

# GENERALIZATION THROUGH FUNCTIONAL TASKS BY A STUDENT WITH AUTISM

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## Introduction

Algebra is one of the subjects studied in secondary school with which many students struggle. To try to mitigate these difficulties, several studies suggest to start working with functional tasks from early ages, as they provide an appropriate context for developing generalization and algebraic thinking (Kieran et al., 2016). A task involving a function in the context of algebraic thinking usually shows the first terms of an increasing sequence of natural numbers. The students evidence generalization and functional relationships when finding other terms of the sequence. Autistic students are increasingly incorporated into mainstream educational programs and often require additional support for mathematical learning. We present an exploratory study with a 9-year-old-student with autism aimed at mobilizing generalization strategies through functional tasks involving consecutive and non-consecutive terms, and the general rule.

## Methodology

Multiple representation intervention

Improvement in solving growing-patterns tasks

- Multi-base methodology
- 3 autistic students

The present study

- Student A
- Training phase
- Task involving  $f(x)=x+1$

## Participants in the larger study

Student	Age	IQ <sup>1</sup>	Math Age <sup>2</sup>	Grade	Math Curricula <sup>3</sup>	Specialist Support <sup>4</sup>
Student A	9,41	88	6,83	4th	2nd-3rd	6
Student B	7,25	87	6,66	2nd	2nd	4
Student C	7,41	96	5,5	2nd	2nd	2

Note. <sup>1</sup>Measured by WISC-W (Wechsler, 2015), <sup>2</sup>Measured by TEMA-3 (Ginsburg et al., 2007), <sup>3</sup>Mathematic curricula followed by the student at school, <sup>4</sup>Hours per week at school

## Procedure

Prescreening		
Baseline		No material   4 sessions
Training	Multiple representation with <b>mediation and guideline sheet</b>   4 sessions	<ol style="list-style-type: none"> <li>1. Check their own previous work following the guideline sheet with mediation and feedback by the instructor</li> <li>2. Complete another similar task without mediation or feedback by the instructor</li> </ol>
Follow-up	No material   3 sessions	
Transfer	<b>Real-life context tasks</b> → No material   2 sessions	
Maintenance	No material   1 session	

## Materials

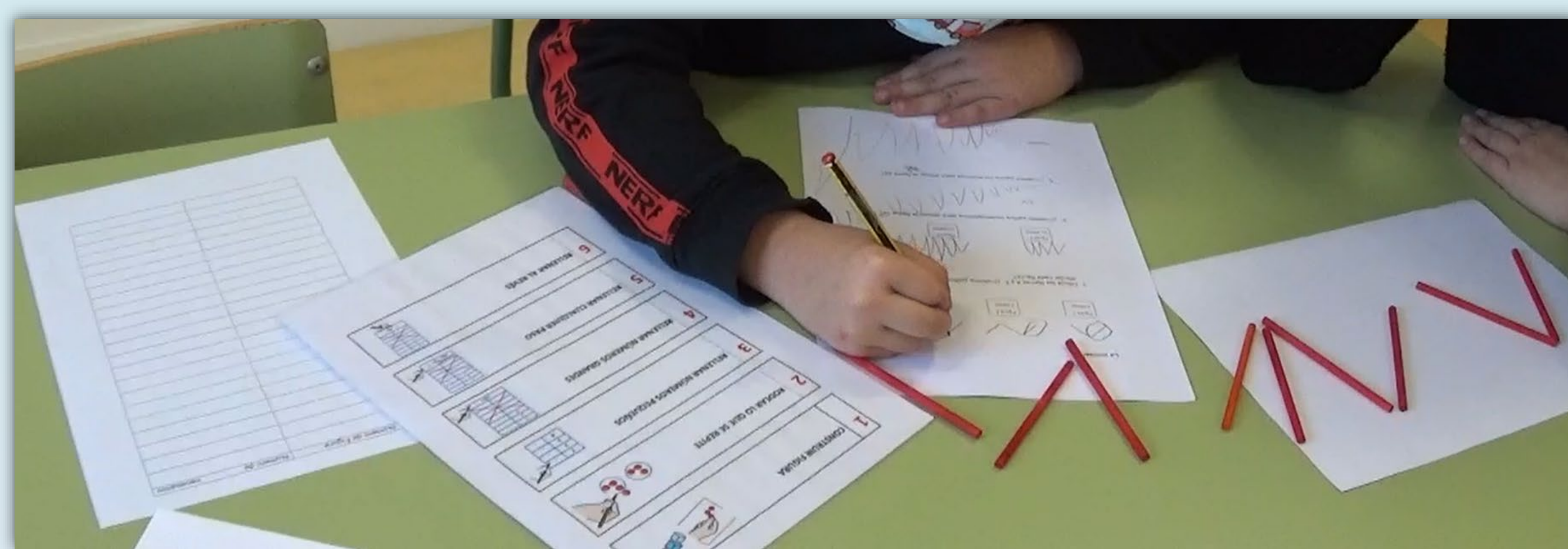
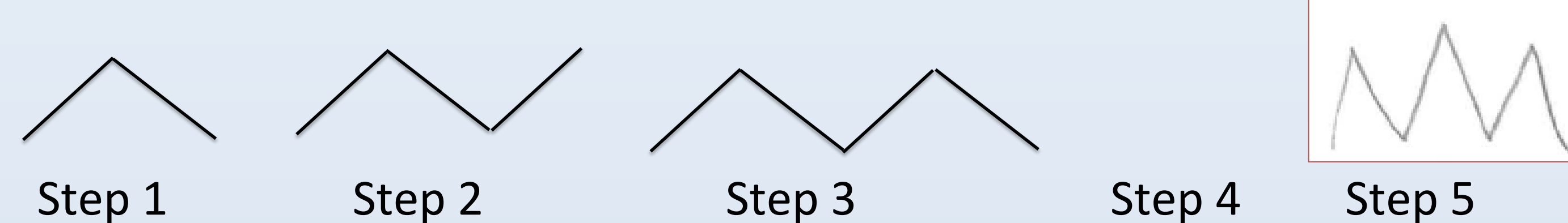


Table      Guideline sheet      Worksheet      Manipulatives

## Results

### Example of a task involving $f(x)=x+1$

Look at the following figure:



Draw the figure in the steps 4 and 5. How many sticks do you need?

How many sticks do you need to build the figure in the step 10 ?

How many sticks do you need to build the figure in the step 25 ?

How many sticks do you need to build the figure in the step 12 ?

How many sticks do you need to build the figure in any step?

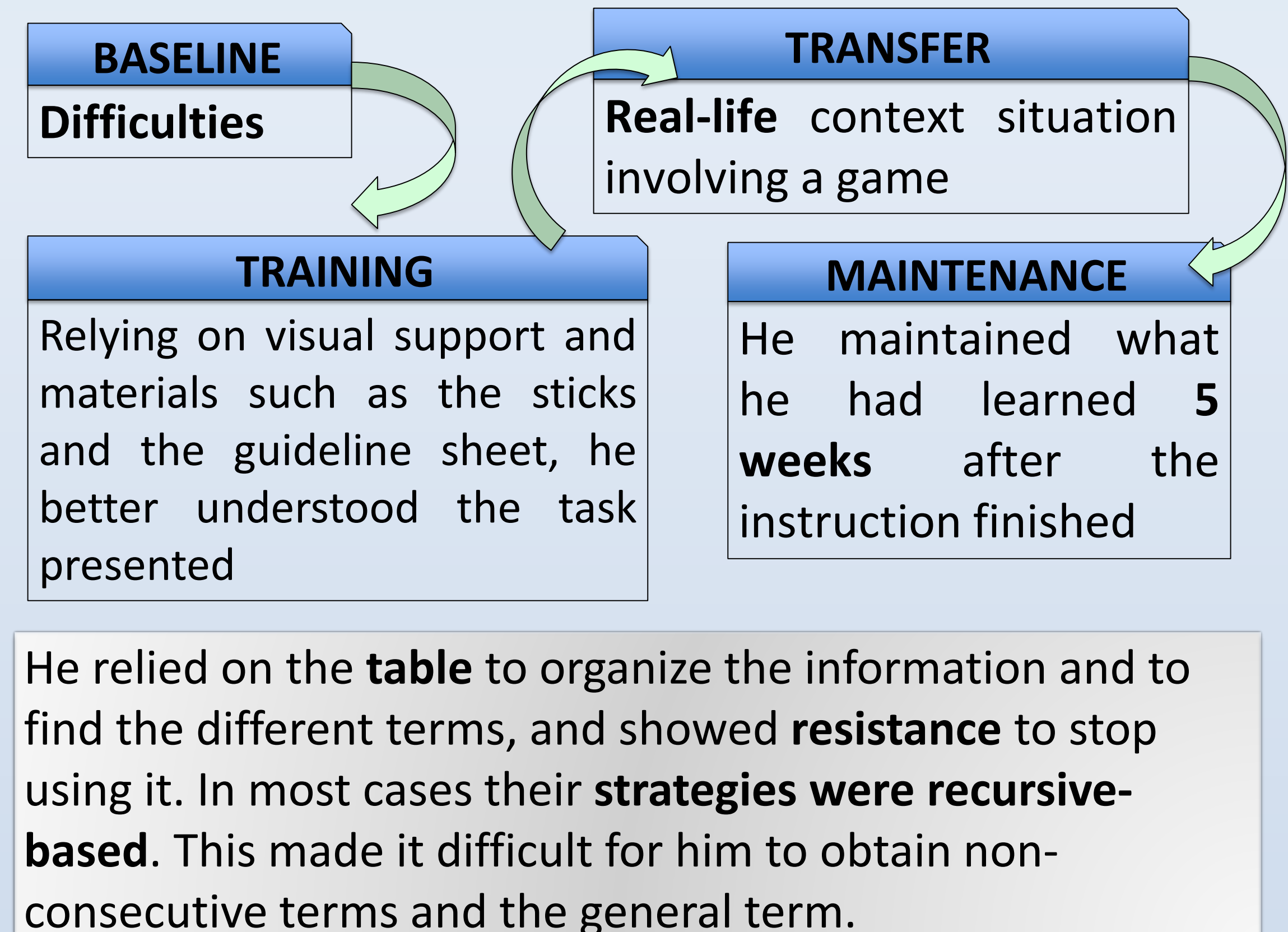
If we have used 11 sticks, which step of the figure have we built?

26. Counting one at a time

I have to count forward

10. I looked at my table

### General results for Student A



## Conclusions

This exploratory single case study contributes to the scarce research on autism and algebraic thinking and shows that organizing the information in tables and modeling the task helped this student to improve. Modelling the situation has been shown to be a successful strategy in other studies of algebraic thinking with autistic students, as in Goñi-Cervera et al. (2021). However, the rigidity the participant showed by insisting on always using the table prevented him from moving towards functional strategies and to generalize. It is necessary to further explore how to help students with characteristics similar to those of the participant in this study advance toward functional strategies and the generalization of functional relationships. The design of learning sequences with functional tasks should take into account the cognitive characteristics of students with autism (such as by providing visual aids to support their communication deficits, or task sequencing to help with possible deficits in executive functions). Exploratory studies such as the one presented in this poster provide clues about which aspects can help students with autism to develop their functional thinking.

More works on mathematics and autistic students at: <https://matematicasyautismo.unican.es/>; More works on algebraic thinking at early ages at: <https://pensamientoalgebraico.es/es/>

**References:** Goñi-Cervera, J., Cañadas, M. C., & Polo-Blanco, I. (2021). Estrategias por alumnos con trastorno del espectro autista al resolver una tarea que involucra una relación funcional. In P. D. Diago, D. F. Yáñez, M. T. González-Astudillo, & D. Carrillo(Eds.), *Investigación en Educación Matemática XXIV* (pp. 311-318).SEIEM.

Kieran, C., Pang, J., Schifter, D., & Ng, S. F. (2016). *Early algebra. research into its nature, its Learning, its Teaching*. Springer.

**Work funded by** PID2019-105677RB-I00/AEI/ 10.13039 / 501100011033, PID2020-113601GB-I00 and Concepción Arenal grants, from the government of Cantabria.

