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# The Effectiveness of Metacognition on Academic Achievement among the Jordanian Universities Students

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## Abstract

The study aimed to investigate the effect of the metacognition on academic achievement among the Jordanian universities' student. The sample consisted of (440) first academic year students in the faculty of education. This study follows the quantitative study approach. The study employed the Stratified Random Sampling and Simple Random probability sampling techniques. The results showed a level of students was a moderate generally in their metacognition level, results also showed a significant difference between the degrees of students with high achievement on the test compared with the degrees of students with moderate and low achievement, there is a significant difference in the achievement metacognition level of male and female. The mean level of females is higher than males. Metacognition dimensions had a positive predictive effect on academic achievement among the Jordanian students in their first academic year. According to these findings, the study recommended activating the blended learning strategies in teaching at universities.

**Keywords:** Metacognition, Academic Achievement.

## Introduction

The fact that education has a significant role in reducing the weakness of the educational attainment of the students, and education for proper education is those that combine the individual and social goal, which develops the individual to strengthen the goals and objectives of the good community (Tamimi, 2011). Studies have continued to be improved upon by studying the joint effect of predictor variables which this study is one of such. Age has played a considerable part as regards to education; Gender is the properties that distinguish the organism on the basis of their reproductive roles as female or male Abubakar and Uboh (2010).

In the learning process, metacognition, cognition, Meta-comprehension, Thinking, problem-solving, learning, acquiring and employing these strategies are productive and effective, they worked for many researchers, especially cognitive psychologists. A number of studies dealing with this modern type of strategies and their repercussions on the educational process continued to keep abreast of the development. Researchers in the field of cognitive and pedagogical psychology have been increasingly interested in seeking better methods that support the success of the educational process that is the cornerstone of building nations. In addition, researchers have been researching and using modern strategies to increase the effectiveness of education and learning on student's life and his/her knowledge in various teaching subjects. In this aspect, a confirmed group of researchers studied the importance of thinking beyond knowledge and the use of his theories in this area (Coutinho, 2007).

Even though this research puts into questions whether gender differences still exist in academic achievement, many researchers are still finding differences in performance as well as general interest in areas related to math and science and education. Separately, the examinations of gender and achievement differences in motivation have histories that span at least three decades (Darensbourg & Blake, 2013). The Important of this study comes to discusses the differences of the academic achievement among the Jordanian universities students according to gender and metacognition in the first academic year and how we can predict by their academic achievement depending on their metacognition there are inconclusive results over which individual factors successfully predict academic performance, elements such as metacognition, motivation, test anxiety, environment, cognition, intelligence, and emotions require consideration when developing models of academic achievement. In addition, the questions of what skills are the most strongly associated with academic learning (metacognition or motivation), this study examines the predictive validity of a measure of metacognition components tasks in academic achievement. We used random effect models and fixed effects models to examine the predictive relations of academic outcomes during the first academic year (Tompsonowski, et al, 2015).

The attention has been paid to teaching higher thinking skills as tools that enable the individual to pursue these changes. Teaching thinking skills is an important educational objective of the educational system. Most researchers believe that the teaching of thinking skills and processes is straightforward regardless of the content of the subjects, while others have suggested that these skills and processes can be integrated into the content of subjects and as part of the teacher's plans and lessons.

### **Study Problems**

Some gaps were spotted in the existing literature. Thus, there is a lack of research on the role of metacognition and motivation as factors could be an effect on academic achievement. However, a majority of studies focused on this topic are confined to one dimension of motivation in terms of the effect on achievement and the metacognition has been measured in general case, in the area of Jordan never these factors were taken in a group to examine any direct effect on academic achievement in one group. Therefore, the outcomes are still ambiguous and unsatisfied especially in the first academic year as it is. More specifically, this study aims to provide viewpoints and empirical outcomes to shed light on this topic.

Depending on the above- mentioned and through the deliberation of the research noticed, it becomes clear that gender differences extent and effect of motivational attributes amongst

students exist and in other studies not exist. However, due to the inconsistencies in prior findings, it is still unclear which factors are associated with academic outcome in male and female undergraduates. Moreover, although the effect of motivational attributes on academic achievement has been previously explored, much research does not simultaneously investigate attributes external to these set categories to obtain a more comprehensive understanding of the gender differences in motivation. Pirmohamed, et al. (2017).

Low levels of cognitive perception in its comprehensive sense and motivation are considered the main reasons for academic failure, which is one of the biggest educational problems experienced by Arab nations, especially in Jordan (Sawalha & Alomari, 2013; Mahasneh, Al-zubi and Bataineh, 2013; Tweissi, Ababneh and Lebdi (2014). Methods used in both these studies were applied on Jordanian university students and found that students were weak in academic achievements, especially first-year students. It was recommended that more studies be conducted on academic achievement and choosing of appropriate strategies for overcoming weak academic achievement as there was a lack of studies dealing with this issue. Results showed that most first-year college students lacked metacognitive strategies since they did not know how to listen well, make notes on what they hear, read comprehensively, or write referentially (all of which are skills that lead to academic success). Studies found that "many college students have difficulty in figuring out right learning strategies. Even after the instructor adopted good instructional practices aimed at helping students learn content-specific information, learning might not fully occur unless a student learns to monitor his or her own learning (Erskine, 2010). Meanwhile, first-year students were found to experience considerable stress compared to students in other schooling years (Sawalha & Alomari, 2013; Mahasneh, Al-zubi & Bataineh 2013; Bayram & Bilgel, 2008; Dahlin, et al, 2018). In this context, the researchers felt the need to investigate the correlation between metacognition and academic achievement (Aljaberi & Gheith, 2015).

### **Literature Review**

The researchers noticed that most of the previous researchers focused on measuring the strategies of metacognition, not the metacognition as one unit. Prior to carrying out this study, a thorough investigative literature review was conducted which revealed that some of the research conducted so far has not been predominantly carried out by researchers from the education field. Consequently, the current study assumes that, of the research conducted, little has been conducted by experts of the metacognition field particularly in the low academic achievement at public universities in Jordan. Hence, it is anticipated that the current research will establish the platform for a research agenda that will reveal valuable insights into a whole systems approach to higher education institutions. Besides, another speculation of this work is that to know how metacognition effect on academic achievement among the student in the first academic year will result in the organizational improvement and change that will help sustain and grow these institutions well into the 21st century

Deepika & Sushma (2018) investigate the relationship between motivation, self-concept and academic achievement. In addition, late childhood school student's differences between self-concept, motivation and academic achievement were investigated. The study utilized a

quantitative conceptual study. The study found that there were significant correlations between self-concept, motivation and academic achievement of late childhood school students. It was also found that female students are significantly more motivated than their male counterparts. The study concluded that the findings justify the importance of self-concept and motivation to academic achievement, and some recommendations were made regarding the enhancement of motivation and self-concept of late childhood school students. Ramlan & al-Shar'ah (2016) aimed to trace the influence of using some metacognitive strategies in improving reading comprehension on the conclusion and application levels among non-Arabic speaking students in Malaysian universities, The researchers made use of quasi-experimental method to suit with the nature of the study, The sample consists of 52 students from first year students of The Islamic Sciences University Malaysia selected purposefully for the objective. They were divided into two groups: 26 students for the experimental group and the other 26 for the control group. The former was exposed to teaching with metacognitive strategies while the latter was taught ordinarily. The researchers had designed a teaching manual and assignment papers according to the meta cognitive strategies. An examination was deployed to measure the reading comprehension on the literal, conclusion and application levels. The results showed significant difference of  $\alpha=0.05$  in two levels: literal and interpretation that correlates with the metacognitive strategies applied on the experimental group.

Ünal (2010) examined the relationship between the meta-cognitive learning strategies and academic success of university students was examined. The data of this study were gathered from randomly chosen undergraduate students who have been studying at Ahi Evran University which is the restricted universe of the study, in the first term of 2009-2010 academic year. Randomly chosen 230 students from different departments of Ahi Evran University were included in the sample of the study. "Metacognition Awareness Inventory" developed by Namlu (2004) that is a survey instrument including 4 components of meta-cognition, 21 items, was used to collect data. The alpha coefficient of the scale was calculated as 0,827. On the other hand, the grades of students in the courses were taken as the data for students' academic success. The data were analyzed by using frequencies, percentages, t-test and one way ANOVA with the help of SPSS 15 package program. The results showed that there is a significant difference between the metacognitive strategies of students and on their gender, the difference is in favor of female students, there is a significant difference between the academic success of students and their gender. The difference is in favor of female students. There is a significant difference between the meta-cognitive strategies of students and their department. The students in Classroom Teacher Training Department have higher meta-cognition than the students in Science Teacher Training, Marketing, and Electricity Departments. There is a significant difference between the meta-cognitive strategies of students and their average grades of last term courses. The difference is in favor of the students who have higher grades from applied meta-cognition awareness inventory. There is a significant difference between the meta-cognitive strategies of students and their cumulative academic grades in general. The difference is in favor of the students who have higher grades from applied meta-cognition awareness inventory.

Gbari & abu-shairh, (2010) aimed to reveal the level of use of Alzarqa Private University students for special metacognitive processes, reading comprehension of foreign texts, and aimed at detecting differences in the use of these processes according to the gender variables



School year and college. The sample of the study consisted of (242) students from different disciplines of the university were selected from Four people from the English language course responded to the scale of meta-cognitive processes. The results have shown that students the students of university use meta-cognitive processes of reading comprehension weakly, that they cannot understand texts. And the results showed that there were no statistically significant differences in the degree of use of metacognitive processes Of the reading comprehension was due to gender or college, while the results showed that there are significant differences in the degree of use Meta-knowledge processes of reading comprehension are due to the variable of the school year; students were the fourth year most Use of such operations. In light of these findings, the researchers recommended several recommendations.

Rababah, et al., (2011) identify the degree of acquisition of secondary school students in Jerash governorate, of the skills of knowledge and its relationship to the gender variable, specialization, and academic achievement. The study sample consisted of 380 male and female students from the secondary school of Jerash in Jordan. The results indicated that students acquire intermediate knowledge skills there are no statistically significant differences in students' acquisition of knowledge skills due to the gender variable and the academic specialization. There are statistically significant differences in students' acquisition of meta-knowledge skills due to academic achievement.

This study primarily aimed to explore the effect of metacognition on academic achievement among the Jordanian universities students in the faculty of education to provide insight into the about the level of the students in their metacognition and academic achievement, to examine if there are any significant differences between the students in their metacognition and motivation depending on gender and to examine what extent the significant contribution in metacognition on academic on academic achievement. In essence, this study was urged by the recent findings on weak academic achievement to know the reasons sand up behind this problem. this makes this study different from other studies we mentioned above.

### **Research Objective**

From the foregoing section, various issues and challenges relating to the effects of metacognition on academic achievement among universities student in Jordan. These issues are summarized and translated into objectives.

The current study aims to evaluate the level metacognition, examine the differences in gender and to identify the contribution of metacognition on academic achievement among the student at Jordanian universities in the first academic year. This is possible through a designed questionnaire distributed to students with the view to determining the student perceptions about metacognition and how its effect on academic achievement.

### **Research Hypotheses**

Ho1: There are no any significant differences between male and female students in their metacognitive.

Ho2: There are no any significant relationship between students metacognitive and their academic achievement.

### **Research Significance**

The significance of this study lays in its examination the effect role of metacognition on academic achievement among the students in the first academic year in the faculty of education in Jordan universities. Also, to examine the level of the students in metacognition on academic achievement, and to identify if there are significant differences in metacognition on academic achievement do exist among the students according to gender in the first academic year. This represents an important step in motivational and metacognition literature, if they are found will be illuminated by within-group comparisons, not an across-group comparison. Additionally, the aim of this study is to examine the perception of the students towards metacognition practices and to determine whether or not of these theories practices lead to enhance academic achievement and improved student's competence.

This study's scope is confined to the students in the first academic year of Jordanian universities (Al-Yarmouk, Al-albeit, Al-Tefillah and University of Jordan). The population of this study contains students from one main faculty (faculty of education), which consist all of the fields of education to obtain empirical evidence on the role of metacognition and motivation on academic achievement and the relationship between metacognition.

### **Size of Sample**

The sample size for this study consists of 384 respondents selected from the target population of 3,500 and it was calculated according to a table developed by Krejcie and Morgan (1970). However, the sample size can be increased to 440 respondents to avoid any bias or ambiguity. The study employed the Stratified Random Sampling (proportional random sampling techniques) and Simple Random probability sampling techniques. In Stratified Random Sampling or proportional random sampling technique, the number of samples will be divided according to the number of students from each university to determine the exact number of questionnaires to be distributed. Thus, after the division process, this study will employ a simple random technique. In simple random sampling, every sample in the population has a known and equal chance of being selected as a subject (Alvi, 2016).

### **Study Instruments**

The questionnaire was the instrument used for collecting data and were separated into two parts. Part (A) has captured information about metacognition, while Part (B) has captured the respondent's Grade Point Average (GPAs) and information about the respondents. The participants completed a scale about their perceived use of metacognition. The motivation was measured using the MC5 scale. Each measure was modified to address questions of perceived metacognition in four different universities subjects in the faculty of education. The answers given to corresponding questions for each subject were compared to identify the degree of generalizability across domains; Responses to each question were reported using a five-point Likert scale, ranging from "Never" to "Always" for metacognition scale, the respondents were asked to indicate the extent to which they agree/disagree with the statements.

### **Metacognition Scale**

The metacognition scale is consist of three parts as shown in the table above the first part is Regulation of Cognition and it's consist of 19 questions, the second one its knowledge of

Cognition consist of 12 questions and the last one is Cognition Processing and consist of 11 questions.

Table 1.1 Instruments of the Metacognition Questionnaire

S/N	Dimensions of metacognition	Number Of Questions	Source
1	Regulation of Cognition	19	Adjusted by Abdelnaser Al- Jarrah and Alaa Addeen obeidat (2011) created based on Schraw Dennison (1994)
2	Knowledge of Cognition	12	
3	Cognition Processing	11	

The researcher's Obidat and Al-jarrah 2009, they translated the scale was created based on Schraw Dennison (1994), into the Arabic language to be suitable for their study. Translation of the Instrument into the Arabic Language is an important step before conducting or carrying out the main study, especially when the research is conducted across different cultures. A researcher must take into consideration serious steps for translating the instrument (questionnaire) in order to make sure that the respondents understand every single question, because each culture may have its own interpretation. This point may indicate that research must make sure the cross-cultural respondents understand the exact meaning for every single item in the questionnaire.

#### Validity of Metacognition Scale

Validity is defined as the extent to which a concept is accurately measured in a quantitative study. The second measure of quality in a quantitative study is reliability or the accuracy of an instrument. In other words, the extent to which a research instrument consistently has the same results if it is used in the same situation on repeated occasions. It's important to consider the validity and reliability of the data collection tools (instruments) when either conducting or critiquing research.

The first category is content validity. This category looks at whether the instrument adequately covers all the content that it should with respect to the variable. Where all the questions of the scales which were addressed in the current study were taken from previous studies, these questions were stated as reliable and valid to measure constructs of the phenomenon that they intend to investigate. They were taken from the previous literature which shared and measured the similar context of the current research. This may provide more validity of the items used in this study. The researcher requested six academic staff from Al-yarmouk University faculty of education to re-revision the scales to ensure its fit for this study all answers were the scales are fit for the current study.

#### Reliability of Metacognition Scale

Cronbach's  $\alpha$  is the most commonly used test to determine the internal consistency of an instrument. In this test, the average of all correlations in every combination of split-halves is



determined. Instruments with questions that have more than two responses can be used in this test. The Cronbach's  $\alpha$  result is a number between 0 and 1. An acceptable reliability score is one that is 0.7 and higher.

Table (1) shows the Cronbach' Alpha value which rang (0.68 – 0.86), and total questionnaire items was (0.92), this indicate to acceptable Cronbach' Alpha value for each domain, whenever Cronbach' Alpha value is acceptable if it's more than (0.60).

**Table (1) Cronbach' Alpha value for each domain**

Domain	Cronbach' Alpha value
Regulation of Cognition	0.86
Knowledge of cognition	0.84
Cognition Processing	0.68
<b>Metacognition scale</b>	<b>0.92</b>

### **Pilot Study**

The first draft of the questionnaire went through many revisions to rectify problems and clarify ambiguities. It was crucial to conduct the pilot test using data collected from a sub-set of the participants to test measurement validity and reliability as asserted by Sproull (2002). A pre-test uses a small number of respondents to test question appropriateness and veracity before it is administered to a large number of respondents (Awang, 2012). Consequently, pre-test validation of this study's questionnaire was first ensured by consulting six academicians in the al-Yarmouk University who experts in the study area. Then, the pilot test was administered to respondents from the same population of the study from which the real data was collected (Bradburn, 2004).

A pilot test was carried out to tweak measurements prior to distribution to the study respondents to collect data, rephrase ambiguous questions, decide on the time required to respond, and arrange questions from easy to difficult and to measure the reliability and validity of the measurements used. The phases involved in the pilot test are explained in the following sections along with the source of the gathered data.

### **Procedures of the Pilot Study**

A pilot study is a term used to describe a process by which feasibility study or trial-run is conducted in preparation for the full-scale study. A pilot study is considered a crucial element of good study design. Though the pilot study itself cannot guarantee the attainment of a successful full-scale study, it does increase the likelihood that the main study is effective. Anderson (2013) strongly advises running a pilot study to ensure effective instrument design, as an inappropriately designed survey or instrument is likely to generate data that will be of little value. Aside from developing and testing the adequacy of a research instrument, a pilot study would also be able to assess the feasibility of a full-scale study.

The pilot study was conducted at the three public universities of Jordan which are Hashemite University, Al-Balqa Applied University, and Mu'tah University. Self-administered questionnaires were used to collect data in which the respondents were asked to complete the survey on their own. 60 questionnaires were distributed to sample students at Jordanian

universities. The questionnaire took an average of 15 minutes to 20 minutes to complete, which was considered reasonable.

As this was a preliminary study, a random sampling technique was used where the researcher distributed and collected the questionnaires by hand. From the total number of distributed questionnaires, 45 were retrieved, and from this retrieved number of questionnaires, 5 of the respondents didn't complete their questionnaires. Therefore, the total remaining completed questionnaires numbered 40, representing a rate of response of 80%, and this number of questionnaires was deemed ready for Exploratory Factor Analysis. These participants were not included in the final study sample. If the same participants were used then this could decrease study reliability and validity, as they would have already seen and responded to the questionnaire (Kutaula, 2014).

Feedback from the respondents of the pilot study revealed the need for little instrument improvement. The respondents also provided feedback on the adequacy of the range of responses provided in the pilot questionnaire. A further check on the provided responses enabled the author to re-word or re-scale specific questions that were not answered as expected. As a result of the feedback, we were able to amend errors and shorten, revise, and improve the measurement instrument (questionnaire) until no further amendments were deemed necessary. Prior to administrating the finalized questionnaire to the intended respondents, there was a need to determine the size of the sampling frame, sampling units, and sample elements.

### Results and Discussions

To answer the first research question with its corresponding objectives by the means and standard deviations. The results are presented in Table 1.3 as follows

What is the metacognition level among Jordanian university students?

**Table Error! No text of specified style in document..2: Descriptive of Metacognition and its Dimensions**

	Mean	Std. Deviation	Percentage
<b>Cognition Processing</b>	<b>3.3092</b>	<b>.67239</b>	<b>66.184</b>
<b>Cognition Knowledge</b>	<b>3.2473</b>	<b>.77892</b>	<b>64.946</b>
<b>Cognition Regulation</b>	<b>3.2832</b>	<b>.74280</b>	<b>65.664</b>
<b>Metacognition</b>	<b>3.2799</b>	<b>.73030</b>	<b>65.598</b>

Metacognition perceptions of the students are measures by using 42 questions in Likert-5 style. In addition the questions are asking about three dimensions of metacognition, regulation by 19 questions, knowledge by 12 questions, and processing by 11 questions. Figure 4.8 shows info graphic of metacognition and its dimensions and Table 4.3 shows the related descriptive scores. Students' perception of metacognition is moderate satisfaction

with score of 3.28 (66%). In addition the three dimensions are within the moderate satisfactory level with rates between 65% and 66%.

The study justifies that there are Possible factors, for instance, the different levels of difficulty in the courses taken at different academic years perhaps could lead to a slightly lower total average marks. These results also suggest that metacognitive awareness tends to increase with academic years. The female's students tend to have higher scores for metacognitive knowledge, metacognitive regulation, and also in overall metacognitive awareness than males students. Perhaps awareness is the factor here because generally students' experiences and maturity are an increase in line with their interests.

the moderate level students could have become more aware of their self-responsibility in their own learning process, and therefore become more self-regulative- that is better at planning the best strategies for learning, better at monitoring their progress in learning and most importantly become aware of the importance of evaluating what how they have been doing so far, how should they improve, and why they should improve to be not only to be a highly academic achiever but perhaps most important, useful and meaningful is for them to become better in metacognition learner, which became part of the public education process in which the learner acquires efficiency through exposure to a wide range of positions of education, it is not taught skills and strategies directly, but they show through the experiences of each learner support received from professors and content that is exposed to it. Findings assert the importance of metacognition in learning. It recommends that college professor have to adopt teaching technique and strategies in presenting information to students in a way that encourage the use of metacognitive skills that has an effective impact on the academic achievement and teaching performance.

### **Independent Sample T-Test for MetaCognition and Gender**

The Independent Samples t-Test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. The Independent Samples t Test is a parametric test. The Independent Samples t Test can only compare the means for two (and only two) groups. It cannot make comparisons among more than two groups. The assumption is "H0: there is equal variance between group 1 and group 2", and the rule of thumb stated that if Levene's Test score is rejected ( $p\text{-value} > 0.05$ ), H0 is rejected and there is differences between mean scores. In addition the p-value score of t-test must be significant ( $p\text{-value} < 0.05$ ) to approve the differences between mean scores (Hair et al., 2016).

Info graphic of the relation is proposed in Figure 4.11, in which gender two groups could be different for metacognition, regulation cognition, knowledge cognition, and process cognition. As seen in Tables 4.6 and 4.7, this study found that male group participants had statistically significantly lower metacognition ( $3.10 \pm 0.69$ ) based on their answers of the survey compared to female group ( $3.46 \pm 0.72$ ),  $t(438) = 5.383$ ,  $p = 0.000$  and Levene's test score confirm the result with a rejected  $p\text{-value} = 0.807$ .

Table **Error! No text of specified style in document.**.1: Independent Sample T-test of Gender – Metacognition Relation

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Metacognition	.060	.807	-5.383	438	.000	-.36344
Cognition Processing	.017	.897	-5.341	438	.000	-.33214
Cognition Knowledge	.527	.468	-5.260	438	.000	-.37932
Cognition Regulation	.024	.877	-5.527	438	.000	-.37886

Table Error! No text of specified style in document..2: Mean Values of Metacognition based on Gender

	Gender	N	Mean	Std. Deviation
Metacognition	Male	220	3.0982	.69304
	Female	220	3.4616	.72282
Cognition Processing	Male	220	3.1431	.64091
	Female	220	3.4753	.66341
Cognition Knowledge	Male	220	3.0576	.72747
	Female	220	3.4370	.78403
Cognition Regulation	Male	220	3.0938	.71492
	Female	220	3.4726	.72305

For cognition processing, this study found that male group participants had statistically significantly lower cognition processing ( $3.14 \pm 0.64$ ) based on their answers of the survey compared to female group ( $3.48 \pm 0.66$ ),  $t(438) = 5.341$ ,  $p = 0.000$  and Levene's test score confirm the result with a rejected p-value = 0.897.

For knowledge cognition, this study found that male group participants had statistically significantly lower knowledge cognition ( $3.06 \pm 0.73$ ) based on their answers of the survey compared to female group ( $3.44 \pm 0.78$ ),  $t(438) = 5.260$ ,  $p = 0.000$  and Levene's test score confirm the result with a rejected p-value = 0.468.

For regulation cognition, this study found that male group participants had statistically significantly lower regulation cognition ( $3.09 \pm 0.71$ ) based on their answers of the survey compared to female group ( $3.47 \pm 0.72$ ),  $t(438) = 5.527$ ,  $p = 0.000$  and Levene's test score confirm the result with a rejected p-value = 0.877. Based on the above discussions, metacognition, regulation cognition, knowledge cognition, and process cognition have mean value differences based of the gender of the students. Hypothesis "Ho1-there is no significant difference between male and female students in their metacognitive" is rejected.

**Hypothesis 1: There is no significant difference between male and female students in their metacognition.**

My first hypothesis was partially not supported; the four research question focuses on the investigation of the differences between genders in their metacognition. An Independent samples T-test was conducted to compare participants of male and female students in their metacognition including students from all grades. There was a significant difference in metacognition between female and male participants.

This relationship was addressed in proposed hypothesis H1 and according to the findings; there was a significant relationship between the male and female in their metacognition, that shows reject the hypothesis. This result is not aligned with that. However, I found that girls scored higher in metacognition than boys in the faculty of education, showing an overall gender effect rather than the gender-by-domain interaction. An interaction of gender-by-step was also observed, as females scored higher than males.

There has been little to no research evaluating whether gender differences in metacognition are consistent across domains. Though I anticipated that boys and girls would differ in overall metacognition across domains, no previous research has indicated gender effects on theories of metacognition across domains, so I predicted that boys and girls would not differ in terms of whether they adopted a domain-general or domain-specific approach to metacognition. This hypothesis was also supported, as boys and girls were both shown to adopt a domain-general approach to metacognition, meaning that though boys and girls differ in their use of metacognitive skills, the skills each gender tends to use remain consistent across school subjects. The reasons behind that refer to the girls may be more reflective on their learning strategies and are thus more aware of their metacognitive skill use than males. As a result, males and females may both use metacognitive skills to the same degree but females may be more aware of their use of such skills, thus reporting higher scores than males. The girls scored higher in metacognition than boys in social studies.

The differences in the findings of the current study could be due to the various social environments, which could affect what experiences individuals may have acquired and the way they learn, which calls for further research this result could be also because of the way learning environments are organized and the way some factors affecting metacognition are applied not similar. Research of Okcu and Kahyalioglu (2007) support this research finding, while that of Bedel and Cakir (2013) and Coban (2012) do not. In addition, metacognition skills differ according to the number of books they read a month. Considering that the reading habit develops metacognition (Ozbay & Bahar, 2012), metacognition skills differ also according to whether or not they take lessons on learning strategies. Using learning strategies can be dependent on metacognitive skill development (Hoskins & Fredriksson, 2008; Senemoglu, 2012).

However, I found that girls also scored higher in metacognition than boys showing an overall gender effect rather than the gender-by-domain interaction. As girls scored higher than boys in Assessing the Task, Planning, Applying Strategies and Monitoring Performance, and Reflecting and Adjusting. There was no difference between boys and girls in Evaluating Strengths and Weaknesses.



These results support previous trends that boys and girls differ in their use of metacognition, and support the findings of Bidjerano (2005), Zimmerman and Martinez-Pons (1990), and Liliana and Lavinia (2011) that girls are higher than boys in multiple dimensions of metacognition. The current findings were consistent with those of (Aljarah & Obeidat, 2011), as they showed statistically significant differences based on the variable of sex in metacognitive thinking, in favour of females; our findings are also consistent with those of (Yunus& Ali, 2008) which showed that female students have a higher level of metacognitive thinking compared to male students. also, these results consistent the findings of (Sabatin, 2006), which showed that some differences exist based on gender in the evaluation factor in favour of males, and planning, in favour of females, which could be due to the difference in age groups.

Results of this study are inconsistent with the results of some previous studies regarding the level of metacognitive thinking through the three factors such as (Yunus& Ali, 2008) which showed high metacognitive thinking levels in the following factors: Debugging, Managing & Conditional knowledge in comparison with Procedural knowledge, Monitoring, Planning & Declarative Knowledge. It also is inconsistent with the study conducted by (Aljarah and Obeidat,2011), which showed that the level of metacognitive thinking of the students was higher

### One-way Annona for Metacognition and Grade

The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of two or more independent (unrelated) groups (although you tend to only see it used when there are a minimum of three, rather than two groups). To assure the existence of differences between mean values based of the control variable p-value must be less than 0.05. In addition Post Hoc results must be reported. Recall from earlier that the ANOVA test tells you whether you have an overall difference between your groups, but it does not tell you which specific groups differed – post hoc tests do. Because post hoc tests are run to confirm where the differences occurred between groups, they should only be run when you have a shown an overall statistically significant difference in group means (i.e., a statistically significant one-way ANOVA result).

Info graphic of the relation is proposed in Figure 4.11, in which categories of grade could be different for metacognition level. Table 4.10 show the frequencies of metacognition based on three level categories, low, medium, and high. The majority have high metacognition with score of 45.9%, followed by Medium (43.9%), then low (10.2%).

Table **Error! No text of specified style in document.**3: Frequency Distribution of Metacognition

		Frequency	Percent
Metacognition	Low	45	10.2
	Medium	193	43.9
	High	202	45.9
	Total	440	100.0

Table Error! No text of specified style in document..4: One Way ANOVA of Cognition – Grade Relation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	220.318	2	110.159	166.893	.000
Within Groups	288.446	437	.660		
Total	508.764	439			

Table Error! No text of specified style in document..5: Post Hoc Tests of Metacognition – Grade Relation

Dependent Variable: Grade					
	(I) MetaCognition_Categories	(J) MetaCognition_Categories	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	Low	Medium	-.474*	.134	.001
		High	-1.778*	.134	.000
	Medium	Low	.474*	.134	.001
		High	-1.304*	.082	.000
	High	Low	1.778*	.134	.000
		Medium	1.304*	.082	.000
Bonferroni	Low	Medium	-.474*	.134	.001
		High	-1.778*	.134	.000
	Medium	Low	.474*	.134	.001
		High	-1.304*	.082	.000
	High	Low	1.778*	.134	.000
		Medium	1.304*	.082	.000

As seen in Tables 4.11 and 4.12, there was a statistically significant difference between metacognition groups as determined by one-way ANOVA ( $F(2,437) = 166.893$ ,  $p = 0.000$ ). A Tukey post hoc test revealed that score was statistically significantly higher for high-metacognition ( $1.778 \pm 0.134$ ,  $p = 0.000$ ) and medium-metacognition ( $1.304 \pm 0.082$ ,  $p = 0.000$ ) compared to low-metacognition ( $0.474 \pm 0.134$ ,  $p = 0.001$ ). There was statistically significant difference between the high-metacognition and medium-metacognition groups ( $p = 0.000$ ).

Based on the above discussions, grade values have differences based of the metacognition level of the students. Hypothesis "Ho3: there is no significant difference in the relationship between students metacognitive and their academic achievement." is rejected.

The results of this study revealed that metacognition has a significant joint effect on the academic motivation of university students; that is, mastery goals and metacognition have the capacity to predict the academic motivation of university students.

In sums, findings of the present study provide significant information about the concept of metacognition in learning and its relationship with students' academic performance. Overall results showed metacognition and students' academic performance were correlated, and metacognitive regulation rather than metacognitive knowledge was found to be highly related to students' academic performance. Significant differences were observed in metacognition awareness between students, but yet on gender differences, the results showed no clear advantage of any particular gender over the other ones.

Metacognition is very important in one's learning. The use of metacognitive strategies ignites one's thinking and can lead to more profound learning and improved performance, especially among learners who are struggling. These metacognitive strategies can be developed in oneself. Students who are aware of their own cognitions or thoughts processes will be more responsible for their own learning processes. These are some practices or metacognitive activities students should do to develop their metacognition: 1) talking about thinking, 2) keeping a thinking log, 3) identifying "what you know" and "what you don't know", 4) Planning and self-regulation and 5) self-evaluation. Talking about thinking is similar like thinking aloud, in which students verbalize and internalize their thoughts to themselves.

This technique is best practised in small groups, where students can take turn asking questions, clarifying and summarizing the topics being studied. When one student talks through a topic, he actually describing his thinking processes to himself and to his peers. Developing metacognition through a thinking log involves students making self-reflection upon their own thinking or thoughts and its progress. Teachers can very much help on this by asking students to write a reflection on what they have learnt, the things they understood and the things they do not understand on the day itself. The third practice is students should identify what they know and what they do not know at the beginning of any new topics learnt and this can be done via self-asking approach at the beginning of any classes. The purpose is so that the students can make conscious decision about their role as a learner, in particular for the purpose of that specific topic/course and as well as, about their existing knowledge on the topic/course they are currently undergoing – things such as what they already know, and what they want to learn about from that class. This session is important because it acts as the first step to develop metacognition skills in our students. The fourth and fifth practices basically complement each other. Planning, self-regulation (monitoring) and self-evaluation as mentioned earlier in the literature are very important to ensure successful learning. This finding is consistent with other research findings (Coutinho, 2007; Mohsenpour, Hejazi & Kiamanesh, 2008; Oguz & Ataseven (2015); Akpur (2017); Çetin, (2017). Rezvan, Ahmadhi, and Abedi, 2006; Ponnusamy, 2002; Dunning, Johnson, Ehrlinger and Kruger, 2003; Kocak and Boyaci, 2010).

### **Conclusion**

The objective of this study was to investigate the effectiveness of metacognition on academic achievement among the students in the first academic year of public universities in Jordan

(faculty of education). Nevertheless, the present study confirms the fundamental role of students in metacognition in the process of treatment for weak academic achievement early in the first academic year, while adding some new features. The first is methodological, as this is the first study to feature a longitudinal analysis of the effects of metacognition on academic achievement and to examine the relationship between gender and metacognition among the students in multi universities in Jordan. The second is that for the first time one of the important educational relations with the main theoretical determinants—metacognition thereby providing an empirical contribution that can confirm the theoretical predictions based on one of the models that have been shown to have the greatest heuristic value in academic achievement.

Overall, this study has made a significant contribution to the understanding of academic achievement by examining the impacts of types of metacognition on academic achievement among the students in Jordanian public universities. The results highlighted the influence of metacognition on academic achievement in Jordanian public universities. Furthermore, this research will serve as a base for future research on the different impacts of metacognition on academic achievement specifically in Jordanian public universities.

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