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# A case study comparing the comments written by two students on their mathematics notebooks

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*The mathematics notebook of the student is a very usual tool in Spain, but, at secondary level, students are usually free to develop and use it as they want. Here, we put our attention on a particular aspect: the kinds of comments the students add in their notebooks when they are writing in them. As a first step, we have carried out a case study in which we compare the notebooks of two high school students with high grades. There are some similarities, like the large amount of comments, which link different concepts, but, also, important contrasts related to the role of the notebook.*

**Keywords:** Notebooks, writing, comments, case study, high school.

## RESEARCH QUESTIONS, FRAMEWORK AND METHOD

The mathematics notebook (MN), understood as the place in which students take their class notes, carry out and correct tasks and collect their mathematical work, is a very common tool in Spain. At secondary level, teachers usually do not indicate to their students how to develop it. We could see the MN as a tool with various use schemes among the students, but there is little research on this (e.g., Fried & Amit, 2003). In our research, we are looking for different profiles of elaboration and use of MN in students, in which writing plays an important role. Students usually transcribe in their MN the theoretical development of a topic (definitions, examples, theorems) and the solving of exercises. But students can add other written elements such as memories of previous concepts, clarifications or study aids. We call them *comments* and here we present an exploratory study focusing on them, with two research questions: What types of comments can we find in a student's MN? What are the relationships between them and how the students use their MN to study?

In the 80s and 90s a lot of studies about writing and its role in the learning of mathematics were developed. Some of them propose different classifications of students' writing in particular given tasks, according to the understanding and learning they reflect: in mathematics journals (Waywood, 1992) or in explanations of concepts (Shield & Galbraith, 1998). In our study, we do not have any particular task but we adopt these classifications as a basis to study what kinds of comments they add in their MN.

Four classes of high school students, chosen by availability, have participated in our research. The four have mathematics teachers with "traditional" methodology (theoretical exposition of contents, posing and solving of exercises). To start the study of the written comments, we have done a case study selecting two students of different classes with high grades in mathematics: a girl (S1) and a boy (S2). We have done photocopies of their MN to analyse the comments found in them (with the aid of the previous research) and an interview with each student about her/his use of the MN.

## ANALYSIS AND FIRST RESULTS

In the poster we present and illustrate the similarities and differences between the kinds of comments we have found in the MN of these two students. Besides, we link them with the role of the MN and the way they use this tool to study mathematics, in order to extract the first results. Regarding the similarities, there are a high number of comments linking different concepts (or new concepts with prior knowledge) and justifications about the need to introduce some concepts or techniques or why they can apply a procedure. Comments of these types seem to be an indicator of good achievement in mathematics; they show that the students are beginning to understand the relational

and logical nature of mathematics (Shield & Galbraith, 1998).

But there are key differences. The memories and clarifications about processes are more common in the MN of S1, and only in it can we find some recommendations about the resolution of exercises (“recipes” or good practices). We have found in S1’s MN some signs (smiles or question marks) about her understanding (or not) of concepts and processes. In the interview, she says to base her study of the subject on the revision of theory and on the review and repetition of exercises made in her MN. These kinds of comments act as study aids for her, reinforcing an algorithmic aspect of mathematics (Shield & Galbraith, 1998) and a utilitarian stance towards knowledge (Waywood, 1992). In addition to these aids, she says she needs the visible correction of mistakes (using colours, marks or signs) and the order and cleanliness in her MN. It seems that S1 constructs her MN as a personal “textbook”, emphasizing some clarifications and her difficulties to conduct her study throughout the reading of it.

There are almost no comments of those types in S2’s MN, probably due to the different role of the MNs for him and his vision about mathematics. To prepare the test, instead of reviewing the exercises of his MN, S2 solves other exercises in which he has the solution to check. He seems to see mathematics as a constructive activity more than a gathering of contents submitted (Waywood, 1992). In the next steps, we have to extend the study to more students to learn more about the different types of comments and their functionality, in order to develop a classification of them.

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