



## **Complex Connections: How Epistemic Beliefs and Self-Regulated Learning Influence University Achievement**

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Received: 14 April 2025/ Accepted: 15 May 2025/ Published: 19 May 2025

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### **Abstract**

*The study we propose focuses on analyzing the relationships between students' epistemic beliefs (EB) from several faculties, self-regulated learning (SRL), and academic performance (GPA). A sample of N=202 participants was involved in the research, to whom they have been applied two questionnaires: the Epistemological Beliefs Questionnaire (EBQ) and the Motivated Strategies for Learning Questionnaire (MSLQ). After applying multiple linear regression, we found that self-regulated learning and epistemic beliefs accounted for a small variation in academic performance ( $R^2 = 0.048$ ). However, it was found that epistemological beliefs had a statistically significant predictive power, but in a negative direction: stronger adherence to absolutist epistemic beliefs was associated with lower academic performance. Thus, the study highlights the complex dynamics of the relationship between students' ideas about the nature and characteristics of knowledge, their ability to self-regulate the learning process, and their academic achievements, while emphasizing the need to consider potentially simplified mediators and contextual factors and ultimately calling for more nuanced and tailored approaches in pedagogical practice that can take into account the full range of these relationships.*

**Keywords:** academic performance; epistemic beliefs; higher education; self-regulated learning

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**How to cite:** Grigoriță, M.-E., & Frumos, F. (2025). Complex Connections: How Epistemic Beliefs and Self-Regulated Learning Influence University Achievement. *Journal of Innovation in Psychology, Education and Didactics*, 29(1), 83-92. doi:10.29081/JIPED.2025.29.1.06

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## **1. Introduction**

In recent years, theoretical and empirical research has significantly expanded our understanding of how epistemological beliefs are formed and modified in different educational settings, as well as how they interact with self-regulation processes. Models of knowledge development suggest that initially simplistic, rigid, and limited views of the knowledge are gradually replaced by more complex, meaningful, and evidence-based ones, which in turn influence not only the choice of learning strategies but also the level of motivation and engagement of students. In parallel, self-regulated learning is often considered one of the key elements determining academic success, since students who can manage their own cognitive processes demonstrate greater flexibility, resilience to difficulties, and are more effective in building knowledge on the long term. However, how exactly these two phenomena - the system of beliefs about the nature of knowledge and the ability to self-regulate - interact with each other and how their combined influence affects learning outcomes remains poorly understood. The study aims to analyze and explain the relationships between epistemic beliefs, self-regulated learning, and academic performance in a sample of 202 participants of different ages and backgrounds.

Self-regulated learning is a synthesis of several motivational, strategic, and performance control factors. It is an active and constructive process of monitoring, regulating, and adjusting cognitive activity, motivational resources, and one's own behavior according to a person's set of goals. In this context, the purpose of learning is the acquisition by students of a set of skills for self-assessment of their own abilities and for managing efforts and time resources to achieve superior performance. Learning is an active, cognitive, constructive, meaningful, mediated, and self-regulated process (Torrano & Gonzales Torrez, 2004). The quality of teaching-learning experiences, both for the teacher and the student, is determined by the extent to which the student prepares to be actively engaged in the learning process. Thus, emphasis is placed on the study of independent academic learning and the focus on self-regulation of learning. The student's competence to self-regulate cognition and behavior influences academic efficiency and performance. Self-regulatory skills are some of the most important prerequisites for individual study. One of the essential features of self-regulated learning is the dynamic approach to the learning material. According to Foucher and Himech (2000, p. 28), higher education constitutes the "space reserved for self-training practices." The formation of students' self-training competence should represent an essential component of educational policies.

The competence of self-instruction of students implies the interdependent functioning of its components and sub-competences, such as those of self-knowledge, to determine the internal resources of self-instruction, to identify the external resources of one's own instruction, and to contextualize the personalized strategy of self-instruction of self-evaluation. The development of the competence of self-instruction of students is becoming increasingly relevant in the context of transformations in education. An important goal of university education is to develop in students advanced and independent academic learning methods. As students progress in their training, they acquire better expertise in effective learning strategies. Vermetten et al. (1999) highlight that older students have a deeper level of processing, self-regulated learning strategies, and higher levels of critical thinking compared to novices. According to Zimmerman (2002), the personal performance profile is determined by the following variables: active engagement in one's own learning, metacognition, motivation, and conduct in the academic environment. Applying strategies for academic self-regulation generates motivation and positive attitude, effective thinking about oneself, comfort, and satisfaction from learning (Brooks et al., 2001). The academic environment focused on the formation of self-regulation skills, through strategic training, creates maximum opportunities for students to effectively monitor personal and environmental resources and become responsible subjects of their own decisions and performances, by managing the process and results of their own learning.

## **2. Epistemic Beliefs, Self-Regulated Learning (SRL) and Academic Performance**

### **2.1. Epistemic beliefs**

Epistemic (or epistemological) beliefs represent flexible and multiple belief systems that reflect people's views about the nature of knowledge, how it arises, what it is based on, and how it is confirmed or accepted. It is important to note that such beliefs do not remain static but transform depending on the scope, nature of the task, and the specific situation, demonstrating complex relationships between different domains of knowledge and contexts.

From a dimensional point of view, there are four significant axes along which epistemic points of view are differentiated (Baytelman et al., 2020; Noroozi, 2023):

- Certainty of knowledge - knowledge can be seen as provisional, mutable, or in fixed and unchangeable form.
- Simplicity of knowledge: information simplicity is a fact of a representation of information that could be seen as separate facts or as fused into one.
- Source of knowledge - knowledge generated by students when interacting with information or with another person.
- Justification of knowledge - defined as perspective, is the standards and criteria that individuals use to assess (judge), accept (back up), and validate the knowledge claims they are willing to believe, including intuition (wishful thinking), blind faith, and authority.

The conception of knowledge evolves through several stages of formation: from the perception of knowledge as something unambiguous and indisputable, to the recognition that information can be interpreted in different ways and that even experts can disagree, and, finally, to the ability to evaluate and justify claims based on generally accepted evidence and criteria (Schiefer et al., 2022). Local approaches to the study of epistemic beliefs are complemented by more complex, multi-level models, one of which is the Theory of Integrated Domains in Epistemology (Merk et al., 2018), according to which beliefs about knowledge are formed within an interconnected system of levels, each of which is influenced by social, cultural and academic factors and also interacts with other levels. Another theoretical framework is the AIR model that represents a multifaceted model of epistemic thinking. The analysis of epistemic beliefs refers not only to their descriptive aspects, but also their normative ones, which include an account on their cognitive, metacognitive, motivational, emotional, and social dimensions (Barzilai & Chinn, 2018).

It is largely accepted that epistemic beliefs are an organized set of beliefs about how knowledge is built, why it is accepted, how it is organized, replaced, or changed, and are essential for both personal and group learning, reasoning, and success with knowledge.

### **2.2. The Relationship Between Epistemic beliefs and Self-Regulated Learning (SRL)**

Epistemic beliefs are explored in the literature, along with self-regulated learning. Self-Regulated Learning (SRL) describes a way of learning where students manage their own educational tasks. To use it, students focus on targets, design a strategy, keep track of their progress, and update their ways of learning if needed for success in university. SRL means the learner is involved in their own learning process by producing relevant thoughts, feelings, and actions to help them reach their goals (Caixia et al., 2025; Metallidou, 2012).

Merk et al. (2018) have demonstrated that people can hold different epistemic beliefs not only across different domains (e.g., psychology vs. biology) but also across different topics within the same domain. These beliefs are strongly influenced by familiarity with the topics and the origin of knowledge (e.g., academic vs. non-academic). This helps support the idea that epistemic beliefs are not stable properties but change dynamically as a result of contextual, social, and educational experiences.

The results of a study conducted by Muis & Franco (2009) indicate that epistemological beliefs in university students are significant for self-regulated learning and academic performance. They found that, at the beginning of a task, the strength of these beliefs leads to the selection of certain goals, which in turn guide the choice of learning strategies. Lonka et al. (2020) identify the existence of three distinct epistemic profiles among students: pragmatic, reflective-collaborative, and fact-oriented. The use of knowledge, the values attributed to it, and its practical utility are significantly different across these epistemic profiles. The results obtained prove that the way students think about knowledge affects their approach to learning and study outcomes, and that teaching advanced perspectives on knowledge is essential in higher education.

Epistemic beliefs are reflected in self-regulated learning through the organization of learning goals (from memorization to critical elaboration), the selection of metacognitive strategies (planning, self-monitoring, self-assessment), and the degree of engagement with academic challenges. Self-regulated learning (SRL) practices involve structured feedback and reflective experiences that, over time, move learners from a rigid, fixist view of information (centered on immutable facts and repetition) to complex and dynamic perspectives in which knowledge is negotiated, collaboratively constructed, and continually re-evaluated. A reflective-collaborative epistemic profile is represented by the extensive use of metacognitive strategies and, also, by significantly higher academic performance.

### ***2.3. The Relationship Between Epistemic beliefs and Academic Performance***

The researchers (Noroozi, 2022; Schiefer et al., 2022) demonstrate that students with a flexible perception of knowledge as a constantly evolving system are more likely to achieve high results - they structure their thinking more effectively, participate more actively in discussions, and find solutions to problems faster. This approach does not involve mechanical memorization but critical analysis, the ability to compare data from different areas, assess their reliability, and adapt learning methods to specific tasks. These skills directly affect the quality of material acquisition, which is especially noticeable at the university level. Moreover, advanced views on the learning process are significantly associated with improved grades, regardless of the discipline or cultural context of the group, although this dependence may be weakened by external factors such as the student's level of engagement, his previous educational experience, or material living conditions. Ultimately, the depth of understanding the nature of knowledge becomes a catalyst for academic motivation; it strengthens self-confidence, helps overcome intellectual barriers by stimulating persistence when faced with complex problems, and also contributes to the formation of well-founded judgments based on a thorough analysis of information. Thus, internal beliefs and knowledge about "how to learn" are no less important than the knowledge itself, creating the basis for sustainable academic progress.

Kivimäki (2023) demonstrate that certain domains of epistemic beliefs and emotions recorded in learning logs can predict academic performance. Of all the predictors studied, high ratings of "secure cognition" and frequency of neutral emotions were strongly correlated with the number of credits earned (CR), compared to the correlation of average grades (GPA) with feelings of competence, task difficulty, and regular selection of neutral emotions. In addition, the post-test scores for 'reflective learning,' 'valuing metacognition,' and 'collaborative knowledge construction' had significant relationships with GPA, indicating that students who use deeper thinking generally have higher grades. Their findings support the idea that metacognition, confidence in difficulty, and some epistemic beliefs play a role in learning outcomes, and the use of learning logs makes it possible to detect these problems when they arise. For this reason, the study highlights the importance of educational approaches that foster awareness of cognitive and emotional processes to enhance students' academic success.

#### **2.4. The Relationship between Epistemic Beliefs, Self-Regulated Learning (SRL) and Academic Performance**

The research conducted at King Saud University (Alotaibi et al., 2017) has shown that self-regulated learning skills in community colleges are linked to good English and math outcomes. Self-regulated learning focused on selecting future goals and it is particularly significant. The study indicates that individuals who actively plan what they want to achieve, check their own progress, and draw upon both personal and group resources are more able to make use of what they have learned at school.

Contemporary research reveals the relationship between the transformation of ideas about knowledge and external conditions - the educational environment, cultural norms and social context, which is confirmed by concepts such as the TIDE model (Theory of integrated domains in epistemology) and the Theory of multifaceted epistemic thinking, which combines the analysis of intellectual processes: reflexive self-assessment, emotional reactions, motivational attitudes and group interaction (Barzilai Chinn 2018). The ability to self-regulate learning enhances this dynamic, since the skills of formulating goals, adapting methods to tasks and analyzing results create the basis for sustainable academic performance (Caixia et al., 2025; Metallidou, 2012; Muis & Franco, 2009). Empirical research also finds that different types of epistemic profiles - one being team-oriented and the other being fact-focused - can predict students' academic results - those who are reflective and work together tend to do better in school (Lonka et al., 2020). Knowing more about one's own thinking, having secure thoughts and controlling emotions are found to be significant for scholastic achievement. It is, thus, significant learning to focus on ethical awareness and conscious thinking (Kivimäki, 2023). All in all, epistemic beliefs are important for learning and achieving favourable academic outcomes.

Epistemic beliefs serve as the primary predictor, influencing the quality and nature of self-regulated learning, which then could mediate academic results. Direct effects also exist between epistemic beliefs and academic outcomes. Profiles and additional factors (metacognition, emotion) moderate or support these relationships, enhancing or reducing their impact. However, there is insufficient understanding of how students' epistemic beliefs are contextually activated, how they develop over time (across disciplines or years of university study), and how these beliefs affect actual engagement and motivation in diverse learning environments. We should broaden the interaction between SRL, epistemic beliefs, and the relationship between academic performance from both a discipline and an interdisciplinary perspective. Issues in contextual and social construction of epistemic cognition remain under-theorized and under-explored. There is evidence that epistemic beliefs may influence academic performance in ways that are not always straightforward or simple and these effects may be mediated or moderated by factors such as students' particular academic goals, how they go about studying and the context they learn in.

### **3. Research methodology**

The present research assumes that epistemic performance, self-regulated learning, and student performance play a role in academic success. We assume that there are positive relationships between these variables that we intend to explore: academic performance (dependent variable), epistemic beliefs (independent variable), and self-regulated learning (independent variable).

We used two questionnaires: the Epistemological Beliefs Questionnaire (EBQ) and the Motivated Strategies for Learning Questionnaire (MSLQ). The sample consisted of N = 202 students from Alexandru Ioan Cuza University of Iași from different specializations (psychology, social work, mathematics, literature, physics, chemistry, and geography), with most respondents being N = 90 (44.6%) from psychology and N = 54 (26.7%) from social work. N = 24 (11.9%) male students and N = 178 (88.1%) female students responded to the questionnaires.

Epistemological Beliefs Questionnaire (EBQ) contains 14 items, organised on different dimensions of epistemic beliefs (*Everyone should believe what the experts say; Theories that confirm my opinions are good theories*), whereas the self-regulated learning was measured with the Motivational Strategies for Learning Questionnaire (MSLQ), that has 62 items (*It is important for me to learn what is being taught in this class; I always try to understand what the teacher is saying even if it doesn't make sense*). The items were organized on a Likert scale with different levels: the EBQ had 5 stages (strongly disagree, disagree, neutral, agree and strongly agree), while the MSLQ was reported at 7 stages (not at all true, somewhat untrue, partly untrue, neutral, partly true, somewhat true and very true). The internal consistency resulting from the calculation of the Cronbach's alpha coefficient for both questionnaires yielded a value of  $\alpha = 0.70$ , indicating good internal consistency.

#### 4. Results

##### *H1. Epistemic beliefs and self-regulated learning predict academic performance.*

As part of the study on academic performance, an analysis of the relationship between the individual's cognitive attitudes and their ability to manage their own learning was conducted. We tested the hypothesis that epistemic beliefs (measured by the EBQ questionnaire) and self-regulation skills in the educational process (assessed by the MSLQ) predict academic performance (GPA). To verify this assumption, the multiple linear regression method, a statistical tool that allowed identifying the combined contribution of these factors to predicting academic results, was used. The data obtained demonstrated a statistically significant model  $F(2; 199) = 5.03$ ;  $p = 0.007$ , which confirms that the combination of measured psychological characteristics explains a significant part of the variability in students' academic success. The coefficient of determination  $R^2$  was .048 (Adjusted  $R^2 = .039$ ), hence that the two predictors explain approximately 4.8% of the variance in academic performance (Table 1).

**Table 1.** Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.219	.048	.039	.81698	.664

**Table 2.** Coefficients

Predictor	B	Std. Error	Beta	t	Sig.	95% CI for B
(Constant)	9.726	.668		14.570	.000	[8.409; 11.042]
<b>EBQ</b>	-.439	.139	-.226	-3.170	.002	[-.712; -.166]
<b>MSLQ</b>	.108	.122	.063	0.886	.377	[-.132; .348]

Analysing each coefficient separately, we observe that only epistemic beliefs (EB) have a significant predictive contribution: a one-point increase in EB is associated with a decrease of about 0.44 points in the mean high school graduation GPA. In contrast, self-regulated learning does not add predictive value after controlling for EB; its coefficient is not significant.

Thus, although the overall model suggests that epistemic beliefs and self-regulated learning explain a modest part of the variation in academic performance, only epistemic beliefs prove to be a significant independent predictor.

##### *H2. Self-regulated learning mediates the relationship between epistemic beliefs and academic performance.*

To test whether self-regulated learning mediates the relationship between epistemic beliefs and academic performance, we applied the simple linear regression method (Table 3). The epistemic beliefs score is a significant predictor of the use of self-regulated learning strategies.

The model explains approximately 5.7% of the variability of the MSLQ scores ( $R^2 = .0565$ ), and the coefficient for the EBQ scores is  $a = 0.270$  ( $SE = 0.0781$ ),  $t(200) = 3.459$ ,  $p = .0007$ . The 95% confidence interval of this coefficient,  $[0.1161; 0.4239]$ , does not include zero, which robustly confirms the significant effect. Thus, for each additional point obtained on the EBQ, we expect, on average, a 0.27 point increase in the MSLQ score, indicating that students with stronger epistemic beliefs more frequently apply self-regulated learning strategies.

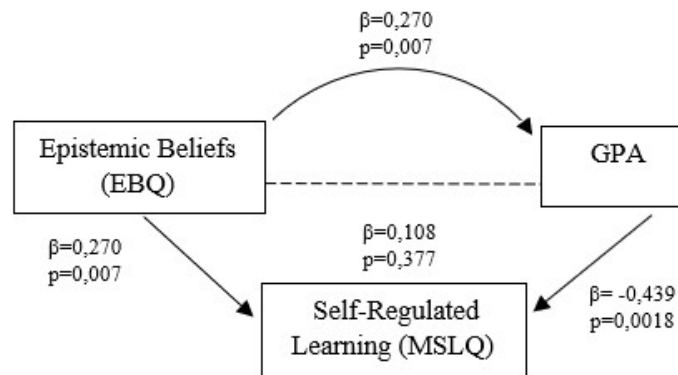
In the simple linear regression model, the coefficient associated with the MSLQ (path b) was  $\beta = 0.108$  ( $SE = 0.122$ ),  $t(199) = 0.886$ ,  $p = .377$ , and the 95% confidence interval for  $\beta$  ranged from -0.132 to 0.348. In this sense, once the EBQ variable is controlled, the intensity of the MSLQ does not have a significant impact on academic performance. Basically, although EBQ and MSLQ are correlated, variations in MSLQ do not explain the differences in GPA when EBQ is also included in the model.

In the regression model in which both variables (EBQ and MSLQ) are included as predictors of GPA, the coefficient for EBQ (path c') is  $\beta = -0.4391$  ( $SE = 0.1385$ ),  $t(199) = -3.17$ ,  $p = .0018$ , and the confidence interval between 0.95% and 95% ranges from -0.1659, not including zero. The results show that, after controlling for the level of self-regulated learning strategies use, a one-point increase in EBQ score is associated, on average, with a decrease of approximately 0.44 points in GPA. Together, EBQ and MSLQ explain only about 4.8% of the GPA variance ( $R^2 = .0481$ ), indicating that there are other important factors influencing student performance.

**Table 3.** Direct and indirect effects of EBQ (X) on GPA (Y) by MSLQ (M)

Effect type	Effect	SE / BootSE	t	p	LLCI / BootLLCI	ULCI / BootULCI
Direct	-0,4391	0,1385	-3,1697	.0018	-0,7123	-0,1659
Indirect	0,0292	0,0382	-	-	-0,0260	0,1229

Indirectly, the influence of epistemic beliefs on academic performance through self-regulated learning strategies is minimal, with an estimated effect size of approximately  $\beta = 0.03$ , which does not pass the significance test. Specifically, the product of the  $a \times b$  coefficients ( $0.270 \times 0.108$ ) yields an indirect effect of 0.0292 with a bootstrap standard error of 0.0382. The 95 percent confidence interval for this effect ranges from -0.0260 to 0.1229, including zero; therefore, there is no statistical evidence that the MSLQ mediates the relationship between EBQ and GPA. In simple terms, although epistemic beliefs lead the student to apply self-regulated strategies more often, those strategies do not, in this sample, produce any significant influence on GPA.



**Figure 1.** Mediation model

Figure 1 shows the mediation model tested, illustrating the relationships between epistemic beliefs (EBQ), self-regulated learning (MSLQ), and performance (GPA). The results indicate that self-regulated learning (MSLQ) does not significantly mediate the relationship between epistemic beliefs (EBQ) and academic performance (GPA). However, epistemic beliefs show a positive and statistically significant relationship with self-regulated learning ( $\beta = 0.270$ ,  $p = 0.007$ ). Self-regulated learning (MSLQ) on performance does not show statistically significant results ( $\beta = 0.108$ ,  $p = 0.377$ ). EBQ scores have a significant direct effect on GPA ( $\beta = -0.439$ ,  $p = 0.0018$ ), suggesting that the variable influences performance independently of self-regulated learning.

## 5. Discussion and conclusions

The results of this study provide important clues as to how students' beliefs about learning, their learning habits, and grades are related. As expected, higher scores on certain, simple, and emerging from authority knowledge predict lower academic performance. That explains why higher levels of epistemic beliefs, as measured by the EBQ, tended to be related to lower academic performance, meaning that beliefs in absolute, unchanged knowledge might hinder learning performance. Even though students' epistemic beliefs and learning strategies are interrelated, jointly shaping academic outcomes, self-regulated learning strategies, as measured by the MSLQ, did not independently predict academic performance, nor did they connect epistemic beliefs to academic achievement when the two are examined together. Therefore, more in-depth research is needed to explore and explain relationships among these variables.

Finally, the study emphasizes that we need to deepen our understanding of how epistemic beliefs and self-regulated learning interact to shape academic performance. Epistemic beliefs influenced performance, but their complex and nuanced interaction with performance should be clarified. Student performance is determined by the ability to mobilize their resources to effectively perform learning tasks. Self-regulation strategies in learning play an important role in self-motivational dynamics. Further studies should clarify what dimensions of epistemic beliefs (simple knowledge, certain knowledge) are, in fact, negatively associated with performance. Future work should also look for different ways self-regulated learning, influenced by students' different epistemic beliefs, impacts academic results.

## 6. Limitations

According to the regression analysis, both epistemic beliefs and self-regulated learning contributed to only about 4.8% of the variance in academic performance among students. The model's limited explanation of academic outcomes indicates the exclusion of many significant contributing factors. Motivation, prior knowledge, emotions during learning, teaching approaches, types of assessments given, and the students' socio-economic background may have had large effects that were not assessed directly in this project. Because the model explains a small proportion of the total variance, it seems there are other influences that remain unstudied.

It is plausible that context and discipline may play a role in the specific findings. Most participants were psychology or social work students, so the findings may not be generalizable to fields other than education. According to the report, more in-depth knowledge is needed about how epistemic beliefs become active in certain situations, how they develop over a student's educational journey, and how they influence a student's motivation across multiple learning settings. These variations were not examined in detail as part of the current study, which is a gap.

Despite examining the interactions through a mediation model, the study found that self-regulated learning failed to explain the relationship between epistemic beliefs and a person's academic performance. It is clear that the full mechanisms by which epistemic beliefs influence performance are not yet fully understood, possibly due to the impact of other mediating and moderating factors. It is explicitly stated that we do not have a complete picture of how students' epistemic beliefs are initiated into the learning situation, change over time, and affect how much



they participate and feel motivated. This means that we need to create new ways to study these factors and analyse how they interact with each other, including influences from different domains and the environment, in future research.

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