E = MD^2:
Excellence in Math Education through (e-) Debate AND DIVERSITY

Guidebook for new Math (e-) Debate Teaching Methodology with STEAM Approach in Inclusive Classroom

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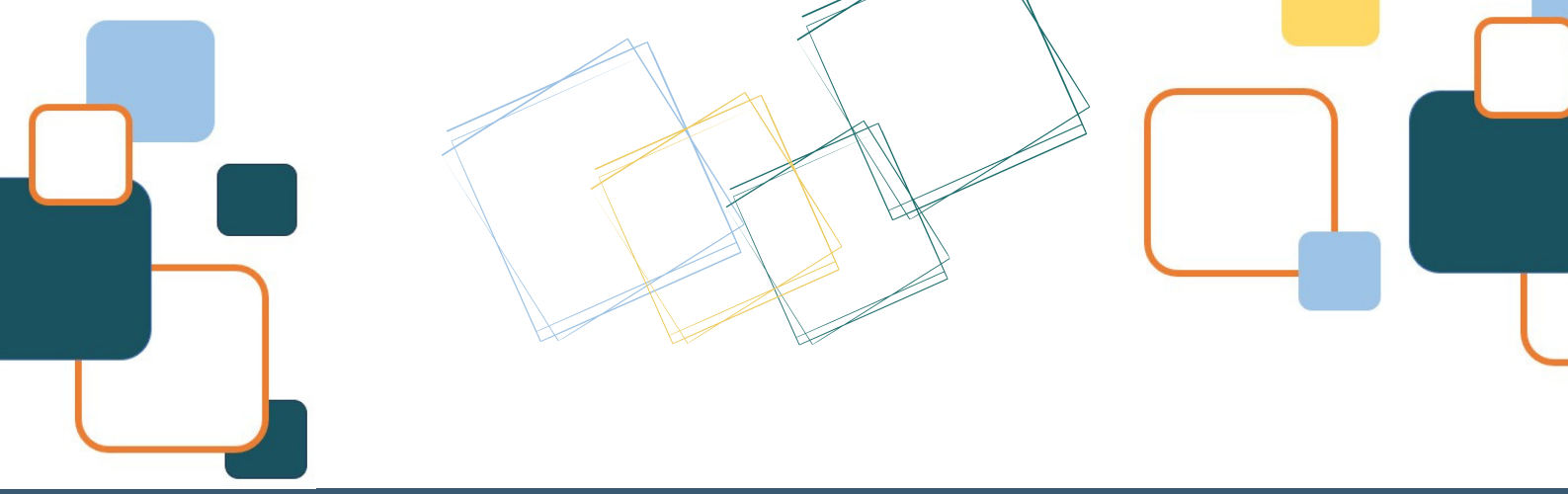

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а) STEAM (Интегриран систем на образование) -- Математика -- Наставна методологија -- Лица со потешкотии во учењето -- Инклузивност -- Дебатирање -- Водичи

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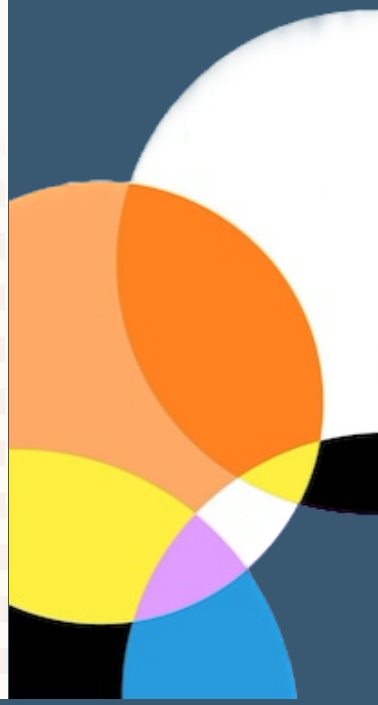
INTRODUCTION

Welcome to the world of (e-)Debate: STEAM and Diversity Edition! In this exciting and interactive e-debate methodology, we aim to engage students aged 11-14 in lively discussions and critical thinking about topics in matematics related to STEAM (Science, Technology, Engineering, Arts, and Mathematics) and diversity. By incorporating a STEAM approach, we seek to highlight the interdisciplinary nature of math and its real-world applications. Additionally, we have carefully designed adaptations to ensure that students with dyscalculia can fully participate and excel in the MathDebate.

Mathematics is often perceived as a subject detached from the real world, but in reality, it plays a fundamental role in various fields of study and industries. Through this MathDebate, we want to bridge the gap between abstract mathematical concepts and their practical applications, particularly in STEAM-related fields.

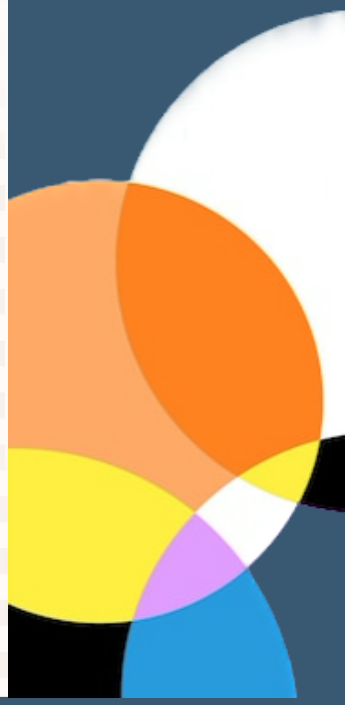
By exploring topics such as geometry, algebra, statistics, and probability, students will gain a deeper understanding of how mathematics is interconnected with science, technology, engineering, art, and even societal issues related to diversity.



Moreover, inclusivity is a core principle of our Math (e-) debate methodology. We recognize that students with dyscalculia may face unique challenges when it comes to understanding and working with numbers. To address this, we have incorporated adaptations that provide additional support, such as visual aids, manipulatives, alternative communication methods, and extra time for preparation and group work. By embracing diversity and accommodating different learning needs, we strive to create an inclusive and equitable learning environment for all students.

Throughout this (e-)debate, students will have the opportunity to research, prepare arguments, engage in debates, and reflect on their learning experiences. They will collaborate in small groups, learn from one another's perspectives, and sharpen their critical thinking and communication skills. We encourage students to think creatively, apply mathematical concepts to real-world scenarios, and develop well-reasoned arguments supported by evidence.

So, get ready to embark on a math-filled journey that combines STEAM, diversity, and critical thinking! Through this MathDebate, we hope to inspire a love for mathematics, foster interdisciplinary connections, and empower all students, including those with dyscalculia, to embrace their mathematical potential. Let the (e-)Debate begin!



E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM AND IS DESIGNED TO ACCOMMODATE STUDENTS WITH DISCALCULIA

1. Introduce the topic: Begin by introducing the topic, which could be anything from geometry to algebra. Use real-world examples to illustrate how the topic is relevant to student's lives and the world around them.

2. Present the problem: Provide a math problem related to the topic. The problem should be challenging enough to require some thought, but not so difficult that students feel overwhelmed. Consider using visual aids, manipulatives, or other tools to help students understand the problem.

3. Split students into small groups: Divide students into small groups of three or four. Encourage them to work collaboratively, and assign roles to each group member (e.g., leader, scribe, researcher).

4. Research and prepare arguments: Each group should research and prepare arguments for both sides of the problem. For example, if the problem is about the area of a triangle, one group could argue that the formula is easy to understand and use, while the other group could argue that it's confusing and difficult.

5. First round: In the first round of the debate, each group presents their arguments for one side of the problem. Encourage students to use visual aids and other tools to support their arguments.

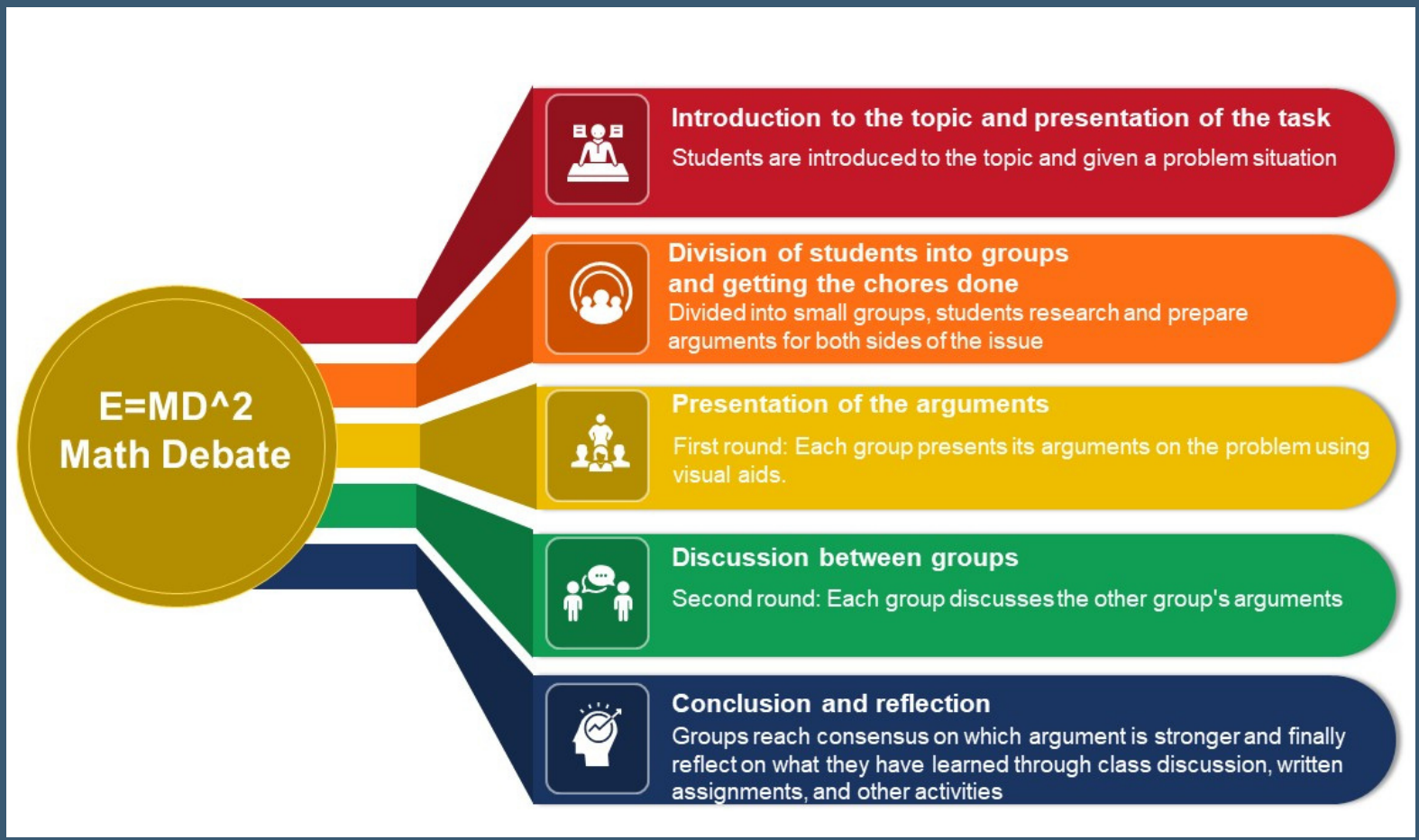
6. Second round: In the second round, each group presents their arguments for the other side of the problem. Again, encourage the use of visual aids and other tools.

7. Conclusion: After both rounds, each group should come to a consensus on which argument was stronger. Encourage students to explain their reasoning and to consider the evidence presented by the other group.

8. Reflection: As a final step, have students reflect on the debate and what they learned. This could include a class discussion, individual writing assignments, or other reflective activities.

E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM AND IS DESIGNED TO ACCOMMODATE STUDENTS WITH DISCALCULIA

To adapt this methodology to students with dyscalculia, you need to provide additional visual aids and manipulatives to help them understand the problem.
You can also assign specific roles to each group member based on their strengths and abilities and provide additional time for group work and preparation.
Encourage students to use multiple modes of communication (eg, visual, verbal, written) to express their ideas and arguments. Finally, be sure to give lots of positive feedback and encouragement throughout the process.



E=MD^2 (e-) DEBATE METHODOLOGY FOR TEACHING STUDENTS AGED 11-14 WITH A STEAM APPROACH, ADAPTED FOR STUDENTS WITH DISCALCULIA

1. Preparing for the Mathdebate: Prior to the (e-)Mathdebate, students should be given a week to prepare. Teachers should provide students with a set of topics that involve geometry, algebra, statistics, and probability. These topics should be presented in a way that is easy to understand for students with dyscalculia. Teachers should also provide resources such as videos, infographics, and diagrams to aid in understanding.

2. Formation of groups: Students should be divided into groups of 3-4, with a mix of abilities and learning styles. Each group should have a designated leader to manage time and keep the debate on track.

3. Rules and Guidelines: Teachers should provide clear rules and guidelines for the Mathdebate, including the format of the debate, time limits for each round, and expectations for behavior. Special accommodations should be made for students with dyscalculia, such as extra time or alternative forms of communication.

4. The Debate: The (e-)Mathdebate should be divided into three rounds, each focusing on a different topic. Each round should include a set of questions that challenge students to think critically and apply their math skills. Examples of topics and questions for each round could include:

- Geometry: "What is the best way to find the area of an irregular shape?" or "How can we use geometry to design a sustainable building?"
- Algebra: "What is the most efficient way to solve a system of equations?" or "How can we use algebra to model real-world situations?"
- Statistics and Probability: "What are the best ways to collect and analyze data?" or "How can we use probability to make informed decisions?"

5. Evaluation: Each group should be evaluated on their participation, argumentation, and use of math skills. Special accommodations should be made for students with dyscalculia, such as evaluation based on effort and participation rather than accuracy.

E=MD^2 (e-) DEBATE METHODOLOGY FOR TEACHING STUDENTS AGED 11-14 WITH A STEAM APPROACH, ADAPTED FOR STUDENTS WITH DISCALCULIA

6. Reflection: After the (e-)Mathdebate, students should reflect on their performance and identify areas for improvement. Teachers can facilitate this reflection by asking questions such as "What did you learn from the Mathdebate?" and "How can you apply the skills you learned in future math tasks?"

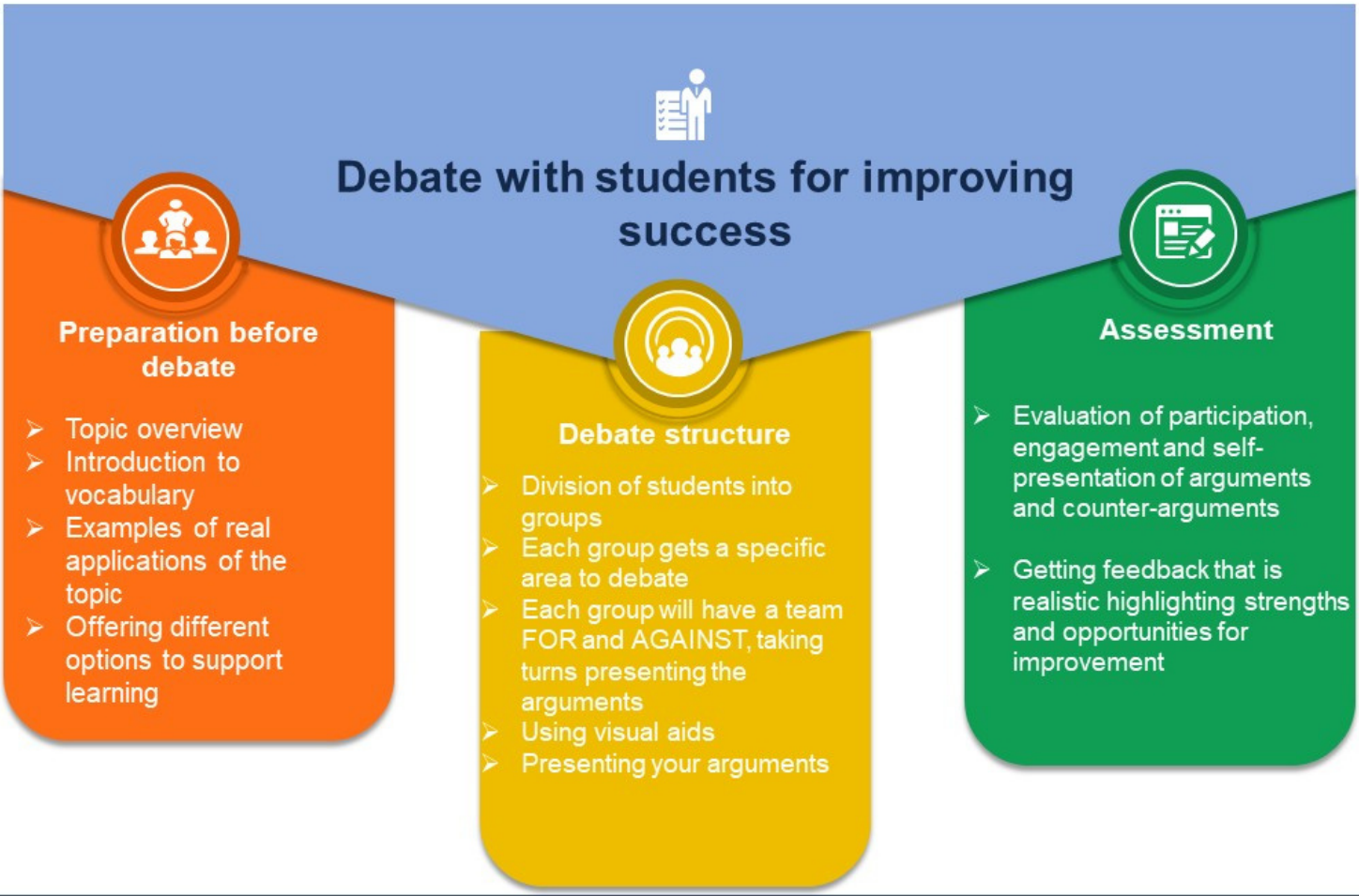
By following this methodology, students with dyscalculia can participate fully in the Mathdebate and develop their math skills in a fun and engaging way.

E=MD^2 (e-) DEBATE METHODOLOGY FOR TEACHING STUDENTS AGED 11-14, INCLUDING STEAM APPROACH, WITH IMPROVEMENTS FOR STUDENTS WITH DISCALCULIA

1. Pre-debate preparation:
   - Provide an overview of the topic to be debated, such as geometric shapes or angles.
   - Introduce the key vocabulary and concepts that will be used in the debate.
   - Provide examples of real-world applications of the topic, emphasizing how it is relevant to STEAM fields.
   - Offer differentiated instruction options to support students with dyscalculia, such as providing manipulatives, diagrams, or audio descriptions.
2. Debate structure:
   - Divide students into small groups of 3-4.
   - Assign each group a specific angle or shape to debate about, and provide a list of potential arguments for both sides.
   - Each group will have a designated pro and con team, with each student taking turns presenting their arguments.
   - Encourage students to use visual aids, diagrams, and other tools to support their arguments.
   - Provide opportunities for students with dyscalculia to present their arguments in alternative formats, such as drawing or verbal explanations.
   - After the debate, allow time for reflection and discussion, including opportunities for students to share their perspectives and ask questions.

3. Assessment:

- **Evaluate student participation, engagement, and ability to articulate arguments and counter-arguments.**
- **Provide feedback that is specific and actionable, highlighting areas of strength and areas for improvement.**
- **Offer differentiated assessments to support students with dyscalculia, such as alternative methods of demonstrating understanding, such as drawing or verbal explanations.**



METHODOLOGY FOR AN E=MD^2 (e-) DEBATE FOR STUDENTS AGED 11-14 THAT INCORPORATES STEAM AND ADDRESSES THE NEEDS OF STUDENTS WITH DISCALCULIA

1. Introduction and Warm-up (10 minutes): The teacher introduces the concept of math debate and explains the objectives of the activity. The teacher then leads a warm-up activity to get students excited and ready for the debate. This can be a quick game or quiz related to math or geometry.

2. Brainstorming and Group Formation (20 minutes): The teacher presents a list of math and geometry topics related to STEAM and asks students to brainstorm and suggest additional topics. The teacher then helps students form groups of 3-4 based on their interests and abilities, making sure to mix students with and without dyscalculia.

3. Research and Preparation (40 minutes): Each group is assigned a topic to research and prepare for the debate. The teacher provides a list of resources and encourages students to use various forms of media to conduct research (e.g., books, websites, videos, etc.). The teacher also provides additional support and resources for students with dyscalculia.

4. Debate Round 1 (20 minutes): Each group presents a short introduction to their topic and takes turns presenting their arguments and evidence.

Each group member should have a role to play, such as a presenter, a researcher, or a fact-checker. The teacher and other students provide constructive feedback and ask questions.

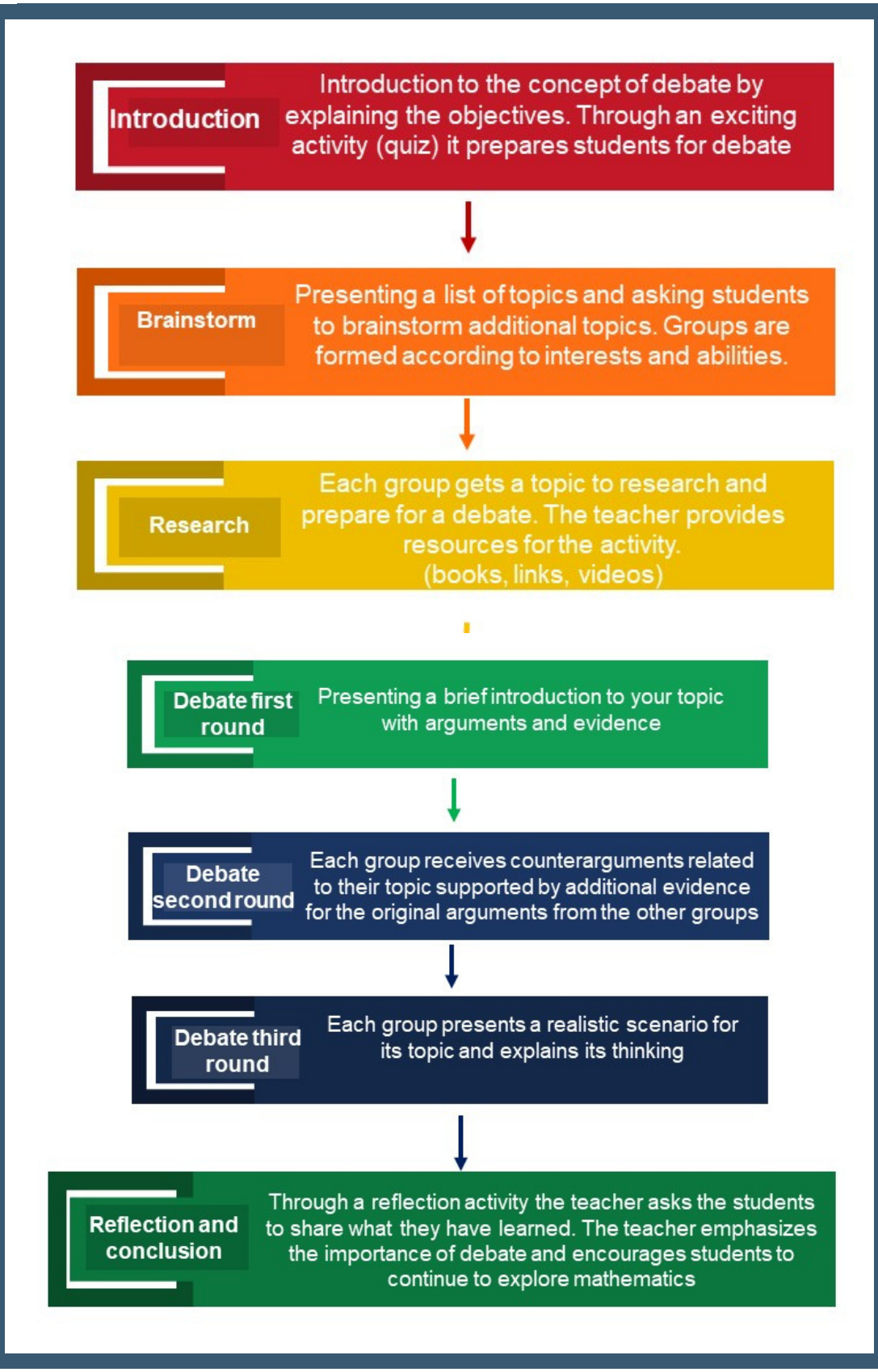
5. Debate Round 2 (20 minutes): Each group is presented with a counter-argument related to their topic. The groups take turns presenting their rebuttals and providing additional evidence to support their original argument. Again, the teacher and other students provide constructive feedback and ask questions.

6. Debate Round 3 (20 minutes): Each group is presented with a real-life scenario related to their topic. The groups take turns presenting solutions to the scenario and explaining their reasoning. Again, the teacher and other students provide constructive feedback and ask questions.

7. Reflection and Conclusion (10 minutes): The teacher leads a reflection activity, asking students to share what they learned and what they enjoyed about the debate. The teacher also emphasizes the importance of respectful and inclusive debate and encourages students to continue exploring math and geometry topics in the future.

This methodology incorporates STEAM by encouraging students to explore topics related to science, technology, engineering, art, and mathematics. It also addresses the needs of students with dyscalculia by providing additional support and resources, and by ensuring that students with and without discussion work in groups.

E=MD^2 (e-) DEBATE METHODOLOGY FOR TEACHING STUDENTS AGED 11-14, INCLUDING STEAM APPROACH, WITH IMPROVEMENTS FOR STUDENTS WITH DISCALCULIA



PLAN FOR THE E=MD^2 (e-) DEBATE FOR STUDENTS AGED 11-14, INCLUDING STEAM APPROACH AND ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

1. Topic Selection: The debate topics will be related to geometry and its applications in real life. The topics will be selected to ensure that they are suitable for students with varying levels of mathematical ability and will be adapted for students with dyscalculia. Some possible topics include:

- Is geometry useful in daily life?
- What is the relationship between geometry and architecture?
- How does geometry relate to nature?
- Why is geometry important in art and design?
- What are the uses of geometry in robotics and engineering?

2. Pre-Debate Preparation: Before the debate, students will be provided with reading material to familiarize themselves with the topic. Teachers will also provide an overview of the debate format and evaluation criteria. Students will be encouraged to work in groups to research and prepare their arguments.

PLAN FOR THE E=MD^2 (e-) DEBATE FOR STUDENTS AGED 11-14, INCLUDING STEAM APPROACH AND ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

3.Debate Format: The debate will take place in three rounds:

- Round 1: Closed-Ended Question In this round, a closed-ended question related to the topic will be asked, and each student will have to take a position and defend it. The evaluators will score each student based on the clarity and coherence of their argument.
- Round 2: Open-Ended Question In this round, an open-ended question related to the topic will be asked, and students will be evaluated based on the depth of their understanding of the topic and the quality of their argument. The evaluators will look for evidence of research and an understanding of both sides of the argument.
- Round 3: Creative Solution In this round, students will be given a problem related to the topic, and they will have to come up with a creative solution. The evaluators will be looking for innovative and logical solutions that demonstrate a clear understanding of the topic.

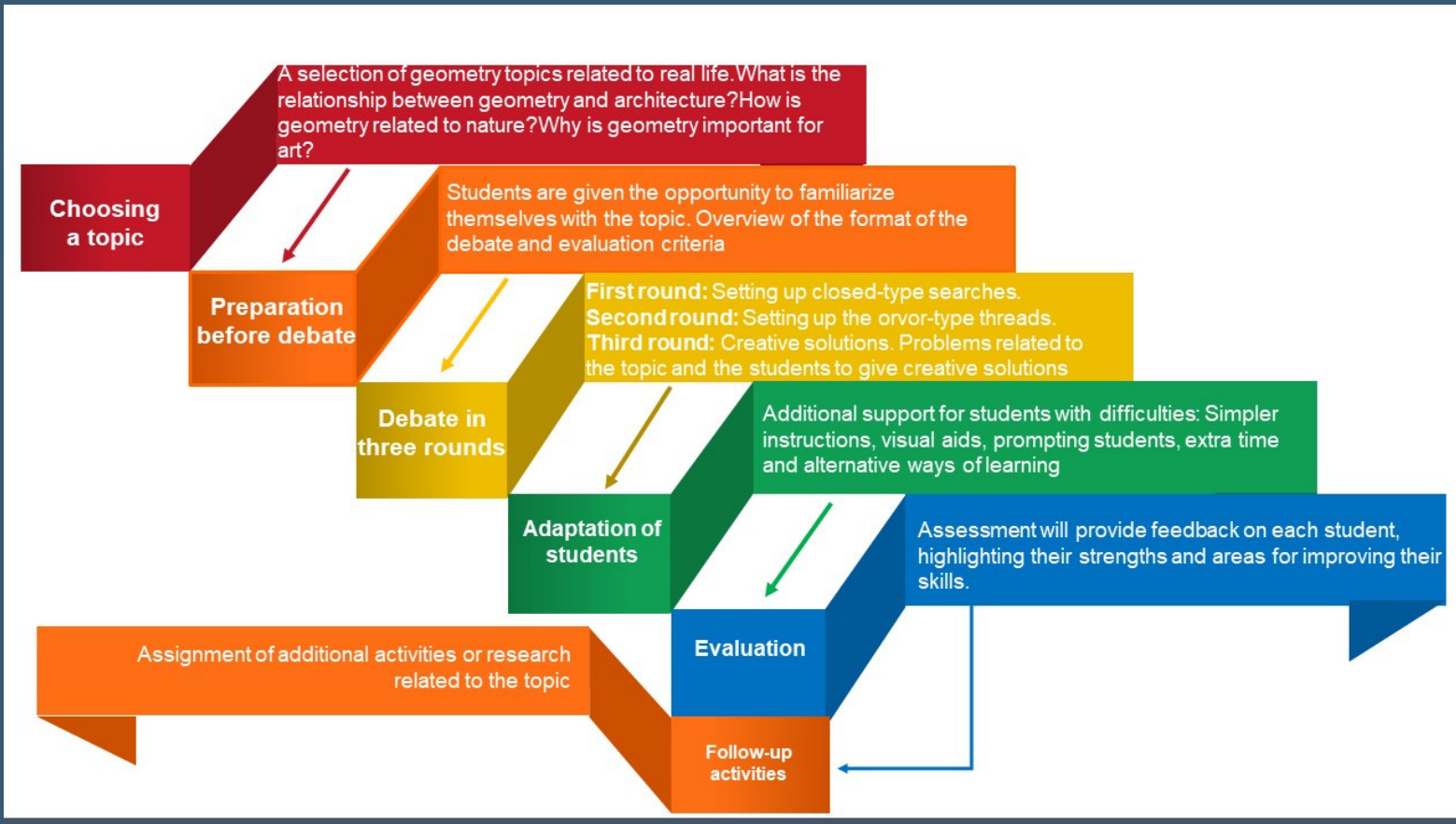
4. Adaptations for Students with Dyscalculia: To ensure that students with dyscalculia are able to participate fully in the debate, teachers will provide additional support such as:

- Providing simplified instructions and language for math problems.
- Using visual aids and diagrams to help students understand geometry concepts.
- Encouraging students to work in groups to help each other.
- Allowing extra time for students to prepare and present their arguments.
- Offering alternative ways for students to participate, such as creating a visual presentation or video.

PLAN FOR THE E=MD^2 (e-) DEBATE FOR STUDENTS AGED 11-14, INCLUDING STEAM APPROACH AND ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

5. Evaluation and Feedback: At the end of the debate, evaluators will provide feedback to each student, highlighting their strengths and areas for improvement. The feedback will be constructive and focused on helping students improve their argumentation and critical thinking skills.

6. Follow-Up Activities: Teachers may assign follow-up activities such as writing a reflection on the debate, researching a related topic, or creating a project related to the topic. These activities will reinforce the concepts learned during the debate and encourage further exploration of the topic.



DETAILED PLAN FOR AN E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM APPROACH AND DIVERSITY, AND INCLUDES ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

Title: (e-)MathDebate: STEAM and Diversity Edition

Objective: The objective of this MathDebate is to engage students aged 11-14 in a lively and interactive debate on mathematics problems that relate to STEAM (Science, Technology, Engineering, Arts, and Mathematics) and diversity, while also providing adaptations for students with dyscalculia.

Materials:

- **Whiteboard or chart paper**
- **Markers**
- **Math problems related to STEAM and diversity**
- **Timer**
- **Scoring sheet**
- **Rubric for evaluation**
- **Tokens or awards for winning teams**

Structure:

1. **Introduction (10 minutes): The facilitator introduces the topic and explains the rules of the (e-)Debate, including the evaluation criteria and adaptations for students with dyscalculia.**

DETAILED PLAN FOR AN E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM APPROACH AND DIVERSITY, AND INCLUDES ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

2. Round 1: Open (e-)Debate (20 minutes): The facilitator presents a math problem related to STEAM and diversity, and teams are given time to discuss and prepare their arguments. The teams then participate in an open debate, where they present their arguments to the audience and respond to questions and counterarguments from the opposing team. Each team will be evaluated based on their argumentative skills, communication, and mathematical accuracy.

3. Round 2: Team (e-)Debate (30 minutes): The facilitator presents a more complex math problem related to STEAM and diversity, and teams are given time to discuss and prepare their arguments. Each team selects a representative to participate in a debate against the representative from the opposing team. The team debate is structured in a way that allows the representatives to present their arguments, counterarguments, and rebuttals in a timed manner. Each team will be evaluated based on their argumentative skills, communication, and mathematical accuracy.

4. Round 3: Rapid Fire Round (10 minutes): The facilitator presents a series of math problems related to STEAM and diversity, and teams must solve them as quickly as possible. The team that solves the most problems correctly within the time limit wins this round.
5. Conclusion (5 minutes): The facilitator announces the winning team and awards the tokens or awards.

DETAILED PLAN FOR AN E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM APPROACH AND DIVERSITY, AND INCLUDES ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

Example Math Problems:

Round 1: Open Debate

- How can fractions be used to solve real-life problems in science or engineering?
- How can geometry be used to design art or architecture?
- What is the importance of statistics in STEM fields?

Round 2: Team Debate

- Team A argues that the Fibonacci sequence has no practical applications in real life, while Team B argues that it has significant applications in fields such as biology and computer science.
- Team A argues that Euclidean geometry is outdated and irrelevant, while Team B argues that it is still relevant in modern mathematics and scientific research.
- Team A argues that probability is not a necessary mathematical concept for success in STEM fields, while Team B argues that probability is essential in fields such as data analysis and finance.

Round 3: Rapid Fire Round

- What is the volume of a sphere with a radius of 5 cm?
- What is the Pythagorean theorem and how is it used in real life?
- What is the area of a triangle with a base of 8 cm and a height of 12 cm?

Evaluation Criteria:

- Each team will be evaluated based on the following criteria:
- Mathematical accuracy: Correctness of mathematical concepts and calculations presented in their arguments.
- Argumentative skills: Clarity, coherence, and persuasiveness of arguments presented.
- Communication: Effectiveness of verbal and nonverbal communication during the debate.
- Adaptations for students with dyscalculia: Strategies used to support and include students with discalculia in the debate.

DETAILED PLAN FOR AN E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM APPROACH AND DIVERSITY, AND INCLUDES ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

RUBRIC FOR MATHDEBATE EVALUATION

Criteria	Excellent (5)	Good (4)	Average (3)	Below Average (2)	Poor (1)
Content Knowledge	Demonstrates thorough understanding of the mathematical concept(s) and can apply it effectively to the problem	Demonstrates good understanding of the mathematical concept(s) and can apply it with some accuracy to the problem	Demonstrates some understanding of the mathematical concept(s) and can apply it with limited accuracy to the problem	Demonstrates limited understanding of the mathematical concept(s) and has difficulty applying it to the problem	Demonstrates little to no understanding of the mathematical concept(s) and is unable to apply it to the problem
Communication Skills	Articulates ideas clearly and persuasively using appropriate mathematical vocabulary	Communicates ideas clearly and with some persuasiveness using appropriate mathematical vocabulary	Communicates ideas with some clarity but lacks persuasiveness and/or uses mathematical vocabulary incorrectly or inconsistently	Communicates ideas with limited clarity and/or uses mathematical vocabulary inaccurately or inconsistently	Communication is unclear and confusing, and mathematical vocabulary is not used appropriately
Teamwork and Collaboration	Works effectively with team members, actively listens and responds to other perspectives, and contributes to a collaborative effort	Works well with team members, listens and responds to other perspectives, and contributes to a collaborative effort	Works adequately with team members, listens and responds to other perspectives, and contributes to a collaborative effort	Works minimally with team members, has difficulty listening and responding to other perspectives, and contributes minimally to a collaborative effort	Does not work with team members, does not listen or respond to other perspectives, and does not contribute to a collaborative effort

DETAILED PLAN FOR AN E=MD^2 (e-) DEBATE METHODOLOGY THAT INCORPORATES STEAM APPROACH AND DIVERSITY, AND INCLUDES ADAPTATIONS FOR STUDENTS WITH DISCALCULIA

RUBRIC FOR MATHDEBATE EVALUATION

Criteria	Excellent (5)	Good (4)	Average (3)	Below Average (2)	Poor (1)
Problem-Solving Strategies	Develops and implements a creative and effective problem-solving strategy that is appropriate for the given problem	Develops and implements an effective problem-solving strategy that is appropriate for the given problem	Develops and implements a problem-solving strategy that is partially effective and/or not entirely appropriate for the given problem	Develops and implements a limited problem-solving strategy that is not entirely appropriate for the given problem	Develops and implements no problem-solving strategy
Adaptation for Students with Discalculia	Strategies are implemented effectively to support students with discalculia, such as visual aids or alternative methods of problem-solving	Strategies are implemented effectively to support students with discalculia, but could benefit from additional creativity or adaptation	Strategies are implemented to support students with discalculia, but effectiveness is limited	Strategies are attempted but not effective in supporting students with discalculia	No attempt is made to support students with discalculia

CONCLUSION

THIS GUIDEBOOK HAS AIMED TO EQUIP YOU WITH THE ESSENTIAL KNOWLEDGE AND TOOLS NEEDED TO EMBARK ON YOUR STEAM AND DIVERSITY JOURNEY THROUGH THE LENS OF MATHEMATICS. WE HAVE EXPLORED THE PROFOUND CONNECTIONS BETWEEN MATHEMATICS AND VARIOUS DISCIPLINES, EMPHASIZING THE IMPORTANCE OF INTERDISCIPLINARY LEARNING AND THE PRACTICAL APPLICATIONS OF MATH IN SCIENCE, TECHNOLOGY, ENGINEERING, ARTS, AND SOCIETAL ISSUES RELATED TO DIVERSITY.

THROUGHOUT THIS GUIDEBOOK, WE HAVE HIGHLIGHTED THE SIGNIFICANCE OF FOSTERING INCLUSIVITY IN MATHEMATICS EDUCATION. BY UNDERSTANDING AND ADDRESSING THE UNIQUE LEARNING NEEDS OF ALL STUDENTS, INCLUDING THOSE WITH DYSCALCULIA, WE CAN CREATE AN ENVIRONMENT THAT EMBRACES DIVERSITY AND EMPOWERS EVERY INDIVIDUAL TO EXCEL IN MATHEMATICS.

WE HAVE ALSO PROVIDED PRACTICAL STRATEGIES, RESOURCES, AND ACTIVITIES TO ENHANCE YOUR UNDERSTANDING AND ENGAGEMENT WITH MATHEMATICS. FROM HANDS-ON EXPERIMENTS AND PROJECT-BASED LEARNING TO INCORPORATING TECHNOLOGY AND REAL-WORLD APPLICATIONS, THESE APPROACHES WILL ENABLE YOU TO EXPLORE MATHEMATICS IN A MEANINGFUL AND RELEVANT WAY.

AS YOU EMBARK ON YOUR STEAM AND DIVERSITY JOURNEY, WE ENCOURAGE YOU TO ADOPT A GROWTH MINDSET, EMBRACE CURIOSITY, AND APPROACH CHALLENGES WITH PERSEVERANCE. MATHEMATICS CAN SOMETIMES SEEM DAUNTING, BUT REMEMBER THAT IT IS A SUBJECT THAT OFFERS ENDLESS OPPORTUNITIES FOR EXPLORATION, PROBLEM-SOLVING, AND CREATIVITY.

FURTHERMORE, WE URGE YOU TO COLLABORATE WITH PEERS, EDUCATORS, AND EXPERTS IN VARIOUS FIELDS. BY WORKING TOGETHER AND SHARING PERSPECTIVES, YOU CAN GAIN VALUABLE INSIGHTS, EXPAND YOUR KNOWLEDGE, AND CREATE INNOVATIVE SOLUTIONS TO COMPLEX PROBLEMS.

FINALLY, WE WANT TO EMPHASIZE THE IMPORTANCE OF LIFELONG LEARNING. MATHEMATICS, LIKE ANY DISCIPLINE, IS CONSTANTLY EVOLVING. STAY CURIOUS, KEEP SEEKING NEW KNOWLEDGE, AND REMAIN OPEN TO THE EXCITING DEVELOPMENTS IN THE WORLD OF STEAM AND DIVERSITY. BY DOING SO, YOU WILL CONTINUE TO BROADEN YOUR HORIZONS, MAKE MEANINGFUL CONTRIBUTIONS, AND SHAPE A BETTER FUTURE FOR YOURSELF AND THE WORLD AROUND YOU.

WE HOPE THAT THIS GUIDEBOOK HAS INSPIRED YOU TO EMBARK ON A TRANSFORMATIVE JOURNEY, WHERE MATHEMATICS SERVES AS YOUR GATEWAY TO EXPLORING THE INTRICATE CONNECTIONS BETWEEN SCIENCE, TECHNOLOGY, ENGINEERING, ARTS, AND DIVERSITY. EMBRACE THE POWER OF MATHEMATICS, EMBRACE THE BEAUTY OF DIVERSITY, AND LET YOUR STEAM JOURNEY BEGIN!

REMEMBER, THE POSSIBILITIES ARE LIMITLESS WHEN MATHEMATICS AND DIVERSITY INTERSECT. EMBRACE THE CHALLENGES, CELEBRATE THE SUCCESSES, AND LET YOUR PASSION FOR STEAM AND DIVERSITY FUEL YOUR PATH TO GROWTH AND ACHIEVEMENT. GOOD LUCK ON YOUR EXTRAORDINARY JOURNEY AHEAD!

ANNEXE 1

LEARNING DISABILITY

A learning disability is a "disorder or dysfunction that results in a person learning differently than a person without disorder or dysfunction" according to the 2005 Disability Standards for Education.

Learning disabilities usually have a neurological basis and are permanent. The most common learning disabilities are dyslexia, dyscalculia, dysgraphia, dysorthography, aphasia, dysphasia and ADHD.

1. DYSLEXIA

> Dyslexia is an alternative term used to refer to a pattern of learning difficulties characterised by problems with accurate or fluent word recognition, poor spelling and poor spelling skills. If dyslexia is used to specify this particular pattern of difficulties, it is also important to specify any additional difficulties present, such as difficulties in reading comprehension or mathematical reasoning. (American Psychiatric Association Diagnostic and Statistical Manual, 1994, p.39-40).

DYSLEXIA

TYPES

- Acquired or traumatic dyslexia: refers to reading difficulties associated with a brain injury or localised neurological deficit.
- Developmental or specific dyslexia: refers to reading difficulties that occur for no apparent reason.

ASSESSMENT AND INTERVENTION

The assessment of dyslexia is a complex process. It has to be comprehensive and address all the factors and processes that underlie learning to read. There is no one-size-fits-all treatment for dyslexia. Each child with reading impairment requires a specialised plan that addresses the nature of the disorder, the type of impairment, and takes into account a wide range of personal and environmental factors and variables in order to be effective.

DYSCALCULIA

2. DYSCALCULIA

In 1974, Kosk first proposed the term dyscalculia. He defined dyscalculia as a disorder, emphasising its inheritability and/or congenital impairment of the brain substrate responsible for mathematical functions.

Within ICD-11 (WHO, 2018), dyscalculia is no longer classified as a school learning disorder but as a developmental learning disorder with mathematical difficulties, within the general classification of developmental learning disorders.

According to the DSM5, dyscalculia is classified as a specific learning disorder. People with specific learning disabilities may have difficulties in reading, writing and/or mathematics.

TYPES

Wilson and Dehaene (2007) developed a theoretical model of dyscalculia that includes three subtypes, associated with different causes of dyscalculia:

DYSCALCULIA

A. Basic deficiencies in numerical processing

Children with dyscalculia who show problems in quantity comparison and subitization, i.e. with a deficit in number sense, are grouped here.

These problems at the level of representation and manipulation of numerical quantities are also reflected in difficulties in all tasks involving the symbolic handling of numbers.

B. Phonological processing deficits

In this group we include children with dyscalculia with problems at the level of verbal symbolic representation. This would result in difficulties in all mathematical skills that rely heavily on the ability to process and manipulate verbal information, such as reading and writing numbers, learning arithmetic facts, problem solving and counting sequence.

C. Impairments in working memory and executive functions

Deficits in working memory and executive functions are an important cognitive marker of developmental dyscalculia. In fact, each new acquisition in arithmetic learning places high demands on working memory in terms of information storage and processing.

Children with this type of dyscalculia show delays in the acquisition of simple arithmetic strategies, frequent errors in the execution of mathematical procedures, poor understanding of the concepts underlying the use of procedures and difficulties in

DYSCALCULIA

EVALUATION

The age for detecting a dyscalculia problem is between six and eight years old. First of all, it is important to distinguish between a child who is bad at mathematics and a child who really has difficulties in learning mathematics;

The following areas should be assessed in the diagnostic process:

- Intellectual capacity
- Numeracy and calculation skills
- Executive functions: especially memory and attention
- Visuoperceptual and visuospatial skills
- Neuropsychological assessment

For the evaluation of these areas we will use interviews with teachers, with families and, finally, the evaluation of the pupil.

DYSCALCULIA

Assessment of mathematical competence

Two types of tests can be used to assess curricular competence:

- Curricular competence tests: to find out the student's academic level.
- Standardised tests: which provide a standardised score of numerical ability. Some of these tests include the following:

  TEDI-MATH. Test for the diagnosis of basic competences in mathematics. It is a test battery. It allows us to describe and understand the difficulties that children have in the numerical field.

  - TOPIC-3. Test of basic mathematical competence. It is designed to assess the mathematical competence of children from 3 to 8 years old, but it is also useful for older students with problems in learning mathematics.
  - Calculation and mathematical level test, by A. Palomino and J. Crespo. Its aim is to detect difficulties or errors in the learning of calculus.
  - Test of Mathematical Aptitude and Performance by R. Olea, L. E. Líbano and H. Ahumada. The test consists of three series:
    - Preliminary notions
    - Knowledge of mathematical symbolisation
    - Willingness to calculate and solve problems

DYSCALCULIA

INTERVENTION

Attention to learning difficulties should be the object of early detection and intervention in order to prevent the child's possible failure at school. The student with dyscalculia requires more intensive and explicit teaching of number sense, more practice in the use of the number system and concrete experiences with large and small numbers. The very early detection of mathematical problems suggests the need for individualised re-education programmes during childhood, which will facilitate their effectiveness.

Barranchina et al. (2014) suggest a series of guidelines for effective re-education. First, the playful aspect should be promoted in order to offer successful experiences to children who normally fail at school. In addition, students should be positively reinforced in order to increase their confidence. That is why the objectives must be short term, the work must be highly structured and the materials used must be varied, promoting multisensoriality.

DYSCALCULIA

INTERVENTION

The pupil should be monitored in all subjects and families should be involved in the treatment. Providing an appropriate educational response involves drawing up an Individualized Work Plan and making explicit in it a Curricular Adaptation to the needs and interests of the pupil, ensuring meaningful and functional learning, coordinating all the agents involved in the assessment process and avoiding prejudicing the pupil.

Focusing on the use of Information and Communication Technologies (ICT), they enhance the playful aspect of learning mathematics. Examples are the software created by Dehaene called The Number Race (2004) based on his cognitive model, and Rescue Calcularis (2011) created by Kucian et al. (2011). The number race is a programme designed primarily for children aged 4-8 years aimed at learning basic mathematical and arithmetic concepts. The game aims to strengthen the brain circuits involved in the manipulation and mental representation of numbers. The Rescue Calcularis software is a computer-based training programme from Calcularis (Kucian et al, 2011), designed on the basis of typical and atypical development of mathematical skills. Another option available is Number Sense, a website developed by Butterworth and Laurillard's team at the London Institute of Education.

DYSGRAPHIA

3. DYSGRAPHIA

It is characterised by an inadequate layout of the graphic signs, making them excessively difficult to read and intelligible.

TYPES

At a general level, the first classification is made according to the nature of the disorder. Thus, most authors distinguish between:

- Acquired dysgraphia is characterised by the presence of a brain lesion that destroys some areas of the brain and leaves others intact, so that certain psychological mechanisms are altered, but others continue to function perfectly.
- Developmental dysgraphia are difficulties in learning to write in children who do not have any organic, sensory, intellectual or other impairment.

DYSGRAPHIA

ASSESSMENT AND INTERVENTION

The assessment of dysgraphia is complex. Expressing oneself in writing requires a certain degree of knowledge of the subject, the development of basic skills, the mastery of strategies and the ability to coordinate multiple processes (Salvador, F. 1997). This implies that, in order to assess the difficulties that occur in writing, it is necessary to resort to a combination of tests and assessment techniques that make it possible to identify the symptoms and specific alterations of dysgraphia, as well as to attend to the maturational factors, cognitive processes and other conditioning factors that influence the deficit or impossibility of writing correctly.

Preparatory training is the preliminary phase for learning to write and is also used as a method of graphomotor re-education in some cases. Ajuriaguerra (1983) establishes two main categories of preparatory techniques for learning to write:

- Non-graphic techniques
- Graphic techniques
- Pictographic techniques
- cryptographic

DYSORTHOGRAPHY

4. DYSORTHOGRAPHY

Dysorthography is an alteration in the subject's communicative process, which manifests a serious dysfunction in the subject's graphic expression, by virtue of which the subject is not able to match his or her thoughts with the written representation of his or her thoughts.

TYPES

- Temporal dysorthography: inability to perceive clearly and consistently the phonetic aspects of the spoken string.
- Perceptual-kinaesthetic dysorthography: deficit in the correct analysis of the kinaesthetic sensations involved in articulation.
- Disortokinetic or kinetic dysorthography: the phonemic sequencing of speech is altered, causing errors in the joining or fragmentation of words.
- Visuospatial dysorthography: consists of an alteration in the distinctive perception of the image of the graphemes or set of graphemes.
- Dynamic dysgraphia or dysgrammatism: alteration of the syntactic writing of sentences and the written expression of ideas.
- Semantic dysorthography: altered conceptual analysis of words, use of diacritical marks or orthographic signs.
- Cultural dysorthography: inability to learn spelling rules.

DYSORTHOGRAPHY

ASSESSMENT AND INTERVENTION

The assessment approach is based on obtaining general information about the pupil and a specific assessment of the dysorthographic problem.

In relation to the treatment and re-education of dysorthography, the general aim is to improve spelling and develop an awareness of spelling that is reinforced by the desire to write correctly.

As an example of a concrete intervention plan to tackle spelling difficulties, Ramírez Serrano (2010) proposes:

- Daily dictation, but following the psycho-pedagogical recommendations for this.
- Have a notebook where intaglio listings are kept.
- Intaglio file: making cards with words of a certain spelling difficulty, in which he/she usually makes mistakes.

DEVELOPMENTAL LANGUAGE DISORDER (DLD)

5. DEVELOPMENTAL LANGUAGE DISORDER.

DLD, formerly known as Specific Language Disorder (SLD), is a neurodevelopmental disorder of oral language acquisition and development in childhood that persists into adulthood. It is not associated with a medical condition, therefore, it may involve one or different components of language to varying degrees in both expression and reception (comprehension of spoken language) and affects social and/or school development (Bishop, 2016).

TYPES

- Developmental language disorder with impairment in receptive and expressive language.
- Developmental language disorder with impairment mainly in expressive language.
- Developmental language disorder with impairment mainly in pragmatics.

DEVELOPMENTAL LANGUAGE DISORDER (DLD)

ASSESSMENT AND INTERVENTION

The assessment of a possible case of DLD involves three fundamental aspects to consider:

- Anamnesis of children. It is essential to record the child's developmental process in order to note any relevant personal or family history, and to know the child's context and the degree of family support.
- Assessment of possible difficulties that may be co-existing with language difficulties according to the areas of concern and in accordance with the results and observations made of the child.
- Comprehensive assessment of oral language difficulties. The difficulties of children with DLD focus on difficulties in oral language expression and comprehension.

The response to the intervention will be focused according to the speech therapy-educational intervention model:

- Direct intervention, which can be individualised or in groups, and involves receiving face-to-face support from the speech therapist or virtual or telematic support (Wales et al., 2017).
- Indirect intervention, which is generally designed by the speech therapist with other professionals and educators in order to implement it in the classroom.

6. ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

Attention Deficit Hyperactivity Disorder (ADHD) is the most common psychiatric disorder in childhood. It is estimated that 5% of the child and adolescent population suffers from it, which is equivalent to one or two children per classroom. This disorder is biological, neurological in origin, caused by an imbalance between two neurotransmitters in the brain: noradrenaline and dopamine, which directly affect the areas of the brain responsible for self-control and inhibition of inappropriate behaviour.

It is classified as a neurodevelopmental disorder and symptoms usually occur at an early age, before the age of 12.

ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

TYPES

- **Hyperactive/impulsive ADHD**
  Hyperactive/impulsive ADHD is that form of the disorder in which the predominant symptoms are hyperactive and/or impulsive behaviours. In other words, the main manifestation of ADHD is that the child has difficulties in controlling impulses, but there are no problems with attention span.

- **ADHD with inattention**
  ADHD with predominant inattention is that form of the disorder in which the main symptoms are constant distractions and difficulties in concentrating and paying attention.

- **Combined ADHD**
  Combined ADHD is that form of the disorder in which both hyperactive and impulsive behaviour and attention deficit are observed. It is, in fact, the most common manifestation, as 60% of diagnosed cases are of this type.

ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

ASSESSMENT AND INTERVENTION

Deciding whether a child has ADHD is a comprehensive process. There is no single test to diagnose ADHD and there are many other problems, such as anxiety, depression and certain types of learning disabilities, which can have similar symptoms.

The treatment that has been shown to be most effective, according to some authors, is the one that combines the following components (for this reason it is called multimodal):

- Psychological treatment for parents, teachers and children
  - Information on the disorder
  - Management strategies
  - Communication strategies to improve the relationship with your child/student
- Pharmacological treatment: The aim of medication is to bring about the remission of the basic symptoms of the disorder.
- Psychopedagogical treatment: Aimed at improving the child's academic skills and behaviour while studying or doing homework, it also aims to establish a study habit for the child who does not have one.

ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

ASSESSMENT AND INTERVENTION

To improve the behaviour of a child with ADHD, you should focus on three axes:

- Constant supervision (look at him/her often, find a task such as touching the back, passing by the side in order to make sure that he/she has started the task, etc.).
- Individualised tutorials of about 10 minutes.
  These tutorials serve to indicate to the child what is expected of him/her, what signals or instructions can be agreed upon to improve his/her behaviour and performance and to set the limits or basic rules of behaviour in the classroom (specific objectives that we think the child will be able to achieve). It must become a space for positive communication with the pupil.
- Use of basic tools for behavioural management
  - Reinforcers or rewards
  - Extinction technique: For its application, the child's problematic behaviour must be ignored.
  - Contingency contract technique: This is established in writing after the period in which the educator or the child's family discusses an issue on which there are distant positions. It should also include the first consequences of one of the two parties breaking the contract.

ANNEXE 2

HIGHLY ABLE STUDENTS

CHARACTERISTICS

When we talk about children with special educational needs, we immediately think of children who have a slower learning pace and we often forget those who have a faster learning pace. And this is due to the mistake of thinking that they already have it all, that they have superpowers. But gifted students are not superheroes or superheroines and they need the support of families and schools to develop their potential.

Gifted students have high cognitive abilities, which implies that in all intellectual resources they present a high level of both logical reasoning and creativity, good memory management and information retrieval. At the same time, they may also present relevant affective and social problems, such as low self-esteem, difficulty in expressing emotions and interpersonal relationships.

Despite the influence of biological, environmental, personal and social factors, high intellectual abilities are dynamic and can vary throughout life, therefore, their detection is not only focused on infancy when children excel in learning to speak and read and write and show excellent memory.

HIGHLY ABLE STUDENTS

Its detection focuses on discovering and finding the following characteristics (Zavala, 2004):

- Ability to acquire, remember and use a large amount of information.
- Ability to remember one idea and another at the same time.
- Ability to make good judgements.
- Ability to understand the functioning of higher systems of knowledge.
- Ability to acquire and manipulate abstract systems of symbols.
- Ability to solve problems, reworking questions and creating new solutions.
- Intense intellectual curiosity.
- Fascination with words and ideas.
- Perfectionism.
- Need for accuracy.
- Learning with great intuitive leaps.
- Intense need for intellectual stimulation.
- Difficulty in adapting to the thinking of others.
- Early moral and existential concerns.
- Tendency to introversion.

In short, the gifted represent approximately 10 % of the world's population and show an IQ of 130 or above, as well as a talent in one or more specific areas, mainly in verbal reasoning, mathematical reasoning and spatial aptitude.

THE GIFTED IN THE CLASSROOM

THE GIFTED IN THE CLASSROOM

One of the main risks for gifted students is that classroom dynamics are generated that penalise their contributions and frequent attempts to go beyond the academic content of the course, thus limiting their curiosity and creativity.

When a student completes the exercises and is presented with repetitive and mechanical tasks as the only alternative, it is very likely that he or she will become demotivated, bored, hide his or her abilities and end up experiencing school failure. Likewise, the absence of intervention can also lead to a low sense of belonging to the group, which can lead to maladaptive social behaviour and school failure (Masdevall i Costa, 2010).

THE GIFTED IN THE CLASSROOM

Therefore, it is very important that in the classroom, gifted pupils need an environment that stimulates their potential, autonomy, independence and self-control, feelings of belonging to the peer group, acceptance and trust from the people around them, teaching adapted to their needs and personal pace of learning, a flexible curricular offer that allows them to go deeper into the content, access to additional educational resources, planning and evaluation of the learning process. Furthermore, it is crucial that, at school, the gifted have to mix with others, as their affective-emotional development has to take place with people of their own age, who are often better than them in artistic, sporting or social activities.

THE MATHEMATICALLY GIFTED

All resources are manifested in verbal reasoning, mathematical reasoning and spatial ability. In the following, we focus on one of these areas: mathematics.

THE MATHEMATICALLY GIFTED

Mathematical ability can refer to performing various mathematical activities, such as problem solving, learning complex content and algorithms, etc., in a way that is clearly superior to the average of one's classmates, i.e. more quickly, efficiently and successfully. For this reason, it can be affirmed that mathematical skills exist dynamically and are formed and developed through activity, which requires that certain external and affective factors are favourable and, in addition, that the student himself wishes to make an effort and work.

Among the main results of the research that has been carried out over the years, we find a set of general characteristics of students with High Mathematical Abilities (HMA):

- Ability for formalised perception of mathematical material, to understand the formal structure of a problem.
- Ability to think logically in the domain of quantitative and spatial relationships, numerical and literal symbols; ability to think in mathematical symbols.
- Ability for rapid and broad generalisation of mathematical relations, operations and objects.
- Ability to abbreviate the mathematical reasoning process and the corresponding system of operations; ability to think in abbreviated structures.
- Flexibility of mental processes during mathematical activity. Seeking clarity, simplicity, economy and rationality of resolutions.

THE MATHEMATICALLY GIFTED

- Ability for rapid and free reconstruction of the direction of a mental process, changing from direct to inverse thinking (reversibility of the mental process during mathematical reasoning).
- Mathematical memory (generalised memory for mathematical relations, typical features, outlines of arguments and proofs, methods of problem solving and principles of approach).
- Mathematical thinking.

It should be taken into account that some of these characteristics evolve with age and education, being a sign of MCL in students with a certain age and mathematical education, but not in older students and students in higher grades. For example, expressing oneself in a formalised way when doing mathematics is a sign of MCL in primary school students, but not in students in the second year of the Baccalaureate. In contrast, other characteristics are applicable to students of any age and mathematical background, such as the ability to change the direction of mental processes.

We found three types of mathematical thinking used to process mathematical information that not only allow us to understand the way of thinking of gifted students, but of all students, as any mathematics student shows signs of a preference for one type of thinking:

TYPES OF MATHEMATICAL THINKING

TYPES OF MATHEMATICAL THINKING

- Analytical thinking: characterised by an obvious predominance of a well-developed verbal-logical component as opposed to a weak pictorial-visual component. These students operate easily with abstract schemes; they do not need visual support to visualise objects or patterns during problem solving, not even when the mathematical relationships given in the problem "suggest" visual concepts.

- Geometrical thinking: this is characterised by a very well-developed pictorial-visual component, and we can provisionally speak of its predominance over a well-developed verbal-logical component. These students feel the need to visually interpret an abstract mathematical expression or relationship and show great ingenuity in doing so: in this sense, relatively speaking, for them the figurative often replaces the logical.

TYPES OF MATHEMATICAL THINKING

- Harmonious thinking: characterised by a relative balance between well-developed logical-verbal and pictorial-visual components, with the former component in a dominant position. Students are quite ingenious in their visual interpretation of abstract relationships, but their visual images and schemes are subordinate to verbal-logical analysis. They are successful in implementing both analytical and pictorial-geometric approaches in solving many problems.

Because of all these characteristics of gifted students, the education system must take care to detect students with this mathematical potential in order to ensure that they develop it and achieve the highest possible mathematical performance. Therefore, we can see that the greatest effort in mathematics education research on giftedness in mathematics is focused on these aspects, with specific research objectives aimed at providing the actors involved (educational authorities, teachers, parents and students) with information and products that enable them to understand how students with MCI at different educational levels think mathematically and what feelings towards mathematics they have, to identify effectively and reliably students who may have MCI, and to have teaching materials and methodologies appropriate to the needs and ways of learning of these students.

CONCLUSION

CONCLUSION

In conclusion, we have to bear in mind that the gifted pupil not only thinks differently from other children, but also feels differently.

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INFORMATION

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