



Funded by the ERASMUS+
Programme of the
European Commission

Thematic Working Group 19
Mathematics Teaching and
Teacher Practice



Pre-service teachers' experiences in selecting and proposing challenging tasks in secondary classrooms

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Acknowledgments

- **This project, entitled “Enhancing Differentiated Instruction and Cognitive Activation in Mathematics Lessons by Supporting Teacher Learning (EDUCATE)”, has been funded with support from the European Commission. This publication [communication] reflects the views only of the author(s), and the Commission cannot be held responsible for any use which may be made of the information contained therein.**



Erasmus+



EDUCATE Project

- EDUCATE - Enhancing Differentiated Instruction and Cognitive Activation in Mathematics Lessons by Supporting Teacher Learning
- Funded by Erasmus+ Programme of the European Union: 2017 – 2020



HELLENIC REPUBLIC
National and Kapodistrian
University of Athens

EDUCATE Project

- EDUCATE - Enhancing **Differentiated Instruction** and **Cognitive Activation** in Mathematics Lessons by Supporting Teacher Learning
- Elaboration of modules for teacher education (in-service and **pre-service**~~prospective teachers~~), supported by previous studies

Objective and research questions

To understand what happens when pre-service teachers (PTs) are encouraged to propose challenging tasks in the classroom

- ✓ What is the nature of the tasks selected, adapted or designed by the PTs?
- ✓ What are the main challenges that PTs face when they propose and enact challenging tasks?

Theoretical framework

- **Challenging tasks**

- Challenging tasks are very important to foster mathematics learning, promoting high level thinking (Christiansen, & Walther, 1986; NCTM, 2014; Shimizu *et al.*, 2010)
- Different conceptualizations by authors and teachers (Foster & Inglis, 2017)
- Taxonomy of tasks (Stein & Smith, 1998) – levels of demands

Theoretical framework

- **The enactment of challenging tasks**
 - Demands a certain teaching practice, requires lesson structures that supports a student-centred approach, and values classroom discourse (Ponte *et al.*, 2017; Russo & Hopkins, 2017; Sullivan & Mornane, 2014)
 - To pose adequate questions, to sequence the questions, to provide enabling prompts (Mata-Pereira & Ponte, 2017; Sullivan et al., 2015)

Methodology

- Interpretative study (Creswell, 2012)
- Participants: **Marta** and **Madalena**, two prospective teachers selected by contrasting criteria:
 - Marta is 22 years old, graduated in Applied Mathematics and Computation, teaches in a private school, 12th grade class (age 17) with 13 students interested and motivated for studying, good achievement in mathematics.
 - Magdalena is 24 years old, graduated in Applied Mathematics, teaches in a private school, 10th grade class (age 15) with 17 students, heterogeneous regarding their school achievement.

Methodology

- Data collection
 - Observation of 2 lessons, video recorded
 - Interview, Pre- and post-lesson reflections, audio recorded
 - Document analysis of the post-lesson written reflections and lesson plans
- Analysis of data
 - Content analysis – pre-defined categories for the nature of tasks (Stein & Smith, 1998) and post-defined categories for challenges of PTs.

The nature of tasks

PTs were invited to select challenging tasks

Task 2 - Marta (P)	Procedures with connections	Requires “some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly”.
Tasks 1a and 2 – Magdalena (P)		
Task 1 - Marta	Doing Mathematics	Requires “students to access relevant knowledge and experiences and make appropriate use of them in working through the task” and “considerable cognitive effort”.
Task 1b – Magdalena (P)		

The perspectives of the PTs about the tasks are similar to our analysis.

Challenges of the PTs

- Planning: To obtain challenging tasks; to perceive the level of difficulty for the students
- In classroom:
 - Autonomous work - To decide which is an adequate intervention
 - Whole-class discussion – To sequence students' work
 - Time management (autonomous work and whole-class discussion)
- Analysis of data

Conclusions

- The pre-service teachers were able to answer the request made, but faced diverse challenges, most of them similar with those of in-service teachers (Foster & Inglis, 2017; Ponte & Quaresma, 2016; Russo & Hopkins, 2017)
 - Why are the type of challenges so common?
 - How a context of a Master of Teaching degree may explain the similarities found?
 - How the demands of challenging tasks to practice can be overcome?