higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

Co- funded by the
European Union

Knowledge and Practice Standards for Mathematics in Initial Teacher Education

Mathematical Thinking

17th of April 2019

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TEACHING & LEARNING DEVELOPMENT CAPACITY IMPROVEMENT PROGRAMME

Purpose and Rationale

According to Devlin (2012) and Katz (2014), learners may become able to calculate by following set 'rules', but the majority do not develop the capacity to think mathematically.

They learn to mathematic thinking by actively participating in "the practices of those who produce or use mathematics" (UNESCO, 2012, p.10).

Teachers need to facilitate this engagement.

But to do this, teachers themselves need to have experienced these processes and practices – they themselves need to have learned to think mathematically

General Statement

Prospective primary teachers demonstrate effective and appropriate mathematical thinking to make sense of and engage with:

- The world in which they and their learners live,
- Their professional tasks in schools,
- Their classroom teaching of mathematics and other subjects,
- Their interaction with learners focusing on learning and doing mathematics together

Knowledge and practice standards focusing on Process: Mathematical Thinking

1. Playful engagement to develop, or search for, mathematical insight
2. Represent and use mathematics
3. Develop mathematical productions
4. Reason and reflect

Standard 1: Developing Mathematical Insight

Name	Process Sub-Standards
Act	Use action and perception to develop mathematical insight
Explore	Explore relationships in patterns and processes (contextual and mathematical) to generate mathematical structure
Connect	Identify, construct and formulate connections between mathematical patterns and/or representations
Clarify	Pose and investigate questions to clarify understanding

Standard 2: Represent and use mathematics

Name	Process Sub-Standards
Model	Make sense of real-life situations using mathematical models (problem solving)
Identify properties	Identify properties that can be counted, measured or that form geometrical invariants
Attend to precision	Decide upon and generate precision appropriate to the task
Represent	Form and manipulate mathematical representations (including names, diagrams, figures, symbol systems, and functions / relations)
Describe and define	Describe and define in mathematical ways

Category 3: Develop mathematical productions

Name	Process Sub-Standards
Specialize	Consider special cases to generate mathematical insight
Generalize	Generalize patterns, relationships and attributes
Conjecture	Generate and test conjectures
Classify	Distinguish and organize mathematical objects to create systems

Category 4: Reason and reflect

Name	Process Sub-Standards
Justify	Provide supporting reasons for claims
Prove	Validate conjectures
Refute	Construct counterexamples
Critique	Compare mathematical productions for efficiency, effectiveness and elegance
Regulate	Reflect to regulate task process