

**Título** Individual Differences in Basic Cognitive Processes and Self-Regulated Learning: their interaction effects on Math Performance

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**Tipo de Producto** Publicación Científica

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Publicado en: Learning and Individual Differences 71 (2019) 58–70  
<https://doi.org/10.1016/j.lindif.2019.03.003>

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## Código del Proyecto y Título del Proyecto

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P17S01 - Patrones complejos en la predicción de resultados en la educación superior: abriendo la “caja negra” de Redes Neuronales Artificiales para su mejor comprensión.

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## Responsable del Proyecto

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Musso, Mariel

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## Línea

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Psicología Educativa y del Desarrollo

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## Área Temática

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Psicología

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## Fecha

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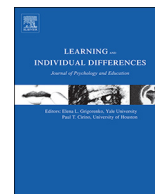
Marzo 2019

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**INSOD**

Instituto de Ciencias Sociales y Disciplinas  
Proyectuales

FUNDACIÓN  
**UADE**



# Individual differences in basic cognitive processes and self-regulated learning: Their interaction effects on math performance



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## ARTICLE INFO

### Keywords:

Working memory  
Executive attention  
Self-regulated learning  
Item characteristics  
Math performance

## ABSTRACT

The study analyzes the relationships between working memory capacity, executive attention, and self-regulated learning (SRL) on math performance (MP), and more specifically on items with different levels of complexity and difficulty. Sample: 575 university students (female: 47.5%; 18–25 years old), first academic year. Instruments: Attention Network Test; Automated Operation Span; Mathematics Test; On-line Motivation Questionnaire, and Learning Strategies Questionnaire. Results confirm the crucial role of individual differences in WMC that impact directly on MP, mediated by subjective competence. Affective SRL contribute significantly as mediating variables but their positive effect depends on the availability of cognitive resources. Findings partially confirmed the differential contribution of cognitive processes in the prediction of performance in complex vs difficult items. We found support for a complex pattern of interactions between cognitive processes and components of SRL model at the strategy level, in their effect on MP, and given specific item characteristics.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## 1. Introduction

Self-regulated learning (SRL) is a broad construct that involves the interaction between different control systems (cognition, attention, metacognition, emotions, motivation, and volition) (Boekaerts, 2011; De Corte, Mason, Depaepe, & Verschaffel, 2011; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2011). According to the literature, self-regulation involves a set of cognitive and affective processes that share a common characteristic: the coordination of information processing and control (Heyder, Suchan, & Daum, 2004).

Although there is substantial research which has investigated the influences of: (a) working memory (e.g. Pickering, 2006); (b) attentional systems (e. g. Rueda, Posner, & Rothbart, 2004); (c) motivational and affective factors, on math performance (Seegers & Boekaerts, 1996; Pekrun, Elliot, & Maier, 2006), we have little understanding about how these cognitive and non-cognitive variables interact among themselves. The assessment of individual differences in working memory capacity

(WMC) and attentional resources as micro-processes of SRL is absent from most educational psychology research (Boekaerts, 2017). The cognitive literature has pointed out that WMC could explain how different resources are available in a specific learning situations according to the student's goal(s), while another function such as executive attention (EA) could help to maintain the focus on the task (Checa & Rueda, 2011; Kane, Conway, Hambrick, & Engle, 2008; Posner, Rothbart, Sheese, & Voelker, 2014). The main research question of this study focuses on the relationships between these cognitive processes and self-regulated learning factors in their effects on math performance in general, and specifically on the effect they have in the processing and therefore the outcome for different types of items (according to their complexity and difficulty characteristics).

## 2. Theoretical framework

### 2.1. Self-regulated learning

Several SRL models have been described in the educational literature (for a recent literature review see Panadero, 2017). The present

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