

Metacognitive monitoring in relation to academic achievement in reading and writing by first and second year undergraduates

العلاقة ما بين التحكم في ما فوق الإدراك والتحصيل الأكاديمي في القراءة والكتابة لطلبة ما قبل التدرج: سنة أولى وثانية

Surveillance métacognitive par rapport aux résultats scolaires en lecture et en écriture des étudiants de première et de deuxième année

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ملخص

يعتبر التحكم في ما فوق الإدراك مكونا أساسيا في النشاطات الأكاديمية التي يقوم بها الطالب في الجامعة. يعرفه (Valdez, 2013) على أنه تقدير المتعلم لمعرفته، من بينها الاستراتيجيات التي تدعم الإدراك ومعرفة الشروط التي تسير متى وكيف يجب استخدام هذه الاستراتيجيات التي يمكنها التأثير على التعلم. بالنسبة للقراءة والكتابة في طور ما قبل التدرج فإن التحكم في ما فوق الإدراك مهم لأن له علاقة بالأداء في هذه المهارات اللغوية وكذلك في مواد علمية أخرى والتي تستدعي بدورها القراءة المكثفة والكتابة. تهدف هذه الدراسة إلى إيجاد العلاقة ما بين التحكم في ما فوق الإدراك لطلبة السنة الأولى والثانية جامعي وتحصيلهم الأكاديمي في القراءة والكتابة. تستعمل الدراسة سلم تقديرات ما فوق الإدراك لجمع المعطيات فيما يخص التحكم من جهة وكذلك النتائج المتحصل عليها في امتحان القراءة والكتابة من جهة أخرى. تظهر نتائج البحث ارتباطا إيجابيا ما بين المتغيرين كما تدعو إلى تطبيق التعليم عن طريق تطوير ما فوق الإدراك الذي يدعم مهارات القراءة والكتابة للطلاب والتي بدورها تنمي استقلالية التعلم في الجامعة.

الكلمات الدالة: التحكم في ما فوق الإدراك؛ القراءة والكتابة؛ التحصيل.

Abstract

Metacognitive monitoring, as a key component of general metacognition, is part and parcel of most of the academic activities students at university are involved in. It refers to 'learners' estimates of their own knowledge, that is, learners' knowledge of strategies that support cognition and their knowledge of conditions that dictate when and how to execute strategies that might influence their own learning (Valdez, 2013). For reading and writing at the undergraduate stage of instruction, monitoring is crucial. It determines academic performance in these two demanding skills and in other subjects that require reading extensively and composing in the same time. This study investigates the correlation between metacognitive monitoring of first and second year university

students and their academic achievement in reading and writing. It employed the Taxonomy of Metacognitive Judgments to collect data on monitoring and the Reading/Writing test scores for achievement data. The results revealed an important correlation between the aforementioned variables and calls for instruction in metacognitive development that can assist students with the reading and writing skills necessary for independent learning in college.

Keywords: metacognitive monitoring; reading and writing; achievement.

Résumé

La maîtrise métacognitive en tant qu'élément clé de la métacognition générale fait partie intégrante de la plupart des activités académiques auxquelles participent les étudiants à l'université. Leur connaissance de cette question détermine les conditions qui dictent quand et comment exécuté des stratégies susceptibles d'influencer leur propre apprentissage (Valdez, 2013). Pour la lecture et l'écriture au premier cycle de l'enseignement, le suivi est crucial car il détermine les performances académiques dans ces deux compétences exigeantes et dans d'autres matières qui nécessitent une lecture intensive et une capacité de synthèse en même temps. L'étude en question traite de la corrélation entre le suivi métacognitif des étudiants universitaires de première et de deuxième année et leurs résultats scolaires en lecture et en écriture. La taxonomie des jugements métacognitifs est utilisée pour collecter des données sur la surveillance et les résultats des tests de lecture / écriture et sur les résultats de réussite scolaire. Les résultats ont révélé une corrélation importante entre les variables susmentionnées et les appels à l'enseignement du développement métacognitif qui peut aider les élèves à acquérir les compétences en lecture et en écriture nécessaires à un apprentissage indépendant au collège.

Mots-clés: suivi métacognitif; lecture et écriture; réalisation.

Introduction

Students involved in university studies are expected to make use of a range of techniques that allow them to cope with the demands of highly challenging academic tasks. Among these tasks, particularly in language learning settings, are reading and writing. In Algerian EFL classrooms, these two skills are not required in general reading and writing classes per se; they also represent the main processes students engage in almost all content subjects like literature, research, linguistics, to name but a few. Therefore, students' readiness to take



charge of their learning and their awareness of how to employ effective strategies is compulsory at university level and leads to efficient study habits as supported by research evidence. This is referred to in the literature as metacognitive monitoring which is defined as one's awareness about thought processes and actions.

Metacognitive monitoring constitutes one sub component of metacognition together with knowledge and regulation as framed by Pintrich, Wolters and Baxter (2000). The three components are interrelated and play an important part in developing strategic learners. Regarding monitoring as the main concern of this study and according to Thiede et al (2003), metacognitive monitoring affects regulation of study, and this affects overall learning. It means that a student who can accurately discriminate better learned material from less learned material will regulate his or her study more effectively. In the same line of thought, Isaacson and Fujita claim that: "Students' ability to monitor their learning is one of the key building blocks in self-regulated learning; students who are aware of the level of their mastery of material can adjust their study time and strategies" (Isaacson; Fujita 2006, p. 40). Thus, this study focuses on the metacognitive component of monitoring for its direct relevance to effective learning.

This paper is divided into six sections: section one and two deal with the research problem of the study and the review of relevant literature. Section three and four are devoted to the objectives and research questions along with the description of the sample. Section five and six describe the methods of data collection and the presentation and discussion of the results. Section one below presents the research problem of the study.

1. The research problem

In relation to the study at hand, EFL undergraduates in the Algerian context experience difficulties in reading and writing. This is the case of first and second year university students in the department of English at the university of Algiers². The evidence of their failure is represented by the reading/writing exam scores they obtained. The majority of the student participants in the study are below average achievers. Thus, the study aims to highlight one of the key factors that might improve reading and writing at the undergraduate level that is metacognitive monitoring. This latter is one of the processes students are required



to engage in when coping with high order thinking tasks like reading technical materials in linguistics, critically analyzing literary passages and preparing projects.

2. Related literature

University students acquire an important amount of new knowledge and are engaged with classroom tasks that require them to apply problem solving skills for higher order thinking. The literature on metacognition advocates that accurate monitoring of new learning enables students with effective metacognitive strategies to concentrate on new content and adjust their learning goals (Hartman, 2001). It also argues that students who accurately distinguish between what they have already mastered and what is yet to be learned have an advantage in these situations since they can be more effective and strategic learners. Yet many students have ineffective metacognitive strategies. It is important, therefore, to evaluate students' metacognitive abilities and target instruction to the development of these key learning strategies (Everson; Tobias, in Hartman, 2001, p. 69, 83).

For reading and writing integrated, writing is closely linked to reading. According to Hacker, Dunlosky and Graesser "research in writing instruction resembles work on metacognition and reading" (Dunlosky; Graesser 1998, p.75). They justified this similarity arguing that the two skills inform each other. Writers read their texts and often construct texts from sources that they have read. While reading their own texts during composing, they exhibit the same moves as when reading the texts of others, such as backtracking to aid comprehension and building a representation in memory. This granted, the primary focus of writing research has been on the production of texts rather than on their comprehension. The one area where the two activities interface most notably is in revision, particularly revision involving peer review or editing. Reading and writing are usually described as 'parallel processes' or 'natural partners' (Trosky, Wood, Tierny, Pearson, Sarasota, Tsai, in Farahzad; Emam, 2010) where the activities of readers are congruent to or mirror images of the activities of writers (Smith, in Farahzad, Emam, 2010). Reading and writing are rightly referred to as 'parallel' because there is a connectedness between what readers do and what writers do as they prepare to



read or write: as they create meaning through text (in writing), and as they reflect on the text (in reading).

Although research on metacognition in SLA has captured attention in recent years, early research on metacognition in reading and writing is largely descriptive and exploratory as claimed by Li and Larkin (2017). These studies focused on the types of metacognitive knowledge and the strategies students generally use in reading and writing tasks. Little has been done to examine the role of metacognition in L2 reading and writing across EFL contexts according to Liu and Li (Liu, Li, 2015, in Li and Larkin, 2017, p. 6). The current study was motivated by the need to investigate this gap with an emphasis on the notion of monitoring. Students at university need to possess effective metacognitive monitoring skills considering the high demands of reading and writing at this level that require from them not only to critically read academic texts but also to produce them through writing.

Researchers (Grabe, in Farahzad, Emam, 2010) claim that helping students become strategic readers and strategic writers should be a major role for any English for Academic Purposes curriculum. Accomplishing this goal requires extended attention to strategic processing and continual students' awareness of planning, monitoring, and repairing. Students' attention and awareness need to be built steadily and consistently by learning, modeling, and using many types of strategies: strategies for planning, for learning information, for monitoring comprehension and writing, for re-evaluating goals and plans, and for repairing and revising. All these processes and sub processes are key to metacognitive monitoring and regulation highlighted in the present study.

3. Objectives, Research questions and Hypotheses

The purpose of this investigation is to point out a possible relationship between two variables: metacognitive monitoring and academic achievement in reading and writing. First and second year undergraduate students experience difficulties in the tasks of reading and writing and demonstrate below average levels according to the scores they obtained in this subject. Thus, a number of factors are possibly responsible for this level of achievement, and the present research aims to highlight one of these factors. The variable of interest is that of metacognitive monitoring in reading and writing. Students are probably not able



to regulate the processes due to the ineffective and inappropriate use of strategies. According to Everson and Tobias (Hartman, 2001, p. 69):

‘‘The metacognitive ability to accurately estimate one’s knowledge was hypothesized to be related to academic achievement in college’ and that ‘students with effective metacognitive skills accurately estimate their knowledge in a variety of domains, monitor their on-going learning, update their knowledge, and develop effective plans for new learning’.’.

Besides considering the overall state of first and second year students metacognitive monitoring in relation to their reading and writing achievement, this study compares between degree level and monitoring. This is to point out whether year of instruction plays a part in enhancing metacognitive monitoring. Therefore, the study attempts to answer two main research questions and hypotheses:

RQ1: ‘What is the relationship between first and second year students metacognitive monitoring and their academic achievement in reading and writing?’

RQ2: ‘How do first year students compare to second year students in terms of metacognitive monitoring in reading and writing?’

Null HYP1: ‘There is no relationship between students’ metacognitive monitoring and their academic achievement in reading and writing’

Null HYP2: ‘there is no difference between first and second year students metacognitive monitoring in reading and writing’

4. Subjects of the study

Two groups of students from the Department of English at University of Algiers-2 participated in this research. Eighty (n=80) first and second year male and female undergraduates represent the sample of the study (50 first year students and 30 second year students). The two degree levels are merged purposefully in the first part since they represent the population of students who study reading



and writing as a module. Yet, they are later compared in terms of metacognitive monitoring in reading and writing to consider the role of degree level in metacognitive monitoring. The two groups were the most accessible since the reading and writing teachers of these groups accepted to participate in the study allowing the researcher to administer the taxonomy of metacognitive judgments and to use their exams and their students' scores in the present investigation. Moreover, this study is cross sectional and does not aim to establish a cause-effect relationship between the variables (as it is the case in experiments); it rather seeks for an association between the variable of metacognitive monitoring and reading/writing achievement. This is why the fact that the sample contains students from year one and year two will not influence the results. In addition to students, the two reading and writing teachers of the two groups were consulted for the scores of the students in the reading/writing exam.

5. Methods and procedure of data collection

At the onset of the study, reading and writing exam scores were collected to classify the students into achievement levels. The two teachers of the groups provided the exam scores obtained in the academic year 2015-

After the classification of the students into high, average and low achievers, the researcher asked for permission to administer the **Taxonomy of Metacognitive Judgments** that is a means to gather data on students metacognitive monitoring during task performance in an exam setting. The tool elicits students monitoring of the reading/writing task and how they judge their performance before, while and after working on the task. It concerns the metacognitive judgments made by students to describe the state of metacognitive monitoring at different levels of task performance (adapted from Schraw, 2009, p. 416, 417).

This tool is an inventory of metacognitive judgments adopted from the literature in the form of statements that students have to measure by selecting appropriate percentages that apply directly to the rate of their reading/writing performance. The taxonomy was also adapted to the reading/writing exam context.

After measuring the relationship between students monitoring and reading/writing achievement, the study compares between the two levels of instruction regarding metacognitive monitoring in reading and writing.



6. Data presentation and discussion

The first range of data collected concerns the variable of reading/writing achievement. The 1st and 2nd year reading/writing teachers provided the marks obtained by the eighty student participants in the study. The aim is to classify the 80 participants in different achievement levels. The R/W exam was prepared and corrected by the two teachers of the module. The total mark on which the exam was assessed is 20/20. The teachers assigned the following scores to each achievement level:

- 13/20 and above is the mark assigned to high achieving readers/writers.
- Between 12.99/20 and 09/20 is the mark assigned to average readers/writer.
- 8.99/20 and below is the mark assigned to low achieving readers/writers.

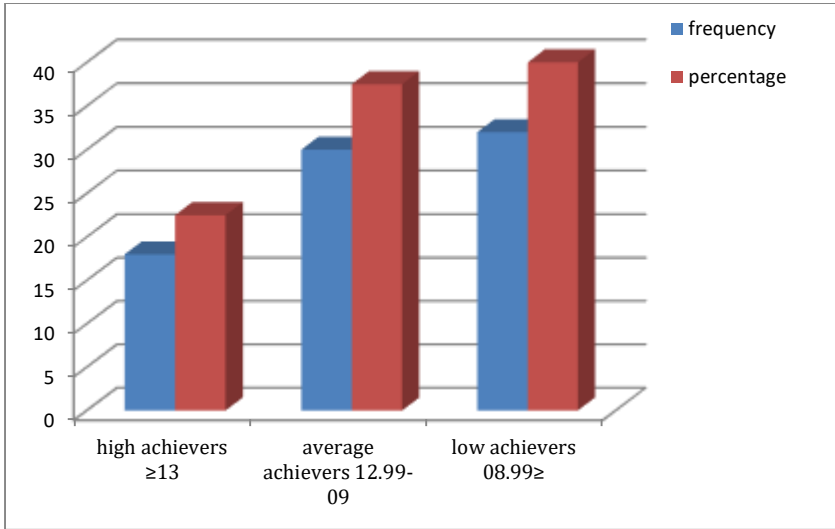
The table below shows the frequency and percentage of each achievement level i.e., high, average and low, among the 80 student participants.

Table 1: Frequency and percentage of each R/W achievement level

Level	Frequency	Percentage
High achievers ≥ 13	18	22.5
Average achievers 12.99-09	30	37.5
Low achievers $08.99 \geq$	32	40
Total	80	100

The graph below demonstrates further the frequencies and percentages of the three different achievement levels of the students.





Graph 1: Frequency and percentage of each achievement level

Both the table above and the graph show that the number of low and average students exceeds that of high achievers. High achievers represent 22.5% whereas average and low achievers are of 37.5 and 40% consecutively.

The second variable of interest in this study is metacognitive monitoring that was measured by the administration of the taxonomy of metacognitive judgments (adapted from Schraw, 2009) to the students in a reading/writing exam setting. The participants attributed their measures of performance in the form of percentages before, while, and after reading and writing. In other words, they made prospective, concurrent and retrospective quantitative judgments.

Monitoring levels before reading and writing

The prospective metacognitive judgments of the participants are demonstrated quantitatively in table 2 below. It concerns the percentages of monitoring selected by students prior to taking the R/W exam. The before R/W exam phase consists of three judgments that refer to the extent to which students:

- Recollect what they learnt in the R/W course
- Think the R/W exam is easy
- Know what the content of the R/W exam is

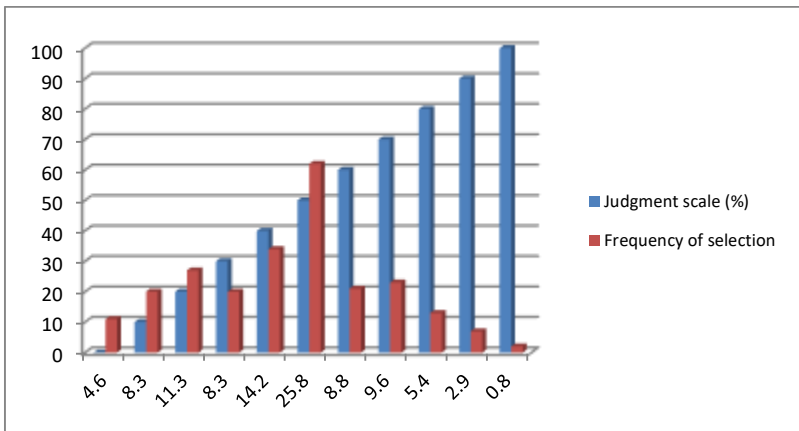


Table 2: Students' metacognitive judgments before the R/W exam

Judgment scale (%)	Frequency of selection	Percentage of selection
00	11	4.6
10	20	8.3
20	27	11.3
30	20	8.3
40	34	14.2
50	62	25.8
60	21	8.8
70	23	9.6
80	13	5.4
90	7	2.9
100	2	0.8

A further presentation of the data obtained from the taxonomy of prospective judgments is provided in graph 2 below:

Graph 2: Students' metacognitive judgments before the R/W exam



What is noticed from the data collected for prospective judgments is that the degrees of knowledge are varied. Yet, it is clear from the table and graph that 25.8% of the participants selected 50% as the degree of their knowledge monitoring prior to the R/W exam. Most judgments are inferior to 50% and few are above.



Monitoring levels while reading and writing

Data gathered for the concurrent judgments are reported in this section. Student participants attributed a percentage to each of the three items related to the while R/W exam performance. The statements refer to the extent to which students:

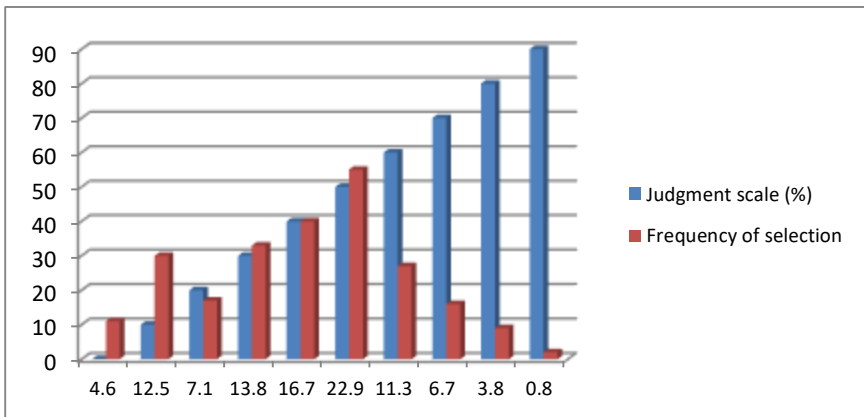
- Feel confident in the R/W exam
- Find it easy to answer the R/W exam questions
- Think they are answering the questions correctly

Table 3: Students’ metacognitive judgments during the R/W exam

Judgment scale (%)	Frequency of selection	Percentage of selection
00	11	4.6
10	30	12.5
20	17	7.1
30	33	13.8
40	40	16.7
50	55	22.9
60	27	11.3
70	16	6.7
80	9	3.8
90	2	0.8

The data obtained for the concurrent R/W exam judgments are further illustrated in the graph below.

Graph 3: Students’ metacognitive judgments during the R/W exam



Both the table and graph display differences in the extent of students' concurrent judgments. However, what is remarkable is that 30% of the participants rated their monitoring of the exam at 50%. The majority of the students stated that they monitor at lower than 50%, the rest reported that they can monitor their knowledge while doing the exam above 50%.

Monitoring levels after reading and writing

As regards the third category of judgments, the participants of the study made retrospective decisions on the extent to which they:

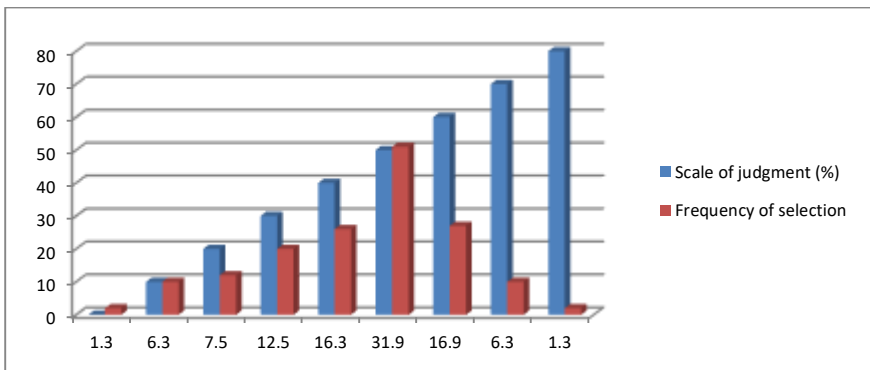
- Think that the R/W exam was easy
- Think they performed well in the R/W exam

The table and graph below present the data collected for retrospective judgments.

Table 4: Students' metacognitive judgments after the R/W exam

Scale of judgment (%)	Frequency of selection	Percentage of selection
00	2	1.3
10	10	6.3
20	12	7.5
30	20	12.5
40	26	16.3
50	51	31.9
60	27	16.9
70	10	6.3
80	2	1.3

Graph 4: Students' metacognitive judgments after the R/W exam



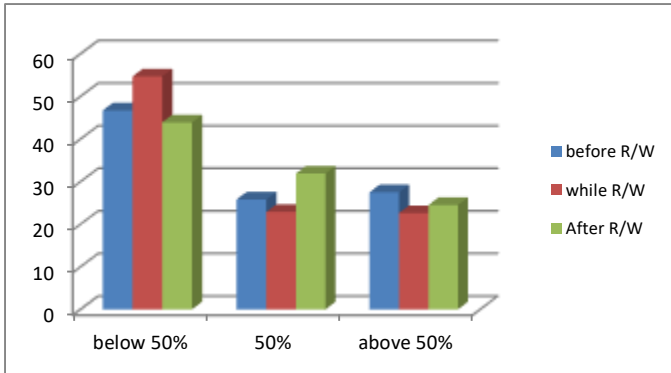
The table and graph show that 32% of the students describe their monitoring of knowledge after the exam at 50% scale. The majority of participants are able to monitor below 50% according to the results presented and the rest (16.9%, 6.3% and 1.3%) at above 50% level.

The sum of judgment percentages in each R/W phase are further presented in the following table.

Table 5: Comparison of monitoring levels in the three R/W phases

Scale	Before R/W	While R/W	After R/W
Below 50%	46.7	54.7	43.9
50%	25.8	22.9	31.9
Above 50 %	27.5	22.6	24.5

Graph 5: Comparison of monitoring levels in the three R/W phases



The table and graph show that students monitor their knowledge at the extent of 50% or less. Lower levels of monitoring are shown above 50%. It is clear from the graph that the majority of students cannot monitor their knowledge beyond 50%.

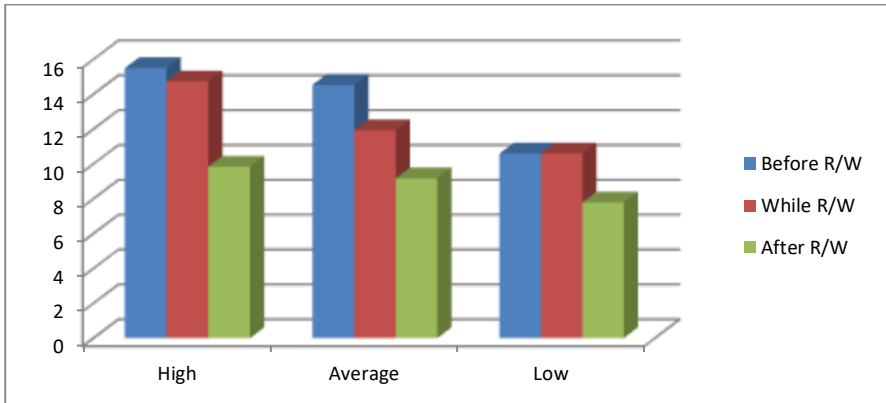
Comparison between high, average and low achievers' metacognitive monitoring

Data obtained from student participants through the taxonomy of metacognitive judgments are presented in three tables. Following the procedure adopted above, the three tables display the means, analysis of variance and significance in this part. The three phases of monitoring (before, while and after) are displayed in relation to each level of achievement.



From the data displayed in the three tables results show different means among the three achievement levels. The means related to metacognitive monitoring in the before and while stages are importantly different among the three levels. Yet they are not considerably distinct among high and average achievers in the after R/W stage but again noticeable compared to those of low achievers. The graph below provides a clear difference among the levels in monitoring.

Graph 6: Mean differences in metacognitive monitoring



According to the means displayed, high achievers monitor more than average and low achievers in the before and while R/W phases. They also monitor more than low achievers in the after R/W phase but monitor at approximately the same level with average achievers in the after R/W stage. Moreover and from the analysis of variance (ANOVA) scores, the variations are significant in the three phases for the three levels since $p \leq 0.05$ as shown in the ANOVA table above. However, the sheffe test determines the alpha level at ≤ 0.05 between high and low achievers in the before and while phases which means that the difference between them is important, yet it is not significant between high and average achievers in the same phases. It is also not significant among the three groups in the after R/W stage as it is ≥ 0.05 . Thus, the null hypothesis that states that 'there is no difference between high, average and low R/W achievers in terms of metacognitive monitoring' is rejected due to the obtained level of significance among the three groups i.e. $p\text{-value} \leq 0.05$.



The relationship between metacognitive monitoring and academic achievement in reading and writing of first and second year undergraduates

Metacognitive monitoring in relation to reading/writing achievement is also presented in this section so as to display the correlation coefficient. This, as justified above, provides an exact statistical result of the overall relationship between the key variables of the study. In the table below, the correlation coefficient along with its significance are provided.

Table 6: Correlation between metacognitive monitoring and R/W achievement

Correlation			
		results	metacognitive_monitoring
results	Pearson correlation	1	,395**
	Sig. (bilateral)		,000
	N	80	80
Metacognitive monitoring	Pearson correlation	,395**	1
	Sig. (bilateral)	,000	
	N	80	80
**. The correlation is significant at 0.01 (bilateral).			

The results show a correlation coefficient of $r=.4$ in the table. This refers to a positive significant relationship given that the significance level is that of ($p \leq 0.01$). Therefore, it is concluded that there is a positive significant relationship between metacognitive monitoring and reading/writing achievement.

Comparison between year of instruction (1st and 2nd) and metacognitive monitoring in reading and writing

After displaying the results of the total sample of 80 students that include first and second year undergraduates in the Department of English, it is important to compare the participants' degree of instruction and their metacognitive knowledge monitoring. This will answer the second main research question of the study and give evidence about the role of year of instruction in relation to metacognitive knowledge monitoring. For this purpose quantitative descriptions are displayed in the table 7 to show the results.



Table 7: Comparison between 1st and 2nd year students' monitoring in reading/writing

	Degree Level	N	Mean	Standard deviation
Metacognitive knowledge monitoring	1st year	50	40,5000	12,44129
	2nd year	30	48,4000	12,49441

For a clearer presentation of the difference between the two years of instruction, Levene test along with the t-test are conducted to calculate the significance of variance between the two levels. This is presented in the table 8 below.

Table 8: significance of variance between 1st and 2nd year students monitoring in reading/writing

	Levene test for equality of variance		t-test for equality of means		
	f	Sig	t	df	Sig (bilateral)
Metacognitive Hypothesis monitoring for inequality of variance	,013	,908	-2,754	78	,008
			--2,752	60,993	,008

The tables reveal that the two levels of instruction i.e. first and second year are distinct in terms of metacognitive monitoring. The mean is higher for second year undergraduates ($M=48.4$) compared to first years ($M=40.5$). As for variance, it is clear from the scores obtained out of Levene and t-tests that the difference is significant given that $p \leq 0.05$ ($\alpha=0.008$).

Therefore, the answer to research question two proclaims that second year students show higher metacognitive monitoring than first year students in reading/writing. Year of instruction then might be an important factor in promoting metacognitive monitoring and this provides an interesting area of investigation since:



‘little research has been conducted on the metacognitive processes related to learning in adults, looking, for example, at those in college or in advanced instructional or training programs, where instructional times less easily accommodates research. Thus, more efficient measures of metacognition are needed not merely to satisfy psychometric standards (although important), but because they would permit research in settings where instructional time is less flexible, such as college classrooms and training courses’.

(Everson; Thobias, 2001, p. 70)

This paves the way to higher education researchers to embark on studies that might provide more evidence for the type of relationship between monitoring and academic achievement. More importantly, the study calls for the investigation of the effect of academic instruction in promoting metacognitive monitoring.

Conclusion

The results pertaining to the monitoring construct of metacognition reveal that high achievers monitor their knowledge more than average and low achievers prior to and while reading and writing. They also monitor more than low achievers in the post reading/writing phase but monitor at approximately the same level with average achievers in the after reading/writing stage. What is important is that the difference among the three levels of achievement in terms of knowledge monitoring is significant.

Furthermore, the results confirm to a large extent the positive relationship between metacognitive monitoring and reading/writing achievement which is the main concern of this piece of research. These findings also demonstrate that metacognitive monitoring as a construct of metacognition is a key determiner of achievement in reading/writing and in academic achievement in general. This is highlighted by research findings which conclude that: ‘The findings of a number of studies indicating that accurate knowledge monitoring was related to achievement in different domains’ and ‘demonstrated the importance of accurate



knowledge monitoring in a variety of school settings' (Tobias & Everson, 2009, p. 123). Thus, the study confirms the association between monitoring and achievement in reading and writing and paves the way to further investigations on the impact of training students in using monitoring skills to enhance their reading and writing. Studies on metacognition as a predictor of academic achievement are scarce especially intervention studies and therefore this paper calls for more research into how metacognitive processes can influence academic attainment at university by using confirmatory/longitudinal studies.

As for the second aspect of this study that targeted year of instruction in relation to metacognitive monitoring, it demonstrated higher metacognitive monitoring of second year students compared to their first year counterparts. This suggests the need to address the effect of university instruction on metacognitive development in general and monitoring in particular.

In light of these results, researchers have considered the power of metacognitive skill instruction. They gave evidence that instruction in metacognitive development can assist students with the reading and writing skills necessary for independent learning at university. Teaching metacognitively develops knowledge of cognition and also regulation of study.

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