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Relationship Between EFL Students' Use of Cognitive Strategies and their Class Level and Grade Point Averages

Abeer Hameed Albashtawi
Luminus Technical University College, Irbid, Jordan, *abeerbashtawi11@gmail.com*

Omer Hassan Ali Mahfoodh
Corresponding author, School of Languages, Literacies and Translation, Universiti Sains Malaysia, 11800 Penang, Malaysia, *omer@usm.my*

This study examined the frequent cognitive strategies used by Jordanian undergraduate EFL students and how these cognitive strategies are related to students' class levels and Grade Point Averages (GPAs). The study used the quantitative research design. Sixty-two EFL students in an academic reading course at a public university in Jordan were randomly selected to respond to a questionnaire which was adapted from Oxford (1990). Data were analysed using descriptive statistics, independent samples t-test, One-Way ANOVA, and Scheffe test. The study revealed that the top four frequent cognitive strategies used by EFL students are inferencing, prediction, elaboration, and paraphrasing. In other words, this study revealed that these cognitive strategies are useful techniques for EFL students to use in academic reading courses. The study also showed that there are no significant differences between students' use of cognitive strategies and their class level. In addition, One-Way ANOVA and Scheffe tests revealed that there are significant differences between three cognitive strategies which are sounds, prediction, and paraphrasing and students' GPAs, in favour of students with excellent GPAs. Thus, in EFL contexts, teachers of academic reading courses need to train students to use cognitive strategies effectively for better academic reading comprehension. This can be enhanced through designing reading activities and tasks that should involve the use of cognitive strategies in order to help EFL students practice these strategies.

Keywords: cognitive strategies, academic reading, class level, GPA, EFL

INTRODUCTION

Studies on learning strategies in Second Language (L2) contexts have focused on either identifying strategies that are used by successful and less successful learners or on the effect of direct instruction of learning strategies in helping less successful learners to improve their skills and learning (Chamot, 2001). Although it has been argued that reading poses great challenges for English as a Foreign Language (EFL) learners

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(Alhabahba, Pandian, & Mahfoodh, 2016; Alsheikh, Alhabbash, Liu, Al, & Al Mohammedi, 2020; Benner, Michael, Ralston, & Lee, 2022; Supakorn & Panplum, 2022), previous studies in EFL contexts have not adequately addressed EFL learners' use of cognitive strategies in academic reading courses and how these strategies can affect EFL students' performance, compared to other L2 contexts. Thus, this study aimed at providing insights into the use of cognitive strategies by Jordanian undergraduate EFL students and the relationship that might exist between the use of cognitive strategies and two variables: GPA and class level.

Learning strategies are the conscious specific actions, behaviours, steps, or techniques taken to improve language learning (Oxford, 1994). Effectiveness of language learning strategies has been reported in various studies (e.g., Albashtawi, 2019; Brod, 2020; Plonsky, 2011). These strategies could help learners to improve their overall performance or their specific language skills (Al-Khasawneh & Huwari, 2014; Chamot, 1995). Further, research has shown that the use of tailored strategies does not only facilitate learning an L2 but also help in improving L2 students' academic achievement (Albashtawi, 2019). Additionally, it has been found that learners' academic achievement is associated with several factors that may be associated with the context of learning and individual characteristics of learners (Bandura, 1988). Even more, language learning strategies can be used to predict discrepancies among L2 learners' outcomes and performance (Green & Oxford, 1995; Griffiths & Parr, 2001).

Scholars have viewed cognitive strategies as the techniques or tools used by learners to facilitate their overall process of learning, or self- regulated actions to develop learners' communicative ability (O'Malley & Chamot, 1990). For example, use of background knowledge, paraphrasing, and breaking words into syllables are all techniques used by learners to comprehend the textual information, especially in case of challenging academic texts. It has been reported that cognitive strategies can distinguish high proficient and low proficient learners (Supakorn & Panplum, 2022). Hence, learners should be aware of how to match the suitable strategy with learning tasks. In addition, the combination of the main categories of strategies (cognitive, metacognitive, and social-affective types) can yield better achievement. Understanding when to use strategies such as guessing, paraphrasing, analyzing, deduction, elaboration, and summarizing is necessary (Oxford, 1990). However, in EFL contexts, factors that affect the use of learning strategies are various, including motivation, gender, students' age, cultural background, attitudes, beliefs, learning style, and types of tasks. For example, successful learners are more motivated by using more strategies than less successful learners. Hence, learners' awareness of what, when, where, why, and how to use a particular learning strategy should be increased to help less motivated students improve their performance (Oxford, 1990, 1994). Yet, it should be noted that investigating the association between cognitive strategies and other factors such as academic achievement, GPA, and class level would give some useful insights on EFL students' learning processes.

To this end, this study identified the cognitive strategies that are frequently used by Jordanian undergraduate EFL students in an advanced reading course and the

relationship between students' use of cognitive strategies and two variables: class level and GPA. Taking into account the scarcity of research on cognitive strategies in academic reading courses in Arab EFL contexts, this study was carried out to provide important findings related to Jordanian undergraduate EFL students. Furthermore, the findings of this study could provide insightful contributions to the field of learning strategies, which can be of importance for teachers of EFL students in academic reading courses. The results would definitely help teachers, educators, and policy makers understand the needs of EFL students in terms of cognitive strategies. Thus, teachers may understand the practices that should be encouraged and focused on while teaching academic reading. Specifically, this study aims at addressing the following three research questions:

1. What are the cognitive reading strategies used by the Jordanian undergraduate EFL students in an academic reading course?
2. Are there any statistically significant differences between Jordanian undergraduate EFL students' use of cognitive strategies and their class level?
3. Are there any statistically significant differences between Jordanian undergraduate EFL students' use of cognitive strategies and their GPAs?

Literature Review

This section starts with an explanation of the theory that has informed the design of this study. This is followed by presenting background information on cognitive strategies and academic achievement. Then, previous related studies in EFL contexts are reviewed to highlight the gaps in these studies.

Theoretical framework

With reference to the three research questions addressed in this study, the cognitive theory of learning is considered important for the research design of this study. Cognitivism depends on an organized internal competence that can guide learners in their learning, thinking, and problem-solving processes. According to the principles of this theory, the learner is a thinking being and an active processor of information and learning materials. Cognitive learning emphasizes the effective use of the mental processes that can help learners gain knowledge and understand the content of learning materials (Alahmad, 2020). It has been argued that when learners have a good command of cognitive learning, this can help them to maintain a lifelong habit of continuous learning. Hence, abilities to use cognitive learning strategies effectively can be one of the factors that contribute to successful learning. Taking this into consideration, teachers are responsible for discovering ways of providing their students with opportunities to cognitively experience learning and to use cognitive strategies effectively. This, in turn, can help learners understand academic reading materials and develop effective ways of using cognitive strategies.

Cognitive Strategies and Academic Achievement

Since the early 1970s, teachers and researchers in the discipline of L2 learning have shown a high interest in understanding cognitive abilities that are utilized by learners to acquire another language (Wenden, 1986). Cognition refers to the acquisition of information through various techniques or processes such as observation, thinking, imagination, memory, and judgment, problem-solving, and selective attention (Williams, 2005). Although there are various classifications of learning strategies, one of the early classifications of learning strategies was proposed by Bialystok (1978), who classified learning strategies into four types: formal practicing, functional practicing, monitoring, and inferencing strategies. In another attempt to classify learning strategies, Fillmore (1979) proposed only two categories of learning strategies: social strategies and cognitive strategies. Taking into account the great developments in cognitive psychology, 1980s witnessed a rapid increase in the attention given to learning strategies and their effect on language learning. Consequently, Rubin (1975) identified two major types of learning strategies: direct and indirect. While direct strategies can include clarifying, guessing, inductive, and inferencing; the indirect strategies encompass some strategies such as creating opportunities for practice. Rubin (1987) further classified learning strategies into three types: learning strategies, communicative strategies, and social strategies. However, the most common classifications of strategies were proposed by O'Malley, Chamot, Stewner-Manzanares, Kupper, and Russo (1985) and Oxford (1990). O'Malley et al. (1985) classified learning strategies into three types: cognitive strategies, metacognitive strategies, and socio-affective strategies. Following this classification, Oxford (1990) divided learning strategies into two types: (a) direct strategies (memory, cognitive, and compensation strategies) and (b) indirect strategies (metacognitive, affective, and social strategies).

Cognitive strategies involve the use of linguistic and topical knowledge to solve problems that are related to comprehension of reading materials. Cognitive strategies are operations that are employed by language learners in order to solve comprehension problems. These operations encourage learners to use prior knowledge and synthesize learning materials. Through the use of cognitive strategies, learners manipulate or transform the materials of target language (Oxford, 1990). Activities that can be grouped under cognitive strategies may include rehearsal, organization, and elaboration (O'Malley & Chamot, 1990; Oxford, 1990). Thus, it can be concluded that cognitive strategies are associated with the requirements of individual learning tasks such as those employed in academic reading courses. In other words, the choice of a particular learning strategy, including cognitive strategies, should be based on the type of the task learners are asked to do. In EFL contexts, it has been reported that learners in reading courses need a wide variety of strategies to perform tasks and specific activities. Further, research has proven the effectiveness of using cognitive strategies to fulfil specific purposes (Albashtawi, 2019). Good learners always use clusters or groups of strategies in combination in order to do a challenging task. For example, the strategy of using background knowledge can be used in conjunction with other strategies such as making inferences and making predictions.

In various learning contexts, assessment of learners' academic achievement tends to rely on the GPA which is widely considered one of the measures of choice for assessing academic achievement in universities and colleges (Ismail & Jani, 2016). The diversity of adult learners' goals and knowledge poses particular challenges and requires the development of a high level of learners' self-management and abilities to use learning strategies effectively. On the other hand, teachers should draw adult learners' greater ability to articulate their thinking processes in order to work independently. Hence, teaching should be directly related to something a learner is having a problem with. Here, the importance of learning strategies, including cognitive strategies, emerges where learners who have high command on how to use these strategies can obtain high academic achievement.

Related Studies

In this section, previous studies that have focused on language learning strategies in EFL contexts are reviewed. Although there has been an intensive focus on learning strategies in L2 contexts, especially metacognitive and cognitive strategies, and their effect on language learners, most of the previous studies in EFL contexts have examined the effect of direct instruction of learning strategies (e.g., de de la Peña & Soler, 2001; Fan, 2010; Mistar, Zuhairi, & Yanti, 2016). Most of these studies have shown that direct instruction of learning strategies has significantly affected EFL reading comprehension. However, previous studies have not adequately examined how cognitive strategies vary across class level or students' GPAs. Taking into account that this study was carried out in the Jordanian EFL context, it should be noted that there is a lack of comprehensive studies on cognitive strategies, especially in academic reading courses, in Jordan. This is obvious as most of the studies on language learning strategies in Jordan have focused on the explicit instruction of learning strategies (e.g., Al-Ghazo, 2016), metacognitive strategies (e.g., Abu-Snoubar, 2017), strategies of learning vocabulary (e.g., Al-Khasawneh, 2012; Rabadi, 2016).

In the Indonesian EFL context, some studies have examined language learning strategies through either the use of established inventories of language learning strategies or qualitative inquires (e.g., Alfian, 2021; Lestari & Wahyudin, 2020; Santihastuti & Wahjuningsih, 2019; Suyitno, 2017; Tunga, 2021). Using quantitative research designs, Santihastuti and Wahjuningsih (2019), Suyitno (2017), and Lestari and Wahyudin (2020) examined cognitive strategies in reading classes. However, Suyitno (2017), after identifying the frequent cognitive strategies, further examined the effects of cognitive strategies on Indonesian EFL students' comprehension scores. Suyitno (2017) reported that Indonesian EFL students employed a wide range of cognitive strategies in comprehension of English texts. Using an established instrument, which is Oxford's (1990) Strategy Inventory for Language Learning (SILL), Lestari and Wahyudin (2020) and Santihastuti and Wahjuningsih (2019) reported that the most frequently used strategies by Indonesian EFL university students are metacognitive strategies. Although Alfian (2021) and Tunga (2021), a two recent studies in the Indonesian EFL context, employed a qualitative approach to examine language learning strategies used by EFL students, Tunga (2021) focused on the cognitive strategies which were employed by

high and low achievers. While Alfian (2021) highlighted that EFL students frequently employed both metacognitive and cognitive strategies, Tunga (2021) showed that the high achievers used resourcing, repetition, summarizing, and inferencing strategies.

In the Omani EFL context, both Amer, Al Barwani, and Ibrahim (2010) and Ahmed (2020) investigated reading strategies through using Survey of Reading Strategies (SORS) of Mokhtari and Sheorey (2002). Amer et al. (2010) did not find any significant differences between students' preferences for metacognitive, cognitive, and support strategies. In a recent study, Ahmed (2020) compared and contrasted strategy use across disciplines and examined the relationships between students' strategy preferences and disciplines. She showed that Omani EFL learner's most preferred category of reading strategies was cognitive strategies. However, One-way ANOVA revealed no significant differences across students' disciplines in terms of strategy preferences for metacognitive, cognitive, and support strategies.

In the Iranian EFL context, a good number of studies has examined language learning strategies, with research designs that included quantitative and qualitative approaches. Using think-aloud approach, Tabataba'ian and Zabihi (2011) identified the strategies used by only four EFL students while doing reading exercises. They identified that the most frequent strategies used by EFL Iranian students are cognitive strategies. In a quasi-experimental research, Mahdavi and Azimi (2012) chose two cognitive strategies, i.e., note-making and underlining, and examined their effect on Iranian EFL learners' reading comprehension. Based on the statistical analysis, they reported that these two cognitive strategies had positive effects on students' reading comprehension. Khosravi (2012) identified the most frequent strategies used by Iranian EFL students and the relationship between these strategies and students' language proficiency. The study reported that there is a significant relation between cognitive strategies and English language proficiency. The study also revealed that Iranian EFL students with higher proficiency employ a wider array of strategies, especially cognitive, metacognitive and social strategies. In the same context, both Gerami and Baighlou (2011) and Ketabi and Mohammadi (2012) used SILL of Oxford (1990) to examine language learning strategies. It was reported that successful EFL students frequently employed metacognitive strategies (Gerami & Baighlou, 2011), and cognitive strategies can be strong predictors of language proficiency (Ketabi & Mohammadi, 2012). Similarly, Ghafournia (2014) reported that the successful learners implement both metacognitive and cognitive strategies.

In other EFL contexts, a good number of studies targeted language learning strategies. For example, Shyr, Feng, Zeng, Hsieh, and Shih (2017) showed that the most frequently used strategies were compensation strategies, and the least used strategies were cognitive and metacognitive strategies. Wu (2008), in the same EFL context, showed that students with high proficiency showed a better use of language learning strategies, compared to low level proficiency students. Further, this study revealed that cognitive strategies exhibited a strong influence on language proficiency. In Turkey, it was revealed that there were some significant differences on the effective use of cognitive

reading strategies in terms of EFL students' variables such as gender, age, and proficiency in reading (Ozek & Civelek, 2006).

To sum up, it can be found that most of previous studies on language learning strategies in EFL contexts have not fully explored the relationship between cognitive strategies and EFL students' GPAs and class level. Nevertheless, these studies have generated some important findings which can open doors for further research on language learning strategies used by EFL students in reading courses. This is because there are some discrepancies in the findings reported in these studies. For example, while both Ahmed (2020) and Tabataba'ian and Zabihi (2011) reported that cognitive strategies was the most frequent strategies used by Omani EFL and Iranian students, respectively; Alfian (2021) showed that Indonesian EFL students frequently employed both metacognitive and cognitive strategies. In addition, the participants in the studies reviewed here varied from one study to another. For example, Khosravi (2012) examined cognitive strategies among elementary and intermediate levels in Iran, while other studies in other EFL contexts focused on EFL university students. Further, studies that used qualitative approach did not employ any of the established instruments in identifying language learning strategies. What is common among all these studies is that EFL students use variety of learning strategies, and that cognitive strategies can contribute to EFL students' achievement, with variations in the reported learning strategies in accordance with learning task or activity. Further, these studies did not focus on the relationship of this variable to any variables such as those related to the learner or the context. In regards to the foregoing, this study seeks to contribute to understanding EFL learners' use of cognitive strategies in a foreign language context, and to stimulate awareness of the effect of these strategies on the students' GPAs and achievement.

A close examination of previous studies on learning strategies and reading in EFL contexts, especially the Arab EFL context, can reveal that previous studies have ignored paying attention to the important role played by cognitive strategies in learning English. To be more specific, although academic reading skills are essential for success in university education and have their contributions to university students' development, studies in the Arab EFL context have not adequately addressed the use of cognitive strategies in academic reading courses. This is one of the gaps our current study intended to address. Additionally, another important gap in previous studies is that they have not fully considered the relationship between students' use of cognitive strategies and students' achievement in terms of GPAs. Further, our study focused on the connection between students' level and their use of cognitive strategies. In other words, do EFL university students need the same cognitive strategies regardless of their levels of study? This question was one of the concerns of our study.

The findings of this study can be important for teachers of academic reading courses in EFL contexts, including the Jordanian one. Through focusing on cognitive reading strategies, this study offers practical recommendations for educators and teachers. Further, this study contributes to research done in the Jordanian EFL context because it was conducted taking into account what has been highlighted by researchers concerning academic reading problems of undergraduate students in the Jordanian EFL context.

Teachers of academic reading courses can consider the integration of the frequent cognitive strategies in academic reading courses. Through this integration, teachers of academic reading can help their students to cope with academic reading difficulties. Compared to previous studies on reading comprehension in EFL contexts, the current study is different as it focused on an academic reading course at the university level. As shown in our review of literature, previous studies have either examined learning strategies in general or learning strategies in proficiency courses or general English courses. Even when studies that have examined cognitive strategies are considered, it can be found that these studies have not investigated this category of learning strategies in academic reading courses.

METHOD

Participants and Context

This study employed a quantitative research design, which is one of the popular research designs in education and social sciences. Researchers who choose this design are interested in research that is based on numerical data that are analysed statistically (Muijs, 2010). The target population in this study is represented by all students who registered for the Advanced Reading course at the Department of English and Literature, the Hashemite University, Jordan. The sample included 62 students who were randomly selected. The students who registered for the Advanced Reading course had already passed the pre-requisite course, i.e., Reading course. The students' ages ranged between 19-21 years old. They were also homogenous in terms of their mother tongue (which is Arabic), cultural background, and the years of studying EFL (12 years) in the Jordanian schools. Ethical approval was obtained from the university to carry out the study.

Data Collection

Data were collected using a questionnaire which was adapted from Strategy Inventory for Language Learning (Oxford, 1990) to suit the academic reading course in the Jordanian EFL context. The questionnaire used in this study consists of two parts. The first part was constructed to collect background information about the participants (age, gender, GPA, and class level). The class level included two levels: junior and senior. Students' GPAs were verified with the data obtained from the Department of English and Literature, the Hashemite University. Students' GPAs included three categories: good, very good, and excellent. The second part of the questionnaire includes 30 items, which covered seven cognitive strategies (i.e., imagery, sounds, elaboration, inferencing, prediction, paraphrasing, and sequencing). Five-point Likert scale (1=never, 2=occasionally, 3=sometimes, 4=usually and 5= always) was used to obtain data on students' use of these seven cognitive strategies.

Validation of the instrument was conducted by asking a jury of university lecturers to give their remarks on the validity of the questionnaire and its suitability for the Jordanian EFL context. This was followed by a pilot study to test the practicability of the questionnaire. Further, the reliability of the questionnaire was also investigated using Cronbach Alpha. The reliability of the questionnaire ranged between 0.83 and 0.89, and it was 0.90 for the whole questionnaire.

Data Analysis

Jordanian EFL students' perceived use of cognitive strategies was addressed through analysing students' responses to 30 items on cognitive strategies distributed into seven cognitive strategies. To specifically address this, descriptive statistics (means and standard deviations) was used. Through descriptive statistic, the first research question was answered. To answer the second and third research questions, independent samples (t) test, One-way ANOVA test, and Scheffe test were used.

FINDINGS

Research Question One

As presented in Table 1, the highest frequently used cognitive strategies in the academic reading course are inferencing, prediction, elaboration, and paraphrasing. While inferencing ranked first based on the mean value (3.67 ± 0.81), prediction (3.64 ± 0.73) was ranked the second. With reference to the students' responses to imagery, the results showed that imagery strategy ranked the fifth, which is considered as neither high nor low (3.40±0.76). On the other hand, sounds strategy ranked the sixth, which indicated also neither high nor low (3.39±0.69). However, the analysis of the questionnaire showed that the least frequently used cognitive strategy was sequencing (3.34±0.73). The grand mean of students' responses was (3.51±0.58).

Table 1
Descriptive statistics of students' responses to the questionnaire

Strategies	Mean*	Std. Dev.	Degree of Use	Rank
Inferencing	3.67	0.81	High	1
Prediction	3.64	0.73	High	2
Elaboration	3.61	0.84	High	3
Paraphrasing	3.55	1.10	High	4
Imagery	3.40	0.76	Mid	5
Sounds	3.39	0.69	Mid	6
Sequencing	3.34	0.73	Mid	7

*Out of 5.

Based on the means of the responses given in Table 1, the four top frequent used strategies in academic reading as perceived by most of the students are inferencing (3.67±0.81), prediction (3.64 ± 0.73), elaboration (3.61±0.84), and paraphrasing (3.55±1.10). However, the least frequently used strategy as perceived by most students is the sequencing (3.34±0.73). Thus, those cognitive strategies which have high degree of use among the students are inferencing, prediction, elaboration, and paraphrasing. On the other hand, imagery, sounds, and sequencing strategies had a medium degree of use.

Research Question Two

To answer the second research question, descriptive statistics (means and standard deviations) of students' responses to the questionnaire and independent samples t-test were used to identify the differences between students' use of cognitive strategies and their class levels. Independent samples t-test was used because we had two groups

(junior and seniors) with different participants in each group (Hinton, McMurray, & Brownlow, 2014). Table 2 below shows that there are no significant differences between the means of students' responses to the questionnaire and their class levels. This reflects that there is no relationship between the use of the seven cognitive strategies and students' class level as all p-values are higher than 0.05 (refer to Table 2).

Table 2
Independent samples t-test for cognitive strategies and the class level

Strategies	Class Level	Freq.	Means	Standard Deviations	df	t-Value	P-value
Imagery	Junior	49	3.32	.758	60	1.673	.100
	Senior	13	3.71	.696			
Sounds	Junior	49	3.37	.734	60	.305	.761
	Senior	13	3.44	.523			
Elaboration	Junior	49	3.49	.882	60	.548	.585
	Senior	13	3.64	.671			
Inferencing	Junior	49	3.43	.793	60	1.215	.229
	Senior	13	3.73	.836			
Prediction	Junior	49	3.44	.672	60	1.087	.282
	Senior	13	3.69	.914			
Paraphrasing	Junior	49	3.08	.987	60	1.774	.081
	Senior	13	3.67	1.382			
Sequencing	Junior	49	3.32	.717	60	.396	.694
	Senior	13	3.41	.795			
Total	Junior	49	3.39	.598	60	.208	.836
	Senior	13	3.61	.533			

Research Question Three

The third research question intended to identify the relationship between students' use of the seven strategies and their GAPs. To answer this question, descriptive statistics (means and standard deviations) was run to identify the differences between students' responses to the 30 items of the second part in the questionnaire and their GPAs. Based on the means displayed in Table 3, it can be understood that there are observed differences between some cognitive strategies and students' GPAs. Thus, it was necessary to find out whether these differences were significant or not. The one-way ANOVA was used to determine whether there are any statistically significant differences between the means of the two variables (students' use of cognitive strategies and their GPAs).

Table 3
Descriptive statistics of students' use of cognitive strategies and their GPAs

Strategies	GPA	Freq.	Mean*	Std. Dev.
Imagery	Good	31	3.35	.772
	Very Good	21	3.29	.789
	Excellent	10	3.78	.561
Sounds	Good	31	3.16	.600
	Very Good	21	3.37	.661
	Excellent	10	3.93	.738
Elaboration	Good	31	3.54	.944
	Very Good	21	3.49	.686
	Excellent	10	4.06	.693
Inferencing	Good	31	3.65	.790
	Very Good	21	3.50	.878
	Excellent	10	4.10	.568
Prediction	Good	31	3.50	.619
	Very Good	21	3.58	.760
	Excellent	10	4.18	.800
Paraphrasing	Good	31	3.19	.980
	Very Good	21	3.57	1.165
	Excellent	10	4.60	.516
Sequencing	Good	31	3.27	.574
	Very Good	21	3.21	.957
	Excellent	10	3.83	.360
Questionnaire as a whole	Good	31	3.39	.544
	Very Good	21	3.44	.559
	Excellent	10	4.00	.531

As shown in Table 4, one-way ANOVA test was used to test the significance of these differences. ANOVA assumptions (independent observations, normally distributed variables, and homogeneity) were tested to measure that this statistical test meets the requirements. Table 4 clearly reflects that there are no significant differences between the means of the sample responses on all the seven cognitive strategies based on their GPAs. However, Table 4 obviously reveals that there are significant differences between the means of the sample responses to three strategies, i.e., sounds, prediction, paraphrasing, and students' GPAs. Yet, Table 4 does not show which GPA level (excellent, very good, or good) can have a strong relationship with the cognitive strategies. So, Scheffe test was run to identify the sources of these differences and to find out which pairs of means are significant. The outcome of this post-hoc test is shown in Table 5, which shows that there are significant differences at ($\alpha \leq 0.05$) between these three cognitive strategies and students with excellent GPA.

Table 4
One-Way ANOVA test for the differences between students' use of cognitive strategies according to their GPAs

Strategies	Source	Sum of Squares	df	Mean of Squares	F	P-Value
Imagery	Between Groups	1.782	2	.891	1.584	.214
	Within Groups	33.178	59	.562		
	Total	34.960	61			
Sounds	Between Groups	4.720	2	2.360	5.697	.005*
	Within Groups	24.439	59	.414		
	Total	29.159	61			
Elaboration	Between Groups	2.492	2	1.246	1.817	.172
	Within Groups	40.465	59	.686		
	Total	42.957	61			
Inferencing	Between Groups	2.501	2	1.250	1.992	.145
	Within Groups	37.027	59	.628		
	Total	39.528	61			
Prediction	Between Groups	3.537	2	1.768	3.623	.033*
	Within Groups	28.798	59	.488		
	Total	32.335	61			
Paraphrasing	Between Groups	14.973	2	7.487	7.566	.001*
	Within Groups	58.382	59	.990		
	Total	73.355	61			
Sequencing	Between Groups	2.966	2	1.483	2.979	.059
	Within Groups	29.366	59	.498		
	Total	32.332	61			

*Significant at ($\alpha \leq 0.05$).

Table 5
Scheffe test of the differences between the means of the sounds, predictions, paraphrasing strategies and students' GPAs

Strategies	GPA		Good	Very Good	Excellent
		Means	3.16	3.37	3.93
Sounds	Good	3.16		0.21	0.77*
	Very Good	3.37			0.56*
	Excellent	3.93			
Predictions	GPA	Means	3.50	3.58	4.18
	Good	3.50		0.08	*0.68
	Very Good	3.58			*0.60
	Excellent	4.18			
Paraphrasing	GPA	Means	3.19	3.57	4.60
	Good	3.19		0.38	*1.41
	Very Good	3.57			*1.03
	Excellent	4.60			
Questionnaire as a whole	GPA	Means	3.39	3.44	4.00
	Good	3.39		0.05	*0.61
	Very Good	3.44			*0.56
	Excellent	4.00			

* Significant at ($\alpha \leq 0.05$).

DISCUSSION

In this study, we have examined Jordanian EFL students' use of seven cognitive strategies and the relationship between their use of these strategies and two variables: class level and GPAs. A quantitative research design was used to address three research questions. Data were analysed using descriptive statistics, independent samples t-test, one-way ANOVA, and Scheffe test. This study has revealed that the highest frequently used cognitive strategies used by Jordanian undergraduate EFL students in an academic reading course are (1) inferencing, (2) prediction, (3) elaboration, and (4) paraphrasing. While the study revealed that students' use of imagery and sounds strategies was medium, it was found that the least frequently used strategy in academic reading course, as perceived by most students, was sequencing. These findings can be attributed to the difficulty of academic reading texts when compared to other types texts. Students' reservoirs of academic words make them aware of the use of some cognitive strategies such as inferencing and prediction to help them understand what they read.

In making an inference in academic reading, students need to use what they know to guess meanings of texts they read and to encourage them to read between the lines. As this study reveals that this cognitive strategy was highly used by Jordanian EFL students, it points out that it is an important strategy that students rely on for reading academic materials. By using this cognitive strategy, Jordanian EFL students can use clues in the text along with their own experiences to assess what is not directly stated in academic reading materials. Subsequently, this can promote the development of critical reading and make students enjoy reading classes. Students' heavy reliance on the prediction

strategy is evident in this study as it allows students to use information from academic reading texts, such as titles and headings, to anticipate what they are going to read in the text. When making predictions, students can enhance thinking ahead and can be able to generate questions for themselves to understand academic texts. Since this study reported that this strategy is one of the most frequently used strategies, it can be inferred that EFL students perceived this strategy as a valuable strategy to improve their reading comprehension.

Elaboration strategy was found to be used frequently by Jordanian EFL students, which reflects that they prefer this strategy in the academic reading course because they can utilize words or methods as associations for learning. This can reflect that academic reading material require students to find alternate ways to retrieve information from their memories. The fourth cognitive strategy that was highly used by Jordanian EFL student is the paraphrasing strategy. This may indicate that EFL students are aware of this strategy and prefer to use it in order to focus on the most important information in academic reading materials. This strategy requires students to rephrase the content in their own words, and it is important because students need rich vocabulary in order to employ this strategy successfully. Thus, it can be concluded that students used elaboration and paraphrasing strategies as these strategies could be helpful to overcome students' academic reading difficulties. The high use of some of the cognitive strategies can exhibit the importance of these strategies for the comprehension of academic reading materials and for doing related reading tasks successfully.

With reference to the findings of our study, it can be affirmed that they are similar to those reported by Tunga (2021) who has emphasized that EFL students prefer to use inferencing. Similar to the findings of Ahmed (2020), Suyitno (2017), Gerami and Baighlou (2011), and Tabataba'ian and Zabihi (2011), this study has revealed that various cognitive strategies are frequently used by EFL students. Yet, the findings of our study are not consistent with those reported by Lestari and Wahyudin (2020) and Santihastuti and Wahjuningsih (2019) who revealed that metacognitive strategies were the most frequent strategies.

This study revealed that EFL students' class level is not related to their use of cognitive strategies. In other words, class level has no significant effect on the use of the seven cognitive strategies. This reflects that whatever students' level is they need all the seven cognitive strategies. Junior and senior students are required to use the seven cognitive strategies in their academic reading course. Hence, our findings do not agree with those reported by Amer et al. (2010) who have shown that there are significant differences between the students based on the class level only in the global strategies. This finding contradicts the finding of the present study where it shows that there are no significant differences between the use of the strategies based on students' class level. With reference to GPA level, our study revealed that EFL students' GPA has a significant influence on only three cognitive strategies, i.e., sounds, prediction, and paraphrasing. The students with excellent GPA applied these three strategies more frequent, compared to students in other categories of GPA.

Similar to other studies, the current study has some limitations. Thus, generalizations of the findings should be done with cautions because this study focused on only a sample of EFL students from an academic reading course in a public university in the Jordanian EFL context. Though this study has revealed that the frequent cognitive strategies used by EFL students in an academic reading course are inferencing, prediction, elaboration, and paraphrasing, it cannot be claimed that all students in academic reading courses use these four cognitive strategies. Hence, further investigations of this topic in academic reading courses can discover similar or different findings. However, the findings may be found to be useful for teachers and instructors teaching academic reading courses in other universities in Jordan. Teachers of academic reading may create instructional materials that focus on inferencing, prediction, elaboration, and paraphrasing strategies to explicitly train students on how to use these strategies for effective reading comprehension. Regarding this, Alhabahba et al. (2016) have argued that university students in Jordan need to develop skills related to identification of main ideas in texts and scanning. In fact, these skills require students to use a variety of cognitive strategies, including those addressed in this study.

CONCLUSIONS

The findings of this study could contribute to language learning strategies in the Jordanian EFL context, in particular, and other EFL contexts. Reading is a complex cognitive process which relies on the important role of language learning strategies. As this study reveals the importance of cognitive strategies which are widely used by Jordanian EFL students, focusing on cognitive strategies, institutions of higher education in Jordan can develop remedy programs to help students overcome their academic reading difficulties and have better achievement in academic reading courses. The findings provide important insights for curriculum developers and teachers towards Jordanian EFL students' use of cognitive strategies. Hence, teachers can teach these strategies explicitly to train EFL students on how to use these strategies effectively. Then, teachers of academic reading courses might introduce some new useful specific exercises and tasks that can help students develop these strategies.

Taking into account the limitations of this study, future studies may focus on other EFL contexts, with different and larger sample sizes. Further, employing a mixed-method approach to study students' perceived use of learning strategies could also provide useful contributions. Meanwhile the present study has been limited to studying the cognitive strategies, other studies could consider cognitive strategies in other disciplines. As this study was qualitative, further research may consider the impact of teaching the seven cognitive strategies explicitly in academic reading. Future investigations may consider the relationship between cognitive strategies and other variables such as students' self-efficacy beliefs and attitudes towards learning English.

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