**INTRODUCTION**

- Why this research?
  - Inclusive Education: Schools for everyone
  - Differentiation of teaching for SEN
  - ICT: a tool for Inclusion
  - Dyslexia: How about Mathematics?
  - ICT resources in Cyprus (Mavrou, 2005)
  - Suitability of Educational Software
  - Value of Mathematics

**Scarcity of Research**

**Heterogeneity of difficulties**
BACKGROUND

- **Dyslexia**
  - What is it?
  - Difficulties

Specific developmental disorder which affects literacy across the life-span
(Reynolds et al., 2003; Snowling, 2000)

Grapheme-phoneme schema; phonological awareness; short-term and long-term memory; sequencing; processing; orientation; concentration

- Only difficulties in Reading and Writing?

![Diagram](image)

Snowling (2000)

ICT FOR DYSLEXIA

- ICT for students with SEN or without SEN (Rooms, 2000)
- Students with dyslexia
  - computers enable multi-sensory elements into the natural education process
  - game-like design: Mayer's multimedia principle → individual preferences in the use of animation, auditory narration and text (Taraszow et al., 2007)
  - Learning → easily accessible
  - exciting way of teaching compared to traditional teaching approaches.
  - ICT: ultimate tool for better access to the curriculum for every learner (Lovless and Ellis, 2001)
  - collaboration with peers (Mavrou, 2005; Vygotsky, 1978)
- Restricted ICT facilities in Cypriot mainstream classroom.
METHODS

Purpose
- This study aims to explore the impact of the use of the available software for the design of learning environments for differentiation of instruction on
  - the performance,
  - classroom involvement,
  - peers interaction
of students with dyslexia with difficulties in solving word problems in mathematics in the mainstream classroom in Cyprus.
- In two different settings
  - (1) students of the classroom in pairs/groups using computers in school’s lab
  - (2) student with dyslexia with a parent using the computer at home for homework.

AIMS AND OBJECTIVES

- Using restricted ICT resources for students with Dyslexia in the mainstream classroom for:
  - Differentiation of teaching word mathematical problem solving (WMPS)
  - Increasing their classroom involvement
  - Increasing peers interaction
  - Improving performance?
- Exploration of the potential of restricted ICT facilities in Cyprus for WMPS

<table>
<thead>
<tr>
<th>available</th>
<th>downloadable</th>
<th>free</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-commercial educational software</td>
<td>Web-based learning environments</td>
<td>Tools for designing WBLE</td>
</tr>
</tbody>
</table>
METHODS

- **Participants**
  - 23 Students
    - 22 +1 with dyslexia
    - 5th grade of Primary School
    - Limassol, Cyprus
  - Teacher of the classroom
  - Special Needs Teacher of the School
  - Parents of the student with dyslexia

- **Case Study**
  - 6 weeks
    - 12 forty-minutes sessions in the classroom
    - 6 thirty-minutes sessions at home (one session per week)

- **Data Collection Tools:**
  - Observations
  - Interviews
  - Computer Screen's Recordings
  - Pre-Tests and Post-Tests

RESEARCH DESIGN

1. **Diagnosis of Dyslexia**
2. **Observations/ Interviews/ Pre-test**
3. **Design of WBLE**
4. **ICT training**
5. **Intervention: Implementation of evaluated WBLE**
6. **Observations/ Interviews/ Post-test**
MATHEMATICAL PROBLEM SOLVING

Problem solving model (Krulik & Rudnick, 1987)

1. Understanding the Problem
2. Investigation
3. Choosing Strategy
4. Problem Solving
5. Checking the answer
ANALYSIS

- Content Analysis
  - audio recordings
  - video recordings
  - observation notes
  - diary recordings
  - peers interviews
  - student’s with dyslexia interview
  - computer’s screen recordings
  - teacher interview
  - special teacher of the school interview
  - students’ work and essays
  - pre-tests and post-tests
  - school documents

- Comparisons

FINDINGS

- Data analysis is under processing
- Not safe conclusions
- Before the implementation
  - Students
    - want to use the computer during the lessons
    - had no opportunity to work individually or in groups on the computer
    - sit in groups of 4-5 pupils \(\Rightarrow\) collaborating learning.
  - Teacher
    - uses the single computer in the classroom
    - encourages students to collaborate but the student with dyslexia does not contribute a lot in the group.
  - Low rates of participation in the classroom
  - Specific weaknesses in solving word mathematical problems
FINDINGS

During the Implementation

- all students showed great interest and enthusiasm
- participation rate was significantly increased
- collaboration in pairs proved to be very helpful → students showed significant improvements
- the direct provision of feedback → helpful and entertaining
- no any change in terms of acceptance of the student with dyslexia from his peers
- positive results → during the implementation of the programme at home
- student with dyslexia works more individually and less support from his mother is needed

After the implementation

- Students
  - prefer to work on the computer for WMPS
  - found WBLE more helpful
  - found text, sound, navigation, game-like design, feedback, interaction with computer helpful, exciting, useful and relaxing
  - prefer the collaboration in pairs or small groups while they are working on WBLE

- Student with dyslexia
  - admits that WBLE increased his self-confidence in solving mathematical problems with the computer
  - participates in the same extent as before
  - no significant improvements in participation during the instruction without the use of the computer

- Teacher
  - supports the idea but it is time consuming in design, creation and implementation
  - Increased participation and better performance the day after the session at home
  - Parents: useful, helpful, innovative, increased interest, exciting, game-like
CONCLUSIONS

- weaknesses of the programme in achieving permanent and long-lasting changes and improvements when it is applied in short-term period
- difference between a programme for the differentiation of the instruction and an interventional approach to dyslexia
- Promising results from the use of the computer for solving mathematical problems in the classroom
- ICT + collaborative learning → possibility of using the computer in WMPS in Cypriot primary schools for differentiation
- Positive outcomes: participation, equal access, performance, self-confidence
- significant difficulties in implementing the programme in environments with limited ICT facilities
- promising results from the use of the computer for solving mathematical problems at home for students with dyslexia.

REFERENCES

REFERENCES


THANK YOU

Source: http://www.poi.passion.com/fire_and_poi_info/dyslexia_and_brain_gym.php