6. Symbolic Translation of the Studied Problem
3.2.9. Information Processing
3.2.9.1. Numerical Apprehension Model
3.2.9.2. Pre-linguistic Numerical Skills
3.2.10 Counting Principles (Gelman and Gallistel)
3.2.10.1. Biunivocal Correspondence Principle
3.2.10.2. Stable Order Principle
3.2.10.3. Cardinality Principle
3.2.10.4. Abstraction Principle
3.2.10.5. Inconsequence of Order Principle
3.2.11. Comparison of Counting Principles between Piaget's, Gelman's and Gallistel's Theory

3.3. Informal Arithmetic I
3.3.1. Introduction
3.3.2. Towards an Informal and Intuitive Arithmetic in Pre-school Education
3.3.2.1. Recognize Quantities
3.3.2.2. Relate Quantities
3.3.2.3. Operate Quantities
3.3.3. Objectives
3.3.4. Early Arithmetic Skills
3.3.4.1. Preservation of Inequality
3.3.5. Arithmetic Skills and Chants
3.3.5.1. Preliminary Considerations
3.3.5.1.1. Socio-Cognitive Conflict
3.3.5.1.2. Role of the Language
3.3.5.1.3. Creation of Contexts
3.3.5.2. Procedures and Mastery of the Chants
3.4. Informal Arithmetic II
3.4.1. Memorization of Numerical Facts
3.4.1.1. Activities to Work on Memorization
3.4.1.2. Domino
3.4.1.3. Hopscotch
3.4.2. Didactic Situations for the Introduction of Addition
3.4.2.1. Dialed Number Game
3.4.2.2. Race to 10
3.4.2.3. Christmas Greetings
3.5. Basic Arithmetic Operations
3.5.1. Introduction
3.5.2. Additive Structure
3.5.2.1. Phases of Mialaret
3.5.2.1.1. Approach Through Manipulation
3.5.2.1.2. Action Accompanied by Language
3.5.2.1.3. Mental Work Supported by Verbalization
3.5.2.1.4. Purely Mental Work
3.5.2.2. Strategies to Add
3.5.2.3. Initiation to Subtraction

3.5.2.4. Addition and Subtraction
3.5.2.4.1. Direct and Object Modeling
3.5.2.4.2. Counting Sequences
3.5.2.4.3. Recalled Numeric Data
3.5.2.4.4. Strategies to Add
3.5.2.4.5. Subtraction Strategies
3.5.3. Multiplication and Division
3.5.4. Arithmetic Problem Solving
3.5.4.1. Addition and Subtraction
3.5.4.2. Multiplications and Divisions
3.6. Space and Geometry in Pre-school Education
3.6.1. Introduction
3.6.2. Objectives Proposed by the NCTM
3.6.3. Psychopedagogical Considerations
3.6.4. Recommendations for Teaching Geometry
3.6.5. Piaget and his Contribution to Geometry
3.6.6. Van Hiele Model
3.6.6.1. Levels
3.6.6.1.1. Visualization or Recognition
3.6.6.1.2. Analysis
3.6.6.1.3. Sorting and Classification
3.6.6.1.4. Rigor
3.6.6.2. Learning Phases
3.6.6.2.1. Phase 1: Consultancy
3.6.6.2.2. Phase 2: Directed Guidance
3.6.6.2.3. Phase 3: Explication
3.6.6.2.4. Phase 4: Guidance
3.6.6.2.5. Phase 5: Integration
3.6.7. Geometry Types
3.6.7.1. Topological
3.6.7.2. Projective
3.6.7.3. Metrics
3.6.8. Visualization and Reasoning
3.6.8.1. Spatial Orientation
3.6.8.2. Spatial Structuring
3.6.8.3. Gálvez y Brousseau
3.6.8.3.1. Microspace
3.6.8.3.2. Mesospace
3.6.8.3.3. Macrospace
3.7. Magnitudes and their Measurement
3.7.1. Introduction
3.7.2. Construction of the Notion of Magnitude in the Child
3.7.2.1. Piagetian Phases in the Construction of Magnitudes
3.7.2.1.1. Consideration and Perception of a Magnitude
3.7.2.1.2. Conservation of Magnitude
3.7.2.1.3. Ordering with Respect to Magnitude
3.7.2.1.4. Correspondence of Numbers to Quantities of Magnitude
3.7.2.2. Stages in the Construction of the Measure
3.7.2.2.1. Direct Perceptual Comparison
3.7.2.2.2. Displacement of Objects
3.7.2.2.3. Operability of the Transitive Property
3.7.2.3. Stages in the Teaching-Learning of Magnitudes
3.7.2.3.1. Sensory Stimulation
3.7.2.3.2. Direct Comparison
3.7.2.3.3. Indirect Comparison
3.7.2.3.4. Choice of Unit
3.7.2.3.5. Irregular Measurement System
3.7.2.3.6. Regular Measurement System
3.7.3. Measuring Magnitudes
3.7.4. Length Measurement
3.7.5. Length Measurement
3.7.6. Measurement of Capacity and Volume
3.7.7. Measurement of Time

3.7.8. Phases of the Different Magnitudes
3.7.8.1. Preparation Phase
3.7.8.2. Measurement Practice Phase
3.7.8.3. Consolidation Phase of Techniques and Concepts
3.8. Play in Pre-school Education
3.8.1. Introduction
3.8.2. Objectives
3.8.3. Playing Features
3.8.4. Evolution of the Game
3.8.4.1. Types of Games
3.8.4.1.1. Functional Game
3.8.4.1.2. Imitation or Symbolic Play
3.8.4.1.3. Game with Rules
3.8.4.1.4. Construction Game
3.8.5. Chance and Strategy
3.8.6. Competition in the Games
3.8.7. Didactic Considerations on the Game
3.9. Didactic Resources of the Game
3.9.1. Games and Logical Thinking
3.9.1.1. Three in a Row
3.9.1.2. Quarto
3.9.1.3. Portrait Games
3.9.2. Quantitative Games
3.9.2.1. Number to Compare
3.9.2.1.1. Home!
3.9.2.2. Number to Calculate
3.9.2.2.1. Couples
3.9.2.2.2. No more!
3.9.2.2.3. Cat and Mouse
3.9.3. Games and the Structure of Space
3.9.3.1. Puzzles
3.9.3.1.1. Two-Color Paintings
3.9.3.1.2. The Hex
3.10. Games in Different Spaces
3.10.1. Introduction
3.10.2. Games in the Classroom
3.10.2.1. The Butterfly Game
3.10.2.2. The Partitioning Game
3.10.2.3. Image Trains
3.10.2.4. The Newspaper
3.10.2.5. Flat Figures
3.10.2.6. The Containers
3.10.3. Games in Psychomotor Skills
3.10.3.1. Working with Sizes
3.10.3.2. Classify
3.10.3.3. We Play with the Hoops
3.10.4. Outdoor Games
3.10.5. Mathematical Games with ICT
3.10.5.1. Playing with the Turtle's Mind
3.10.5.2. Geometric Figures
3.10.5.3. For 3-Year-Old Students
3.10.5.4. Variety of Activities
3.10.5.5. Didactic Unit

Module 4. Problem Solving and Mental Arithmetic

4.1. Problem in Pre-school Education
4.1.1. Methodological Considerations
4.1.2. Psychopedagogical Considerations of the Initiation of Problem Idea Representation
4.1.3. What is a Problem?
4.1.4. How to Pose Problems in Pre-school?
4.2. Idea of a Problem to be Introduced in Pre-school Education
4.2.1. Why do We Solve Problems?
4.2.2. Perspectives for the Inclusion of Comprehension and Problem Solving in Pre-school Education
4.2.3. Specific Didactic Contract for Problem Solving in Pre-school Education
4.2.4. Most Appropriate Models for Introducing the idea of Problem in Pre-school Education

4.2.5. Reading and Understanding Statements
4.2.5.1. Factors of Understanding Statements
4.2.6. Didactic Variables of the Statements
4.3. Towards a Didactic Approach to the Introduction to the idea of Problem in Pre-school Education
4.3.1. Factors to be Taken into Consideration in the Approach and Resolution of Problems in Pre-school
4.3.2. Learning Logical-Mathematical Concepts Through Problem Solving
4.3.2.1. Heuristic Strategies
4.3.2.2. Technique Most Commonly Used at These Ages for Problem Solving
4.3.2.3. Numerical Strategies
4.3.3. Various Situations for the Teaching of Proposition and Problem Solving
4.3.4. Problem Solving Constituent Elements of a Problem
4.3.4.1. Problems that Serve as Exercises to Practice the Problem Idea
4.3.5. Main Recommendations for Approaching the Problem Idea in Pre-school Education
4.4. Mathematical Value of Stories
4.4.1. Pre-school Learning and Mathematics
4.4.2. Stories and Mathematics
4.4.3. Examples of Stories and Mathematical Learning
4.4.3.1. Logical Development
4.4.3.2. Numerical Development
4.4.3.3. Development of Magnitudes and their Measurement
4.4.3.4. Development of Geometric Thinking
4.4.3.5. Problem Solving
4.5. Logical Basis of Mental Arithmetic in Pre-school Education
4.5.1. Logical Operations
4.5.1.1. Classifications
4.5.1.2. Relationships of Order
4.5.2. Mental Arithmetic, Written Arithmetic and Estimated Arithmetic
4.5.3. Counting Process
4.5.4. Phases for Learning the Counting Activity
4.6. Informal Arithmetic
4.6.1. Arithmetic Strategy
4.6.2. Comparison and Equivalence
4.6.3. Composition and Decomposition
4.6.4. Initiation to Operational Activity: Adding, Subtracting, Folding and Distributing
4.7. Mental Arithmetic in Pre-school Education
4.7.1. Calculation Examples for Pre-school Education
4.7.2. Perform Calculation by Manipulating Material
4.7.3. Calculation Without Material Handling
4.7.4. Proposal for Mental Arithmetic in Pre-school Education
4.7.4.1. Guessing Game
4.7.4.2. It is Learned by Heart
4.7.5. Mechanics Acquired at the End of Pre-school Education
4.7.6. Resources to Achieve Apprenticeships
4.7.7. Practical Issues
4.8. Resource Bank for Calculation in Pre-school Education
4.8.1. Abacus
4.8.1.1. Description
4.8.1.2. Possibilities for Didactic Use
4.8.1.3. Classroom Didactic Situations
4.8.2. Multibase Blocks
4.8.2.1. Description
4.8.2.2. Possibilities for Didactic Use
4.8.2.3. Classroom Didactic Situations
4.8.3. Cuisenaire Strips
4.8.3.1. Description
4.8.3.2. Possibilities for Didactic Use
4.8.3.3. Classroom Didactic Situations
4.8.4. Domino
4.8.4.1. Description
4.8.4.2. Possibilities for Didactic Use
4.8.4.3. Classroom Didactic Situations

4.8.5. Battle Game
4.8.5.1. Description
4.8.5.2. Possibilities for Didactic Use
4.8.5.3. Classroom Didactic Situations
4.9. Open Number Based Calculus Method (ABN)
4.9.1. What is the ABN Algorithm Method?
4.9.1.1. Quantity and Cardinality of Sets
4.9.1.2. Number Structure and Set Comparison
4.9.1.2.1. Figurative Representation
4.9.1.2.2. Symbolic Representation
4.9.1.2.3. Symbol-Sign Representation
4.9.1.2.4. Representation by Signs
4.9.1.3. Counting Well Over Ten
4.9.1.4. Number Transformations First Operations
4.9.2. Background of the ABN Method
4.9.3. Intuitive Approach vs. Traditional Approach
4.10. ABN Method Activities Proposal
4.10.1. Block 1: Numerical and Cardinal
4.10.1.1. Search for Equivalent Sets
4.10.1.2. Establishment of a Physical Pattern
4.10.1.3. Pattern Sorting
4.10.1.4. Numeric String Start of Counting
4.10.1.5. Subitization
4.10.1.6. Estimate
4.10.2. Block 2: Number Structure and Comparison
4.10.2.1. Introduction to the Ten
4.10.2.2. Ordering, but not Counting
4.10.2.3. Arrangement of Disordered Sets
4.10.2.4. Interaction of Missing Elements
4.10.2.5. Arrangement with Non-Manipulable Material
4.10.2.6. Comparison of Real Objects
4.10.2.7. Comparison of Figurative Elements
4.10.3. Block 3: Number Transformations
4.10.3.1. Number Transformations
4.10.3.2. Addition with the Number Line
4.10.3.3. Subtraction with Toothpicks
4.10.3.4. Finding the Double with Grid
4.10.3.5. Finding Half with the Number Line
4.10.4. Assessment

Module 5. Logical-Mathematical Thinking in Primary School

5.1. Nature and Development of Logical-Mathematical Thinking
5.1.1. Conceptualization
5.1.2. Piaget and Logical-Mathematical Thinking
5.1.3. Definition of Basic Concepts of Piaget's Theories
5.1.4. Logical-Mathematical Thinking in the Pre-School Education Study Plan
5.1.5. Logical-Mathematical Thinking in the Primary School Education Study Plan
5.1.6. Logical-Mathematical Thinking in the NCTM
5.1.7. Ausubel's Significant Learning
5.1.8. Logical-Mathematical Relationships in the Montessori Method
5.2. Bloom's Taxonomy in the Development of Logical-Mathematical Thinking
5.2.1. Benjamin Bloom
5.2.2. Concept
5.2.3. Dimensions
5.2.4. Cognitive Domain Development
5.2.5. Renewal of the Theory
5.2.6. Digital Application
5.2.7. Digital Applications
5.2.8. Criticism

5.3. Prenumerical Knowledge
- 5.3.1. Introduction
- 5.3.2. Logical-Mathematical Contents in Pre-school Education
- 5.3.3. Classification
- 5.3.4. Centration and Decanting Processes
- 5.3.5. The Series
- 5.3.6. Enumeration
- 5.3.7. Correspondence
- 5.3.8. Quantity Conservation

5.4. Numerical Knowledge
- 5.4.1. Number Concept
- 5.4.2. Numbering Systems
- 5.4.3. Concept of Number from the Psychology of Development
- 5.4.4. Concept of Number from the Experimental Psychology
- 5.4.5. Current Situation in the Teaching of Arithmetic and the Concept of Number
- 5.4.6. Counting Skills
- 5.4.7. Classroom Application
- 5.4.8. The Spelling

5.5. Development of Logical-Mathematical Thinking Through Problem Solving
- 5.5.1. What is a Problem? Problem Definition
- 5.5.2. Typology
- 5.5.3. Problem Solving in Curricular Proposals
- 5.5.4. Problem Solving Difficulties
- 5.5.5. Problem-Based Learning

5.6. Difficulties in Learning Mathematics
- 5.6.1. Learning Difficulties in Primary School Education
- 5.6.2. Difficulties in the Field of Mathematics
- 5.6.3. Dyscalculia
- 5.6.4. Classification
- 5.6.5. Symptoms
- 5.6.6. Affected Functions
- 5.6.7. Suggestions for Working with Children with Dyscalculia
- 5.6.8. Methods and Instruments to Detect Mathematics Difficulties

5.7. Flipped Classroom and Gamification
- 5.7.1. *Flipped Classroom*
- 5.7.2. Methodology
- 5.7.3. Phases
- 5.7.4. Advantages and Disadvantages
- 5.7.5. Guidelines
- 5.7.6. Conclusions
- 5.7.7. Gamification in the Classroom
- 5.7.8. Gamification and Motivation
- 5.7.9. Classroom Application

5.8. Cooperative Learning
- 5.8.1. Cooperative Learning
- 5.8.2. Methodology
- 5.8.3. Outline of the Classroom Work
- 5.8.4. Cooperative Work Groups
- 5.8.5. Internal Organization of the Groups
- 5.8.6. Simple Learning Structures 1st and 2nd Grades
- 5.8.7. Simple Learning Structures 2nd and 4th Grade
- 5.8.8. Simple Learning Structures 5th and 6th Grade

5.9. Montessori Pedagogy, Reggio Emilia, Waldorf
- 5.9.1. Alternative Pedagogies
- 5.9.2. Montessori Pedagogy
- 5.9.3. Montessori Method
- 5.9.4. Curriculum
- 5.9.5. Reggio Emilia Pedagogy
- 5.9.6. Advantages and Disadvantages of Reggio Emilia Pedagogy
- 5.9.7. Waldorf Pedagogy
- 5.9.8. Difference Between Waldorf Education and Traditional Education

5.10. Multiple Intelligences, Entusiasmat, ABN
- 5.10.1. Theoretical Framework
- 5.10.2. Linguistic-Verbal Intelligence
- 5.10.3. Logical-mathematical Intelligence
- 5.10.4. Spatial or Visual Intelligence
- 5.10.5. Musical Intelligence
- 5.10.6. Body-Kinesthetic Intelligence
- 5.10.7. Intrapersonal Intelligence
- 5.10.8. Interpersonal Intelligence
- 5.10.9. Naturalistic Intelligence

Module 6. Arithmetic, Algebra and Measurement Play

6.1. Natural Number and its didactics
- 6.1.1. Natural Numbers and Decimal Numbering Systems in the School Curriculum
- 6.1.2. Correspondence
- 6.1.3. Natural Number
- 6.1.4. Number Use
- 6.1.5. Numbering Systems
- 6.1.6. Decimal Numbering System
- 6.1.7. Difficulties and Errors
- 6.1.8. Teaching Stages and Strategies
- 6.1.9. Materials

6.2. Arithmetic of a Natural Number
- 6.2.1. Additive Structure
- 6.2.2. Difficulties and Errors in the Process and Learning of Additive Operations
- 6.2.3. Structure of Multiplication and Division
- 6.2.4. Difficulties and Errors in the Learning of Multiplicative Operations
- 6.2.5. Properties
- 6.2.6. Additive Problems
- 6.2.7. Classification of Multiplicative Problems
- 6.2.8. School Study Plan
- 6.2.9. Mental Arithmetic Techniques

6.3. Teaching and Learning Rational Numbers
- 6.3.1. Rational Number and the Study Plan
- 6.3.2. Fractions
- 6.3.3. Operations with Fractions
- 6.3.4. Equivalence
- 6.3.5. Comparisons of Fractions
- 6.3.6. Teaching
- 6.3.7. Materials

6.4. Teaching and Learning Decimal Numbers
- 6.4.1. Decimal Numbers in the Official Curriculum
- 6.4.2. History of Decimal Notation
- 6.4.3. Decimal Numbers
- 6.4.4. Expanding the Numbering System
- 6.4.5. Operations with Decimal Places, Decimal Numbers
- 6.4.6. Decimal Approximation
- 6.4.7. How Many Decimal Places Does a Fraction Have?
- 6.4.8. The Introduction of Decimal Places from the Measurement

6.5. Measurement of Magnitudes and its Didactics
- 6.5.1. Context and History
- 6.5.2. Magnitudes and Measurement Direct Measures
- 6.5.3. Objectives of the Teaching of Magnitudes and their Measurement in Primary School Education
- 6.5.4. Learning to Measure Quantities
- 6.5.5. Difficulties and Errors in the Learning of Magnitudes and their Measurement
- 6.5.6. Unit of Measure
- 6.5.7. Direct Measurement Measurement Procedures
- 6.5.8. Indirect Measurement and Proportionality
- 6.5.9. Arithmetic Proportionality

6.6. Geometry in the Plane
- 6.6.1. Geometry in the Curriculum
- 6.6.2. Beginning of Geometry
- 6.6.3. Elements of Geometry
- 6.6.4. Polygonal
- 6.6.5. Polygons
- 6.6.6. Triangles
- 6.6.7. Quadrilaterals
- 6.6.8. Curvilinear Figures

6.7. Geometry in Space and Geometric Movements in the Plane
- 6.7.1. Curricular Considerations
- 6.7.2. Object Recognition Geometric Objects
- 6.7.3. Angles in Space
- 6.7.4. Polyhedra
- 6.7.5. Round Bodies
- 6.7.6. Isometries in the Curriculum
- 6.7.7. What is Symmetry?
- 6.7.8. Geometric Transformations

6.8. The Contributions of Piaget and the Van Hiele Couple to the Field of Geometry
- 6.8.1. Piaget's Research on the Development of Geometrical Concepts
- 6.8.2. The Van Hiele Couple
- 6.8.3. Level 0 Recognition Display
- 6.8.4. Level 1 Analysis
- 6.8.5. Level 2 Informal Deduction
- 6.8.6. Level 3 Formal Deduction
- 6.8.7. Level 4 Rigor
- 6.8.8. Duval's Cognitive Theory

6.9. Statistics and Probability
- 6.9.1. Statistics and Probability in the School Curriculum
- 6.9.2. Statistics and its Applications
- 6.9.3. Basic Concepts
- 6.9.4. Tables and Graphs
- 6.9.5. The Language of Probability Calculation
- 6.9.6. Teaching Statistics and Probability
- 6.9.7. Stages in Learning Statistics and Probability
- 6.9.8. Errors and Difficulties in the Learning of Statistics and Probability

6.10. Learning Mathematics Through Play
- 6.10.1. Introduction
- 6.10.2. Play as a Resource for Learning
- 6.10.3. Games as a Strategy for Logical-Mathematical Learning
- 6.10.4. Importance of the Corners in Pre-school Education
- 6.10.5. LEGO as a Resource
- 6.10.6. Geometry and Fractions with LEGO Pieces
- 6.10.7. EntusiasMat
- 6.10.8. ABN

Module 7. Methodology and Classroom Based Learning in the Primary School Classroom Students with Adaptations

7.1. Didactic Methodology in Primary School Education
- 7.1.1. Introduction to Didactic Methodology in Primary School Education
- 7.1.2. Teaching Methodology for Primary School Mathematics
- 7.1.3. Didactic Methodologies of the XXI Century: Education 3.0
- 7.1.4. Methodologies: Which one to Choose?
- 7.1.5. State - Memorize - Understand vs. Understand - State - Memorize - Apply
- 7.1.6. Metalanguage and Object Language
- 7.1.7. Competencies of the Mathematics Teacher
- 7.1.8. Educational Practice

7.2. Assessment in the Mathematics Classroom
- 7.2.1. What is Assessment?
- 7.2.2. Assessment in the Mathematics Curriculum
- 7.2.3. Learning Assessment
- 7.2.4. Assessment of the Acquisition of Key Concepts
- 7.2.5. Assessment of the Teaching Methodology
- 7.2.6. Mathematics Test Design
- 7.2.7. Correction of Mathematics Exams
- 7.2.8. Headings
- 7.2.9. Student Self-Assessment

7.3. Errors, Difficulties and Blockages in the Teaching and Learning of Mathematics
- 7.3.1. Visual Memory
- 7.3.2. Understanding of Concepts about Magnitudes
- 7.3.3. Understanding Abstract Concepts
- 7.3.4. Reading and Interpreting Statements
- 7.3.5. Basic Operations
- 7.3.6. Multiplication Tables
- 7.3.7. Fractions
- 7.3.8. Problem Solving
- 7.3.9. Rushing

7.4. Materials and Resources for the Teaching and Learning of Mathematics
- 7.4.1. Introduction to Materials and Resources
- 7.4.2. Sense and Purpose of its Use for Learning Enhancement
- 7.4.3. Classification of Materials
- 7.4.4. Math Book
- 7.4.5. Mathematics Books for the General Public
- 7.4.6. Manipulative Materials vs. Digital Materials
- 7.4.7. Materials
- 7.4.8. Discussion on the Use of a Calculator
- 7.4.9. Audiovisual Materials

7.5. Globalized Teaching: Learning Through Projects
- 7.5.1. Brief Conceptualization
- 7.5.2. Introduction to Project-Based Learning
- 7.5.3. Requirements for Working with Mathematics from a Project Based Learning Approach
- 7.5.4. A Model Applicable to the Classroom
- 7.5.5. Project Sheets
- 7.5.6. Description of Project Objectives
- 7.5.7. Timing
- 7.5.8. Implementation
- 7.5.9. Assessment

7.6. Cooperative Work in the Mathematics Classroom
- 7.6.1. Brief Conceptualization
- 7.6.2. Requirements for Working with Mathematics through Cooperative Work
- 7.6.3. Advantages and Disadvantages in the Mathematics Classroom
- 7.6.4. Teacher facing Cooperative Work
- 7.6.5. A Model Applicable to the Classroom
- 7.6.6. Mathematics Classroom to Develop Cooperative Work
- 7.6.7. Cooperative Learning Models
- 7.6.8. Implementation of Cooperative Work
- 7.6.9. Assessment of Cooperative Work

7.7. Other Methodologies
- 7.7.1. Singapore Method
- 7.7.2. Common Core Standards Method
- 7.7.3. EntusiasMat
- 7.7.4. JUMP Math
- 7.7.5. ABN
- 7.7.6. Dialogic Learning
- 7.7.7. Learning Communities: Reggio Emilia
- 7.7.8. Learning Communities: Montessori
- 7.7.9. Analysis of Methodologies

7.8. Attention to Diversity
- 7.8.1. General Principles of Attention to Diversity
- 7.8.2. Concept of Curricular Adaptation
- 7.8.3. Characteristics of Curricular Adaptations
- 7.8.4. Phases and Components of the Adaptation Process
- 7.8.5. Responding to Diversity: A Collaborative Effort
- 7.8.6. Strategies
- 7.8.7. Resources
- 7.8.8. Specific Didactic Materials
- 7.8.9. Technical Resources

7.9. Methodological Proposals for Students with Special Educational Needs
- 7.9.1. SEN in Mathematics Education
- 7.9.2. Dyscalculia
- 7.9.3. ADHD
- 7.9.4. Student Profile
- 7.9.5. Recommendations when Difficulties are due to the Nature of Mathematics Itself
- 7.9.6. Recommended Guidelines when Difficulties are due to the Methodological Organization of Mathematics
- 7.9.7. Recommendations when Difficulties are Due to Internal Student Factors
- 7.9.8. ICT for the Teaching of SEN Students
- 7.9.9. Recommended Guidelines for Algorithm Implementation

Module 8. Mental Calculation and Problem Solving

8.1. Mental Calculation
- 8.1.1. What is Mental Calculation?
  - 8.1.1.1. Definition
  - 8.1.1.2. Mechanical or Stimulus-Response Calculation
  - 8.1.1.3. Reflective or Thoughtful Calculation
  - 8.1.1.4. Skills
- 8.1.2. Authors' Contribution
  - 8.1.2.1. María Ortiz
  - 8.1.2.2. Jiménez Ibáñez
  - 8.1.2.3. Hope
  - 8.1.2.4. Dickson
  - 8.1.2.5. Carrol and Porter
  - 8.1.2.6. Alastair McIntosh
- 8.1.3. Justification
  - 8.1.3.1. MC Classroom Implementation
  - 8.1.3.2. 6 Reasons why Mental Calculation is Important
- 8.1.4. Mental Calculation in the Basic Curriculum of Primary Education
  - 8.1.4.1. Contents
  - 8.1.4.2. Assessment Criteria
  - 8.1.4.3. Assessable Learning Standards
- 8.1.5. Advantages of Mental Calculation
  - 8.1.5.1. Bernardo Gómez
  - 8.1.5.2. María Ortiz
- 8.1.6. Disadvantages of Mental Calculation
  - 8.1.6.1. Definition
  - 8.1.6.2. Four Areas of Difficulty
  - 8.1.6.3. Causes
- 8.1.7. Approximate Calculation
  - 8.1.7.1. Definition
  - 8.1.7.2. Algorithmic Thinking
  - 8.1.7.3. Onset

8.1.8. Mental Arithmetic
8.1.8.1. Definition
8.1.8.2. Elementary Forms
8.1.8.3. Levels of Use
8.1.9. Keys to Teaching Mental Calculation
8.1.9.1. Uses
8.1.9.2. Strategies
8.1.9.3. Practice
8.1.9.4. Decision
8.1.9.5. Mentality
8.2. Teaching Mental Calculation
8.2.1. Contents and Activities for the CM
8.2.1.1. Basic Concepts of Number and Properties Related to Operations
8.2.1.2. The Tables
8.2.1.3. Strategies
8.2.1.4. Oral Problems
8.2.1.5. Games and Didactic Material
8.2.2. General Didactic Guidelines
8.2.2.1. Strategies to be Proposed
8.2.2.2. Sequencing
8.2.2.3. Level of the Student Body
8.2.2.4. Playful Activity
8.2.2.5. Constancy
8.2.2.6. CM Programming
8.2.3. Mental Calculation Strategies
8.2.3.1. Definition
8.2.3.2. Simpler Strategies
8.2.4. Strategies for Addition
8.2.4.1. Counting
8.2.4.2. Double
8.2.4.3. Commutative Property
8.2.4.4. Associative Property
8.2.4.5. Decomposition
8.2.5. Subtraction Strategies
8.2.5.1. Counting
8.2.5.2. Decomposition
8.2.5.3. Completing Numbers
8.2.6. Strategies for Multiplication
8.2.6.1. Sum Reduction
8.2.6.2. Distributive Property
8.2.6.3. Commutative Property
8.2.6.4. Factorization and Association
8.2.6.5. Basic Multiplications
8.2.7. Division Strategies
8.2.7.1. Division Test
8.2.7.2. Divide by 2 and 3
8.2.7.3. Basic Divisions
8.2.8. Approximation
8.2.8.1. Definition
8.2.8.2. María Ortiz
8.2.8.3. Utility and Advantages
8.2.9. Approximate Calculation Strategies
8.2.9.1. Reformulation
8.2.9.2. Translation Processes
8.2.9.3. Compensation Processes
8.3. Sequencing and Activities to Work on Mental Calculation
8.3.1. Manipulative Resources
8.3.1.1. What Are They?
8.3.2. Design of Activities
8.3.2.1. Infant
8.3.3. Learning Calculation in Relation to Other Areas of Knowledge
8.3.3.1. Tongue
8.3.4. Number Tables
8.3.4.1. What Are They?
8.3.5. Numerical Pyramids
8.3.5.1. What Are They?

8.3.6. Numerical Triangles
8.3.6.1. What Are They?
8.3.7. Magic Squares
8.3.7.1. What Are They?
8.3.8. Mathematical Games
8.3.8.1. What Are They?
8.3.9. Other Games
8.3.9.1. What Are They?
8.4. Materials for working with Mental Calculation
8.4.1. Japanese Abacus
8.4.2. Flash Method
8.4.3. Smartick
8.4.4. Supertic
8.4.5. GeoGebra
8.4.6. Mothmatic
8.4.7. Arcademics
8.4.8. Khan Academy
8.4.9. Gauss Project
8.5. Problem-Based Learning
8.5.1. General aspects of the PBL
8.5.2. Features of a PBL
8.5.3. Planning of a PBL
8.5.4. Role of the Teacher
8.5.5. Role of the Students
8.5.6. Design of the PBL
8.5.7. Implementation of the PBL
8.5.8. Evaluation of PBL
8.5.9. Benefits of PBL
8.6. Logic
8.6.1. Study and Scientific Basis of Logic Principles
8.6.2. Statements
8.6.3. Conditional Expressions
8.6.4. Explanation, Argumentation and Demonstration
8.6.5. Reasoning: Deduction, Induction and Abduction
8.6.6. Reduction to Absurdity
8.6.7. Logic for Learning, Logic for Teaching
8.6.8. Educational Intervention-Didactic Procedures
8.6.9. Resources for Mathematical Logic
8.7. Mathematical Problems
8.7.1. The Problem Concept
8.7.2. Didactic Methodology for Educational Intervention
8.7.3. Variables
8.7.4. Constants
8.7.5. Elaboration of Problems
8.7.6. Interpretation of Problems
8.7.7. Oral Problems
8.7.8. Practical Procedures to Avoid Difficulties and Blockages in Mathematical Problem Solving
8.7.9. Adaptation of the Statements
8.8. Metamodels and Models for Strategy Generation in Problem Solving
8.8.1. Introduction to Metamodels and Models
8.8.2. What are Metamodels for?
8.8.3. Generative Metamodels
8.8.4. Structuring Metamodels
8.8.5. Link Metamodels
8.8.6. Transformation Metamodels
8.8.7. Composition Metamodels
8.8.8. Interconnection Metamodels
8.8.9. ICT Metamodels
8.9. The Mathematical Task in Problem Solving
8.9.1. Mathematical Work
8.9.2. Factors Involved in Problem-Solving Learning
8.9.3. Problem Solving, the First Approach
8.9.4. Resolution Strategies
8.9.5. Problem Solving Phases
8.9.6. Problem Solving Guidelines
8.9.7. Obstacles and Problem-Solving Difficulties
8.9.8. Overcoming Obstacles

8.9.9. Resolution Check

8.10. Materials and Games to Work on the Problems

8.10.1. Manipulative Resources

8.10.2. Non-Manipulative Resources

8.10.3. Playful Resources

8.10.4. Design of Activities

8.10.5. Learning Problems in relation to other Areas of Knowledge

8.10.6. Everyday Problems

8.10.7. Board Games to Work on Problems

8.10.8. Geoplane

8.10.9. Pentominoes

Module 9. Design and Development of Didactic Materials: Mathematics Workshop/Mathematics Games

9.1. Didactic Materials in Mathematics Education

9.1.1. Introduction

9.1.2. Teaching Resources

9.1.3. Disadvantages of Teaching Materials

9.1.4. Advantages of Teaching Materials

9.1.5. Factors for the Utilization of Didactic Material

9.1.6. Functions of Teaching Materials

9.1.7. Didactic Material in the Teaching-Learning Process

9.1.8. Types of Material

9.2. Introduction to the Design and Development of Teaching Materials

9.2.1. Introduction

9.2.2. Introduction to the Design of Teaching Materials

9.2.3. Establishment of a Didactic Situation

9.2.4. Design and Development of Didactic Material

9.2.5. Didactic material to Support the Teaching-Learning Process

9.2.6. Adequacy of the Material for Teaching Purposes

9.2.7. Assessment of Didactic Material

9.2.8. Self-evaluation

9.3. Manipulative Materials

9.3.1. Introduction

9.3.2. Logic Blocks

9.3.3. The Abacus

9.3.4. Multibase Blocks

9.3.5. Cuisenaire Strips

9.3.6. The Geoplane

9.3.7. Tangram

9.3.8. Meters, Scales and Graduated Glasses

9.3.9. Other Materials

9.4. Use of Manipulative Materials in the Classroom

9.4.1. Active and Participative Methodology

9.4.2. Manipulative Materials

9.4.3. Introducing Manipulative Materials in the Classroom through Challenges

9.4.4. Criteria for Manipulative Materials

9.4.5. Development of the Students

9.4.6. The Teacher as Project Guide

9.4.7. Mathematical Contents for the Elaboration of Manipulative Materials

9.4.8. Classroom Work Project

9.4.9. The Teacher and Teaching Materials

9.5. Numerical Learning Materials

9.5.1. Introduction

9.5.2. Types of Numbers: Natural, Integer, Fractional and Decimal Numbers

9.5.3. Contents

9.5.4. Logical-Mathematical Thinking

9.5.5. Materials for Working with Integers

9.5.6. Materials for Working with Fractions

9.5.7. Materials for Working with Decimals

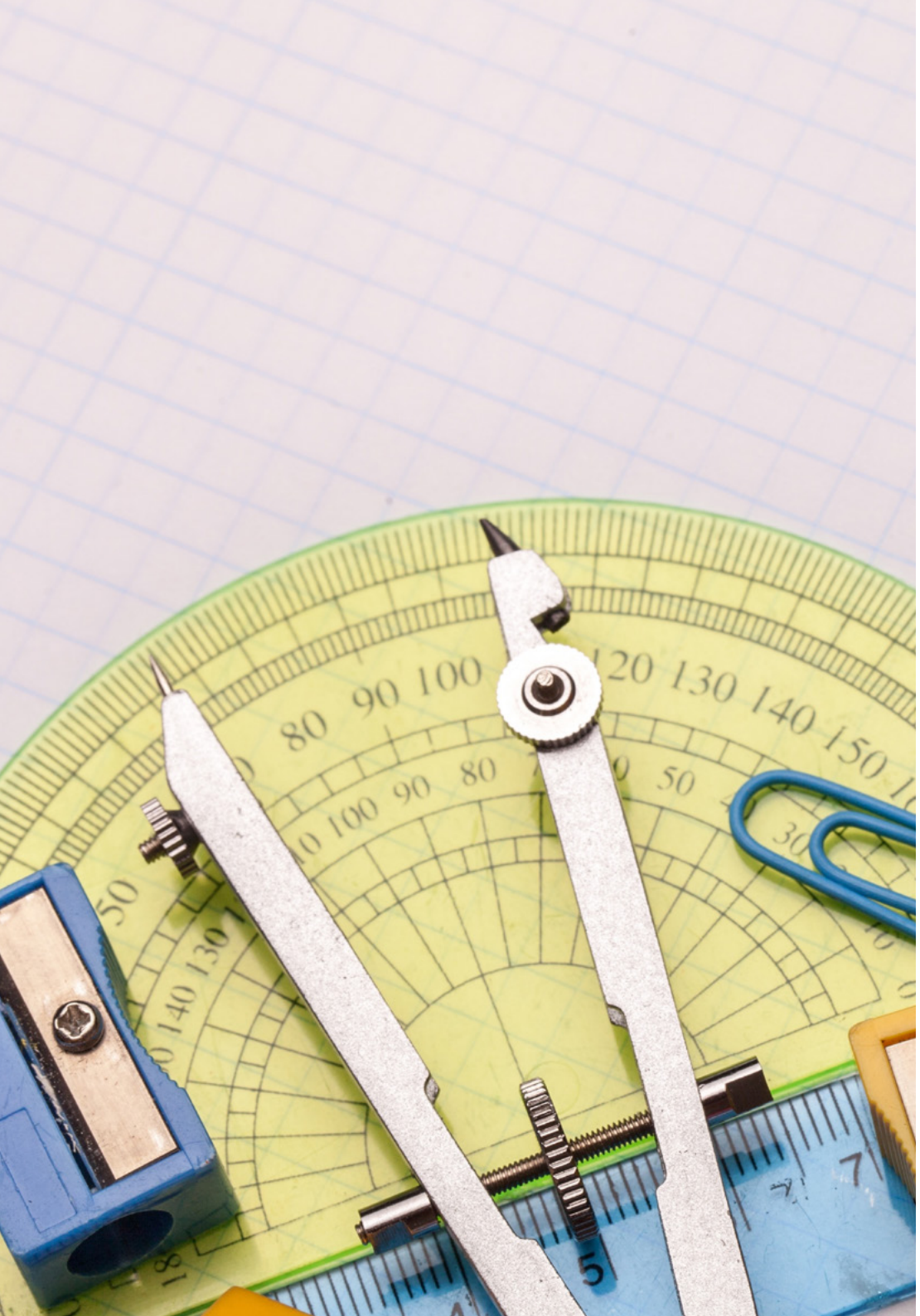
9.5.8. Materials for Working with Operations

9.5.9. Crafts for Learning Numbers

9.6. Materials for Learning to Measure

9.6.1. Introduction

9.6.2. Units and Instruments for the Measurement of Magnitudes



9.9.3. Audiovisual Competence in the Classroom
9.9.4. 10 Principles for the Use of Audiovisuals in the Classroom
9.9.5. Audiovisual Resources and the Teaching of Mathematics
9.9.6. Importance of the Use of New Technologies in Mathematics
9.9.7. Video in Mathematics
9.9.8. Mathematical Photography
9.10. The Game in the Teaching Methods of Mathematics
9.10.1. Introduction
9.10.2. Game Concept
9.10.3. The Importance of the Game
9.10.4. The Importance of the Game in Mathematics
9.10.5. Advantages of the Game
9.10.6. Disadvantages of the Game
9.10.7. Phases of the Game
9.10.8. Strategies
9.10.9. Mathematical Games

Module 10. ICT in Pre-school and Primary Education. Development of Interactive Materials for the Classroom Workshops

10.1. Information and Communication Technologies
10.1.1. What are ICTs?
10.1.2. Theoretical Framework
10.1.3. General Characteristics of ICTs
10.1.4. ICT Issues in Education
10.1.5. Need for the Use of ICTs in Educational Institutions
10.1.6. Use of ICT in Educational Centers
10.1.7. ICT Integration Plan
10.2. Needs for the Implementation of ICT in the Classroom
10.2.1. Equipment
10.2.2. Training
10.2.3. Role of the Coordinator
10.2.4. The Teacher and ICT
10.2.5. ICT in Pre-school Classrooms
10.2.6. ICT Projects
10.2.7. ICT in Primary School Education
10.2.8. ICT in Education: Disadvantages
10.2.9. ICT Assessment
10.3. ICT in Pre-school Education
10.3.1. ICT in Pre-school Classrooms
10.3.2. ICTs in the Legal Framework of Pre-school Education
10.3.3. ICT and Gardner's Multiple Intelligences
10.3.4. Some Possible Uses of ICT in Pre-school
10.3.5. The Computer Corner
10.3.6. Approach to the Potential of ICTs in Pre-school Education
10.3.7. Teaching Methods of Mathematics in Pre-School
10.3.8. ICT Resources for Pre-school Education
10.4. ICT in Primary School Education
10.4.1. Impacts of ICT in Primary School School Education
10.4.2. Incorporation of ICTs in Education: Possibilities and Challenges
10.4.3. Advantages and Disadvantages of ICT Incorporation
10.4.4. New Teaching Methodologies Supported by ICTs: an Active and Constructive Pedagogy
10.4.5. Inclusion of Virtual Platforms in the Teaching-Learning Process
10.4.6. Adaptation of a New Methodology Online and Virtual Teaching
10.4.7. Educational Applications

10.5. Use of ICTs and Active Methodologies
- 10.5.1. Active Methodologies
- 10.5.2. Advantages
- 10.5.3. Educational Principles of Active Methodologies
- 10.5.4. Active Methodologies with the use of ICT
- 10.5.5. Project Based Learning
- 10.5.6. Collaborative and Cooperative Learning
- 10.5.7. Service Learning in the use of ICT
- 10.5.8. *Flipped Classroom*
- 10.5.9. Problem-Based Learning

10.6. Computer Resources for the Mathematics Classroom
- 10.6.1. Tablets in Education
- 10.6.2. ICT in Primary School School Education, a Formative Proposal
- 10.6.3. Best Tools for your Math Class according to AulaPlaneta
- 10.6.4. ICT Resources for Pre-school Education

10.7. Computer and Internet in Education
- 10.7.1. Computer-Assisted Learning
- 10.7.2. Internet
- 10.7.3. Internet and the Expansion of the Educational Framework
- 10.7.4. Benefits of the Internet in Education
- 10.7.5. Disadvantages of the Internet on Education
- 10.7.6. Mathematics on the Internet
- 10.7.7. Websites to Work on Mathematics

10.8. Gamification in the Classroom
- 10.8.1. What is Gamification and Why Is It Important?
- 10.8.2. Elements of Gamification
- 10.8.3. Gamification Objectives
- 10.8.4. Fundamentals of Gamification in the Teaching-Learning Process
- 10.8.5. How to Gamify in Education?
- 10.8.6. Gamification in Pre-school Education
- 10.8.7. Rewards Classification
- 10.8.8. Gamification vs. Ludification
- 10.8.9. Negative Aspects of Gamification
- 10.8.10. ICT Use in Gamification

10.9. ICT Tools and Resources for Assessment
- 10.9.1. Evaluation
- 10.9.2. ICT as a Means of Assessment
- 10.9.3. ICT Assessment Tools
- 10.9.4. Other Tools to Assess in a Different Way

10.10. ICT in the Attention to Special Needs Education
- 10.10.1. BORRAR
- 10.10.2. How ICT Supports Students with SEN?
- 10.10.3. ICT for Students with Physical Disabilities
- 10.10.4. ICT in students with Mental Disabilities
- 10.10.5. ICT for Students with Auditory Disabilities
- 10.10.6. ICT for Students with Visual Disabilities
- 10.10.7. Pervasive Developmental Disorders
- 10.10.8. ICT Resources for SEN

05

Methodology

This training program offers a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

At TECH Education School we use the Case Method

In a given situation, what should a professional do? Throughout the program students will be presented with multiple simulated cases based on real situations, where they will have to investigate, establish hypotheses and, finally, resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method.

With TECH, educators can experience a learning methodology that is shaking the foundations of traditional universities around the world.

It is a technique that develops critical skills and prepares educators to make decisions, defend their arguments, and contrast opinions.

Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method"

The effectiveness of the method is justified by four fundamental achievements:

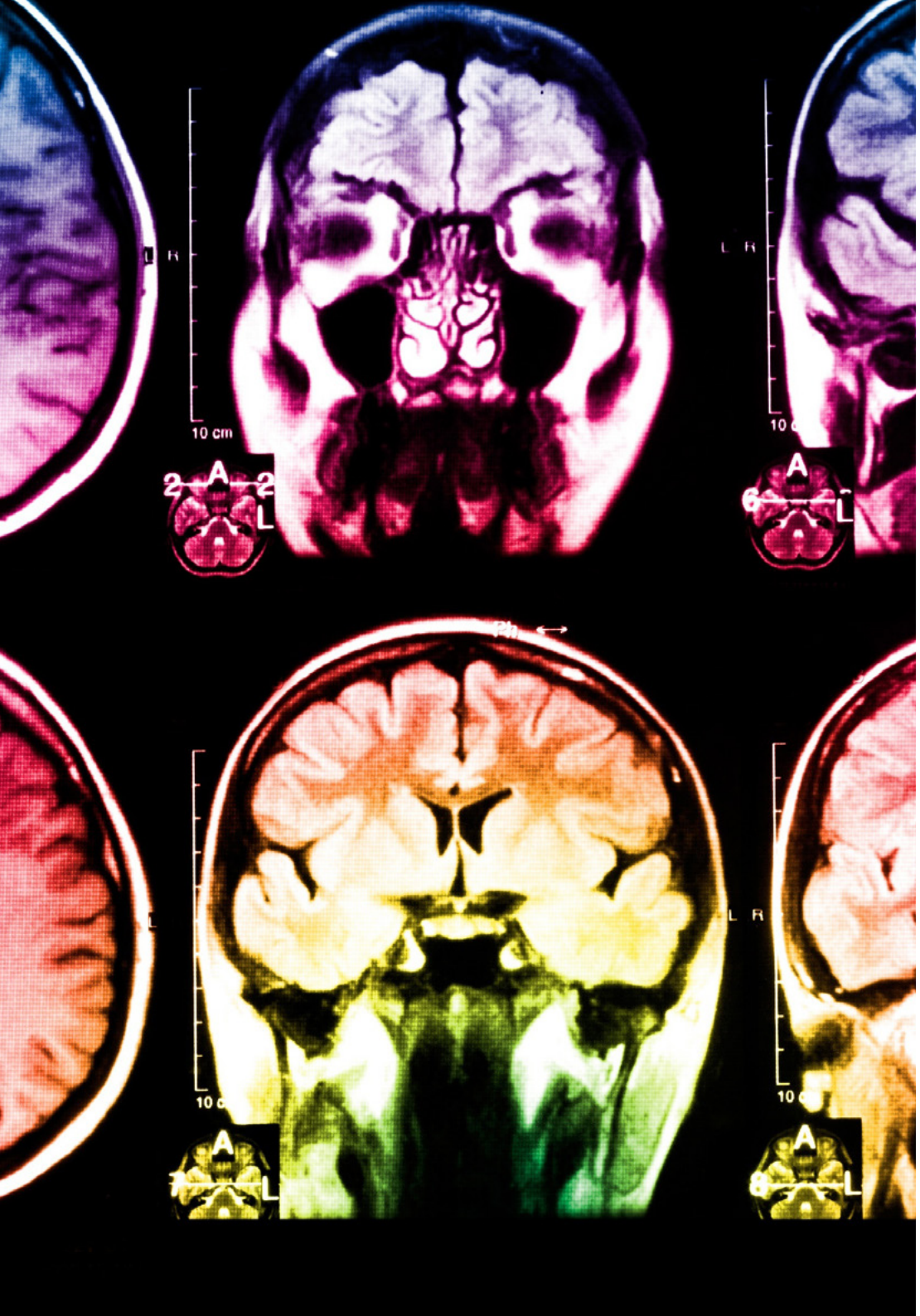
1. Educators who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process is solidly focused on practical skills that allow educators to better integrate the knowledge into daily practice.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life teaching.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

Our University is the first in the world to combine case studies with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, which represent a real revolution with respect to simply studying and analyzing cases.

Educators will learn through real cases and by solving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology we have trained more than 85,000 educators with unprecedented success in all specialties. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

Relearning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to success.

In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

The overall score obtained by our learning system is 8.01, according to the highest international standards.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialist educators who teach the course, specifically for the course, so that the teaching content is really specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Educational Techniques and Procedures on Video

TECH introduces students to the latest techniques, with the latest educational advances, and to the forefront of Education. All this, first-hand, with the maximum rigor, explained and detailed for your assimilation and understanding. And best of all, you can watch them as many times as you want.

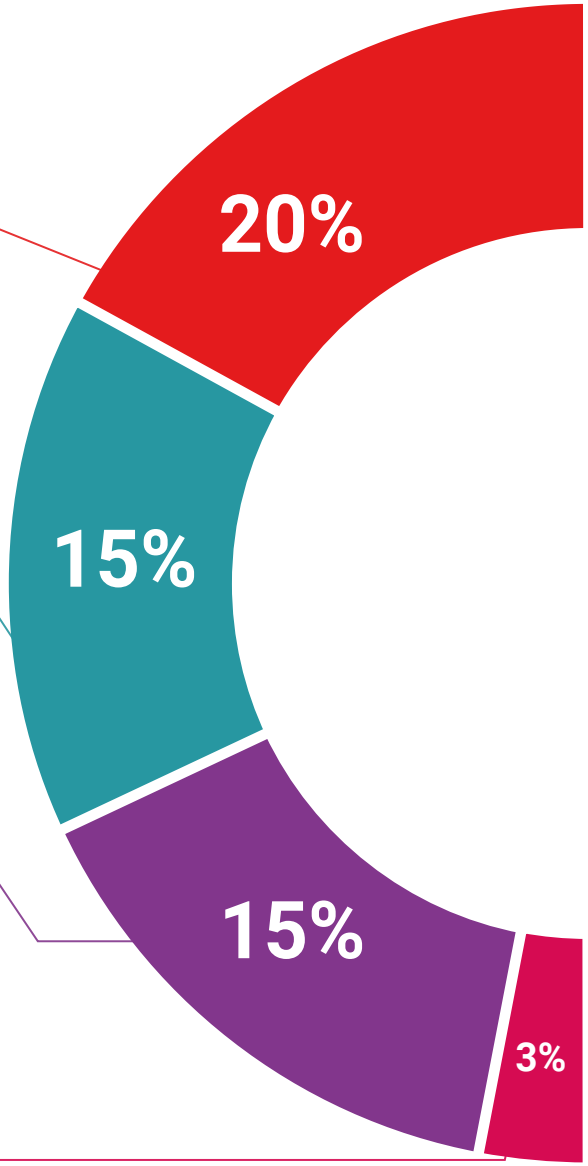
Interactive Summaries

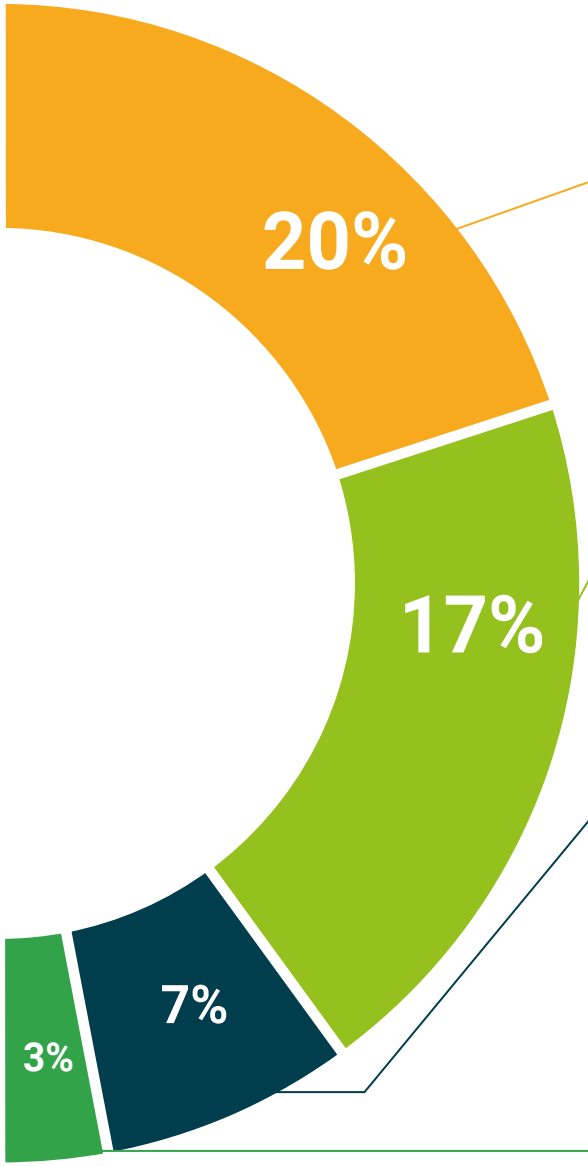
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive multimedia content presentation training Exclusive system was awarded by Microsoft as a "European Success Story".

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises: so that they can see how they are achieving your goals.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.

07

Certificate

The Professional Master's Degree in Teaching Mathematics in Pre-School and Primary School guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree issued by TECH Global University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This private qualification will allow you to obtain a **Professional Master's Degree diploma in Teaching Mathematics in Pre-School and Primary School** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University, is an official European University publicly recognized by the Government of Andorra ***(official bulletin)***. Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University private qualification**, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Professional Master's Degree in Teaching Mathematics in Pre-School and Primary School**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Professional Master's Degree in Teaching Mathematics in Pre-School and Primary School

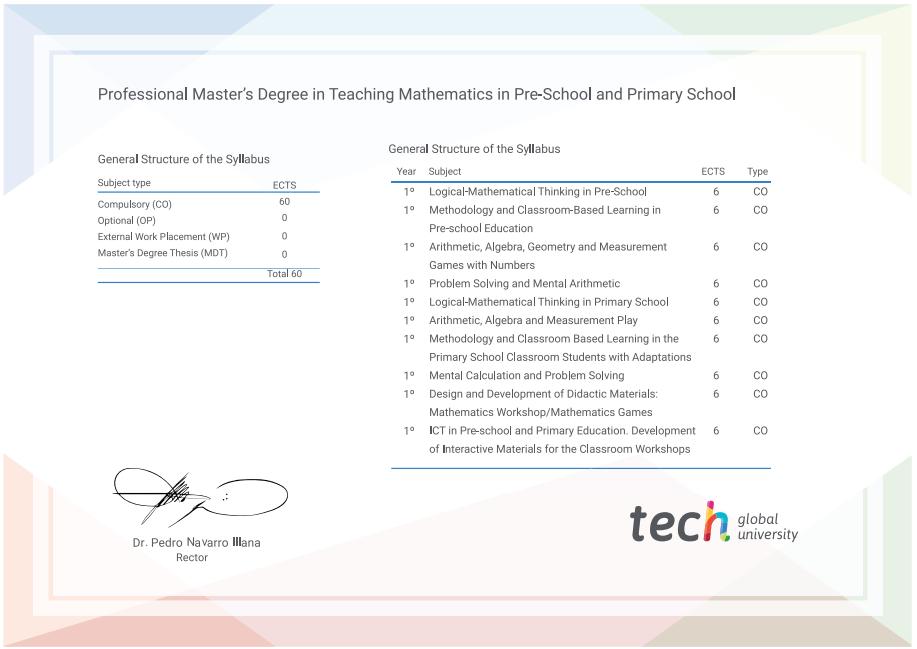
This is a private qualification of 1,800 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Teaching Mathematics in Pre-School and Primary School

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Logical-Mathematical Thinking in Pre-School	6	CO
1º	Methodology and Classroom-Based Learning in Pre-school Education	6	CO
1º	Arithmetic, Algebra, Geometry and Measurement Games with Numbers	6	CO
1º	Problem Solving and Mental Arithmetic	6	CO
1º	Logical-Mathematical Thinking in Primary School	6	CO
1º	Arithmetic, Algebra and Measurement Play	6	CO
1º	Methodology and Classroom Based Learning in the Primary School Classroom Students with Adaptations	6	CO
1º	Mental Calculation and Problem Solving	6	CO
1º	Design and Development of Didactic Materials: Mathematics Workshop/Mathematics Games	6	CO
1º	ICT in Pre-school and Primary Education. Development of Interactive Materials for the Classroom Workshops	6	CO

Dr. Pedro Navarro Illana
Rector

tech global university

*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

tech global university

Professional Master's Degree

Teaching Mathematics in Pre-School and Primary School

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Teaching Mathematics in Pre-School and Primary School

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