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Enhancing Lifelong Learning Through Metacognitive Strategies: Empirical Evidence From EFL Master's Students

Hajar Nhart[1], Hicham Laabidi[2*]
[1,2]Departmentt of English Studies, Moulay Ismail University, Meknes, Morroco

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*Correspondence:
laabiidi.hicham@gmail.com

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Abstract
Although metacognition is fundamental in higher education, little attention was devoted to investigating the association between metacognitive strategies and lifelong learning. Hence, the present study employs an explanatory sequential mixed-method design to examine the relationship between MCS and LLL among EFL master's students at Moulay Ismail University and to explore their perceptions and perspectives toward the use of MCS. 96 students were conveniently selected to participate in the study, with 8 purposefully selected for the semi-structured interviews. Data were collected using a five-point Likert scale questionnaire and semi-structured interviews. Quantitative data was analyzed using descriptives, Spearman correlation, and regression analysis, whereas reflexive thematic analysis was used for qualitative data. Results revealed that the participants used MCS frequently, with monitoring being the highest and planning emereging the least. Additionally, a statistically significant positive correlation emerged between MCS and LLL. Regarding the regression analysis, the results demonstrated that planning, monitoring, and evaluation statistically predict LLL, with varying degrees of influence. Moreover, thematic findings unveiled students' positive perceptions toward MCS and their role in enhancing LLL. In light of the findings, the study calls for the incorporation of MCS and LLF into instructional practices to promote self-regulated and directed learners. The result indicate that metacognitive instruction can be systematically embedded within EFL curricula to foster sustained learner autonomy beyond formal academic settings, thereby positioning MCS as a pedagogical lever for lifelong learning competencies.

INTRODUCTION

In the field of English language teaching, LLL has emerged as a key component of higher education due to the rapid development of knowledge, technology, and professional demands (Lindqvist et al., 2023; Zhao, 2024).). Thus, higher educational institutions, nowadays, are increasingly expected to prepare students not only with academic knowledge but also with the needed skills for ongoing learning processes. This educational shift has placed greater emphasis on learner autonomy, adaptability, and self-regulation, as learners are now required to independently manage their learning processes in rapidly changing academic and professional contexts (Chaiyasit et al., 2023; Hochberg & Waitzman, 2026; Porubin, 2025). Within this framework, MCS have gained growing scholarly attention as a key factor enabling learners to plan, monitor, and evaluate their own learning, thereby fostering greater awareness and control over their learning experiences (Tezer, 2025; Yao et al., 2024). In this context specifically, MCS are believed to support the development of LLL by encouraging reflective learning habits, independent learning behaviors, and continuous engagement with knowledge acquisition.

Theoretically, metacognition was first conceptualized by Flavell in the 1970s as one's awareness, monitoring, and control of cognitive processes during learning. It encompasses a holistic two-dimensional framework, knowledge of cognition, and regulation of cognition (Al-Azzemy & Al-Jamal, 2019; Schunk & Zimmerman, 2022). Knowledge of cognition presents the learners' declarative understanding of cognitive

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functioning and their awareness of how learning occurs, incorporating the learners, the required tasks, and the strategies used (Al-Azzemy & Al-Jamal, 2019; Musullulu et al., 2025; Schunk & Zimmerman, 2022; Yuan & Du, 2026).. On the other hand, regulation of cognition can be understood in terms of the metacognitive activities through which learners manage to orchestrate their cognitive processes. It entails the strategic deployment of planning, monitoring, and evaluating the learning performance (Abdelshiheed et al., 2023; Demır & Doğanay, 2019; Teng, 2025).. Taken together, this indicates that Flavell's theory of metacognition provides the foundation for investigating learners' strategy awareness.

Additionally, the foundational literature of MCS is driven by Flavell's regulation of knowledge (Schunk & Zimmerman, 2022). It was first theorized as the intentional regulatory actions such as planning tasks, monitoring progress, and evaluating the final performance (Schraw & Moshman, 1995; Tarricone, 2011). Later, the definition was adjusted to target the high-order control processes that supervise and coordinate cognitive activities during the process of learning (Thwe & Kálmán, 2024). Within this regulatory perspective, MCS are therefore understood not merely as isolated study techniques but as an integrated system in which declarative awareness of one's cognitive strengths and weaknesses informs the procedural selection and adjustment of strategies in response to task demands (Theobald et al., 2026). Such regulatory processes are central to learner autonomy, since students who can diagnose their own learning needs are better positioned to select and adapt strategies independently (Kharroubi & ElMediouni, 2024). Consequently, learners who develop this capacity are more likely to sustain their engagement with knowledge acquisition beyond the boundaries of formal coursework, which is precisely the orientation that lifelong learning requires (Suharto et al., 2025).

Shifting to LLL, its origins are traced to the late 1960s and early 1970s, when it started emerging as a practical tool for the reform and modernization of national education. UNESCO and OECD played a core role in developing the belief that education should be an ongoing process throughout one's lifespan and be accessible to all individuals regardless of factors such as age or social or economic background (OECD, 2024). In this regard, UNESCO insisted that education should take various forms to move beyond an education for purely academic purposes to a more adaptive, flexible, and ongoing process (Laal, 2011). It also called for the importance of integrating informal and non-formal education alongside formal education (Kuismala et al., 2026). Building on this, LLL was officially introduced as the continuous, personal, and dynamic process that lasts for the entire lifespan, including formal, non-formal, and informal learning experiences, which enables individuals to develop knowledge, skills, values, and integrates key elements such as autonomy, perseverance, motivation, and self-regulation (Kuismala et al., 2026; Martino et al., 2020; Nurmayani et al., 2025).

A considerable body of research was published on the use of MCS among different participants. A variety of studies reveals that participants frequently rely on planning strategies, which represents the pre-task stage. In a Germanic context, E. Nett et al. (2012) introduced planning as the most frequently used MCS among grade 11 students, indicating learners' need to set clear, available, and organized goals. Stephanou and Mpiontini (2017) also shared a similar finding, with planning emerging as the most frequently used. However, other studies reported considerable use of monitoring, the while-task stage, demonstrating that regardless of the lack of planning, learners are still able to control understanding, adjust strategy use, and check progress (Mitsea & Drigas, 2019; Paans et al., 2018; Vandevelde et al., 2015). Evaluation strategy likewise emerged across numerous studies as the most frequently employed strategy during task performance, suggesting that learners tend to engage in a comprehensive appraisal of their accomplished performance following the completion of the task (Zepeda & Nokes-Malach, 2023).

Research on the association between MCS and LLL has significantly expanded over the last few years, providing evidence of a positive association across different populations. Pandey and Agnihotri (2025) described the interrelationship between metacognition and LLL as profound and dynamic, elaborating that metacognition provides the needed mechanisms, which makes LLL learning possible, believing that

metacognition provides a conceptual foundation for LLL (Pandey & Agnihotri, 2025.; Evans, 2018). In terms of statistics, Çutuk et al. (2026) obtained a statistically significant relationship between MA and LLL among university students, revealing the fact that learners with high MA tend to show higher LLL skills. Similarly, Khamisabadi et al. (2021) reported a statistically significant relationship between MCS and LLL among university students, demonstrating that the relationship between the two variables does not occur due to chance or accident. Yet, almost all the studies neglected the relationship between MCS and LLL among master's students, broadly focusing on university students.

Furthermore, Matsumoto-Royo et al. (2022) explored how explicit metacognition predicts LLL among pre-service teachers. The study resulted in a statistically significant predictive relationship, illustrating that high levels of explicit MA are associated with stronger LLL tendencies. However, the study broadly focused on the predictive role of metacognition without particularly isolating MCS as a distinct construct in relation to LLL. Thus, the analysis did not fully differentiate between broader MA and the more specific strategic dimensions of metacognitive regulation.

Taken together, these limitations reveal gaps in literature as well as in population, underscoring the fact that little attention was paid to specifically examining the relationship between MCS and LLL among EFL master's students; also, the predictive role of each of the MCS on LLL was not a focus area. Unlike the previous studies, the current study aims to investigate the relationship between MCS and LLL among EFL master's students and examine the predictive role of MCS (planning, monitoring, and evaluation) on LLL, which can offer educators and curriculum designers valuable insights to enhance LLL through MCS. In alignment with the aforementioned research objectives and in order to empirically operationalize them, the following hypotheses are advanced to guide the statistical analysis of the study:

H1: There is a statistically significant relationship between MCS and LLL.

H2: MCS significantly predicts LLL.

METHODS

Study Design

An explanatory sequential mixed-method design was adopted to carry out the current study. The design enabled the researcher to initially collect and analyse the quantitative data; then, subsequently, reinforce the quantitative results by qualitative findings.

Participants or Subjects

The study was conducted at Moulay Ismail University, Faculty of Arts and Humanities. The sample of participants consisted of 96 EFL master's students. The study made use of convenience sampling, which can be justified by its simplicity, efficiency, and practicality in the data collection process. 55.2% of the sample were female participants, whereas only 44.8% were males. Also, the majority of participants, 72.9%, fall within the 20-25 age group, followed by 19.8% aged between 26 and 35. The other identified age groups were minimally represented, with only 5.2% aged 36-40 and 1% in each of the two groups 41-50 and 51-60.

Materials and Instruments

The data were collected through two main instruments. A structured questionnaire was used to collect quantitative data from participants. It consisted of 33 items on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The questionnaire was adapted from two previously validated questionnaires, namely, the Metacognitive Awareness Inventory (MAI) by Schraw and Dennison (1994) and the Learner Autonomy Questionnaire (LAQ) developed by Zhang and Li (2004). Moreover, the qualitative data were gathered through semi-structured interviews, targeting 8 purposefully selected interviewees from the same population. Deciding the simple size was based on using data saturation; no new themes appeared following the eighth interview, suggesting that adequate

qualitative depth had been reached. The interview guide was developed based on prior empirical studies, as well as on the theoretical framework guiding the study. It was also informed by the constructs measured in the quantitative questionnaire, ensuring alignment and complementarity between both research phases.

Procedure

To ensure the reliability of the adapted version of the questionnaire, a pilot study was conducted within an initial sample of 23 students from the same population, resulting in a Cronbach's alpha coefficient equal to 0.94. The high reliability of the questionnaire allows for completing the data collection by allocating 15 minutes at the end of two classes to administer the questionnaire; the professor as well as the students were informed and agreed to take part.

Data Analysis

Since the study adopted a mixed-method design, the data were analyzed at two main phases. The quantitative phase was analyzed using both descriptive and inferential statistics. In terms of descriptive statistics, measures such as means, standard deviation, frequencies, and percentages were employed. Regarding the inferential statistics, three key assumptions were tested before analyzing the data. First, the normal distribution of data was checked by determining the kurtosis and skewness coefficients. The results of the normality test indicated that MCS and LLL exhibited negative skewness, with values of -.96 and -.87. Concerning the kurtosis test, it revealed values of .04 for MCS and .17 for LLL, which demonstrated that the distribution of data is not perfectly normal. Another test of normality was adopted to confirm the assumption, namely, the Kolmogorov-Smirnov and Shapiro-Wilk tests. The results illustrated that the data of both variables are not normally distributed, as all the p-values are below .5 ($p < .001$). Thus, the assumption of normality is violated, resulting in the use of non-parametric tests. Second, the linearity of data was also checked using a scatterplot, which indicated that the assumption of normality was satisfactorily met. Also, the provided report of coefficient of determination ($R^2 = .618$) revealed that the relationship between the two variables is approximately linear. Finally, a multicollinearity test was run. The findings showed that there is no serious issue with collinearity. The VIF values of the three variables are all below < 5, with planning (1.718), monitoring (1.767), and evaluation (1.407). Additionally, the tolerance values (.582, .566, and .711) are all significantly above .20. Based on the three tests, the inferential statistics were employed through the use of Spearman's rank-order correlation as well as a multiple linear regression analysis. From the perspective of qualitative data analysis, the data obtained from the interviews were analyzed through reflexive thematic analysis, following Braun and Clarke (2019) guidelines, leading to the emergence of five main themes.

RESULTS

Quantitative results

Students' use of MCS

Descriptive statistics mainly: the means and standard deviations of the entire MCS were calculated for the whole sample. Table 1 presents the varying levels of students' awareness of MCS. The planning strategy ranged from a minimum score of 2.75 to a maximum score of 4.50, scoring a mean equal to 3.82 with a standard deviation of .42. Additionally, the monitoring strategy spanned from a minimum of 3.00 to a maximum of 4.50, with a mean score of 3.98 and a standard deviation equal to .38. Lastly, the evaluation strategy scored a minimum of 2.75 with a maximum of 4.50, along with a mean score of 3.84 and a standard deviation of .45.

Table 1. students' awareness of MCS

	N	Minimum	Maximum	Mean	Std. Deviation
Planning	96	2.75	4.50	3.8255	.42631
Monitoring	96	3.00	4.75	3.9896	.38545
Evaluating	96	2.75	4.50	3.8464	.45069

	N	Minimum	Maximum	Mean	Std. Deviation
Planning	96	2.75	4.50	3.8255	.42631
Monitoring	96	3.00	4.75	3.9896	.38545
Valid N (listwise)	96				

The relationship between MCS and LLL

Table two illustrates the Spearman's rank-order correlation, indicating a statistically significant positive correlation between the variables r_s (94) = .656, $p < .001$. Accordingly, the strength of the correlation coefficient is close to .656, suggesting a strong relationship between MCS and LLL.

Table 2. Spearman's rank-order correlation between MCS and LLL

			Metacognitive strategies	Lifelong learning skills
Spearman's rho	Metacognitive strategies	Correlation coefficient	1.000	.656**
		Sig. (2-tailed)	.	<.001
		N	96	96
	Lifelong learning skills	Correlation coefficient	.656**	1.000
		Sig. (2-tailed)	<.001	.
		N	96	96

**Correlation is significant at the 0.01 level (2-tailed).

The multiple linear regression analysis between MCS and LLL

Table 3 illustrates a model summary of the regression analysis findings for predictors of LLL. Starting with the correlation coefficient (R), in the present study the R-value is .79, which demonstrates a strong positive correlation between the predictors (planning, monitoring, and evaluation) and LLL. The R-square is .63, suggesting that approximately 63% of the variance in LLL is accounted for by the predictors. Additionally, the adjusted R-square robust at .61, confirming that the model remains highly significant and reliable even when accounting for the number of predictors used. Thus, the model is statistically significant, as proven by the F-change statistic (F(3.2) = 52.426, P < .001).

Table 3. A model summary of the regression analysis findings for predictors of LLL

Model	R	R square	Adjusted R square	Std. error of the estimate	R square change	F change	Df 1	Df 2	Sig. F change
1	.794 [a]	.631	.619	.27564	.631	52.426	3	92	<.001

a. Predictor (constant) planning, monitoring, evaluation

b. Dependent variable: lifelong learning skills

Table 4 further explains the regression analysis between MCS and LLL, displaying the standardized coefficients, the t-values, and the significance levels of the predictors of LLL. The multiple linear regression analysis resulted in a statistically significant relationship between planning and LLL with a p-value of .02, along with a t-statistic of 2.33. Regarding the predictive strength, the standardized beta coefficient is equal to .19. Monitoring also emerged as a statistically significant predictor of LLL with a beta coefficient of .32, a t-statistic of 3.88, and a $p < .001$. Lastly, the evaluation strategy was likewise revealed as a statistically significant predictor, which can be proven by a beta coefficient of .43, a t-statistic of 5.66, and a $p < .001$.

Table 4. The multiple linear analysis of MCS

Model	Unstandardized B	Coefficients Std. error	Standardized coefficients Beta	t	Sig.	Collinearity tolerance	Statistics VIF
1 (constant)	.037	.322		.116	.908		
Planning	.203	.087	.194	2.333	.022	.582	1.718
Monitoring	.379	.098	.327	3.885	<.001	.566	1.767
Evaluation	.430	.074	.434	5.777	<.001	.711	1.407

Dependent variable: lifelong learning

The figures 1, 2, and 3 are used to visualize the MCS, revealing the relationships between the MCS

(X-axis, IV) and LLL (Y-axis, DV). The scatterplots in the figures indicate the positive correlations between MCS (predictors) and LLL. It also highlights the varying strengths of the relationships. Planning demonstrates a weak association (R^2 = .05); monitoring illustrates a moderate relationship (R^2 = .14) and evaluation reveals the strongest correlation (R^2 = .26).

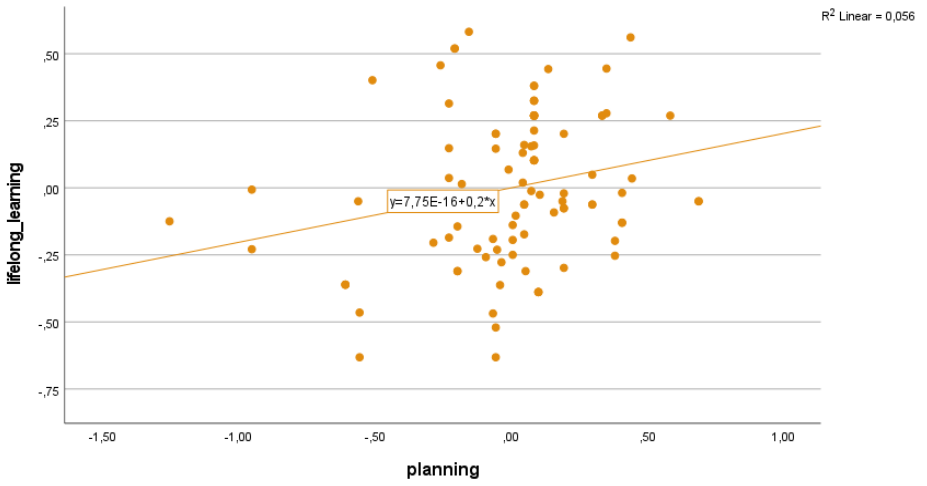


Figure 1. The relationship between planning and LLL

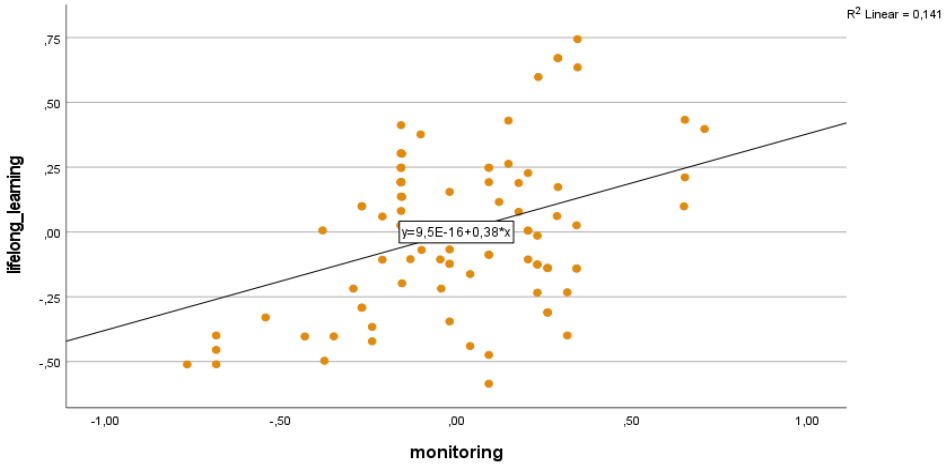


Figure 2. The relationship between monitoring and LLL

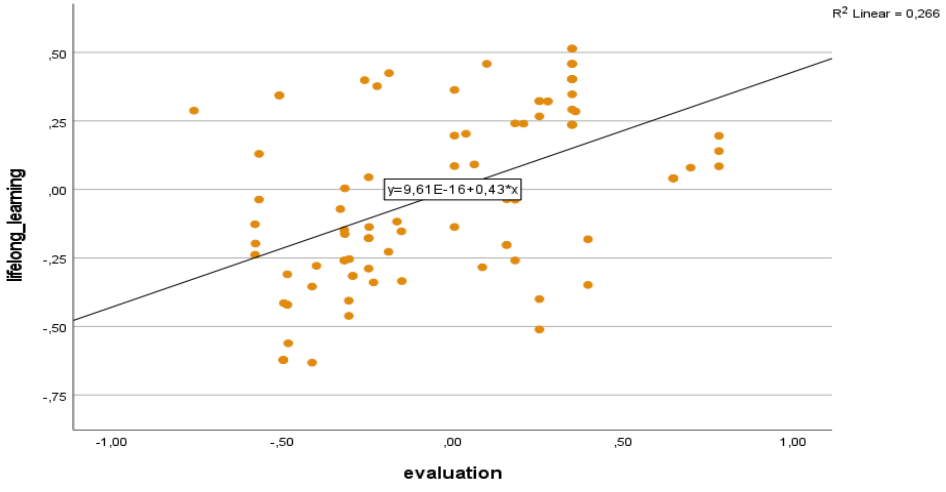


Figure 3. The relationship between evaluation and LLL

Qualitative findings

The qualitative analysis of 8 interviews resulted in five key themes, involving planning, monitoring, evaluation, benefits of MCS, and LLL. Table 5 summarizes the main themes and sub-themes obtained from the thematic analysis.

Table 5. The major themes and sub-themes

Themes	Sub-themes
Planning	Breaking the task into manageable sub-tasks Prioritizing some tasks over the others
Monitoring	Self-assessment opportunities Paraphrasing the content into the one's own words
Evaluation	Learning from experience
Benefits of MCS	Self-dependency Critical thinking and problem-solving Self-directed learning
LLL	

Planning

Planning was found to be the most repeated theme within the informants' contributions. Approximately all eight participants declared that they usually plan and set clearer goals before targeting any task. A male participant declared that "*before starting a task, I like to break it into small steps. I write down what I need to do first, then next. This helps me to stay on track and not feel lost.*" This contribution was further supported by another female participant, who stated, "*Actually, before starting a task, I usually begin by identifying the goals I want to achieve. I set a clear timeline and gather the necessary resources.*" Her words highlighted the role of planning as an organizational strategy that she uses to manage time and identify the needed materials in advance. Similarly, another female participant acknowledged her positive attitudes toward planning, saying, "*So, for the planning and goal setting, before starting a task, I ask myself what I should achieve, how I want to achieve it, and how much time I have.*" Deeply, interviewees mentioned that through the employment of the planning strategy, they managed to break the task into manageable sub-tasks, which allows them to prioritize the most important task that they need to begin with. A female participant pointed out, "*I usually start by setting clear objectives, and then I divide them into manageable subtasks.*" Sharing the same point of view, a female participant noted what follows: "*Then, I break the task into steps, and I organize the steps based on priority. What I should start with and what I can leave for the upcoming.*" A male participant highlighted the same thoughts, saying, "*I like to break the task into small steps; I write what I need to do first and then next.*" Nearly all the participants agreed on the fact that planning helps manage learning tasks.

Monitoring

Throughout the interviews, the participants repeatedly mention monitoring as a significant strategy that equipped them with the necessary tools and skills to engage in self-assessment as well as to paraphrase in their own words. A male participant acknowledged that through monitoring he can overcome learning obstacles at an early stage. He stated, "*I check whether I understood the material through sometimes using quizzes . I just quiz myself and try to make questions out of the task, and then I try to answer them, making analogies of that task, of that concept, actually just to make sure that I understood what I have been studying so far."* This ongoing process of checking understanding was also mentioned by a female participant. She remarked, "*I regularly pause and test myself, either trying to explain the concept in my own words—actually, that's what I always do—or solving related problems without looking at my notes, or teaching it to someone else. If I struggle to do any of these, I know I need to revisit the material.*" This contribution clearly emphasized the importance of monitoring in terms of assessing understanding and checking progress, which was shared by another female participant. She declared, "*So, when it comes to monitoring my understanding, I usually check whether I truly understand the materials by asking myself questions during the task.*" Along with assessing their understanding regularly during

task management, informants stated that they try to summarize what they understand using their own words. A female participant expressed, "*I try to explain the concept in my own words. So, I paraphrase whatever is transmitted into my own words*." It was further shared by another female participant, saying the following: "*I ask myself whether I can generate definitions in my own words*."

Evaluation

Closely, all the participants highlighted that they usually use evaluation for reflective purposes. They acknowledged that the evaluation strategy helps check whether they meet the goals they stated in the planning phase or not. In this sense, a female participant declared that when she is done with whatever task, she asks herself whether she has met her goals and how effective her choices of strategies were. She stated, saying, "I *reflect on the entire process. I ask myself if I met my goals and how effective my strategies were. I also consider what challenges I faced and how I handled them. This evaluation helps me understand my strengths and weaknesses as a learner."* Similarly, another female participant shared a common view; she remarked that after completing a task, she reflected on her performance by listing what was good and effective and what needed adjustment. She reported, *"I evaluate my performance by reflecting on what worked well for me and what did not."* A male participant expressed his use of evaluation strategy in a different way. He demonstrated that he reflects on his performance by quizzing himself; the quizzes take the form of reciting the key ideas. If he manages to remember, then he evaluates his performance as good; if not, he moves to strategy adjustment. He contributed, saying the following: *"I reflect and evaluate my performance through taking some quizzes. If I recall things very well, I find that I remember everything I learned, so I know that the strategy worked. If I struggle to remember or it takes me too long, I recognize that the method was not efficient."* Additionally, a female participant pointed out that the evaluation strategy promotes experiential learning. She brought attention to this saying: "It allows me to refine my strategies and avoid repeating the same mistakes." This claim was also highlighted by another female participant. She asserted, *"Reflection turns my learning experience into a lesson in itself. By understanding what worked and did not, I continuously refine my approach. Also, I avoid repeating the same mistake and build a more personalized and efficient learning process*."

Benefits of MCS

Participants demonstrated through their contributions that the MCS highly affects their attitudes, transforming them from passively accepting information to actively reflecting and evaluating everything they encounter. A female participant contributed, saying the following: "*They allow me to analyze information more deeply and question assumptions and concepts.* " Her words illustrated that her use of MCS really empowers her ability to autonomously and critically analyze information. This claim was also shared by a male participant. He acknowledged, "*If I am reading, I stop and ask myself, who wrote this? Is this true? I critically evaluate information, so I do not just believe everything; I question things more deeply*." This contribution demonstrated that the metacognitive strategies foster the participant's critical thinking and not blind admission of everything. In a similar fashion, a female participant highlighted that metacognitive strategies strengthen her ability to become more self-dependent; she stated, "*They have made me more confident in my ability to learn new things on my own. I no longer feel dependent on a teacher to tell me what to do and what not to do. Now, I have the skills to direct my own learning.*" This sense of self-dependency was further shared by another female participant, who mentioned, "*Consistent use of metacognitive strategies, I think, has significantly strengthened my ability to learn independently and to approach learning from different angles*." A female participant declared that her employment of MCS leads to critical understanding of the learning material instead of accepting everything as given. She pointed out, "*These strategies encourage me to think about my thinking, which naturally leads to deeper analysis. Sometimes, when I plan, I question the relevance of information; I also weigh evidence critically.*"

Lifelong learning

The thematic analysis revealed a fifth central theme that emerged and frequently reoccurred in every step of the analysis. The interviewees acknowledged that MCS highly enables them to continuously keep learning not only in terms of formal education but also at the informal level. A male participant declared, "*These strategies help me learn on my own. Like when I wanted to learn guitar, I made a small plan, practice 15 minutes a day. I checked if I was getting better, and I changed my method when my fingers hurt. This way I continuously keep learning by myself, which I believe leads me to be a lifelong learner.*" His contribution illustrates that lifelong learning is embedded in daily life activities, not strictly linked to formal settings. Similarly, a female participant stated, "For example, when I want to learn a new skill for my career development, I use the same process of setting goals and monitoring my progress. I am also more likely to seek out feedback and reflect on how I can improve. These metacognitive strategies have truly made me a lifelong learner." A male participant contributed comparably. He expressed, "*Yes, metacognitive strategies help and allow me to discover and refine new learning methods and techniques. So, I can adjust them to become more efficient, and this helps me achieve my learning goals with less effort and time. And this, of course, supports my lifelong learning journey.*" This contribution illustrates that the participant actively manages and improves his learning process through the use of metacognitive strategies in a reflective and flexible way. Thus, instead of applying a single method, the participant highlighted that he continuously experiments with and refines different techniques to find what works best, which allows him to become more efficient over time, which leads to better achievements with less effort and time. More importantly, this ongoing adjustment and improvement illustrate a key aspect of lifelong learning, where he does not simply acquire knowledge but develops the ability to learn more effectively across different situations and stages of life. Correspondingly, a female participant mentioned, " *So, these strategies are definitely important for lifelong learning because they allow me to continuously improve and adapt."*

DISCUSSION

The present study examined the relationship between MCS and LLL. The statistical population consisted of males and females belonging to the Faculty of Arts and Humanities at Moulay Ismail University. The required data were collected through a structured questionnaire. Descriptive statistics as well as inferential statistics resulted in the acceptance of the two research hypotheses.

In light of the obtained results, monitoring emerged as the most frequently used strategy, scoring the highest mean, followed by evaluation, and planning appears to be the least used strategy. These results explained that the participants value the active engagement in task regulation and progress checking over the preparatory phase or the final checking phase. To discuss the findings from a metacognitive perspective, the significant role of monitoring recommends that the individuals who took part in the study are more likely to check understanding, detect errors, modify, and make immediate adjustments while being engaged in a particular task, which will lead to better outcomes. These results perfectly match the findings obtained by Juned et al. (2025) who reported that monitoring is among the most frequently used MCS. They stated that across the purposes for which monitoring is used, participants declared the following: checking the effectiveness of the steps followed, verifying the appropriateness of the materials used, and reflecting on their progress. Similarly, Lim et al. (2021) identified high use of monitoring, which can be explained by the participants' need to keep checking the applicability of the strategies used as well as to catch any possible misunderstanding at an early stage. However, E. Nett et al. (2012) presented different findings, with planning emerging to be the most frequently used strategy; also, Stephanou and Mpiontini (2017) found that planning is the most used strategy, which contradicts our findings.

The Spearman's rank-order correlation reveals a strong, positive, and statistically significant relationship between MCS and LLL, indicating that high levels of MCS use are associated with high levels of LLL, which confirms that the observable relationship is unlikely to have occurred due to chance or accident. The qualitative data further supported these findings. Informants acknowledged

that through their use of MCS, they become more autonomous and self-directed, which are essential skills in LLL. Khaamisbadi et al. (2021) shared consistent results, illustrating that as the metacognitive strategies increase, the participants' tendency toward lifelong learning improves too. Closely, Çutuk et al. (2026) shared similar findings; the correlational analysis resulted in a statistically significant relationship between MCS and LLL, which highlights the fact that MCS are central to the development of individuals' lifelong learning.

The results obtained from the multiple linear regression analysis demonstrate that planning, monitoring, and evaluation are statistically significant predictors of LLL. Planning appears to be the weakest predictor, followed by monitoring, and evaluation emerged as the strongest predictor. The findings explain that each of the IVs made a meaningful contribution to explaining variations in LLL and that their predictive effects were unlikely to occur by chance. In other words, changes in the MCS were significantly associated with changes in the LLL. Matsumoto-Royo et al. (2022) implicitly presented planning, monitoring, and evaluation as statistically significant predictors of LLL. In a broader sense, Jaewoo and Woonsun (2014) studied the prediction of metacognition on LLL, indirectly including the three predictors. The results supported the idea that individuals who are engaged in planning, monitoring, and evaluation are more likely to be lifelong learners. These findings are consistent with the broader literature linking self-regulated learning behaviours to sustained learning dispositions, as the relationship between metacognitive skills and lifelong learning has been reported as a positive reinforcement loop in which metacognitive skills supervise and direct the learner's cognitive tasks (Khamisabadi et al., 2021).

From a qualitative perspective, the data obtained from the participants' contributions statistically confirm the quantitative data gathered. The five elicited themes reveal that the participants' employment of MCS led to the enhancement of LLL. Matsumoto-Royo et al. (2022) shared similar results in terms of the qualitative phase. In their findings, the participants' responses illustrated that their active engagement in MCS resulted in continuous learning habits, well-organized learning, and independent professional growth, which are essential elements in LLL. aken together, these findings suggest that metacognitive regulation is not merely associated with lifelong learning but operates as a mechanism through which learners sustain self-directed knowledge acquisition across changing educational and professional contexts (Anthonysamy, 2021).

The present study suggests significant implications for the field of EFL teaching and learning. It highlights the pressing need for instructional practices that explicitly integrate MCS with the aim of enhancing the learners' LLL capacities. The study's results recommend reflective teaching practices, curriculum reform, and teacher training to foster autonomy and self-regulation. For learners, the structured use of MCS can improve critical thinking, self-dependency, and ongoing self-improvement beyond formal settings. This approach also positions learners to transfer metacognitive habits, such as self-questioning and progress checking, to academic and professional contexts where they must manage their own learning independently (Vellanki et al., 2024).

Although this study offers evidence that metacognitive strategies are associated with lifelong learning among EFL learners, its findings should be interpreted in light of methodological limitations. Most notably, the use of convenience sampling restricts the extent to which the results can be generalized beyond the master's program from which participants were recruited. The findings therefore cannot be assumed to represent the wider population of EFL learners. Future studies should use probability sampling across multiple institutions and educational levels to test whether the relationship between MCS and LLL holds across a broader and more diverse population. A larger, more varied sample would also enable researchers to determine whether the relative contributions of planning, monitoring, and evaluation differ by proficiency level, cultural setting, or stage of professional development. In addition, longitudinal research is needed to establish how metacognitive habits develop over time and whether their contribution to LLL changes across learners' career trajectories. These approaches would provide a

stronger basis for assessing the reach, durability, and contextual variation of the present findings.

Given the evolving demands of higher education and professional contexts, future research should rigorously examine how explicit MCS instruction can be integrated across disciplines and educational levels. Identifying context-sensitive approaches is essential to developing durable LLL capacities and ensuring that metacognitive strategy instruction supports learning beyond isolated courses or interventions. It would also allow researchers to clarify how metacognitive instruction interacts with learners' motivation, prior experience, and institutional support in shaping their long-term commitment to learning.

CONCLUSION

The findings of the study demonstrated that the participants exhibited a high use of monitoring, followed by evaluation, and planning came last. Also, the correlation analysis resulted in a statistically significant relationship between MCS and LLL, which confirms the first hypothesis. Additionally, the multiple linear regression analysis illustrated that MCS are statistically significant predictors of LLL, with evaluation being the strongest predictor, monitoring having a moderate effect, and planning emerging as the weakest one, leading to the validation of the second hypothesis. Building on these findings, the current study suggests a number of pedagogical implications. Our results call for an explicit integration of MCS into the classroom; teachers are highly encouraged to provide students with planning templates, monitoring, checklists, and evaluation opportunities to reflect on their performance. The curriculum designers also need to integrate learning objectives related to MCS through which learners can develop a sense of autonomy and self-direction. Also, there is a need to develop programs that enable instructors to align their teaching methods with the integrated strategies. This study is subject to several limitations. The convenience sampling may restrict the generalizability of the findings, as the sample may not fully represent the broader population of EFL master's students. In addition, the study essentially relies on self-reported data, which may be influenced by participants' subjective perceptions and response biases. Also, the investigation focused mainly on the predictive relationship between MCS and LLL without examining additional variables that may mediate or moderate this relationship. Future studies are highly encouraged to employ probability sampling and generalizability. Researchers may also examine other educational contexts and populations, including learners from different academic disciplines. Moreover, future research may explore the mediating or moderating effect of variables such as motivation, self-regulation, or academic achievement on the relationship between MCS and LLL. All together, the results contributed to the growing body of research highlighting the significance of MCS use in enhancing LLL. The study further provides empirical insights into how MCS may contribute to learners' LLL within higher education contexts.

ETHICS STATEMENT

The present study received approval from our institution of Moulay Ismail University, in accordance with the ethical standards outlined in the 1964 Declaration of Helsinki and its later amendments. All participants were informed about the purpose of the study, and informed consent was obtained from all individual participants included in the study. Participation was voluntary, and anonymity was maintained throughout the research process.

CREDIT AUTHOR STATEMENT

Hajar Nhart: Conceptualization, methodology, formal analysis, writing – original draft, writing – review and editing.
Hicham Laabidi: Literature review, data curation, validation, writing – review and editing.

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DECLARATION OF COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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