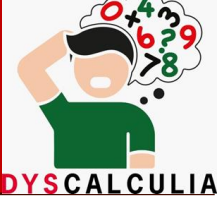


# Dyscalculia

## WP2: Dyscalculia Curriculum and Course Material

Prof. Dr. Marc Beutner  
Helene Lindenthal





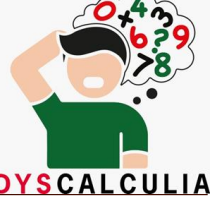
# Dyscalculia

## Module 1: Development of key competences

Prof. Dr. Marc Beutner  
Helene Lindenthal



# Module 1: Development of key competences

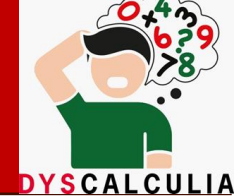


1. Introduction of the Module
2. Content of the Module
3. Link to additional text
4. Link to additional videos
5. Quiz
6. Summary of the Module
7. Resources

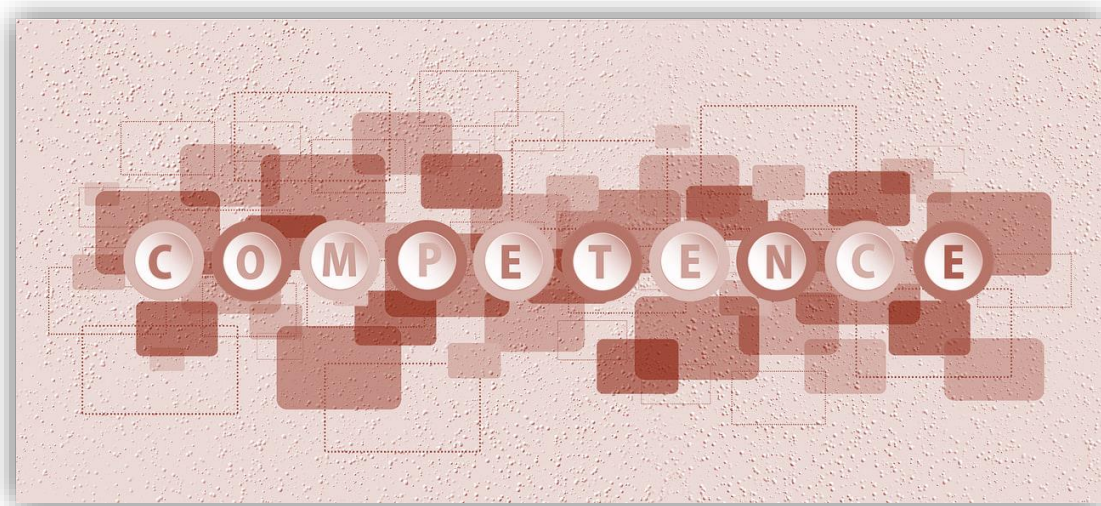


# Module 1: Development of key competences

## 1. Introduction of the Module



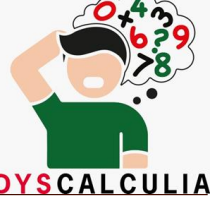
“Module 1: Development of key competences” is about the key competences which are needed as a teacher of dyscalculic students. There will be an overview of teaching and professional skills needed and how to increase them. Methodological competences are presented in order to use different approaches and practices, activity examples, teaching methods and techniques for the education of students with different learning levels. Finally, there will be an outline of how educators can develop their capacity in the long term.



Source: [https://cdn.pixabay.com/photo/2021/06/05/04/52/competence-6311491\\_1280.jpg](https://cdn.pixabay.com/photo/2021/06/05/04/52/competence-6311491_1280.jpg)

# Module 1: Development of key competences

## 2. Content of the Module



Teachers should adapt their lessons not only to the learning content but above all to the individual needs of the learners.

The learners' needs are very individual and different, as each learner brings different prior knowledge, learning requirements, motivation, daily form, etc. to the classroom.

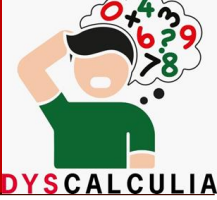
Learners also bring learning disorders with them, such as dyscalculia.

Teachers need knowledge, appropriate awareness and essential skills to effectively treat children with dyscalculia in school to provide them with high-quality teaching.

The key competences of a teacher for dyscalculic learners are crucial for learning success in maths lessons.

# Module 1: Development of key competences

## 2. Content of the Module

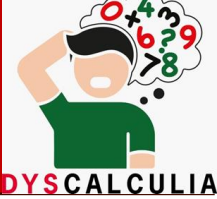


The **key competences** of a teacher for dyscalculic students are:

facilitation	responsibility	reflection	support	feedback
<ul style="list-style-type: none"><li>• Teacher needs to be a facilitator in the learning process</li><li>• Dyscalculic learners in particular need support in their learning processes</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to know when to hand over the responsibility of the learning process to the learners</li><li>• Teacher needs to create space for learners to take responsibility</li><li>• Dyscalculic learners can be strengthened if they are allowed to take responsibility themselves</li></ul>	<ul style="list-style-type: none"><li>• Teacher and learner need to reflect on the teaching and learning processes regularly</li><li>• Reflection is important for dyscalculic learners in order to become self-aware of their progress</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to establish a support system for the development of knowledge, skills, attitudes, values</li><li>• Dyscalculic learners should have the feeling that the teacher is supportive</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to establish a feedback system in which both teacher and learner can receive feedback respectfully and regularly</li><li>• Feedback should be appropriate, specific and timely</li><li>• Both positive and negative feedback can help dyscalculic learners in their learning processes to adapt their learning behaviour</li></ul>

# Module 1: Development of key competences

## 2. Content of the Module

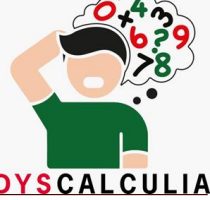


The **teaching skills** of a teacher for dyscalculic students are:

individuality	additional resources	minds-on experiences	hands-on experiences	projects	social form
<ul style="list-style-type: none"><li>• Teacher needs to be able to support learners through individual learning experiences</li><li>• Dyscalculic learners need individual support</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to provide additional open educational resources (OER) for learners to learn individually on their own</li><li>• Additional OER are helpful for dyscalculic learners because they can learn on their own outside of the classroom which could help to reduce possible pressure</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to provide minds-on experiences</li><li>• Dyscalculic learners should be challenged to use and therefore broaden their mind</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to provide hands-on experiences</li><li>• It is helpful to learn with practical cases for dyscalculic learners, so the mathematical content can be transferred into real life</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to offer project-based learning</li><li>• Through different kinds of learning scenarios, dyscalculic learners can transfer their knowledge</li><li>• Projects are closed cases, and these can help to transfer the theoretical knowledge</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to offer different kinds of social form within the learning processes</li><li>• Cooperative learning can help dyscalculic learners to engage and learn with and from others</li></ul>

# Module 1: Development of key competences

## 2. Content of the Module



### Teaching skills: different teaching approaches (1)

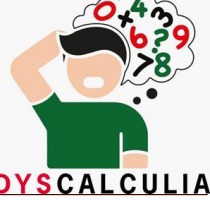
In most cases, the learners in a school class are heterogeneous in many respects. Different teaching approaches are required to meet the different needs. Here is a small selection of teaching approaches:

teaching approach	definition	advantage	disadvantage
Lecture-based teaching	Teacher conveys theoretical content to the whole class, learners only participate passively in the lesson	A lot of content can be conveyed in a short time	Learners are only passive and cannot learn actively
Interactive teaching	Teacher wants participation of learners throughout the lesson	Learners can actively think and contribute to the lesson	Learners don't have to be active
Problem-Based Learning (PBL)	Groupwork for solving real-life problems	Fosters collaboration, problem-solving skills, critical thinking	Learners can be overwhelmed with solving the problem on their own



# Module 1: Development of key competences

## 2. Content of the Module



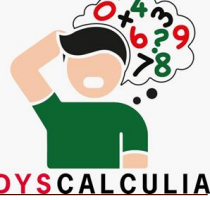
### Teaching skills: different teaching approaches (2)

teaching approach	definition	advantage	disadvantage
Project-Based Learning	Group- or single work for solving problems within a project with what they have learned in class	Promotes action-orientation, collaboration, creativity	Learners can be overwhelmed with the creative task
Flipped Classroom	Gain of knowledge is happening outside of class so hands-on activities are happening in class	Learners can learn the theoretical part on their own and participate actively during the lesson	Learners can have difficulties with learning outside of class



# Module 1: Development of key competences

## 2. Content of the Module



### Teaching skills: practices for students with different levels of learning

The heterogeneous learning requirements of the learners in a class also require different practices.

Provide different tasks with different levels of difficulty

Use different learning material

Let students of different learning levels work together

Prepare extra tasks for fast learners

Provide different learning methods with changing social forms, group work

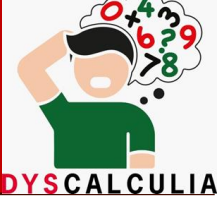
Address all sensory perceptions (listening, reading, writing, watching, etc.)

Learning counters, station learning (various stations, with different materials and tasks)

Individual learning assessments (depending on personal development)

# Module 1: Development of key competences

## 2. Content of the Module



### Teaching skills: Proficiency in planning and delivering effective lessons.

In order to deliver high-quality lessons to a diverse group of learners, teachers need proficiency in planning and delivering effective lessons.

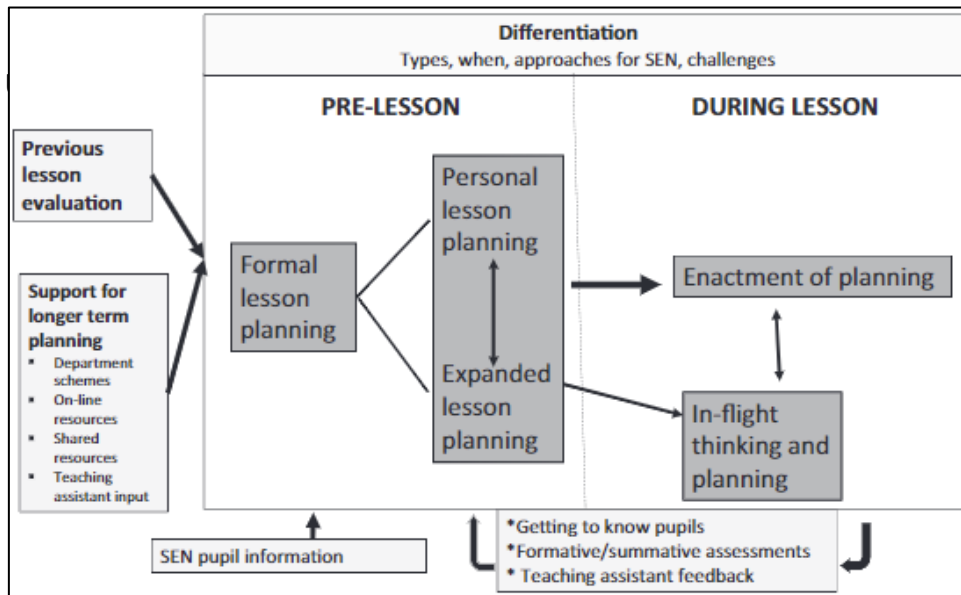


Fig. 1: Concept of lesson planning for inclusive lessons (Black, Lawson & Norwich, 2019, p. 123)

- for performance management and appraisal purposes
- not required for all lessons
- formal process
- evaluating purposes
- planning is written down

Formal planning

- individually
- lesson specific
- some elements of formal planning
- informal, interactive, ongoing process
- formative and practical purposes
- planning is written down, in-mind planning for the lesson

Personal planning

- formative and practical purposes
- planning is written down or takes place in the mind
- for unexpected situations, gives some kind of flexibility/adaptability

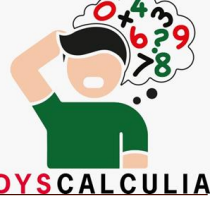
Extended planning

- planning takes place in the mind
- during the lesson in response to the unexpected

Planning on the fly

# Module 1: Development of key competences

## 2. Content of the Module

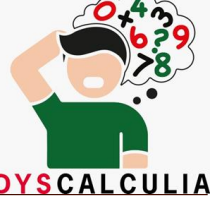


The **professional skills** of a teacher for dyscalculic students are:

knowledge	closeness	pedagogue	further education and training	network
<ul style="list-style-type: none"><li>• In order to effectively teach dyscalculic learners, teachers need to know about dyscalculia and its effects on the learning processes, the learners, the family, friends and other learners in class</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to know each learner in the class, so s/he can help them individually</li><li>• Only when the teacher knows what each of the learner needs, s/he can help them effectively</li></ul>	<ul style="list-style-type: none"><li>• Teacher should not look at dyscalculic learners as ill children</li><li>• Teacher should treat them as children with a speciality</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to actively take part in further education and training concerning teaching, learning and dyscalculia, because the knowledge about dyscalculia is not final, it is still being researched and new insights are being gained</li></ul>	<ul style="list-style-type: none"><li>• Teacher needs to build a network with other teachers, so they can advise each other on the learning processes of the dyscalculic learners</li><li>• Teacher should also stay in contact with the family of the dyscalculic learners</li></ul>

# Module 1: Development of key competences

## 2. Content of the Module



Awareness of the importance of **continuous professional development** for educators is crucial. The professionalisation of teachers plays a central role in supporting learners with dyscalculia. Here are some essential professional skills that teachers should develop in this context:

Teachers should have the ability to continuously learn and improve their teaching skills. Recognising the ever-changing educational landscape and a willingness to learn new methods and approaches are crucial. Especially when it comes to research into learning disabilities such as dyscalculia, teachers must constantly expand their knowledge and adapt their teaching accordingly.

Professional development skills

Pedagogical competence

The ability to develop and implement teaching strategies that meet educational objectives and cater for the needs of different learners is essential. When dealing with learners with dyscalculia, it is particularly important to know and apply alternative teaching methods in order to take individual learning needs into account.

Teachers should be able to collaborate effectively with colleagues, parents and other stakeholders to improve the educational experience for learners. Collaboration enables a holistic approach to support learners with dyscalculia as different perspectives and expertise can be brought together.

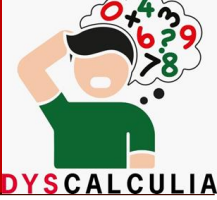
Collaboration skills

Communication skills

The ability to effectively convey information and interact with learners, other teachers and families is essential. Communicating clearly and comprehensibly fosters a supportive learning environment and facilitates collaboration among all stakeholders.

# Module 1: Development of key competences

## 2. Content of the Module



The **methodological competences** of a teacher for dyscalculic students are:

Developing and maintaining these methodological skills enables teachers to organise lessons to meet the needs of learners with dyscalculia. Adaptability and a constant willingness to evolve are key elements in creating an effective and supportive learning environment that meets the diverse needs of learners.

### methodological competence

- Teachers should have the ability to choose and apply appropriate teaching methods and techniques for different levels of learning
- For students with dyscalculia, it is particularly important to master a variety of methodological approaches to meet individual learning needs

### adaptability

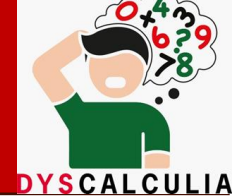
- The ability to adapt teaching methods to meet the needs of students with different learning levels is crucial
- This requires flexibility and a willingness to organise lessons dynamically to meet the different needs of learners with dyscalculia

### continuous development of methodological competences

- In order to successfully use different approaches and practices, examples of activities, teaching methods and techniques in education for students with different levels of learning, the continuous development of methodological competencies is essential
- Teachers should put effort into the improvement of their skills through further training and the exchange of good practice

# Module 1: Development of key competences

## 3. Link to additional text



### "Meeting the Needs of Students with Dyslexia and Dyscalculia"

Authors: B. Witzel & M. Mize (Withrop University)

Published in: SRATE Journal 27(1)

Year: 2018

Link: <https://files.eric.ed.gov/fulltext/EJ1166703.pdf>



# Module 1: Development of key competences

## 4. Link to additional videos

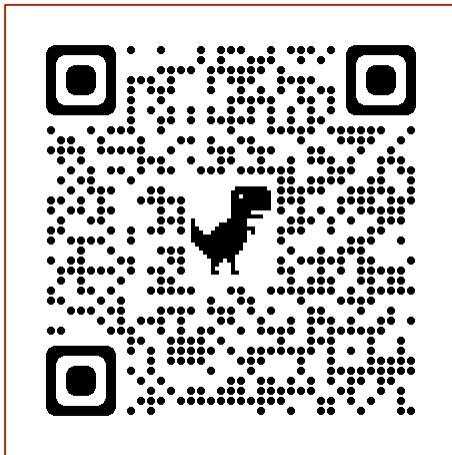
Link Video English: “Dyscalculia: Teaching Strategies & Modifications”

<https://www.youtube.com/watch?v=BWaam8s9wSs>



Link Video German: “Rechenschwäche - Was tun bei Dyskalkulie? | Schule im Gespräch #190”

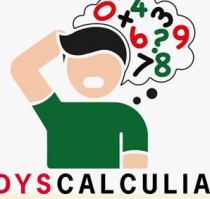
[https://www.youtube.com/watch?v=N\\_ur5UD2iv4](https://www.youtube.com/watch?v=N_ur5UD2iv4)





# Module 1: Development of key competences

## 5. Quiz



DYS CALCULIA

**1. Multiple Choice Question: What are the key competences for teachers of dyscalculic learners?**

1. Reflection
2. Facilitation
3. Inability to communicate
4. Responsibility
5. Intolerance
6. Support

**2. Single Choice Question: Which teaching approach promotes action-orientation, collaboration and creativity?**

1. Lecture-based teaching
2. Interactive teaching
3. Problem-Based Learning (PBL) Project-Based Learning
4. Flipped Classroom
5. Project-based learning (PBL)
6. Lecture-based teaching

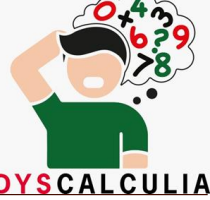
**3. Why is it particularly important for teachers who teach learners with dyscalculia to go through continuous professional development?**

1. To learn alternative teaching methods for individual learning needs.
2. To better meet the difficulties of pupils.
3. To take into account current research findings in the field of dyscalculia.
4. All of the above.

**4. Why is it important for teachers of learners with dyscalculia to plan lessons but still maintain a degree of adaptability?**

1. Because the lesson plan provides a clear structure and teachers can set their objectives in advance.
2. Because flexible customisation of lessons allows individual needs and progress of learners to be addressed.
3. Because learners with dyscalculia benefit from clear and predictable structures.
4. Because a predetermined plan enables teachers to teach more efficiently.

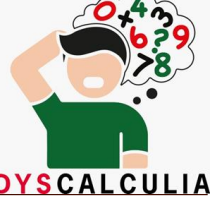
# Resources



- Black, A., Lawson, H. & Norwich, B. (2019). Lesson planning for diversity. *Journal of Research in Special Educational Needs* 19(2), p. 115-125.
- Sankar, S. (2022). Primary Teachers' Competencies For Dealing Students With Dyscalculia. *Journal of Pharmaceutical Negative Results* 13(7), p. 8247-8270.
- Ufer, S., Heinze, A. & Lipowsky, F. (2023). Unterrichtsqualität und Instruktionsstrategien [Teaching quality and instructional strategies]. In R. Bruder, A. Büchter, H. Gasteiger, B. Schmidt-Thieme & H.-G. Weigand (Ed.) *Handbuch der Mathematikdidaktik* (2. ed.), S. 465-492. Berlin: Springer Spektrum.
- Williams, A. (2012). A teacher's perspective of dyscalculia: Who counts? An interdisciplinary overview. *Australian Journal of Learning Difficulties*, 18(1), p. 1-16.



# Contact



Warburger Str. 100  
DE-33098 Paderborn  
**Web** [www.uni-paderborn.de/en](http://www.uni-paderborn.de/en)

## **Prof. Dr. Marc Beutner**

Professor and Head of Chair of Business and  
Human Resource Education II  
Faculty of Economics

**Office** Q1.441

**Telephone** +49 5251 60-2367

**E-Mail** [marc.beutner@uni-paderborn.de](mailto:marc.beutner@uni-paderborn.de)

## **Helene Lindenthal**

Research Assistant  
Faculty of Economics  
Chair of Business and Human Resource  
Education II

**Office** Q1.451

**Telephone** +49 5251 60-5010

**E-Mail** [helene.lindenthal@uni-paderborn.de](mailto:helene.lindenthal@uni-paderborn.de)

