

Comparison of the Efficacy of Metacognition on Students' Academic Performance Between USA, France, Australia, and China

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ABSTRACT

Prior research has emphasized the importance of metacognition as a contributing factor to increasing students' retention at colleges and universities. Enhancing students' awareness of their cognitive skills is just as crucial. As students transition from a frequently controlled and encouraging high school setting to an uncontrolled university or college environment where they are expected to become extremely self-directed and autonomous, it is crucial that they quickly develop the skills and insights needed to become independent learners. However, many college students are ill-equipped to deal with the difficulties and challenges their academic environment presents, affecting their metacognitive skills. Metacognition is the capacity to track and manage thoughts and learning. This research reviewed and compared metacognition studies conducted on students in Australia, China, France, and the USA. These studies used self-regulated learning, self-efficacy, and meta-learning factors to evaluate metacognition performance among undergraduate students, including 362 participants in the USA, 128 in Australia, 118 in France, and 517 in China. Results revealed a positive impact of metacognition skills on all students, increasing their academic performance. However, compared to the participants in China, the results revealed that the overall effect size of self-regulated learning on academic achievement in the USA, France, and Australia was small because the Chinese students learned those metacognition habits at a very young age. The results also indicated that their beliefs contributed significantly to learning outcomes.

Keywords: Academic performance, Comparison, Efficacy, Metacognition, Emotional Engagement, Behavioral Engagement, Achievement, Students

INTRODUCTION

Metacognition, which involves reflecting on one's thinking and learning methods, is essential to learning [1]. Metacognitive techniques may boost students' academic performance by enhancing their capacity to organize, track, and assess their learning [1]. While there is evidence to support metacognition's effectiveness in improving academic performance, it is imperative to consider whether its impact is consistent across different educational systems and cultural contexts. Research studies have investigated the efficacy of metacognition on academic performance in different countries, including the United States, France, Australia, and China. For example, a study by Schraw et al.

[2] found that metacognitive strategies were positively associated with academic performance among American college students. Similarly, a study by Wagener [3] in France found that metacognitive training improved academic performance among college students. Also, another metacognitive study conducted by Yang and Bai [4] on Chinese Ph.D. students of social sciences at Australian universities showed an increase in academic performance. In contrast, a study by Wang et al. [5] in China found that while metacognition was positively associated with academic achievement, the relationship was weaker than in Western countries. These studies collectively demonstrate that metacognition can enhance academic achievement in various cultural contexts [6]. According to the educational system and cultural factors, its effects may vary. For this reason, it's crucial to take cultural context into account while creating and practicing metacognitive treatments. It is commonly known that a student's academic accomplishment cannot be fully explained by their prior knowledge, competencies, and skills [7, 8].

Despite having similar entrance scores, some students excel in the classroom, while others find it difficult to stay focused. Significant disparities in students' abilities to notice and control their learning have been reported from studies on factors that predict academic performance [8, 9]. Students must swiftly acquire the knowledge and abilities they need to become independent learners when they transition from a frequently monitored and supportive school environment (secondary education) to a college/university environment where they are expected to become highly self-directed and autonomous [10]. Yet, many new university students (freshmen), and others lack the necessary skills to handle the challenges this unfamiliar environment presents [11, 12]. Improved student monitoring of their learning activities has one promising strategy to shift these narratives, which makes the need for developing a metacognition intervention necessary, taking into consideration the academic failure in colleges and the challenges students encounter [13].

In the study, we reviewed and compared the relationship between metacognition and academic achievements among students in the United States and three other nations including France, China, and Australia. Hence, our investigation was designed to answer the following research question: Is there an association between metacognition and students' academic performance or achievements based on geographical location? This study clarified the factors that affect academic performance at American, French, Chinese, and Australian universities. It provided insight into the influence of metacognition on students' academic achievements in the context of Western universities and other institutions throughout the world.

Objectives

To review and compare metacognition studies conducted on students in Australia, China, France, and the USA. These studies used various factors, including:

- Self-regulated learning
- Self-efficacy
- Meta-learning, and Location

To evaluate metacognition performance among undergraduate students, including 362 (265+97) participants in the USA, 128 in Australia, 118 in France, and 517 in China.

Hypothesis

This study hypothesized that there is a significant meta-cognition commonality between students' academic performance in the United States, France, Australia, and China despite their geographical locations.

LITERATURE REVIEW

Metacognition is defined as the capacity to reflect on and manage one's own cognitive and learning processes. Metacognition allows students to reflect on and direct their learning; thus, it may benefit learning [14, 15, 16]. While cognition is defined as thinking or learning, the prefix "meta-" adds the layers of "at a later or higher stage of development" and "more comprehensive." Hence, metacognition refers to active, higher-order processing through reflection, monitoring, self-regulation, evaluating, and directing thinking and learning processes.

Many studies have shown that metacognition improves student learning because it fosters self-awareness, which enables people to create efficient learning strategies and be more intentional about learning [17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31]. There is evidence that college students with higher metacognitive knowledge and skills are more likely to perform better than peers with low metacognition on a variety of learning and performance measures than peers with low metacognition [32, 33, 34], even though most metacognition and achievement research has been conducted on school-aged students [35, 36, 37].

According to Flavell [38, 39], metacognition is defined as the act of thinking about one's cognitive processes. Metacognition has two components: (1) knowledge or awareness of one's cognitive processes, and (2) control over those processes. This statement served as the basis for Brown's [40] later and widely accepted theory of metacognition, which saw metacognition as a combination of knowledge and control over cognition. In reality, contemporary research defines metacognition as a construct consisting of cognition management and knowledge of cognition [41, 42, 43, 44, 45, 46, 47, 48, 49]. The term "knowledge of cognition" describes what students know about their cognitive potential, capabilities, and limitations. Declarative, procedural, and conditional knowledge are three forms of this knowledge.

In addition, Hertzog and Robinson [50] reviewed the evidence that higher intelligence is strongly associated with metacognitive awareness. This is also considered a cognitive element. They projected that more research would strongly confirm this notion. It is not surprising that researchers have found links between metacognitive awareness skills and academic achievements, taking into consideration the hypothesized linkage between metacognitive awareness, intelligence, and problem-solving [51, 52, 53, 54, 55]. For instance, studies have

reported a link between metacognitive awareness and academic achievements. These studies show that students with higher levels of metacognitive awareness outperform those with lower levels of metacognition [22, 55]. Particularly, Isaacson and Fujita [22] discovered that undergraduate students with higher metacognition knowledge outperformed those with lower levels on examinations.

Self-regulated learning, self-efficacy, and meta-learning are the three variables considered in this study.

Self-Regulated Learning

Self-regulated learning is an active process that implies the capacity to confront and resolve issues while drawing on a variety of skills to achieve a particular learning objective [56, 57, 58]. Goal setting, self-efficacy, purpose/goal orientation, metacognitive monitoring, self-evaluation, and other methods are all parts of self-regulatory learning [59]. Moreover, self-regulation of learning, or the thoughts, emotions, and actions that students utilize to achieve their academic goals, is closely related to meta-learning since it deals with students' self-awareness of their learning processes [60, 61]. It is often challenging to discern between self-regulated learning and metacognitive learning [62]. In some models, the terms "metacognition" and "self-regulation" are interchangeable; however, in other models, cognitive methods are seen as crucial components of self-regulation.

In Western countries, researchers have established the positive effects of self-regulatory learning on academic performance [63, 62, 64] and mastering motivation [65]. In China, Liu and Chen [67] observed that undergraduate students' writing results were positively correlated with online self-regulatory learning. According to Li et al. [68], self-efficacy, time value, and time monitoring have a substantial relationship with educational progress in elementary school kids. Self-regulated learning contributes to academic success in secondary school [69, 70]. As a result, the association between self-directed learning and academic performance has a similar impact on Western education.

Self-regulated studying involves many strategies, including goal setting, self-efficacy, goal orientation, metacognitive monitoring, self-evaluation, etc. [59]. As part of an overall theory, self-regulation helps students do better in school, but a meta-analysis study found that not all self-regulation techniques work. Particularly, it was discovered that organization, peer learning, and rehearsal learning were not significantly related to GPA [71]. To explain the lack of effectiveness, Baumeister et al. [72] postulated the strength model of self-control, which stated that psychological resources could be consumed using self-regulatory strategies. If the previous self-regulated method consumed too many psychological resources, the performance of the subsequent strategy would decrease, leading to ego depletion [73]. These findings suggest that to preserve psychological resources and maximize academic achievement, it is imperative to identify the most successful teaching or student-related practices. Hence, the current study determines the most effective and ineffective self-regulated learning strategies for Chinese students in elementary and secondary schools.

Self-Efficacy

Numerous studies demonstrate how self-efficacy enhances performance and well-being [74, 75, 76]. A significant and close predictor of academic success is self-efficacy, which is the idea that

a person can manage difficult environmental demands by taking appropriate actions [74]. For instance, highly self-efficacious students engage in more demanding and ambitious goals, insist more on pursuing the goals, and typically succeed in a variety of academic subjects [77, 78]. While Bandura [74] suggested that self-efficacy is typically thought of as either task-specific or domain-specific, some researchers have proposed the idea of generalized self-efficacy, which refers to a broad and stable sense of one's ability to deal effectively with a variety of demanding situations [79, 80].

Past research has shown that Snyder's [81] cognitive goal-directed conceptualization of hope predicts goal-directed behavior and student achievement [82, 83, 84, 85]. The definition of self-efficacy is "belief in one's capacities to plan and carry out the actions necessary to manage potential scenarios" [86]. Self-efficacy, then, is the belief that a person can succeed using their abilities in particular circumstances [87]. According to social cognitive theory [74], three factors influence self-efficacy beliefs: (a) level or size (the degree of a task's difficulty); (b) strength (the likelihood that a task will be completed at a given degree of difficulty); and (c) universality (the extent to which magnitude and strength beliefs generalize across tasks and situations). The research divides self-efficacy into two categories: task-specific or state-like self-efficacy (SSE) and overall self-efficacy (GSE). It is a limited concept because earlier research on it concentrated on the size and strength of the self-efficacy factor [88, 89]. Moreover, Bandura's restrictive words "given situational demands", have given self-efficacy a narrow focus, making it a task-specific concept. Also, numerous studies demonstrate how self-efficacy enhances performance and well-being [74, 75, 76].

Meta-Learning

Meta-learning is conceptual, combination of knowledge, procedures, and attitudes. It encompasses one's awareness of one's learning processes, specifically, one's understanding of the learning behaviors and methods appropriate in a learning setting [90, 91]. It also includes "knowledge of completion," in which students learn to value the knowledge they have acquired and comprehend how to apply it [91].

Meta-learning also has to do with learners' attitudes, such as the conviction that they can use their information effectively and that they can self-regulate in the way that is most appropriate for them [90]. According to this viewpoint, meta-learning is an active, internal process in which learners' perceptions of themselves and their environment alter and can be controlled [91, 92]. Engaging effectively in meta-learning improves academic performance [93]. When students become more conscious of self-regulatory behaviors and understand the efficacy of different learning strategies, they enhance their metacognition and become more effective learners [90].

Additionally, meta-learning can help students develop independent self-reflection [93, 92]. Meta-learning is strongly related to learning self-regulation because it deals with students' awareness of their learning processes [60, 61]; that is, the ideas, feelings, and actions students utilize to further their academic objectives [94]. Location of the students may seem to be a contributing factor. However, students enter colleges or institutions of higher learning with one goal, to go through the matriculation process, and obtain a degree in their chosen field no matter the country or geographical location.

THEORETICAL FRAMEWORK

The proposed framework for this study is a theoretical framework for self-efficacy [74]. Self-efficacy theory: Over time, several theories and frameworks have proposed various mechanisms to account for academic success or failure. Based on Bandura's social-cognitive viewpoint, the self-efficacy theory was one of the first theories to show the relationship between self-efficacy and achievement in the 1960s [74]. Specifically, the theory (Fig. 1, Panel A) more clearly asserts that student self-efficacy is a significant direct predictor of performance in educational tasks and evaluations [95], and educational achievement is a measure of student achievement.

The theory holds that students' judgments of their abilities and perceptions of how well they perform in each area, particularly in core disciplines like math, are directly related to their perceptions of their academic accomplishments. Individual impressions and how they relate to real completion are subject-specific because not all tasks are completed at the same rate and with the same success [95]. The model also emphasizes how successes and task mastery experiences contribute to self-efficacy growth. So, one of the most significant sources of self-efficacy is the information college students acquire regarding their real performance [96]. As a result, students who feel successful at school are more likely to be content with their academic performance. Moreover, self-efficacy demonstrates how past success predicts future success [94]. Ultimately, self-efficacy theory postulates a bidirectional relationship between self-efficacy and achievement based on these theory-driven assumptions.

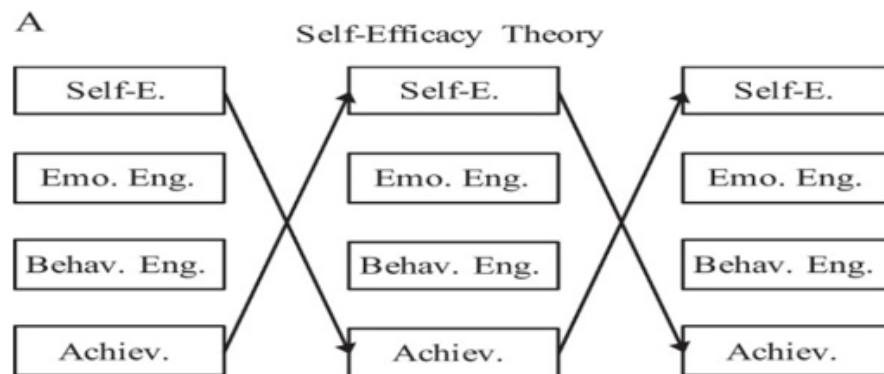


Fig. 1: Hypothetical link for self-efficacy theoretical frameworkSource: Olivier et al. (2019)

METHODS

Participants

For this study, twenty-six metacognition articles were searched and collected. Based on the preliminary review of their relevance to our research topic and research question five (5) articles were considered and analyzed for this study. These articles include two (2) from the United States of America (USA), two (2) from China, one (1) from France, and one (1) from Australia.

The two USA studies were conducted at the Midwestern State University. In the first one, two hundred sixty-five (265) undergraduates were enrolled in an educational psychology course, starting in the fall semester of 2003, and ending in the spring semester of 2006 [97]. In the

second one conducted by Ward and Butler [98], 97 students including 55 females (56.7%) and 42 males (43.3%) enrolled in an introduction psychology course participated.

In the study conducted in France [3], the participants were comprised of hundred and eighteen (118) students enrolled in their second year of psychology studies at the University of Angers, France.

The study at the University of Queensland, Australia [99] had 128 participants who were second-year undergraduate students in the Bachelor of Physiotherapy program.

For the study conducted in China [5], the participants were 517 sophomore students at a Chinese University in the southeastern region of China. All participants studied medicine. The participants were primarily male (81%) and ranged in age from 17 to 25 years, with a mean age of 20.6 years and a standard deviation of 1.08 years.

In another study in China [100], Chinese academic databases were systematically searched for empirical studies conducted in real-world teaching situations. Studies focused on undergraduate students, and special education or online learning students were excluded. Fifty-five cross-sectional studies and four intervention studies (which generated 264 independent samples) were included, for a total sample size of 23,497 participants.

Measures/Assessments

For the United States study [97], the Motivated Strategies for Learning Questionnaire (MSLQ) was used [101]. The MSLQ consists of 81 self-reported items divided into two broad categories: (1) a motivation section and (2) a learning strategies section. The MSLQ is completely modular, and thus the scales can be used together or individually, depending on the researcher's needs. In another U.S. study [98], participants were asked to complete the Metacognitive Awareness Inventory (MAI), a 52-item measure used to assess overall metacognitive awareness [2]. The instrument measures the overall degree of metacognition awareness as well as the sub-factors of cognition knowledge and cognition regulation.

For France study [3], metacognitive monitoring training was conducted using sheets based on Nietfeld et al.'s cognition regulation model [13]. The students had to indicate their general understanding of the day's lesson on a 0-to-100 rating scale. Then, they wrote down the concepts they found difficult to grasp and their plans to enhance their understanding of them.

For Australia study [99], assessment for both courses used for the study included a mid-semester written examination worth 20% or 17% of course assessment in Physiology I and II, respectively, an end-of-semester written examination worth 55% in Physiology I or 59% in Physiology II, and either an assignment (in Physiology I) or three online content quizzes (in Physiology II). In addition, both courses had meta-learning assessment tasks.

Regarding the Chinese study [102], the authors developed two surveys to measure Chinese students' self-efficacy beliefs and SRL strategies while studying English as a second language in American classrooms through multiple interviews and observations [103]. When developing these scales, Wang, and Pape [103] referenced Bandura's [74] theoretical framework of self-efficacy, Zimmerman, and Martinez-Pons' [104] self-regulated learning interview scale, and

Oxford's [105] Strategy Inventory for Language Learning (SILL). Similarly, in a meta-analysis of another Chinese study [100], the random effects model was chosen, and publication bias was also examined.

Analysis

For the United States study [97], analyses of correlation and paths using the Amos 5 program [106] were conducted to examine the relationship between all variables as well as to assess the unique contribution of each predictor to students' total scores variability. In another study conducted at the University of Wisconsin, USA [98], Pearson's correlation method was adopted for data analysis.

For the France study [3], monitoring sheets were used as assessment tools. The teachers specified that the monitoring sheets would not count toward their final grade but serve as a complementary educational tool. For each student, the monitoring sheets' content, and the grades for the two exams were recorded and paired.

For the study in Australia, the authors performed a t-test using Prism™ (GraphPad, San Diego, CA, USA) in order to compare participants' meta-learning tasks.

For the study in China [102], a two-way repeated measures analysis of variance (ANOVA) was used to examine the interaction effect of time (two English written exams) and group membership as well as the main effect of time and group membership.

RESULTS

Al-Harthi and Was [97] found that three predictors had positive direct effects on the total score: self-efficacy ($\beta = .42$), rehearsal ($\beta = -.16$), and performance avoidance ($\beta = -.13$). There was a significant direct effect of self-efficacy on mastery goal orientation ($\beta = .18$) and performance-approach goal orientation ($\beta = -.34$), as well as a moderate correlation to task value ($r = .49$). Also, task value had significant direct effects on mastery goal orientation ($\beta = .30$) and performance-approach goal orientation ($\beta = -.15$). Similarly, the results of the study done by Ward and Butler [98], revealed that Pearson's r-correlational analysis was conducted between overall metacognitive awareness, knowledge about cognition, and regulation of cognition and average cumulative GPA. Accordingly, there was a significant weak correlation [$r(95) = 0.22$, $p < 0.05$] between the general metacognitive awareness (MAI) rating and the common cumulative GPA. Consequently, individuals with better cognition and knowledge also had an increased cumulative GPA.

For France study, the results revealed that the metacognitive monitoring training provided had an impact on the students' results. This simply means that Nietfeld et al.'s [13] metacognitive intervention had a statistically significant effect on the students' performance.

The results of the study done in Australia revealed that the academic performance of students before and after the introduction of meta-learning assessment tasks was evaluated using a t-test, comparing the end-of-semester examination scores in Physiology I. During 2013–2015, after the introduction of the meta-learning tasks, the examination scores of students ($n = 640$) were significantly higher ($68.2 \pm 0.59\%$) than those of students ($n = 754$) during 2010–2012 ($64.9 \pm 0.45\%$; $p < 0.05$), before the introduction of the tasks. However, this change in

examination performance cannot be solely attributed to the introduction of meta-learning tasks and should be viewed with caution.

Li et al. [100], reported a correlation between specific self-regulated learning (SRL) strategies (such as attribution or goal setting) and academic achievement and performance. This study included two hundred and sixty-three (263) independent samples, and the results revealed that five independent samples viewed SRL as an integrated concept and reported correlations between SRL and academic performance. The results of another Chinese study show that there were statistically significant relationships identified between participants' use of SRL strategies and self-efficacy beliefs for completing English language tasks ($r = .52$). Furthermore, students' self-efficacy beliefs were also significantly related to their performance on English exams, and significant relationships were also noted between participants' performance on English-written exams and their oral English proficiency. All studies indicated a positive impact of metacognition on students that increased their academic performance.

When compared to the participants in China, the results revealed that the overall effect size of self-regulated learning on academic achievement in the USA., France, and Australia was small because the Chinese students learned those metacognition habits at a very young age. The results also revealed that their beliefs contributed significantly to learning outcomes.

DISCUSSION

In the present study, the authors reviewed and compared the efficacy of metacognition on academic performance at universities in the United States, France, Australia, and China. The authors also examined the relationship between self-efficacy, self-regulation, meta-learning, and academic performance.

In Western countries, researchers have proven the effectiveness of self-regulated learning on academic achievement [63, 62, 64] and motivation for learning [65]. Thus, a study conducted at a Midwestern State University in the USA [97] assessed the academic performance of 265 undergraduate students who enrolled in psychology courses at the university. And illustrated the relationship between self-efficacy, task value, goal orientations, metacognitive self-regulation, and learning strategies. The results of the study revealed that students' self-efficacy, task value, self-regulation, and elaboration are significantly positively correlated with total scores.

Also, another study was conducted at a North American university, the University of Wisconsin, USA [98]. This study investigated the relationship between metacognitive awareness and academic performance among college freshmen. The results of the study revealed a significant positive correlation between metacognitive awareness and academic achievement among college freshmen as measured by cumulative grade point average (GPA). This suggests that students who have a greater level of metacognitive awareness tend to succeed academically than those with a lesser degree of metacognitive awareness.

In comparison, the authors in the United States focused their studies more on metacognition as a tool to improve academic performance. In contrast, other countries (such as China, Australia, and France) have centered their studies on self-regulation to access and improve academic

performance. In some models, the terms "metacognition" and "self-regulation" relate to the same idea, but in other models, metacognitive methods are seen as an essential component of self-regulation. While metacognition studies conducted in the United States utilized MAI and metacognitive awareness as instruments, other countries utilized metacognitive monitoring training (conducted with sheets based on Nietfeld et al.'s study [13]—a weekly self-evaluation and feedback done through monitoring sheets) and meta-learning tasks (an online assessment task made available on the course Blackboard site for one week, and students could complete the task at anytime during that week). Similarly, university students served as participants in all studies conducted in the United States and other countries (China, Australia, and France).

This was evident in a study conducted at the University of Queensland, Australia, to improve students' understanding of physiology courses in biomedical science. In this study, a t-test was performed using Prism TM (GraphPad, San Diego, CA, USA) to compare the meta-learning tasks completed by the participants. This is contrary to studies done in the United States, as mentioned above. In these studies, both correlation and path analysis were statistical tests used to analyze and investigate the relationship between all variables involved in the study. Meta-learning assessment tasks as part of course assessment in the Australian study were to improve students' metacognition of their learning and, in doing so, promote lifelong learning skills. In that study, the authors implemented such meta-learning tasks in science courses for allied health students. The majority of students reported that the meta-learning tasks had a positive impact on their study, identifying various ways they felt the tasks had aided them.

The results from the Australian study show that meta-learning tasks impacted students' performance, with higher examination scores from 2013–2015 compared to 2010–2012 before the introduction of the task. Inductive thematic analysis conducted on students' responses shows students used self-regulatory skills to conduct the meta-learning task. The responses students gave to the tasks indicate that they believed that answering meta-learning questions gave them opportunities to develop a direction for their learning through setting goals and planning, improve their self-judgments through revising content and self-evaluation, and become more reflective and self-aware learners by giving them opportunities to reflect on their learning and study strategies. The meta-learning tasks may have prompted the completion of the self-regulatory cycle, as indicated by Zimmerman [60].

In addition, research on metacognitive interventions demonstrates that efficient ones rely on monitoring training and clarifying cognitive knowledge. Dunlosky and Metcalfe [107] claimed that a judgment of learning is an essential component of metacognition because it provides students with assessments regarding their performance. As explained earlier, research has proven that this approach is interesting but always needs to be defined and adapted to fit each learning task. Research conducted in France utilized the Nietfeld method for metacognitive interventions [13]. This study aimed to improve students' academic performance during differential psychology courses. The students were divided into two groups: a total of 39 students started monitoring training at the start of the semester, and a total of 43 students started monitoring training in the middle. The study revealed that the group that began training earlier achieved better results on the second exam than the group that began training later [3]. This shows that metacognition monitoring training had an impact on students' results, even when they started later (the impact was lessened) [3].

Similarly, a study conducted in Texas at Midwestern State University in the United States also revealed that metacognitive awareness scores led to higher GPAs for the students that participated [98].

More so, Young and Fry [55] found a positive relationship between metacognitive awareness and cumulative grade-point average in upper-level (e.g., junior, senior, graduate) college students. Although the studies conducted in France and the USA used different instruments and analytical/statistical methods as aforementioned, both studies had positive outcomes by increasing academic achievements and performance. The results of the study conducted in France revealed that training and monitoring (even in the simplest form) can enhance or improve students' exam performance. These findings are consistent with Zimmerman and Martinez-Pons [104], who reported that students' self-reported self-regulated learning strategies were positively correlated with their standardized testing performance. For instance, self-efficacy and self-regulated learning (SRL) strategies are closely related to each other and predictive of students' academic achievement [20, 108, 104].

Another study in China examined Self-Regulation Phases and Strategies for Chinese Students: A meta-analysis of 2 decades of research on the association between self-regulation and academic performance by Li et al. [100].

The methodology involved empirical research carried out in actual teaching settings in elementary and secondary schools that were thoroughly searched utilizing Chinese academic databases, according to a Chinese study [100]. The findings showed that for Chinese children in elementary and secondary schools, the overall effect size of self-regulated learning on academic success was small. Self-efficacy, task strategies, and self-evaluation had larger effect sizes compared to other strategies. The authors found that the effect sizes of self-efficacy, self-evaluation, and task strategies were relatively large, suggesting that these were significant SRL strategies for Chinese students. This finding was consistent with several studies [71, 62, 109, 110], which reported that students' self-efficacy represented the strongest correlation with academic performance and had a significantly greater effect size. The greatest effect sizes in science fields, including physics and mathematics, are produced through self-regulated learning systems. The key stages of self-regulated learning include the performance phase and the self-reflection phase.

When this study is compared with the study done in the United States, the Chinese participants were both elementary and secondary school pupils. This is unlike the United States, where the only participants considered were university students. Also, Chinese studies paid more attention to foreign language learning (English), unlike in the United States, where other courses (such as psychology) were considered more relevant than the English language. Yet both studies' outcomes improved academic performance. In addition, Chinese university students devote more of their free time to learning English than any other topic. Studying these students' self-regulated learning (SRL) techniques for learning English as a foreign language both within and outside of the classroom became essential as a result. Similarly, Wang et al. [102] carried out a study in China to identify self-regulated learning techniques and self-efficacy beliefs in Chinese college students learning English as a foreign language. All participants in this research were majoring in medicine. Contrary to the United States, where participants often reflect college students in terms of academic achievement and

background, but this is not the case. Through several interviews and observations, Wang, and Pape [103] utilized two questionnaires as tools to gauge the SRL and self-efficacy beliefs of Chinese students studying English as a second language in American classrooms. On the other hand, the MAI was the instrument utilized in the study conducted in the United States of America. The main effect and interaction effects of time (two English written tests) and group membership was investigated using a two-way repeated measure analysis of variance (ANOVA). However, correlation and pathway analysis were the analytical methods utilized in the study conducted in the United States of America.

The Chinese study found a significant relationship between SRL techniques, self-efficacy beliefs, and success in learning English, which added more support to the validity of the results from the two questionnaires used in the earlier investigation [103]. Self-efficacy and SRL techniques among participants were poor. On written English tests, students who read articles before reading the questions outperformed their peers. Furthermore, the findings revealed a favorable correlation between academic accomplishment, self-efficacy, and SRL methods [111, 112, 113, 114]. Expectedly, students who held strong self-efficacy beliefs persevered in the face of difficulties and excelled in their academic work [108, 114]. As expected, students who had strong self-efficacy beliefs were persistent when faced with challenges and achieved better academic performance and achievement [108, 114].

Generally, all the studies discussed in this manuscript showed an increase in academic achievement or performance. This was irrespective of the differences in the study instruments used and/or the analytical methods adopted or the country where the studies were conducted. Our research reveals that metacognition had a positive effect on students' academic performance in all the countries listed above. This is consistent with numerous researchers who have reported the influence of metacognitive skills on academic performance or achievement [115, 116], while other researchers view that explicit metacognition training can improve students' metacognition skills and believe that metacognition skills promote and correlate significantly with the student's academic performance or achievement [117, 118].

More so, it has been illustrated by several studies that students who demonstrated high metacognitive awareness skills reached a high level of academic achievement, while students with poor metacognitive awareness skills illustrated a lower level of educational success [119, 120]. Therefore, metacognition can be used as a strong predictor of educational achievement. Several studies have shown the positive impact of training on students with poor metacognition strategies. Those students can benefit from training to improve their metacognitive and academic performance [117, 118, 121]. Although other studies have shown a negative or no relationship between metacognitive awareness and academic achievement, as the case may be [122, 15].

CONCLUSION

After reviewing the articles available for this research on the efficacy of metacognition on students' academic performance in the United States, France, Australia, and China, several conclusions can be drawn.

First, it is clear that metacognition is a valuable tool for enhancing academic achievement, regardless of, location and cultural differences or educational systems. Research shows that

students trained in metacognitive strategies are more likely to engage in deeper learning and critical thinking. This leads to improved performance across a range of subjects.

Secondly, while there are some differences in metacognition teaching and implementation across these four countries, there are also many similarities. For example, metacognitive instruction is most effective when integrated into regular classroom activities and tailored to students' individual needs and learning styles. Additionally, metacognitive strategies like self-assessment and self-reflection are widely recognized as valuable tools for academic success.

Finally, it is worth noting that there are still many opportunities for further research in this area. For example, future studies could examine the effectiveness of different metacognitive strategies in different cultural contexts or explore how technology (like portfolios, metacognitive apps, and online discussion forums, e.g., enabling students to track their learning progress and set goals for future learning) can be used to enhance metacognitive learning. Overall, metacognition is a powerful tool for improving students' academic performance. This is regardless of where they live or what educational system, they are part of.

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