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The Correlation Between Iraqi EFL University Students' Cognitive Load and Productive Skills Performance

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Abstract

Cognitive load refers to the volume of cognitive resources, including perception, attention and memory, necessary to perform a task. These resources must be devoted not only to organizing and understanding the task, but also to analyzing the solution and ignoring irrelevant stimuli. If cognitive load is high, it can decrease or even inhibit one's ability to perform a task. Therefore, it leads to a stressful situation in which emotional coping may be of crucial importance The extent of cognitive load in a given situation depends on many things, including what the person already knows about the task and what supports are available Learning of speaking and writing enjoys a paramount status in any language education classroom. So long as communication in a foreign language is the ultimate goal for learning, the productive skills will continue to be an important component of syllabus content and learning outcomes. The study aims at finding out at: firstly, Iraqi EFL university students' level of cognitive load and performance in productive skills. Secondly: The correlation between cognitive loads with performance in productive skills The current study is a descriptive correlational one. For the academic year 2021-2022, a sample consists 360 third-year college students who are selected randomly from the colleges of education in three universities (Tikrit University, Baghdad University, Wasit University). Two instruments are used to achieve the aims of this study: the cognitive load scale and productive skills test. The findings reveal that Iraqi EFL college students experience an average level of intrinsic cognitive load, a medium level of extraneous cognitive load and have a good level of germane cognitive load. Furthermore, the findings also reveal that Iraqi EFL university students have an average level of productive skills performance.

Keywords: Cognitive Load, Productive Skills, Performance.

Introduction

The concept of cognitive load is based on theories about working memory in humans, which suggest that learner's ability to comprehend information is constrained. Miller's pioneer study, which claims that humans can only keep 7 (plus or minus two) "chunks" of information in working memory at one time and that their information processing ability is constrained to seven entities, provides a crucial insight in this regard. Therefore, cognitive load is a concept that aims to describe how much a task takes of the available mental resources to process information. (Chen et al, 2016; Nawir et al., 2023)

While Paas et al (2003, p. 64) defines cognitive load as "a multi-dimensional construct representing the load imposed on the working memory during performance of a cognitive task".

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Harmer (2007) thinks that the term productive skills refers to the language skills where the students produce the language themselves.

Speaking and writing are called productive skills because people use the language to produce a message through speech or written text. According to Hubackova & Golkova (2014) "productive skills - also called active skills and mean the transmission of information that a language user produces in either spoken or written form" (p.478).

EFL students can encounter a reasonable set of cognitive components that need to be conducted in working memory at the same time during the course of their EFL study.

Literature Review

Cognitive Load

The term "cognitive Load" was first coined by Sweller in the late 1980s (Sweller, 1988, 1989). The developer of cognitive load theory (CLT), John Sweller, concentrated on the cognitive demands of the means-ends analysis method used in conventional problem-solving practice, a method in which students work on their own to answer a large number of problems to gain proficiency or expertise.

CL is defined as the demands placed on a person's working memory by a task. The amount of cognitive load is influenced by task demands and an individual's aptitude. cognition is associated with comprehension and the storage of information in working memory or long-term memory for later retrieval (Ali & Sundus, 2022; Sernaqué et al., 2023)

Sweller claimed that while the cognitive effort spent in means-ends analysis leads to problem solution (the goal of the immediate task) ,still it leaves insufficient cognitive resources for schema development (the goal of instruction). As a result, the initial hypothesis put forth by the theory established a connection between the instructional methods used to promote problem solving and the cognitive load induced by such methods. More specifically, "cognitive processing load is an important factor reducing learning during means-ends analysis" (Sweller, 1988, p. 263).

Sweller et al (1990) affirmed that CLT "is concerned with how cognitive resources are distributed during learning and problem solving. Many learning and problem-solving activities impose a heavy, extraneous cognitive load that interferes with the primary goal of the task at hand" (p.176).

Hence, In the initial stage of the theory, the cognitive load construct focused primarily on the unwanted cognitive demands imposed by instructional design (Van Merrienboer & Ayres, 2005; Pammu & Hasyim, 2023)

The cognitive load construct considers what demands a certain task imposes on an individual. However, it does not take into consideration the psychological effects that individuals' beliefs, expectations, and goals have on their load perceptions. For the most part, CLT attends to how the objective characteristics of the task affect cognitive load and then learning. The only individual characteristic that is explicitly included in its theoretical framework is students' prior knowledge. Other individual characteristics that are highly predictive of learning, such as cognitive abilities and styles, self-regulation, motivation, and affect, are not considered within the CLT framework (Moreno, 2005).

Cognitive load theory is an instructional approach based on knowledge of human cognitive architecture, including the limits of working memory, the organization of information in long-term memory, and the interactions between these memory systems. The main goal of cognitive load theory (CLT) is to optimize learning of complex tasks by efficiently using the relation between the limited working memory and unlimited long-term memory LTM. To achieve this goal, cognitive load researchers attempt to engineer

the instructional control of cognitive load by designing methods that substitute productive for unproductive working memory load (Sweller, et.al, 2011; Afaneh & Bello, 2023)

Cognitive load theory (CLT) can provide guidelines to assist in the presentation of information in a manner that optimize intellectual performance. According to the theory, the limitations of working memory can be circumvented by coding multiple elements of information as one element in cognitive schemata, by automating rules, and by using more than one presentation modality (Sweller, 1994).

The content of the language that is central to determine the cognitive state of an individual (Krebt,2022). According to cognitive load theory (CLT), the limitations of working memory (WM) in the learning of new tasks together with its ability to cooperate with an unlimited long-term memory (LTM) for familiar tasks enable human beings to deal effectively with complex problems and acquire highly complex knowledge and skills (Plass et al, 2010).

Cognitive load theory assumes that knowledge can be divided into biologically primary knowledge that people have evolved to acquire and biologically secondary knowledge that is important for cultural reasons and acquired in educational institutions (Schmidt et al, 2019).

This theory suggests that learning happens best under conditions that are associated with human cognitive architecture. The human cognitive architecture is made of structures called schemas that permit people to treat multiple elements as a single element (Sweller, 2003). The difference between an expert and a novice learner is that a novice hasn't acquired the schemas of an expert. Learning requires a change in the schematic structures of long term memory and is demonstrated by performance that progresses from clumsy, error-prone, slow and difficult to smooth and effortless. The change in performance occurs because the learner becomes increasingly familiar with the material, and the cognitive characteristics associated with the material are altered so that it can be handled more efficiently by working memory (Plaas, 2010).

Types of Cognitive Load

There are three types of cognitive load: extraneous, intrinsic, and germane cognitive load. Some forms of cognitive load are useful, while others waste cognitive and mental resources. Since the total mental capacity is limited, learners need to balance the three forms of cognitive load to maximize learning efficiency. In particular, an effective instruction should consider minimizing the unproductive intrinsic and extraneous cognitive load while stimulating the desirable germane cognitive load (Clark et al, 2005).

Intrinsic Cognitive Load (ICL)

It relates to how difficult a concept or skill is to learn. It precisely alludes to the number of elements that the student needs to pay attention to in order to comprehend the subject matter. The intrinsic cognitive load generated by any task is not fixed *per se* as it is dependent upon the expertise of the problem solver or learner (Ayres et al, 2021).

Extraneous Cognitive Load (ECL)

Negative, unneeded, or extraneous cognitive load is the amount of cognitive load that results from the structure and method of how a learning material is delivered to students. Extraneous cognitive load in particular causes from instruction that is not properly designed. Since it is under the teachers' control, lowering this load should be a key factor when organizing instruction. The way that material is delivered and the tasks that students must complete can both affect the extra load. Extraneous load also places mental strain on students that has nothing to do with learning objectives (Anmarkrud, 2019).

Germane Cognitive Load (GCL)

In order to distinguish between significant, learning-relevant demands on working memory and unimportant and inefficient kinds of cognitive processing, the idea of germane cognitive load was first introduced into the cognitive load theory (Sweller et al , 1998).

According to Clark et al. (2005), germane cognitive load (GCL) is work imposed on working memory that uses mental capacity in ways that contribute to learning. Germane cognitive load GCL is load that directly contributes to learning, that is, to the learner's construction of cognitive structures and processes that improve the performance.

Language Productive Skills

Harmer (2007) thinks that the term productive skills refers to the language skills where the students produce the language themselves.

Speaking and writing are called productive skills because people use the language to produce a message through speech or written text. According to Hubackova & Golkova (2014) "productive skills - also called active skills and mean the transmission of information that a language user produces in either spoken or written form"(p.478).

Learners receive language by listening to conversation, music, and also by reading a newspaper, a poem, a book, etc. Then they move on to the next stage where they produce the language to express their thoughts by using productive skills. From a communicative and pragmatic view, writing and speaking skills are closely intertwined and they are crucial as they give students the opportunity to practice real-life activities in the classroom, and they can also be used as a barometer to check how much the learners have learned (Sagoian, 2018).

Although during most FL tasks all language skills are employed in conjunction with each other, productive skills are an integral part of developing communicative competence in educational contexts. It can be

evidenced in the classroom when learners interact and collaborate through pair or group work to complete a specific task, which ensures a process of negotiation of meaning and the use of authentic language in a creative way (Hossain, 2015).

Chalak (2016) affirms that they form an important part of language learning and require special attention. Thus, the choice of classroom activities is of vital importance as they should be aimed at the development of writing and speaking skills in conjunction which is achieved by the implementations of tasks.

Without the help of receptive skills, productive skills would not exist. The receptive skills, listening and reading, are also called passive skills, serve as a springboard for active application of grammar structures, passive vocabulary lists, and of foreign language sounds. This theoretical perspective is applicable to every language that is being studied. It should also demonstrate that the two sorts of talents are inextricably linked, and that neither can exist without the other. When learning a foreign language, it is common for receptive skills to come first, followed by the actual application of productive abilities. If one of these is missing from a learning process, the end result will be incomplete (Abdul Ridha & Mohammed, 2021).

Speaking and writing are inextricably linked, as most regular users of any foreign language are aware of. Grammatical structures, words and their right application, as well as a particular level of accuracy, must all be observed. These are used in both active and passive skills. Rather than using activities that focus solely on correctness, many language teachers use "communicative activities" to promote communicative competence in FL students (Riggenbach & Lazaraton, 1991).

Thus, productive language skills are important because they are the observable evidence of language acquisition. The more the speaker or the writer produces appropriate and coherent language the more proof of the progress in the learner's language system is present (Roca, 2019).

Cognitive Load and Productive Skills Performance

Cognitive load theory (CLT) is concerned with the learning of complicated cognitive tasks, where learners are frequently overwhelmed by the number of interacting information items that must be processed concurrently before effective learning can begin (Paas, et.al 2010).

As previously mentioned, Cognitive load theory views knowledge of human cognitive architecture fundamental to instructional design. Cognitive load theory argues that information will be processed by short-term working memory prior to being stored in long-term memory via the construction of schema, which influences an individual's performance in a certain field. However, the working memory has a finite capacity (i.e. working memory resources); if the cognitive load exceeds the capacity of the working memory, then learning becomes inefficient and impacts the performance of the learners (Sweller et al, 2011).

The total cognitive load, which is entirely governed by total element interactivity, is the sum of the intrinsic cognitive load and extraneous cognitive load. In relation to productive skills performance, when the difficulty level of the FL tasks and activities exceeds the available resources of the learners, it is thought they will face higher level of intrinsic load. Similarly, when those activities and topics are delivered in unplanned and unarranged fashion extraneous load is expected to erupt to higher levels (Sweller, et al., 2011).

Thus, estimating the number of interacting elements while simultaneously accounting for the nature of the information (content and learning materials) and the expertise of FL learners allows for the determination of the element interaction levels (learner characteristics). "Low element interaction materials impose a low working memory load by allowing individual elements to be learned with little reference to other elements" (Sweller, 2010, p. 124)

A change in instructional practices can remove extraneous cognitive load which is influenced by a combination of learner qualities (such as academic skills and abilities and preexisting schema) and learning materials; however the focus is placed more on the features of the material (Sweller, 2010, p.125).

Conversely, high element interactivity information is made up of components that are interconnected and hence cannot be learned separately. Because of how the pieces interact, understanding each one alone has no purpose. To learn in a meaningful way, all pertinent information must be processed simultaneously (Sweller, et al., 2011). This suggests that whole language instructional methods and techniques can bring about better results during EFL productive skills activities.

Further, the degree to which EF learners have already developed suitable higher-level schema, or even automated schema, to minimize the number of factors interacting, is an important learner attribute (Sweller, 2010). Therefore, giving more focus to fluency activities than accuracy ones can help in processing EFL inherently difficult materials and topics.

Germane cognitive load resources, on the other hand, are the working memory resources that the learner spends to deal with the intrinsic cognitive load associated with the complexity of knowledge. Accordingly, germane cognitive load focuses exclusively on the learner qualities. Increased extraneous load could result in less working memory resources being available to deal with intrinsic cognitive load, which could lower germane resources (Sweller, et al., 2011).

It indicates that more attention should be paid to the instructional design of EFL productive skills activities since they are anticipated to have higher degree of intrinsic load. This is to be done to give more processing working memory space for learners' cognitive systems (Sweller, 2010).

Additionally, the amount of elements connected to academic writing, synthesising material, presenting arguments, and using professional judgments may make the relevant academic activities challenging. As a result, the individual parts in subjects with fewer conceptual components can be learned mostly independently of one another. Less concept-oriented subjects, on the other hand, place a greater emphasis on reading, articulating, and presenting arguments, case analysis, and professional judgments. They entail using sound judgment, critical analysis, and problem-solving techniques in both individual and group settings. As a result, EFL writing and speaking tasks that are more concept-oriented include more element interactivity than ones that are less concept-oriented (Sweller & Chandler, 1994).

Due to linguistic and psychological factors, EFL students will experience more language-related learning challenges (and thus more cognitive load) during the academic acculturation process (Johnstone & Selepeng, 2001). EFL Students are at a linguistic disadvantage because they lack exposure to the various academic and informal settings in which English terms are employed (Dafouz et al, 2016).

EFL students can encounter a reasonable set of cognitive components that need to be conducted in working memory at the same time during the course of their EFL study.

The level cognitive load in EL learning can be high when the learning experiences of speaking and writing make it hard for them to find connections with their previous knowledge. It can be moderated when:

- 1. The topics covered in the academic year not very complex.
- 2. The concepts and definitions can be perceived as easy to some extent.
- 3. moderate mental effort is usually invested in finding important information from the class sessions.
- 4. moderate mental effort is needed in detecting contradictions in the academic year topics, .
- 5. Learners do not need to invest much mental effort in integrating information among texts.
- 6. moderate amount of difficulty is faced in understanding some ideas raised by the academic year items (Leppink et al, 2013).

Furthermore, extraneous cognitive load can be minimized through such actions and indicators as:

- 1. Most instructional activities do not involve processing multiple tasks at the same time.
- 2. Instructional procedures and materials contain a lot of information that they already know.
- 3. The instructional methods used by the instructors are usually changed over the duration of the academic year.
- 4. The class sessions occasional have activity shift and recess.
- 5. The academic year involves means-end activities.
- 6. the textual information presented mostly in auditory form.
- 7. Throughout the class sessions, the same information is presented in different modalities.
- 8. Topics are often revised and reviewed in the same format of the first presentation.
- 9. Revision and reviewing are included into class sessions.
- 10. The presentation formats are designed in a way that help learners understand the topics.
- 11. The instructional methods and techniques are, in terms of learning, quite effective (Cerdan et al, 2018)

Besides, germane cognitive load can be improved through the following:

- 1. EFL learners make a big effort to construct a general idea of what the academic year tasks are about.
- 2. The role models and practical worked examples presented can be of help to learners.
- 3. The learning activities are directed to learning and automation of new knowledge.
- 4. EFL learners can get needed guidance explanations.
- 5. The learning activities involve goal-free problem-solving activities and means-end activities (Chen et al, 2016).

As mentioned earlier, speaking and writing are considered a complex task for many EFL students because of their intricate nature coupled with the lack of vocabulary in their repertoire and their lack of EFL grammatical knowledge.

Also, it is well recognized that when processing novel information, working memory has a limited capacity and a short lifespan. And it can only store a small percentage of the required information or components. Generally, most students are fresh learners and so is most of the information provided to them. Thus, it should be processed by a limited capacity, limited duration, working memory (Sweller et al., 2011).

The capacity and duration restrictions of working memory only apply to novel information gained from the external environment via sensory memory, as opposed to information stored in long-term memory. This restriction does not apply to information retrieved from long-term memory. While coping with known versus fresh information, the features of working memory are drastically altered. So, anytime EFL students have declarative knowledge of the speaking or writing issue at hand, they are in a better position and more equipped to successfully process and function during the learning task. Hence, their emotional resources are used or drained by coping with the stress arousal. They would not need to expend emotional energy to reduce the elevated stress level. Thus, their cognitive resources are freed up to be focused toward the learning issue, and their degree of attention is enhanced(Yuksel &Atan,2019).

The more declarative knowledge EFL learners have about the writing or speaking activity, the greater cognitive strain they are asked to exert, and the better equipped they are to bear other sorts of pressure, whether intrinsic or extrinsic. The objective is to direct working memory resources to the fundamental essentials of a specific subject and away from unnecessary components (Yuksel &Atan,2019)

Methodology

Population and Sample

The population in this study includes Iraqi EFL students at the colleges of Education/ departments of English (except for Kurdistan region) during the academic year 2021-2022. The total number is (2464).

While the study sample consists 360 third-year college students who are selected randomly from the colleges of education in three universities (Tikrit University, Baghdad University, Wasit University) as is it displayed in table below:

Table (1) The blue bample		
University	Sample	Percentage
1.Baghdad	145	40%
2.Wasit	100	28%
3. Tikrit	115	32%
Total	360	100%

Table (1) The Study Sample

Instruments of the Study

The following instruments have been used in the current study in order to collect the required data:

The Cognitive Load Scale (CLS)

The cognitive load scale used in this study is a rating scale though there are various forms of assessment in this respect. The idea for the rating scale is based on the assumption that people are able to introspect on their cognitive processes and to report the amount of mental effort expended. By using self-report, subjects report their invested effort on a graded symmetrical category scale, by translating the perceived amount of mental effort into a numerical value (Paas & Van Gog, 2006).

The use of rating scales to measure mental effort and cognitive load remains popular, because they are easy to use; do not interfere with primary task performance; are inexpensive; can detect small variations in workload (i.e., sensitivity); are reliable; and provide decent convergent, construct, and discriminate validity (Paas et al. ,2003).

Similarly, the cognitive load scale in the current research is developed by the researcher after consulting a jury of experts and after reviewing the relevant literature.

The Productive Skills Test

The productive skills test comprises two parts: speaking and writing. In order to prepare the productive skills test, the researcher has referred to literature on the subject before exposing the draft test to the jury members.

To assess the level of speaking performance among students, a structured interview that the researcher herself prepared is developed. According to Fulcher (2010), the most common speaking exam format is the interview format, in which test-takers converse with an interviewer while having their performance evaluated.

In accordance with the jury members' advice, six interview topics have been chosen, and each topic has a list of suggested question. The interview topics with a list of proposed questions have been prepared. The topics are chosen based on their relevance to the sample's interest and level, their authenticity, and how current they are conceptualized.

In similar fashion the written test has been developed to determine the level of students' writing performance. The students are required to compose an essay of at least (200-250) words on one topic with a list of guided items for the test.

Validity of the study Instruments

Validity is a measure of how well a measuring instrument fulfills its purpose by examining whether it measures the behavior or quality that it is designed to assess (Sürücü & Maslakçı, 2020).

The Reliability of the Cognitive Load Scale

The concept of reliability in a test score means the extent to which it is free from errors that limit the measurement (Shatha & Shaima, 2009). In other words, it is a measure of the reproducibility of the test (Elaf, 2019).

According to Al-Zoba'i et al. (1981), one of the qualities of a good scale is its reliability. Reliability indicates consistency in the findings, which means that one can acquire the same results when re-applying the scale to the same persons and under the same settings.

The validity of the scales depends on the extent of their reliability and validity. Calculating the reliability of the scale or of the test is a prerequisite to determine the true score or the variance knowing that reliability coefficient unveils the percentage of the true variance in the test scores (Imam et al., 1990,pp. 143-144). Thus, the researcher has made use of two methods to find out reliability for the cognitive load scale: the test-retest method and Cronbach alpha.

Reliability of the Productive skills Test

The researcher used Cronbach's alpha to determine the reliability of the productive skills test. There are (360) female and male students in the sample for the statistical analysis. According to the results, the computed reliability coefficient is (0.85) which suggests that the test possesses a high reliability coefficient. As a result, this test exhibits internal consistency and is considered to be reliable. This provides solid proof of the test items' homogeneity and consistency (Anastasi, 1976, p.126).

Results Related to the First Aim

The first aim is to identify Iraqi EFL university students' level of cognitive load and performance in productive skills.

To achieve this aim, the researcher used the cognitive load scale. The research sample consisting of (360) male and female students. it is found that the mean score is (109.206) with standard deviation (15.839). Further, the difference is found to be statistically significant as the calculated t-value is (5.038), which is greater than the table t-value (1.96), with a degree of freedom (359) and at (0.05) level of significance. This indicates that the research sample has a high degree of cognitive load. Table (4.3) and Figure (4.3) below provide more details.

Table (2): The mean, standard deviation and the t-test value for the domains of the cognitive load scale

Variable			Standard Hypothetical t-values		ues	Level of	
	Sample	Mean	Deviation	Mean	Computed	Critical	Significance 0.05
cognitive load	360	109.206	15.839	105	5.038	1.96	significant



Figure (1) the mean, and the hypothetical mean for the cognitive load

With regard to the level of productive skills performance, the sample results from the test show that the mean score is (29,889) and the standard deviation is (6,059), with a hypothetical mean of (15). The calculated t-value is (0.348) which is smaller than the critical value of (1.96) at significance level (0, 05) and (359) degree of freedom. Thus, this indicates that the research sample has an average level of productive skills since the computed mean is close to the hypothetical mean, and there are no statistically significant differences between them. The results are illustrated in the table (3) and figure (2).

Table (3)	The mean,	the standard	deviation and	the t-test value	for the	productive skills	test
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Variable	sample	mean	Standard deviation	Hypothetical Mean	t-test va computed	lues critical	significance (0.05)
The productive skills	360	29.889	6.0569	30	0.348	1.96	insignificant



Results Related to the Second Aim

The second aim is to identify the correlation between cognitive load with performance in productive skills.

To find out this relation, statistical manipulation of the results is done using Pearson correlation coefficient. Table (4) exhibits these results.

Table (4): The correlation between cognitive load and the productive skills performance

Sample size	orrelational value	t-test va	lues	significance (0.05)
Sample size	orrelational value	computed	critical	significance (0.03)
360	0.458	10.178	1.96	Significant

The following appears from the above table:

The correlation coefficient between cognitive load the productive skills is (0.458). The calculated t-value is (10.178), which is greater than the critical value (1.96) at level of significance (0.05) and degree of freedom (358). This means that the relationship between cognitive load and the productive skills is a statistically significant relationship. This means that the level of cognitive load can have an impact on the level of students' productive skills performance.

Discussion of Results

Discussion of Results Related to the First Aim

The first aim of the study is to find out Iraqi EFL university students' level of cognitive load and performance in productive skills.

With respect to the level of the cognitive load, the results are not uniform. The mean and standard deviation for each domain of the cognitive load is extracted, to find out the significance of the difference between the computed mean and the hypothetical mean for each domain, the researcher used the t-test for one sample, and the results are shown in table (4.10) and figure (4.4).

the domains					t- val	Level of	
of the cognitive load scale	sample	mean	Standard deviation	Hypothetical mean	Computed	Critical	Significance 0.05
Intrinsic	360	27.592	8.738	27	1.285	1.96	Insignificant
extraneous	360	47.786	12.664	48	0.320	1.96	Insignificant
germane	360	33.828	6.490	30	11.191	1.96	Significant

Table (5): The mean and standard deviation for each domain of cognitive load

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Figure (3) the mean, and the hypothetical mean for the cognitive load domains

For the domain of intrinsic cognitive load, results indicates that Iraqi EFL third grade college students experience an average level of intrinsic cognitive load. According to this result, students encounter a reasonable set of cognitive components that need to be conducted in working memory at the same time during the course of their EFL study. The level of intrinsic cognitive load expertise in their EL learning has been moderate due to some markers.

A. First, the learning experiences could make it easy for them to find connections with their previous knowledge. Also, they find topics covered in the academic year not very complex. Second, the concepts and definitions have been perceived as easy to some extent. And they usually invest moderate mental effort in finding important information from the class sessions. Third, they do not need to invest much mental effort in integrating information among texts. Therefore, they face moderate amount of difficulty in understanding some ideas raised by the academic year items.

B. For the component of extraneous cognitive load, results show that Iraqi EFL third grade college students face a medium level of extraneous cognitive load. This result can be clarified based upon some justifications. Most instructional activities do not involve processing multiple tasks at the same time. Further, the instructional methods used by the instructors are usually changed over the duration of the academic year. In addition, the class sessions occasional have activity shift and recess. Also, the academic year involves means-end activities and has the textual information presented mostly in auditory form. Furthermore, throughout the class sessions, the same information is presented in different modalities.

C. For the domain of the germane cognitive load, results exhibits that Iraqi EFL third grade college students have a high level of germane cognitive load. This result can be substantiated based upon some benchmarks. Iraqi EFL third grade college students might have made a big effort to construct a general idea of what the academic year tasks are about. Also, the role models and practical worked examples presented in the academic year could have helped them much in learning. Besides, they possibly have aimed at perceiving everything correctly while dealing with the academic year tasks. Further, the academic year activities could have been directed to learning and automation of new knowledge.

D. 4.Another result related to the first aim is to find out Iraqi EFL college students' level of the productive skills. It is evident from table (6) and figure (4) that:

A. Concerning speaking skill, Iraqi EFL college students have an average level of speaking performance. When speaking, it seems that Iraqi EFL university students can usually handle elementary construction quite accurately but does not have thorough or confident control of the grammar. Also, they have sufficient speaking vocabulary to express themselves simply with some circumlocutions and they can get

the gist of most conversation of nontechnical subjects (i. e., topics that require no specialized Knowledge). Moreover, they can handle with confidence but not with facility most social situations, including introductions and casual conversations about current events, as well as work, family, and autobiographical information.

B. Regarding writing skill, Iraqi EFL college students have an average level of writing performance. This result can be accounted for owing to some indices. Their writing seems to be characterized by ordinary introduction or conclusion. Essay addresses the issues but misses some points; ideas could be more fully developed; some extraneous material is present. In addition, it can be detected advanced proficiency in English grammar; some grammar problems don't influence communication, although the reader is aware of them. Lastly, there are some problems with writing conventions or punctuation; occasional spelling errors; left margin correct; and paper is neat and legible. Accordingly, Iraqi EFL college students have an average level of productive skills.

Variable	comple mean		Standard	Standard Hypothetical mean		lues	significance
variable	sample	mean	deviation Hypothetical mea		computed	Critical	(0.05)
Speaking	360	14.808	3.661	15	0.993	1.96	insignificant
writing	360	15.081	3.594	15	0.425	1.96	insignificant
the productive skills	360	29.889	6.059	30	0.348	1.96	insignificant

Table (6): The mean, the standard deviation and the t-test value for the productive skills test



Figure (4): The arithmetic and hypothetical mean for the productive skills test

Discussion of Results Related to the Second Aim

The second aim is to identify the correlation between cognitive load with performance in productive skills. Results reflect that:

With regard to the relation between cognitive load and productive skills, the results are varied. See table (7).

Domains of	Dec. 4	Number of	The correlational	t-test val	significance		
cognitive load	Productive skins	sample	coefficient value	computed	Table	(0.05)	
Intrinsic cognitive	speaking	360	0.429-	8.937-	1.96	significant	
load	writing	360	0.474-	10.304-	1.96	significant	
Extraneous cognitive	speaking		0.412-	8.583-	1.96	significant	
load	writing		0.451-	9.596-	1.96	significant	
Germane cognitive	speaking		0.499	10.848	1.96	significant	
load	writing		0.533	11.844	1.96	significant	
The total cognitive load	The total productive skills	360	0.458	10.178	1.96	Significant	

Table (7): The correlation between the domains of cognitive load and productive skills

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It can be inferred from the above table that:

A. Speaking skill and intrinsic cognitive load have a correlational coefficient value of (-0.429) whereas writing skill has a correlational coefficient value of (-0.474). The researcher further employed the T-test procedure to determine the relationship significance.

The writing skill has a calculated T value of (10,304-) which is larger than the table value of (1.96) at the significance level of (0.05) and (358) degree of freedom, while the relationship with speaking skill has a calculated T value of (-8,937).

As a consequence, there is a statistically significant negative relationship between intrinsic cognitive load and productive skills, which suggests that when the research sample's intrinsic cognitive load is high their productive skills are low.

Intrinsic cognitive load is related to the difficulty of the learning materials. It is intrinsic or inherent to the nature of the material or task being taught . In particular, intrinsic cognitive load is determined by the extent to which various elements interact in order to successfully perform a task. An element is the information that can be processed by a particular learner as a single unit in working memory .Therefore, element interactivity or connectedness is the main generator of intrinsic cognitive load

Performance in productive skills requires EFL learners to tap into multiple linguistic components and elements as syntax, morphology, phonetics and semantics among others simultaneously. This necessitates holding and activating all relevant schemata in working memory at the same time which puts a significant amount of load on working memory.

Consequently, when an EFL learning task in speaking or writing involves many elements interactivity, it can be said to have high level of intrinsic cognitive load the matter that has direct impact on the learner's performance.

A. The value of the correlation coefficient between the extraneous cognitive load and speaking skill is (-0.412) whereas the writing skill is (-0.451). The researcher has applied the T-test procedure to calculate the significance of the correlation coefficient. The calculated T value of the relationship with speaking skill has is (-8.583) and (-9,596) with writing skill which is greater than the table value of (1.96) at the significance level of (0.05) and the degree of freedom of (358). Therefore, the relationship between the extraneous cognitive load and productive skills is a statistically significant inverse relationship, that is, the higher the level of the extraneous cognitive load in the research sample, the lower their productive skills.

Extraneous Cognitive load is imposed by the format and the manner in which an instructional material and activities is presented or conducted to learners. It is also referred to as disadvantageous or unnecessary cognitive load. In particular, extraneous cognitive load results from inadequately designed instruction. Therefore, it is under instructors' control.

When EFL productive skills learning activities are characterized with many extraneous sources of cognitive load, they can result in consuming longer times to learn, producing poorer performance levels. On the contrary, when the EFL productive skills tasks and activities are carefully planned to reduce the expected and associated extraneous cognitive load, EFL learners can perform feasibly better. Hence, Iraqi EFL college students' productive skills can improve with decreasing the extraneous cognitive load.

C .The correlation coefficient between speaking and writing skills and germane cognitive load has been calculated and found to be (0.499) and (0.533), respectively. The significance of the correlation coefficient has been determined using the T-test. The calculated T value of the relationship between speaking skill and writing skills is (10,848) and (11,844). Since the computed t-value is greater than the critical value of (1.96) at the significance level (0.05) and the degree of freedom (358), the relationship

between the two variables is therefore confirmed. The germane cognitive load and productive skills have direct statistically significant correlation. In other words, the research sample's productive skills can improve with increasing the germane cognitive load.

Germane load refers to mental processing imposed by instructional design that positively contributes to attaining better learning outcome. It is also can be viewed as generative and relevant load that facilitates schema construction and automation.

When EFL instructors design productive skills task and activities in a format that makes the learnt information does not occupy the whole working memory capacity (because of a low intrinsic and extraneous cognitive load), increasing germane load may enhance learning process and performance. That happens through engaging learners in conscious cognitive processing that is directly relevant to schema construction.

Furthermore, there are some strategies that can be used to induce germane cognitive load :using worked examples for novice EFL learners and increasing the examples variability . Germane load contributes to construction of cognitive structures and productive cognitive processes that enhance performance.

Conclusions

Considering the study's findings, the following conclusions are made:

- 1. Iraqi EFL college students experience high level of cognitive load.
- 2. Iraqi EFL college students productive skills performance is at an average level.
- 3. The relationship between cognitive load and the productive skills is a statistically significant relationship, that is to say, the level of cognitive load can have an impact on the level of Iraqi EFL students' productive skills performance.
- 4. The more working memory is used up during writing or speaking , the less brain capacity is left for other cognitive tasks. Careful planning of the productive skills learning experiences of EFL students can neutralize cognitive load effects and hence enhance learning.

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Cognitive Load Scale

Please respond each of the items on the following scale.

No	Item	Strongly Agree Agree	Neutral	DisagreeStrongly Disagree
1	The topics covered in the academic year are very			
1	Complex.			
2	The academic year cover concepts and definitions			
2	that I perceive as very complex.			
2	I have invested mental effort in finding important			
3	information from the class sessions.			
4	I have invested mental effort in detecting			
4	contradictions in the academic year topics			
F	I have invested mental effort in integrating			
5	information among texts			

No	Item	Strongly Agree Agree	Neutral	DisagreeStrongly Disagree
6	The academic year involves expertise learning activities			
7	I have made a big effort to construct a general idea of what the academic year tasks are about	f		
8	I have had difficulties in understanding some ideas raised by the academic year items			
9	The learning experiences make it easy for me to find connections with my previous knowledge.			
10	The academic year has lengthy, complex texts presented in spoken form			
11	During the academic year, it is difficult to recognize and link the crucial information			
12	The academic year subjects are related to theories tha I perceive as very complex	t		
13	The presentation formats are designed in a way that helped me understand the topics.			
14	The instructional methods and techniques are, in terms of learning, very ineffective			
15	The instructional events relied on multiple systems and (audio-visual) modalities for learning			
16	Class management approaches make it difficult to interact with the academic year feasibly			
17	Noise and other distractions during the academic yea events affect learning.	r		
18	The instructional methods used throughout the academic year are complicated.			
19	Knowledge representation took multiple forms which caused difficulties in understanding	1		
20	The role models and practical worked examples presented in the academic year help me much in learning.			
21	The instructional material is graded and varied in a way that made learning easy			
22	The academic year really checks my knowledge and understanding of topics in writing and speaking skills			
23	My point while dealing with the academic year tasks i to understand everything correct	S		
24	The instructional activities involved processing multiple tasks at the same time			
25	Instructional procedures and materials contain a lot of information that I am familiar with.			
26	The academic year activities are directed to learning and automation of new knowledge			
27	The academic year involves needed guidance explanations			
28	The academic year involves goal-free problem solving activities.	7 5		
29	The class sessions has occasional activity shift and recess.			
30	The academic year involves means-end activities			
31	The academic year has the textual information			

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No	Item	Strongly Agree Agree	Neutral DisagreeStrongly Disagree
32	Throughout the class sessions, the same information		
32	is presented in different modalities		
33	Revision and reviewing are included into class		
- 55	sessions.		
24	The academic year involves repeated painful		
54	activities.		
25	The academic year involves headache painful		
35	activities.		

Appendix B

Speaking Test

Phase 1

This phase tests the student's ability to use social greeting, to provide information about him/her. The examiner's main aim is to help the students to relax.

It lasts for 1 minute.

Item

T- Good morning/ afternoon/ hello, please have a seat. S- Good morning/ afternoon/hello. T- What's your name? S- My name is [] T- Where do you live? S- I live in []. T- Are you married or single? S- I'm married / single/ engaged. T- How do you feel today? S- I feel [].

The examiner will fit the goals on the move and inform the tester to have a road map and this will make the tester more comfortable.

Phase 2

The students will be able to express themselves in a variety of situations that pertain to common everyday topics they face in their daily life.

-The interviewees will have to choose one of the following topics:

- 1. Their Favourite meals and restaurant.
- 2. Their kind of Fashion for this year .
- 3. The effect of media in human life.
- 4. Their best friends.
- 5. Time management and their study.
- 6. How has Covid-19 affected and is affecting their lives.
- 7. Their Future Career.
- 8. My kind of Hobby or pastime.
- 9. Things I would change if I had the power.
- 10. South or West, home is best.
- 11. The Fruits of hard work.

12. The college instructor that touched them the most

Phase 3

This is the closing part of the interview. The aim behind this phase is to round off the interview. It includes using special formulas, saying farewell, thanking.

It last for 1 minute.

Item
T- Thank you very much for answering my questions.
S- Not at all.
T- How do you feel about today's experience?
S
T- Do you mind to go back again to the same experience in future?
<u>S-</u>
T- Do you have anything to say?
S
T- Good bye.
S- Good bye.

Appendix C

Writing Test

-Write 200 to 250 words on this topic: The Role of the Internet in our Present day Life.