

Eliciting mathematical knowledge in pre-service primary school teachers: a concept cartoon in divisibility



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Theoretical Background

- Vignettes promote pre-service teachers' reflection and discussion of authentic classroom situations (Buchbinder, & Kuntze, 2018; Fernández et al. 2018).
- Among vignettes, Concept Cartoons can be designed to elicit mathematical knowledge in pre-service primary school teachers (Samková, 2020).

Aim of the study:

- To analyse what kind of knowledge pre-service teachers reveal when they participated in a Concept Cartoon on divisibility as an introductory task within a mathematics content course.



Digital Support for Teachers' Collaborative Reflection on Mathematics Classroom Situations

The project coReflect@maths

Erasmus+ Strategic Partnership:
Six partner universities from
four countries

Project goals

- Bringing together and exchanging the practice of vignette-based professional learning established by the project partners
- Developing vignette-based course concepts for teacher students and teacher educators
- DIVER: a digital tool for facilitating the creation of vignettes and collaborative reflection on vignettes

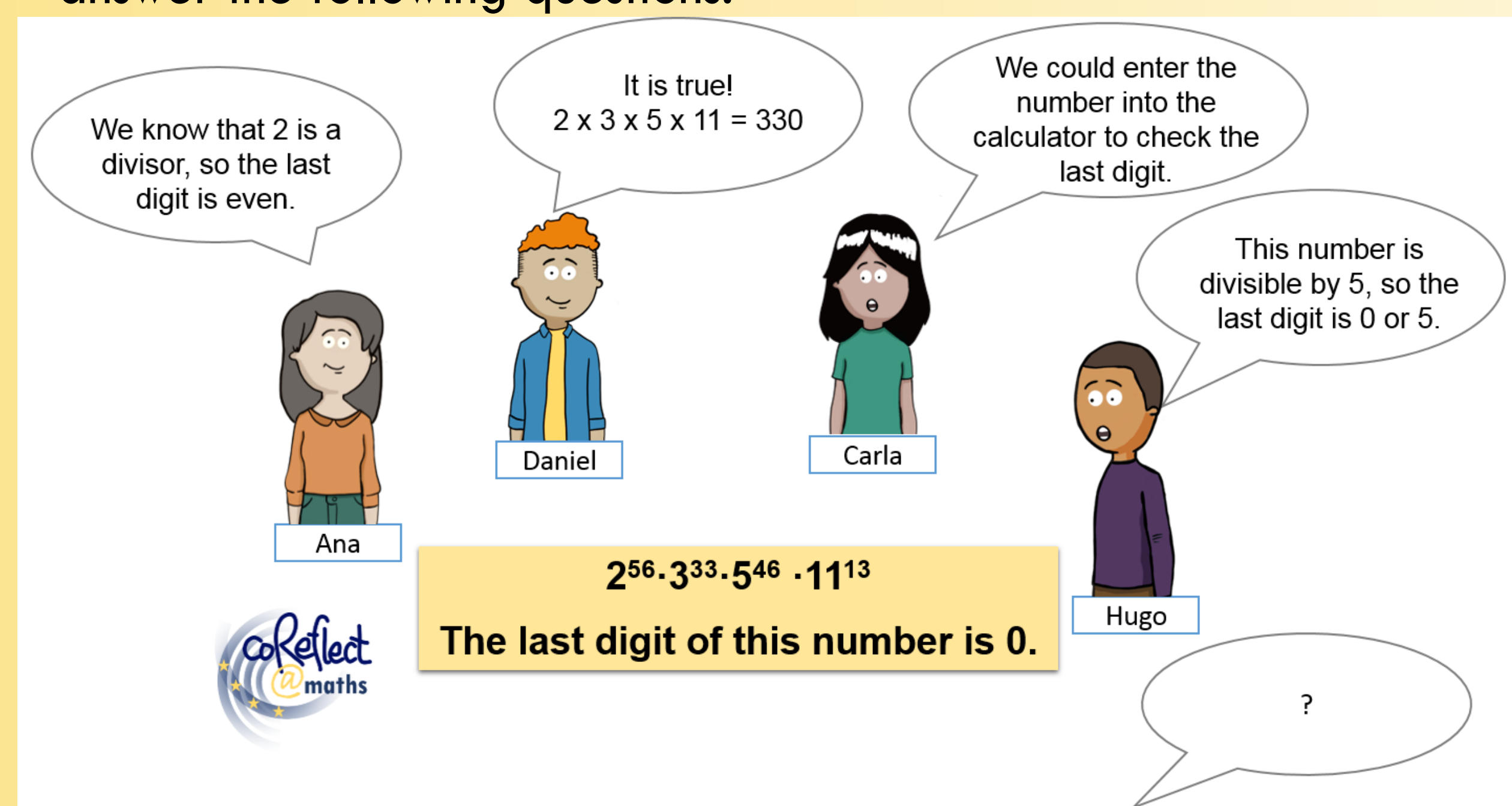
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Method

- Participants:** 51 pre-service primary school teachers (PPTs) solved the vignette.
- Task:** The Concept Cartoon vignette in divisibility consists of
 - a group of four student teachers
 - a divisibility activity
 - four bubbles with different correct and incorrect statements
 - three questions
- Analysis:** We performed an inductive analysis generating categories.

Vignette: A Concept Cartoon in divisibility

Here you can see a group of student teachers discussing the statement in the yellow box. Read through their comments and answer the following questions:



- What thoughts (mathematical concepts, properties...) could be behind the student teachers' comments? Write your ideas of each of the student teachers.
- How could you help the student teachers to correct or to improve their argumentation?
- Write your solution into the empty speech bubble.

Results and conclusions

- Tables 1, 2 and 3 show the frequencies of the categories identified from the inductive analysis in each question.

Table 1. Categories of question a)

Ana	Daniel	Carla	Hugo
Divisibility criterion of 2	23	Multiplication without considering the exponents	12
Divisors	4	Multiplication	20
General concepts	6	General concepts	12
Non-sense	10		
Blank answer	8	Blank answer	7

Table 2. Categories of question b)

Improve their argumentation	
Combine criteria of 2 and 5	6
Discussion with partners	2
Give more examples	3
Explain the properties	9
Solve the activity step by step	5
Incorrect reasoning	3
Non-sense	10
Blank answer	13

Table 3. Categories of question c)

Resolution		
Correct	Combine criteria of 2 and 5	10
	Calculate the number	9
Incorrect	Multiply bases and add exponents	5
	Use only the criterion of 2	1
	Use properties of the exponents	2
	Non-sense	9
	"I don't know"	4
	Blank answer	11

- The categories showed PPT's knowledge/lack of it regarding the key concepts implied in the activity, the type of arguments they provide to describe the thoughts behind the student teachers' thinking and different alternative ideas they proposed to improve their argumentation.
- Our results point out the potential of vignettes in teacher education programs to discuss correct and incorrect argumentations, and therefore to elicit mathematical knowledge.

Buchbinder, O., & Kuntze, S. (Eds.). (2018). *Mathematics Teachers Engaging with Representations of Practice. A Dynamically Evolving Field*. Springer.

Fernández et al. (2018). Noticing students' mathematical thinking: characterization, development and contexts. *Avances de Investigación en Educación Matemática (AIEM)*, 13, 39–61.

Samková, L. (2020). The typology of arithmetical Concept Cartoons. *South Bohemia Mathematical Letters*, 28(1), 28–36.



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