

iDecide



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Pupils with Learning Difficulties

Math Underachievement



Erasmus+

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Math Underachievement



Classroom-based tips (focus on instructional methods)

To support and assist the learning of pupils who are facing this learning difference, consider the following ways to diversify teaching techniques and materials:

1. **Make use of mathematics resources**, plastic letters, magnetic rainbow alphabets, word cards and word mats (BDA, 2012; Dowker, 2009).
2. **Use a multisensory approach** (Dowker, 2009; Witzel, 2005; Scott, 1993). For instance, if you want to teach about squares you can ask pupils to bring square objects from home or ask them to search the classroom for square objects.
3. **Use visual displays in your classroom**, flash cards and math games with your pupils asking them to revise addition and subtraction. (BDA, 2012)
4. **For revising or teaching new concepts use cubes and other items**, such as counting cubes to teach addition, subtraction, multiplication, division.
5. **ICT can play an important role in enhancing pupils' mathematical skills**. Ask your pupils to use applications on their tablets such as SushiMonster, MathMonsters, MotionMath and other free available applications available online. (Meletiou-Mavrotheris & Mavrotheris, 2012; Oliv et al. 2009)
6. **Provide your pupils feedback about the task**: use a rubric for explicit feedback or writing comments for implicit feedback; ask your pupil to give more information. (Brophy, 2010)
7. **Make your lessons and activities interesting and engaging** for your pupils. (Brophy, 2010)



School-based practical tips (focus on instructional methods)

Announcement / Sign at School

Provide visual displays in school common areas to assist pupils in revising mathematical concepts in their daily lives.

Class Divisions / Arrangements

1. **Arrange teacher training workshops and seminars that raise awareness of how to create an inclusive ethos in your school.** This will help teachers to understand concepts like inclusion, diversity, and diverse abilities and needs, Apply inclusive practices which will enhance pupils' math skills (Hoppey, & McLeskey, 2013). Provide to all pupils the option to learn maths through playing with interactive games on their tablets (Kyriakides, Mavrotheris & Prodromou, 2016).
2. **Ask teachers to keep a progress log regarding specific pupils with learning differences, either for a specific lesson, topic or learning objective, or for an academic term.** At the pre-intervention level, arrange a meeting with the pupil's parents in order to determine the pupil's study habits. The maths teacher can offer recommendations in order for the parents to be able to assist in the learning process, if this is feasible. Teachers and parents can work together to set realistic goals. With regular follow-up meetings, a pupil's progress and learning goals can be monitored and reevaluated. If expected progress is not made, then contact the multi-disciplinary team / educational psychologist to determine more appropriate suggestions according to the pupil's needs and how best to address them. Based on this data, re-organise the school schedule (if needed) to allow more time for co-teaching activities (Hoppey, & McLeskey, 2013).

Community

1. **Arrange teacher training workshops and seminars that raise awareness of how to create an inclusive ethos in your school.** This will help teachers to understand concepts like inclusion, diversity, and diverse abilities and needs, Apply inclusive practices which will enhance pupils' math skills (Hoppey, & McLeskey, 2013). Provide to all pupils the option to learn maths through playing with interactive games on their tablets (Kyriakides, Mavrotheris & Prodromou, 2016).
2. **Arrange regular meetings between the parents and the staff to discuss pupil progress and to enhance home-school collaboration.** This will help to monitor progress and to discuss other areas such as social skills, interactions with peers and adults within the school setting, marginalisation, behaviour at home and self-esteem. (McCaleb, 2013).
3. **Demonstrate to your pupils that maths is an essential part of our lives,** by organising school events where pupils are responsible for collecting money as well as other tasks that involve maths skills at work in daily life.

Curricular Adaptations

1. **Arrange teacher training workshops and seminars that raise awareness of how to create an inclusive ethos in your school.** This will help teachers to understand concepts like inclusion, diversity, and diverse abilities and needs, Apply inclusive practices which will enhance pupils' math skills (Hoppey, & McLeskey, 2013). Provide to all pupils the option to learn maths through playing with interactive games on their tablets (Kyriakides, Mavrotheris & Prodromou, 2016).

2. **Ask teachers to keep a progress log regarding specific pupils with learning differences, either for a specific lesson, topic or learning objective, or for an academic term.** At the pre-intervention level, arrange a meeting with the pupil's parents in order to determine the pupil's study habits. The maths teacher can offer recommendations in order for the parents to be able to assist in the learning process, if this is feasible. Teachers and parents can work together to set realistic goals. With regular follow-up meetings, a pupil's progress and learning goals can be monitored and reevaluated. If expected progress is not made, then contact the multi-disciplinary team / educational psychologist to determine more appropriate suggestions according to the pupil's needs and how best to address them. Based on this data, re-organise the school schedule (if needed) to allow more time for co-teaching activities (Hoppey, & McLeskey, 2013).
3. **Enforce curricular adaptations in terms of differentiating to the task.** Inform teachers to make necessary adaptations to tasks so as to responds to the various learning needs of the pupils, and the severity of each case (Hall, Meyer and Rose, 2012; BBC active, 2010).
4. **Make curricular adaptations in terms of resources** – where possible equip the classrooms in which there are pupils struggling in maths with different materials and advanced technology, such as tablets or projectors, so as to attain a single learning outcome.

Discipline

Be aware of the underpinning factors of these pupils' behaviour when you are following the behavioural code at your school. Make sure that before you reach a decision about their behaviour you have consulted the child's parent/guardian/teacher and gain more information about the pupil's history.

Where needed and possible, involve an educational psychologist and/or multi-disciplinary team (based on your country's educational system and available provisions). Remember that sometimes pupils that exhibit significant learning difficulties, including in the area of maths, may present as being withdrawn and indifferent about the lesson presented, whereas others may act out and may assume the role of the class' 'clown'. There may be a number of reasons as to why the pupil exhibits the aforementioned behaviors; there is always a reason/purpose behind a pupil's behavior. Some of the reasons may include: communicating frustration about the specific lesson or about difficulties in a nonverbal manner; acting out to gain some form of attention/negative reinforcement. Make an effort to talk to the pupil on an individual basis in an attempt to firstly show them that someone genuinely cares and so that a trusting relationship can be built. Discuss the purpose of the pupil's behaviour and alternative ways in which s/he can express his/her thoughts and feelings.

Other (Pupils' Involvement)

Collaborate with universities (Ainscow, Booth & Dyson, 2004) and organise collaborative events/trainings for teachers. This will provide teachers the opportunity to become familiar with material and best practices that can be applied when working with pupils who present underachievement in the area of maths, e.g. on the use of mobile technologies for learning maths (Kyriakides, Mavrotheris & Prodromou, 2016).

Other (Assessment)

Ask teachers to keep a progress logs regarding specific pupils with learning differences, either for a specific lesson, topic or learning objective, or for an academic term.

At the pre-intervention level, arrange a meeting with the pupil's parents in order to determine the pupil's study habits. The maths teacher can offer recommendations in order for the parents to be able to assist in the learning process, if this is feasible. Teachers and parents can work together to set realistic goals. With regular follow-up meetings, a pupil's progress and learning goals can be monitored and reevaluated. If expected progress is not made, then contact the multi-disciplinary team / educational psychologist to determine more appropriate suggestions according to the pupil's needs and how best to address them. Based on this data, re-organise the school schedule (if needed) to allow more time for co-teaching activities (Hoppey, & McLeskey, 2013).

Other (Pupils' Involvement in Decisions that Concern Them)

Be aware of the underpinning factors of these pupils' behaviour when you are following the behavioural code at your school. Make sure that before you reach a decision about their behaviour you have consulted the child's parent/guardian/teacher and gain more information about the pupil's history.

Where needed and possible, involve an educational psychologist and/or multi-disciplinary team (based on your country's educational system and available provisions). Remember that sometimes pupils that exhibit significant learning difficulties, including in the area of maths, may present as being withdrawn and indifferent about the lesson presented, whereas others may act out and may assume the role of the class' 'clown'. There may be a number of reasons as to why the pupil exhibits the aforementioned behaviors; there is always a reason/purpose behind a pupil's behavior. Some of the reasons may include: communicating frustration about the specific lesson or about difficulties in a nonverbal manner; acting out to gain some form of attention/negative reinforcement. Make an effort to talk to the pupil on an individual basis in an attempt to firstly show them that someone genuinely cares and so that a trusting relationship can be built. Discuss the purpose of the pupil's behaviour and alternative ways in which s/he can express his/her thoughts and feelings.

Parents / Parents' Associations

1. **Arrange regular meetings between the parents and the staff to discuss pupil progress and to enhance home-school collaboration.** This will help to monitor progress and to discuss other areas such as social skills, interactions with peers and adults within the school setting, marginalisation, behaviour at home and self-esteem. (McCaleb, 2013).
2. **Be aware of the underpinning factors of these pupils' behaviour when you are following the behavioural code at your school.** Make sure that before you reach a decision about their behaviour you have consulted the child's parent/guardian/teacher and gain more information about the pupil's history.

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School Celebrations / Events / Activities

Demonstrate to your pupils that maths is an essential part of our lives, by organising school events where pupils are responsible for collecting money as well as other tasks that involve maths skills at work in daily life.

School Purchases

1. **Arrange teacher training workshops and seminars that raise awareness of how to create an inclusive ethos in your school.** This will help teachers to understand concepts like inclusion, diversity, and diverse abilities and needs, Apply inclusive practices which will enhance pupils' math skills (Hoppey, & McLeskey, 2013). Provide to all pupils the option to learn maths through playing with interactive games on their tablets (Kyriakides, Mavrotheris & Prodromou, 2016).
2. **Equip the school with tablets and personal computers to promote the use of technology to motivate underachieving pupils in maths (Brophy, 2010).** Build on pupils' confidence in using everyday technology such as mobiles and tablets to enhance their motivation and self-efficacy beliefs.
3. **Make curricular adaptations in terms of resources** – where possible equip the classrooms in which there are pupils struggling in maths with different materials and advanced technology, such as tablets or projectors, so as to attain a single learning outcome.

Pupil Support

1. **Where possible, provide additional classroom support, such as a teaching assistant.**
2. **Be aware of the underpinning factors of these pupils' behaviour when you are following the behavioural code at your school.** Make sure that before you reach a decision about their behaviour you have consulted the child's parent/guardian/teacher and gain more information about the pupil's history.

Where needed and possible, involve an educational psychologist and/or multi-disciplinary team (based on your country's educational system and available provisions). Remember that sometimes pupils that exhibit significant learning difficulties, including in the area of maths, may present as being withdrawn and indifferent about the lesson presented, whereas others may act out and may assume the role of the class' 'clown'. There may be a number of reasons as to why the pupil exhibits the aforementioned behaviors; there is always a reason/purpose behind a pupil's behavior. Some of the reasons may include: communicating frustration about the specific lesson or about difficulties in a nonverbal manner; acting out to gain some form of attention/negative reinforcement. Make an effort to talk to the pupil on an individual basis in an attempt to firstly show them that someone genuinely cares and so that a trusting relationship can be built. Discuss the purpose of the pupil's behaviour and alternative ways in which s/he can express his/her thoughts and feelings.

Teacher Professional Development

1. **Arrange teacher training workshops and seminars that raise awareness of how to create an inclusive ethos in your school.** This will help teachers to understand concepts like inclusion, diversity, and diverse abilities and needs, Apply inclusive practices which will enhance pupils' math skills (Hoppey, & McLeskey, 2013). Provide to all pupils the option to learn maths through playing with interactive games on their tablets (Kyriakides, Mavrotheris & Prodromou, 2016).
2. **Collaborate with universities (Ainscow, Booth & Dyson, 2004) and organise collaborative events/trainings for teachers.** This will provide teachers the opportunity to become familiar with material and best practices that can be applied when working with pupils who present underachievement in the area of maths, e.g. on the use of mobile technologies for learning maths. (Kyriakides, Mavrotheris & Prodromou, 2016).

Technology

1. **Equip the school with tablets and personal computers to promote the use of technology to motivate underachieving pupils in maths (Brophy, 2010).** Build on pupils' confidence in using everyday technology such as mobiles and tablets to enhance their motivation and self-efficacy beliefs.
2. **Make curricular adaptations in terms of resources** – where possible equip the classrooms in which there are pupils struggling in maths with different materials and advanced technology, such as tablets or projectors, so as to attain a single learning outcome.

Timetabling

Ask teachers to keep a progress log regarding specific pupils with learning differences, either for a specific lesson, topic or learning objective, or for an academic term. At the pre-intervention level, arrange a meeting with the pupil's parents in order to determine the pupil's study habits. The maths teacher can offer recommendations in order for the parents to be able to assist in the learning process, if this is feasible. Teachers and parents can work

together to set realistic goals. With regular follow-up meetings, a pupil's progress and learning goals can be monitored and reevaluated. If expected progress is not made, then contact the multi-disciplinary team / educational psychologist to determine more appropriate suggestions according to the pupil's needs and how best to address them. Based on this data, re-organise the school schedule (if needed) to allow more time for co-teaching activities (Hoppey, & McLeskey, 2013).

Supportive Literature

Definition: Numerical reasoning and calculation pose major problems for many pupils with learning disabilities. Pupils with learning disabilities perform lower than typically achieving children on every type of arithmetic problem at every grade level (Cawley, Parmar, Foley, Salmon, & Roy, 2001). Deficits in retrieving number facts and solving story problems are particularly evident (L. S. Fuchs et al., 2010; Geary, 2004).

Source: Heward, W. L. (2013). *Exceptional children: An introduction to special education*. Pearson College Div.

Characteristically, pupils with Mathematics Underachievement:

- show confusion with number order, e.g. units, tens, hundreds
- are confused by mathematical symbols
- have difficulty remembering anything in a sequential order, e.g. tables, days of the week, the alphabet
- have difficulty learning and remembering multiplication tables
- may reverse numbers such as 2 and 5

Websites and EU Reports

<http://www.dyscalculia.org/>

<http://www.bdadyslexia.org.uk/dyslexic/dyscalculia>

http://www.catchup.org/resources/610/what_works_for_children_with_mathematical_difficulties.pdf

<https://www.european-agency.org/publications/ereports/ict-for-inclusion-developments-and-opportunities-for-european-countries>

<https://www.european-agency.org/publications/ereports/ra4al-synthesis-report/ra4al-synthesis-report>

Multisensory instruction: <https://www.understood.org/en/school-learning/partnering-with-children/school/instructional-strategies/multisensory-instruction-what-you-need-to-know>

Dyslexia friendly pack (DFA), British Dyslexia Association (2012): <http://www.bdadyslexia.org.uk/common/ckeditor/filemanager/userfiles/Educator/Resources/dfs-gpg-abridged.pdf>

Methods of Differentiation in classrooms
<http://www.bbcactive.com/BBCActiveIdeasandResources/MethodsofDifferentiationintheClassroom.aspx>

References

- Ainscow, M., Booth, T., & Dyson, A. (2004). Understanding and developing inclusive practices in schools: a collaborative action research network. *International journal of inclusive education*, 8(2), 125-139.
- Brophy, J. (2010). *Motivating students to learn*. New York, NY: Routledge.
- Cawley, J. F., Parmar, R. S., Foley, T. E., Salmon S., & Roy, S. (2001). Arithmetic performance of students: Implications for standards and programming. *Exceptional Children*, 67, 311-328.
- Dowker, A. (2009). *What works for children with mathematical difficulties?*. DfES Publications.
- Hoppey, D., & McLeskey, J. (2013). A case study of principal leadership in an effective inclusive school. *The Journal of Special Education*, 46(4), 245-256.
- Jung, I. (2005). ICT-Pedagogy Integration in Teacher Training: Application Cases Worldwide. *Educational Technology & Society*, 8(2), 94-101.
- Konstantinou-Katzi, P., Tsolaki E., Meletiou-Mavrotheris M., & Koutselini, M.(2013) "Differentiation of teaching and learning mathematics: an action research study in tertiary education." *International Journal of Mathematical Education in Science and Technology* 44, 3, 332-349.
- Kyriakides, A. O., Meletiou-Mavrotheris, M., & Prodromou, T. (2016). Mobile technologies in the service of students' learning of mathematics: the example of game application ALEX in the context of a primary school in Cyprus. *Mathematics Education Research Journal*, 28(1), 53-78.
- Meletiou-Mavrotheris, M., & Mavrotheris, E. (2012). Game-enhanced mathematics learning for pre-service primary school teachers. In *International Conference on Information Communication Technologies in Education*.
- Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and teacher education*, 21(5), 509-523.
- Olive, J., Makar, K., Hoyos, V., Kor, L. K., Kosheleva, O., & STRÄSSER, R. (2009). Mathematical knowledge and practices resulting from access to digital technologies. In *Mathematics education and technology-rethinking the terrain* (pp. 133-177). Springer US.
- Scott, K. S. (1993). Multisensory mathematics for children with mild disabilities. *Exceptionality*, 4(2), 97-111.
- Witzel, B. S. (2005). Using CRA to teach algebra to students with math difficulties in inclusive settings. *Learning Disabilities—A Contemporary Journal*, 3(2), 49-60.
- Zaranis, N., Kalogiannakis, M., & Papadakis, S. (2013). Using mobile devices for teaching realistic mathematics in kindergarten education. *Creative Education*, 4(07), 1.
- <https://www.touchmath.com/pdf/UsingTouchMathwithStudentswithLearningDisabilities.pdf>