

Comparative results on the ConMat tests based on years using Innovamat

Marc Colomer, Ph.D., Eudald Correig, Iker Garcia



KEY FINDING: Use of Innovamat for multiple years is associated with better math performance among students.

1. Introduction

The objective of this study is to investigate the impact of using Innovamat on student performance in a math test that evaluates both concepts and procedures. The evaluation analyzes the results of the ConMat tests of students from fourth grade to sixth grade who took the test at the beginning of the school year. The main focus is analyzing the differences in student math performance based on the number of years they have been using Innovamat.

2. Method

2.1. Participants

The study analyzes data from 75 982 Spanish students from 4th to 6th grade who took the test between September 12 and October 13, 2023. Their schools voluntarily decided to participate in the tests. 51 898 of these students are from the region of Catalonia, where Innovamat was founded. The remaining students are from other regions of Spain, with significant representation from communities such as the Basque Country (7 650 students), Madrid (5 473 students), the Community of Valencia (4,400), the Balearic Islands (2 968), and Navarra (2 066).

2.2. ConMat test

The ConMat test was developed by Innovamat and is intended as a benchmark assessment to understand students' conceptual and procedural knowledge at the beginning and end of the school year. The current study focuses on the results of the tests at the beginning of the 2023-2024 school year.

The ConMat test is heavily inspired by the theoretical framework of the TIMSS test (Trends in International Mathematics and Science Study), which distinguishes between content and processes. The classification of the questions in the TIMSS test was adapted to differentiate between two types of content questions: concepts (facts, vocabulary, etc.) and procedures (operations, visualization of constructions, use of measuring tools, reading graphs, etc.).

On the other hand, the classification related to the processes of the ConMat test includes four main categories: Problem Solving, Reasoning and Proof, Connections, and Communication and Representation. The following tables show the distribution of questions in third and fourth grade, as well as fifth and sixth grade:

		Content Categories					
		Numbers and Operations	Space and Shape	Change and Relationships	Statistics and Probability	Measurement	
Cognitive Domains	Knowledge	Conceptual	2	2	0	1	1
		Procedural	2	1	1	1	1
	Processes	Problem Solving	1	0	1	0	1
		Reasoning and Proof	1	0	1	1	0
		Connections	1	1	0	0	1
		Communication and Representation	1	1	1	0	0

Distribution of the 24 questions for 2nd, 3rd, and 4th grades

		Content Categories					
		Numbers and Operations	Space and Shape	Change and Relationships	Statistics and Probability	Measurement	
Cognitive Domains	Knowledge	Conceptual	3	1	0	1	2
		Procedural	2	1	2	1	1
	Processes	Problem Solving	2	1	0	0	1
		Reasoning and Proof	1	1	1	1	0
		Connections	1	1	1	0	1
		Communication and Representation	1	1	1	1	0

Distribution of the 30 questions for 5th, 6th, and 1st year of ESO

2.3. Analytical plan

The present study uses multilevel models to compare test results according to experience with Innovamat, controlling for random effects such as the school and class effect. In order to compare the results between different grades, the percentage of correct answers in the ConMat test in each grade is transformed to obtain a z-score indicator, which allows centering the results of all tests to the same average (in this case, zero): $(\text{Percentage} - \text{Average Percentage}) / (\text{Standard Deviation of Percentage})$.

2.4. Results

The following graphs show the test results by separating the students into three groups: (1) those who have just started to use Innovamat (0Y: No experience), (2) those who have been using Innovamat for one or two years (1_2Y: Minimal experience) and (3) those who have been using Innovamat for more than two years (3_4Y: Extensive experience). We can see a positive progression according to experience, which is statistically significant (Minimal vs. No experience: $t = -7,6$, $p < ,001$; Minimal vs. Extensive experience: $t = 2,4$, $p = 0,016$).



That means, **more experience using Innovamat is related to better performance on the ConMat test**, which evaluates both math content and processes.

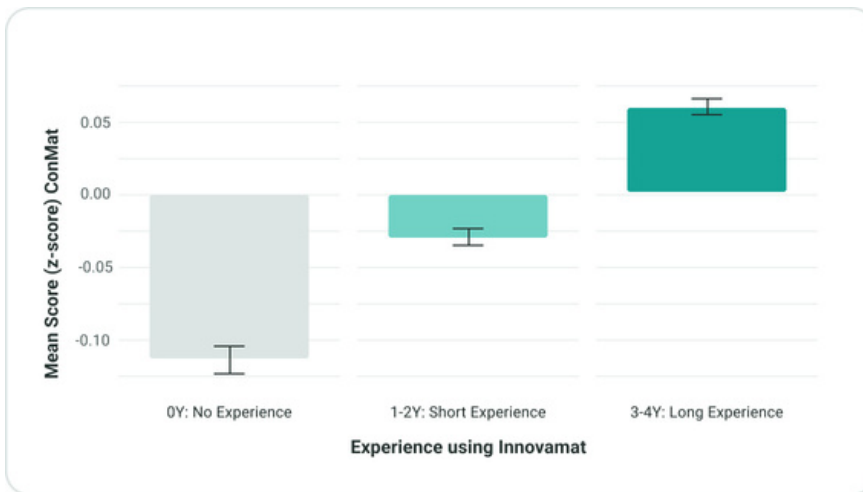


Figure 1. Average ConMat test result according to the experience of schools using Innovamat. All the results of the different levels of ConMat tests are aggregated.

The pattern of progressive improvement can be identified in each grade of the ConMat test, with similar values in fourth and fifth grade; the extremes more clearly differentiated in sixth grade.

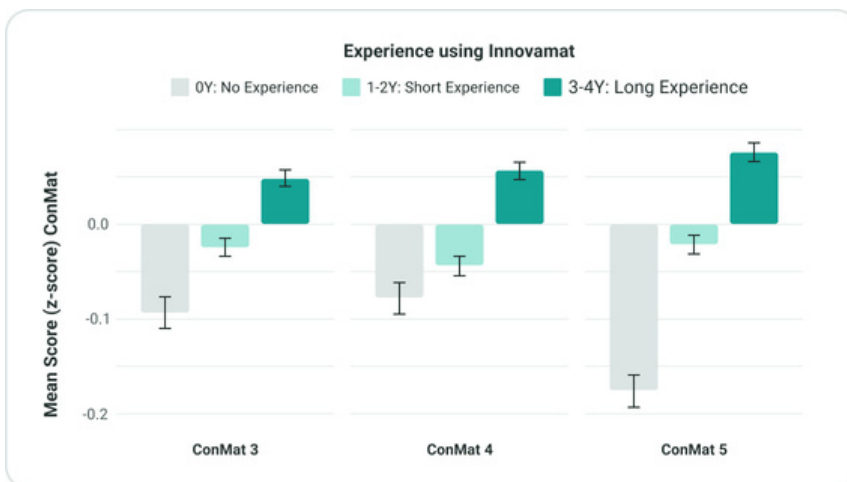


Figure 2. Average ConMat test result according to the experience of schools using Innovamat. The results are separated according to the test level (ConMat3, 4th grade; ConMat4, 5th grade, ConMat4, 6th grade)

3. Conclusion

Results indicate that using Innovamat for multiple years is associated to better performance on the ConMat test. It is important to also understand the limitations of the study. In this case, we do not know the result of the schools before they started using Innovamat, so a causal effect cannot be directly attributed to using Innovamat. Despite this, the sample is very representative, with more than 75 000 students, and it includes schools that have chosen to learn math with Innovamat materials, making the results comparable.