



“DO YOU THINK THIS IS REALLY TRUE?” — DEALING WITH INVESTIGATIVE WORK IN MATHS CLASS

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Mathematics investigations

- “the **students** explore an open situation, look for regularities, formulate and test conjectures, argue and communicate their conclusions orally or in writing” (DEB, 2001, p. 68).
- expressions of a **non-routine** work, referring to complex mathematical processes and involving strongly problematic activity (Martins, Maia, Menino, Rocha & Pires, 2002).
- a **divergent activity** that encourages someone to be curious, to search for alternative strategies, to consider what would happen if certain conditions changed or to generalize the situation (Chamoso & Rawson, 2001; Ponte et al., 1998).
- **teacher's** leading role in classroom management, using a systematic inquiry, challenging the students, to deepen their explorations allowing the formulation of conjectures and following the practice of **argumentation** (Boavida, 2005; NCTM, 1991).

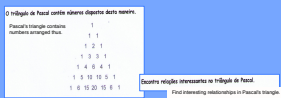
The study (Pires, 2011)

- **goal**: to know how teachers integrate investigations in the curriculum and how they reflect upon their teaching practices.
- a teaching experience, developed in the context of a Mathematics in-service teacher education program (PFCM) and focused on the whole **teaching cycle** of an experienced Mathematics teacher in a 5th grade class of 25 students.
- a qualitative and interpretative approach (Bogdan & Biklen, 1994; Bolívar, Domingo & Fernández, 2001).
- **data collection**: transcriptions of episodes (training sessions; classroom), teacher's written productions, students' written productions while solving the tasks, and field notes (classroom; reflection sessions).
- **data analysis** supported by a *floating* approach and followed by a systematization, setting up classifications and categories, involving negotiation of meanings with the participants.

Preparing the class

In a previous class, the students had shown a great interest in a task (...) they had to find regularities with exponents (...). Because of their enthusiasm and my own curiosity I decided to test them in a different and more complex situation...

The task



Goals

- to explore and investigate regularities in numeric sequences;
- to analyze the relations between the terms of a sequence and indicate a rule, using natural and symbolic language;
- to describe and explain strategies and mathematical procedures orally and in writing;
- to use mathematical language to express ideas with precision;
- to argue and discuss the others' arguments.

Evidences

- search for and anticipation of the conjectures the students could formulate

And if a student follows a path that I do not understand? And if I valid or accept an incorrect conclusion? And if I am faced with a situation that I do not know how to answer?...

- ways of monitoring the students' work, focusing on formative assessment

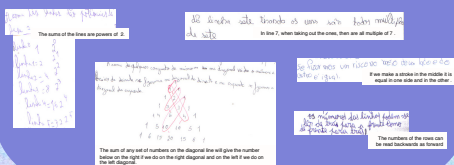
(...) to check whether or not the pairs understand the task, explaining it again if necessary; to encourage students to write down, in an explicit way, all the relationships they find; and ask the students to test and confirm their conjectures and even reformulate them...

Conducting the class

Phases of the class

a	presentation of the task	60 minutes
b	resolution of the task pair work	10 minutes
c	presentation and discussion of the results large group work	40 minutes
d	filling out Pascal's triangle	80 minutes 90 minutes

Some conjectures of the students



Evidences

- presentation of the task
 - I was clear in the presentation, knowing however that I could not be very objective because it is an investigation (...). I did not want to constrain the paths to be followed by students.*
- global attitude: paying much attention to the students' opinions and productions, thinking over the suggestions, no immediate answers, returning the question...
 - Why did you do that? Have you already tried the next line? See what goes on in line 7... Do you think that 22 is a multiple of 7?*
- formulation, validation and discussion of conjectures
 - Do you think the statement is true?... The rule works with these values, but have you already confirmed if it always works?... I don't know if it is always like that... you'd better confirm.... Are you saying what you've just written?...*
- clarification and consolidation of the mathematical concepts and procedures; systematization of mathematical knowledge
 - The more the student has the opportunity to reflect on a subject, talking, writing or representing, the more he can understand it.*

Reflecting upon the class

Evidences

- relevance of investigations in the teacher practice and in the curriculum development
 - What I have really learned (...) was the connection between the investigations and the topics (...) and other curriculum themes.*
- relevance of investigations in the approach of the mathematical topics, although predicting some trouble in time management for the task

The students have surpassed my expectations on validating so many numerical relationships (...) this kind of task is an important contribution to the mathematical development of the students. (...) I recognize that this work is not often used in maths class, because the programs are extensive and time manage is not easy.

- improvement of students' learning as investigations allow personal processes based on their previous knowledge and more meaningful

All students were highly interested. (...) even the weaker ones were able to discover relations (...) so they developed a more positive attitude to mathematics.

Most of the students could build mathematical knowledge in a meaningful way.

I think that the most stimulating discovery tasks, in which the student has a more active role allow to build a more meaningful mathematical learning. Solving the task has given students the opportunity to explain, discuss and test conjectures. The ability to say what they wish and to understand what they listen to must be one of the results of good mathematics learning [and teaching].

- integration of investigations in teaching practices was enhanced by the training program experience, by the opportunity to work in more collaborative contexts oriented to discussion and collective reflection and to direct and continuous support in the classroom

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