The Relationships Between Cognitive Load and Affective Strategies used in Learning Situations among General Diploma Students in Faculty of Education

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Abstract

The current study aimed to investigate the relationships between Cognitive Load and Affective Strategies used by students in learning situations. The study was conducted with a sample of (159) students of General Diploma in the Faculty of Education, Ain Shams University. Using the following study tools: Affective Strategies Scale in learning situations and Cognitive Load Scale (prepared by the researcher). The results showed the following:

- The general level of using affective strategies among students is a high level of (77.6%). The most frequently used strategies are motivation management strategies at a high level (82%), followed by stress management strategies at a high level (78.1%), then impulse control strategies with a percentage of (69.8%).
- There are statistically significant differences in cognitive load (Intrinsic, Extraneous, and Germane) according to the different level of using affective strategies (Stress Management Strategies, Motivation Management Strategies, and Impulse Control Strategies) among students in favor of those with a high level of use.

Keywords: Affective Strategies, Stress Management Strategies, Motivation Management Strategies, Impulse Control Strategies, Cognitive Load.

العبء المعرفي وعلاقته بالاستراتيجيات الوجدانية المستخدمة في مواقف التعلم لدى طلاب الدبلوم العام في التربية

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المستخلص

هدفت الدراسة الحالية إلى بحث العلاقة بين مستوى العبء المعرفي والاستراتيجيات الوجدانية التي يستخدمها الطلاب في مواقف التعلم. وقد أجريت الدراسة على عينة قوامها (١٥٩) طالب وطالبة من طلاب الدبلوم العام في كلية التربية جامعة عين شمس. وذلك باستخدام أدوات الدراسة التالية: مقياس الاستراتيجيات الوجدانية في مواقف التعلم ومقياس العبء المعرفي (إعداد الباحثة)، وأظهرت النتائج ما يلي:

- المستوى العام لاستخدام الإستراتيجيات الوجدانية لدى الطلاب مرتفع بنسبة (٧٧,٦٪). الاستراتيجيات الأكثر استخدامًا هي استراتيجيات إدارة الدافعية بمستوى مرتفع بنسبة (٨٢٪)، تليها استراتيجيات إدارة االضغوط بمستوى مرتفع (٧٨,١٪)، ثم استراتيجيات التحكم في الاندفاع بنسبة (٦٩,٨٪).
- توجد فروق ذات دلالة إحصائية في العبء المعرفي (الداخلي والخارجي ووثيق الصلة) باختلاف مستوى استخدام الاستراتيجيات الوجدانية (إدارة الضغوط، إدارة الدافعية، واستراتيجيات التحكم في الاندفاع) بين الطلاب لصالح ذوي مستوى الاستخدام المرتفع.

الكلمات المفتاحية: الاستراتيجيات الوجدانية Affective Strategies، استراتيجيات إدارة الضغوط Stress Management Strategies، استراتيجيات إدارة الدافعية Motivation Management Strategies، استراتيجيات التحكم في الاندفاع Impulse Control Strategies، العبء المعرفي Cognitive Load.

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Introduction

Emotions interfere with every aspect of our complex human life. It affects our ability to make decisions, perform actions, form and recall memories, and social interactions. Neuroscientists have shown that a person who has high cognitive abilities, but lacks normal emotional responses, is unable to make the decisions necessary for life; affect and perception together influence to shape our experiences and behavior as we engage in daily activities. We are influenced by affect. (Calvo & D'Mello, 2011)

Also, learning at deeper levels of understanding and problem solving is influenced by affect. We experience negative emotions in learning situations (such as annoyance, frustration, anxiety, and sometimes anger) when we fail, make mistakes, and struggle. We also feel positive emotions (such as joy and excitement) when tasks are completed, challenges are overcome, and major ideas and discoveries are made. On the other hand, Cleland and Durning (2015) see that emotions affect the distribution of cognitive resources within working memory. Resource allocation models assume that emotions not associated with ongoing learning activities (episodic emotions) will consume working memory resources and reduce the cognitive resources available for task requirements. This reduction in the available cognitive resources will in turn negatively affect performance.

Calvo and D'Mello (2011: 203) mentioned a close relationship between learners' affective states and processing in working memory. Mohammed (2019) argued that affective factors influence the way information is encoded and stored in the brain that can be regulated by using the affective strategies component, such as reducing anxiety, encouraging oneself and controlling one's emotions.

Considering what is already understood about the importance of affective processes in learning, it will be important to identify steps that can be taken to improve these processes. Affective control strategies are one type of action that makes it possible to regulate affective states in favor of successful learning. Affective strategies facilitate learning through motivation and affection, unlike cognitive strategies that have a direct impact on the process. (Gallego & Yaniz 2014)

Study Problem

General Diploma students are challenged to follow and perform assignments related to the subjects. Where the general diploma program consists of a large and diverse number of study subjects as well as seeks to achieve specific qualitative goals, this requires a high mental effort and a great effort from the student to be able to understand and perceive the elements and contents of each subject, which may lead to a load on working memory. Likewise, the affective and emotional states experienced by the student during the educational process and the performance of learning tasks may affect the level of the cognitive load as well.

Plass and Kalyuga (2019) discuss four ways in which emotion may relate to cognitive load during learning. One perspective describes emotions as extraneous cognitive load, competing for the limited resources of working memory by requiring the processing of task-extra or task-irrelevant information. Another perspective shows that encoding, storage, and retrieval of information are affected by emotions even before awareness of the material, and that emotion may directly affect memory by broadening or narrowing cognitive

resources, and by mechanisms such as mood-dependent and mood-congruent processing. A third perspective describes how emotions may affect intrinsic cognitive load, such as when emotion regulation is part of the learning outcomes. They also discuss a dual-channel assumption for emotions. A final perspective is that emotion affects motivation, and, in turn, mental effort investment.

The student may seek to use affective strategies in the learning process, which are strategies directed towards controlling emotions, whether they seek to reduce the intensity of emotional interference in the learning process, or to generate emotions that support learning that aim to control motivation, as well as maintain focus and attention during implementation.

It plays an important role in dealing with emotional states related to learning processes, as they direct the learner towards affective control or towards controlling motivation, and both affect the individual's performance in learning directly and indirectly, which contributes to achieve learning outcomes (Abdel-Mawla, 2017). From this standpoint, the importance of studying the relationship between the use of affective strategies and the level of cognitive load appears.

Thus, the present study aimed to answer the following questions:

1- What are the most used affective strategies among students of the general diploma in the College of Education in learning situations?

2- Does the level of cognitive load differ according to the level of using affective strategies among students of the General Diploma in the College of Education in learning situations?

The importance of the study:

1- Providing students with a perception of the importance of affective strategies in learning situations that help them improve their academic performance.

2- Supporting educational workers with recent psychological results on the use of affective strategies in their interaction

with some cognitive aspects to achieve the targeted learning outcomes.

3- Enriching those in charge of the educational process in the best ways to provide and employ working memory resources, which reduces the level of cognitive load during the learning process.

Definition of Terms

1- Affective Strategies

Steps and procedures that the learner takes to control affect or emotions during the learning process, either by seeking to reduce the affective impact on the learning process (emotional control) or to generate feelings that support learning (motivational control).

2- Cognitive Load

The effort made by the learner to deal with the activities, information and problems imposed on his cognitive system, and in particular on the working memory during the performance of a particular task.

Review of Related Literature

Affective Strategies

Learning strategies are specific behaviors or thought processes that students use to enhance their learning. The word strategy comes from the ancient Greek word strategia, which means steps or actions taken for the purpose of winning a war. through time the warlike meaning of strategies has fortunately fallen away, but the meaning of control and goal-directedness remain in the modern version of the word. In the 1970s, with the advent of the humanistic orientation, attention was drawn to the affective field of learning, and noticed affective strategies as part of the set of strategies used in learning (Mohammed, 2019).

Oxford (1990) stated that the term affect refers to emotions, feelings, moods, attitudes, values, and motives. It is also one of the indicators of improving the quality of life. Learners can control

these factors through affective strategies. The affective side of learner is probably one of the very biggest influences on learning success or failure.

Abdel-Mawla (2017) defines affective strategies as directed mechanisms used by the student towards controlling emotions in the learning process, either by seeking to reduce the emotional impact on the learning process (emotions control) or to generate feelings that support learning (motivation control), Such as strategies that arouse the desire to act before starting the learning process, as well as strategies to maintain focus and attention during implementation in order to control emotions and motivation.

It was identified by Gargallo et al. (2012) affective strategies are the ability to control emotions, which makes it possible to organize affective states in favor of effective and successful learning; Because affective learning strategies facilitate learning through motivation and emotions, unlike cognitive strategies that have a direct impact on the learning process.

Mohammed (2019) defines them as the steps and procedures the speakers follow to reduce their anxiety, monitor their emotions, and encourage themselves while learning. Mayrand (2016) says that affective strategies are self-regulating strategies that have the effect of creating a favorable psychological climate for learning. Considering the feelings and emotions of the learner.

Importance of Affective Strategies

Affective strategies are very important especially for those students who do not have the support or motivation to learn from their teacher or class. Affective strategies, also called self-motivational strategies, help students deal with personality factors that are believed to hinder their progress in learning, such as anxiety, low self-esteem, and negative attitudes. It also helps them create and maintain emotional stability during learning. These strategies make learning easier, faster, more enjoyable, more self-directed, more effective, and more transferable to new situations. It increases learners' self-esteem and self-confidence, and helps to

achieve the desired goals, as well as influence the use of cognitive strategies (Oxford, 1990).

Affective Strategy Taxonomy

Gallego & Yaniz (2014) presented a model for affective strategies in learning processes that includes five components:

1) Intrinsic motivation: strategies for motivating oneself to the task itself.
2) Social image*:* strategies that seek to make the best of one's social image as a learner. This factor is closely related to goal orientation and its aim is to preserve one's image, in other words, to be highly regarded and valued by others.
3) Internal Control of Anxiety (self-affirmation): strategies that seek to avoid or control anxiety, by relying on one's own abilities.
4) External Control of Anxiety (task): strategies for thinking that you are able to address the difficulty of the task, by using procedures that seek to "minimize" that difficulty.
5) Avoidance of effort: strategies that seek to avoid effort. Management of effort reflects one's commitment to meet learning objectives, despite difficulties and distractions.

Oxford (1990, 2011) classifies affective strategies into three main kinds:

1) Lowering anxiety: To lower anxiety, learners can depend on various procedures such as :progressive relaxation, deep breathing, or meditation, music, laughter.
2) Encouraging yourself: This strategy means how the learners motivate and encourage themselves to learn. This strategy includes making positive statements, taking risk wisely, and rewarding yourself.
3) Taking your emotional temperature: it means learner's self-assessment of their feelings, motivations, and attitudes and, in many cases, to relate them to learning tasks. Unless learners know how they are feeling and why they are feeling that way, they are less able to control their affective side.

Mayrand (2016) also developed a classification of affective strategies based on the theoretical framework of Audy et al. (1993) and Boulet et al. (1996), which includes four basic strategies:

1) Attention management strategies: Which facilitate learning, encoding, and retaining information. This management requires favorable living conditions, but an environment free of distractions as well. This strategy includes nine sub-strategies: being active, talking to others, taking medication, writing down what you think, taking a break, dividing the task, making sure you get a good sleep, using papers, and choosing a suitable place.
2) Stress Management Strategies: Strategies that help relieve pressures on learners and relieve their stress. Including: doing activities and exercises, taking time-outs, delegating, as well as planning, and adopting a healthy lifestyle.
3) Motivation Management Strategies: Strategies that increase the individual's motivation and avoid what leads to a reduction in motivation and frustration. It includes sub-strategies such as: rewarding oneself, finding meaning in what the learner does, making to-do lists, and setting goals and priorities.
4) Impulse control strategies: They are based on reducing students' potential agitation and emotional reactions and managing affective and intellectual barriers. This category of affective strategies is divided into three sub-strategies: pause, anticipate situations, and change the subject.

Cognitive Load

Human memory is the most important and general characteristic of the human mental and psychological system that enables it to receive external influences and obtain information that enables it to process, understand and retain it. The construct of cognitive load is based on models of human working memory which state that we have limited capacity to process information. Cognitive load is therefore a variable that attempts to quantify the extent of demands

placed by a task on the mental resources we have at our disposal to process information.

The relationship between task demands, mental capacity and performance is namely Cognitive Load. It is a multi-dimensional construct representing the load imposed on the working memory during performance of a cognitive task (Chen et al. 2016).

El-Fil (2015) sees the cognitive load as the total mental energy consumed by the learner while addressing a learning topic or performing a specific task, and this mental energy varies from one learning subject to another, from one task to another, and from one learner to another. Hassanein (2018) stated that the cognitive load is a set of mental activities that learners carry out with the aim of storing information in memory, and then recalling it.

Cognitive Load Theory

Cognitive load theory is concerned with the learning of complex cognitive tasks, in which learners may be overwhelmed by the number of interactive information elements that need to be processed simultaneously before meaningful learning can commence. Cognitive load theory assumes human's cognitive capacity in working memory is limited and only stores about seven elements but can operate on just two to four elements. Whereas long-term memory that contains chunks of information called by schemas is unlimited. Schemata are assumed to be abstracted in working memory and may eventually become automatized due to practice. Human's knowledge comes from these schemata but working memory cannot process many elements simultaneously. So, the basic idea of cognitive load theory is that processing instructional information results in cognitive load, which is located in working memory and affects learning outcomes. In learning process, to improve the academic performance and learning quality, the limited working memory should be fully used and the unrelated cognitive load should be decreased as much as possible. (Zhang, 2013)

The Structure of Cognitive Load

Historically, CLT has specified three types of cognitive load: intrinsic, extraneous, and germane: (Sweller, 2019)

1) Intrinsic cognitive load

It is the load resulting from the nature of the content of the educational material and depends on the level of its difficulty. When the course material contains many elements or concepts, or there is an imbalance in the organization of the material, the learner has difficulty processing it in working memory. The student's ability to deal with the intrinsic cognitive load resulting from the difficulty and interdependence of the subject's content depends on the amount of content elements presented, and the extent to which these elements are interconnected and interact with each other, and the greater the number of elements and the greater the interaction between them, the higher the level of the intrinsic cognitive load. The student's experience, previous knowledge, and the size of his knowledge structure play an important role in linking these elements and deleting some elements in the initial stages of learning and replacing them with relatively simple tasks.

2) Extraneous cognitive load

Also known as ineffective or intrusive cognitive load, it is the result of instructional techniques that learners need to participate in learning activities, which are not directly related to the learner's cognitive construction scheme. This load is generated as a result of the traditional teaching methods used in presenting the educational material, the activities used in the presentation, the nature of the teacher, and inappropriate instructional designs that focus on providing learners with a huge amount of important and unimportant information that requires them to memorize without paying attention to their mental ability to process, encode and store information appropriately, these teaching methods make the learner a receiver and a listener of information. Thus, the learner cannot interact with it, which leads to an increase in the cognitive load due to the loss of the ability to pay attention, poor concentration, and

distance from the learning task. The extraneous cognitive load, as the name indicates, is in excess of the information that is learned, and although the extraneous cognitive load is not part of the information being learned, it is part of the learning environment. Therefore, it is sometimes referred to as ineffective, as it represents indirect learning processes, but it is linked to educational quality. This type hinders the learning process and must be reduced through appropriate methods in presenting the material using various educational means.

3) Germane Cognitive Load

It is called the effective or necessary cognitive load, and it is defined as the mental effort that the learner makes in processing the information that is learned and linking it to the existing cognitive structure and transferring it to long-term memory. It is the burden required to generate meaningful learning. It occurs as a result of useful cognitive processing, which is reinforced through educational means, and helps to build new and complex cognitive schemes in a sequential manner. This type results from the learner's active participation in learning, which results in interaction with new information and the transition between the stimuli presented to him and processing them in his cognitive structure. In the sense that this kind of load contributes to the learning process rather than contradicting it, which requires the learner to build new cognitive schemes. This type of cognitive load helps the learner to move from a novice learner to an expert learner.

Affect and Cognitive Load

There is a close relationship between learners' affective states and the operation of working memory. When instructional support provided to learners is not tailored to levels of their prior knowledge, the resulting working memory overload may emotionally upset and de-motivate learners and thus influence the learning outcomes. The inclusion of affective and motivational factors in cognitive load research, particularly in studies of the expertise reversal effect, remains an essential direction for future

research in this area. Therefore, considering cognitive load aspects of affective learning could broaden the focus of research and enhance understanding of the emotional processes that underlie learning. Potentially, cognitive load framework can also offer some novel methodologies for investigating affect and learning. The actual amount of working memory resources invested in learning activities would depend on levels of motivation, attitudes, and affective characteristics of the learner in relation to the activity itself (Calvo & D'Mello, 2011).

In this context, Plass & Kalyuga (2019) discuss four insights that can link affective states and cognitive load during learning:

1) Emotion as Source of Extraneous Cognitive Load

Emotions as extraneous load competing for the limited resources of working memory by requiring the processing of task-extra or task-irrelevant information. Examples for task-extra processing due to learners' emotion include anxiety. Anxiety is thought to lead to worry, which can lead to the reduction of the storage and processing capacity of working memory but may also increase the amount of effort invested in a task. Another example of negative affect is stress, induced by pressure to perform, which can fill working memory with thoughts about the situation and one's performance, effectively reducing the amount of working memory that is available to perform the task at hand.

Task-irrelevant processing occurs when this material is not relevant to the learning goals, the processing of this irrelevant information induces extraneous cognitive load. In general, both positive and negative emotions could result in task-irrelevant thinking that can generate extraneous load. One example of task-irrelevant processing is described by the seductive details effect. This effect describes how the addition of irrelevant but interesting details to learning materials in order to make them more interesting can result in reduced learning outcomes.

Task-extra and task-irrelevant processing describes an important aspect of the interplay of emotion and cognition, yet it is largely

focused on the interpretations of the negative effect of emotions on cognitive load and learning.

2) Emotion as a Factor Affecting Memory

Research has shown that emotion modulates memory even at the earliest stages of perception. Working memory may be affected by emotion in different ways. These include enhanced encoding, broadening or narrowing of resources, and mood- dependent encoding and retrieval. For example, positive affect is a signal that an individual's needs are taken care of, allowing for other goals and needs to be addressed. This is thought to have a broadening effect that may increase the number of cognitive resources available for learning. In fact, research has shown that positive affect leads to outcomes that can be interpreted as indicators of more available working memory, such as increases in creativity and increases in pro-social behavior.

Another mechanism is that positive mood may affect the cognitive processes themselves, not only by broadening available resources and enabling creative thinking, but also by an improved use of the available cognitive resources and facilitation of executive processes. Negative affect, on the other hand, may have a narrowing effect that decreases the number of cognitive resources available for learning. Research has found effects of negative affect that can be interpreted as indicators of less available working memory, which can result in decreases in creativity and reduced learning outcomes, and which may not be explained as task-extra or task-irrelevant processing.

Consider, for example, the well-established effect of mood-dependent memory, which refers to the effect that recall of material is better when the mood at retrieval is the same as at encoding. A related effect is mood-congruent memory, which describes that new material is more likely to be encoded when the learners' mood at the time of encoding matched the mood associated with the material to be learned.

3) Emotion as Intrinsic Cognitive Load

Another way to consider emotion in relation to intrinsic cognitive load is in the context of DCT. Dual Coding Theory is a cognitive theory that describes how information is processed in two representationally distinct but functionally related systems, a verbal system for linguistic information, and a non-verbal system for imagistic information. The verbal system represents language symbols, while the non-verbal system represents a range of modality-specific visual, auditory, or haptic information, as well as tastes, smells, and emotions. Representations within each system are linked by associative connections, and referential connections link representations between systems. Since both systems are considered relatively independent from one another, processing of information in one system does not interfere significantly with processing of information in the other system.

4) Emotion Affecting Motivation to Increase Cognitive Effort

The effect of emotion on learning is mediated by motivation. It has been argued that emotion can foster motivation that will result in increased learning. For positive emotions, this perspective is supported by research that has shown that positive emotions facilitate intrinsic motivation. In the context of emotional design, the features used to induce positive emotions, such as warm colors or round shapes, may make the learning environment more motivationally pleasing and may, as a result, increase motivation. This effect is more likely for activating positive emotions; deactivating positive emotions can have the opposite effect by deactivating motivation and resulting in disengagement from the learning process.

Previous Research

First: Studies that examined Affective Strategies

The study of Saeidi & Jabbarpour (2011) aimed to reveal the relationship between the use of affective strategies and students' academic achievement. (120) students participated in answering a

questionnaire to collect data on affective strategies consisting of (73) questions. The students' academic achievement was also determined by their grades in the final exams. The results of the statistical analysis indicated that there is a statistically significant relationship between the use of affective strategies and the students' academic achievement.

Kiener & Weaver (2011) examined the affective and cognitive learning strategies students use as they complete coursework. The study stated that (53) of undergraduate and postgraduate students had participated in a two-semester study. The data consisted of student interviews, notes written by the researcher, course assignments, and teacher plans and notes. The results indicated that students use learning strategies, both cognitive and affective, that provide support for coursework completion. Time management skills and seeking more interaction with content are some of the most used strategies.

Roboh & Tedjaatmadja (2016) study aimed to find out the affective strategies used by high-efficiency learners. The applied theory was the Affective Strategies Theory put forth by Oxford (1990) as the main theory and Oxford (2011) as the supporting theory. Data were collected through questionnaires and interviews conducted with (10) students. The results showed that the learners mostly used Part 1 and Part 2 of the affective strategies, i.e., "reduce anxiety" and "encourage yourself". The third part of the affective strategies, "Reduce Your Emotion," was the least used by learners. Learners may not be familiar with strategies such as 'using a checklist' or 'writing learning notes'.

Bielak's (2018) study aimed to investigate the effect of teaching affective strategies on students' use of affective strategies and their anxiety levels. The relationship between the use of affective strategies and anxiety levels was investigated using self-reports, as well as measured during, before and after applying oral tests. The Oxford scale (1990) was also used to measure the affective strategies used. With the participation of (23) university students in

Poland. The results indicated that teaching affective strategies to students resulted in their use and application of them more effectively. It also had an effect on their anxiety levels.

In the study of Wijirahayu & Dorand (2018) a survey was conducted that included two main psychological variables in language learning, which are attitudes and affective strategies, and the third variable is speaking performance. This study included (71) male and female students in the second year of university students majoring in communications engineering and electrical engineering. The results revealed a positive effect of affective strategies on students' speaking performance. The survey also showed that students use affective strategies at a high rate.

Second: Studies that examined Cognitive Load

The study of Miendlarzewska et al. (2013) investigated whether load in working memory could impair episodic memory of emotional images. The participants (21 volunteers) performed a task with two levels of working memory load. They were divided into two groups and in one group anxiety was stimulated using a threat trauma model to increase attentional processing of negative information. While performing the task, emotionally distracting images were glimpsed that caused longer response time in the two load states. Post hoc testing of direct perceptual memory revealed that when the load was low, negative items were better recognized in both groups involved. However, this boost decreased under high load, leaving performance on neutrals unchanged regardless of the threat of shock handling. They conclude that under threat and in normal situations, working memory load can lead to poor immediate emotional memory enhancement.

Berggren et al. (2013) examined the effect of cognitive load on attention control in individuals with anxiety. The (94) participants from University of London filled out an anxiety trait scale and then completed a visual task using emotional facial expressions (neutral, happy, and angry) as targets. load was processed using a secondary auditory task that required tone recognition (low load), or specific tone recognition (high load). Results indicated that increased

cognitive load disrupts attentional control processes, especially for individuals with high levels of anxiety.

The study of Kareem (2016) sought to identify the level of negative emotional states (stress, anxiety, depression) and the level of cognitive load (high - low) among students of public and private universities, as well as statistically significant differences according to specialization and gender. The sample consisted of (480) male and female students from the scientific and humanities majors. The researcher used the (Lovibond) scale to measure negative emotional states and their three domains (stress, anxiety, depression) after translating it, and he used the cognitive load scale. And it was concluded that the level of negative emotions is below average, as it was found that (318) male and female students have a high level of cognitive load, while the rest had a low level of load.

The study of Hassanein (2018) aimed to identify that the cognitive load is a predictor of both motivation and academic achievement among first-year students, and the study sample consisted of (50) adolescents in the undergraduate level, from first-year students at the Higher Institute of Administrative Sciences and Foreign Trade. The tools used in this study included the cognitive load test, the motivation test, and the academic achievement test. The results showed that the cognitive load is predictive of both motivation and academic achievement for first-year students.

Garrison & Schmeichel (2018) examined the effects of emotional content on working memory capacity, which includes both short-term storage and procedural attention control. The emotional reinforcement hypothesis predicts that emotional stimuli attract attention and increase processing resources related to neutral stimuli, making it easier to encode emotional information and store it in working memory. In contrast, the emotional inhibition hypothesis predicts that emotional stimuli interfere with attention control and the effective preservation of information in working memory. The sample number was (297) participants who filled out the working memory capacity scale, which included either

emotional or neutral words. The results revealed that the working memory capacity decreased due to the emotional words compared to the neutral words.

Commenting on previous research:

The research objectives of the studies that dealt with affective strategies varied, as some researchers were interested in conducting exploratory studies on the affective strategies used by university students, such as (Kiener & Weaver, 2011) and (Roboh & Tedjaatmadja, 2016). These studies found that the most affective strategies used by students include interacting with content, reducing anxiety, self-motivation, and internal control of anxiety.

In addition, there are some studies that examined affective strategies with other variables, such as (Saeidi & Jabbarpour, 2011) that revealed a positive relationship between the use of affective strategies and academic achievement. As well (Wijirahayu & Dorand, 2018) and (Bielak, 2018), which showed a positive effect of affective strategies on students' speaking performance and their level of anxiety.

Some studies that dealt with the cognitive load aimed to examine its relationship to some affective strategies, such as (Berggren et al., 2013), which examined the relationship of cognitive load and attention and concluded that the increasing cognitive load disrupts attention control, and (Hassanein, 2018) which showed that the cognitive load is predictive of motivation. In addition to other studies that dealt with the effect of some emotions on the cognitive load, such as the study of (Karim, 2016), (Miendlarzewska et al, 2013) and (Garrison & Schmeichel, 2018), the results of which agreed that some negative emotions lead to an increase in the cognitive load and a decrease in working memory capacity.

This shows that previous studies did not address the affective strategies as a whole, but rather focused on some strategies and not others. Therefore, the current study is concerned with studying the combined affective strategies and their relationship to the cognitive load. It also clarifies the role of affective strategies in dealing with

emotions that affect cognitive load, whether positively or negatively.

Method

Approach:

The descriptive approach was used as it is more suitable for the objectives of the current study.

Participants:

The current study population represents graduate students in the general diploma program at the Faculty of Education - Ain Shams University in the academic year 2020/2021. The exploratory sample consisted of (119) male and female students, and the final sample of the study consisted of (159) male and female students.

Instrumentation:

The following scales were used to measure each variable and collect data from participants in order to answer the research questions.

Affective Strategies Scale: is designed based on Mayrand (2016) classification of affective strategies, which is based on integrating the theoretical framework of (Audy et al. 1993) and (Boulet et al. 1996). thus, the basic dimensions of the scale are determined as follows: The first dimension: Attention management strategies consists of (8) items, the second dimension: Stress Management Strategies, consists of (9) items, the third dimension: Motivation Management Strategies, consists of (9) items, and the fourth dimension: Impulse control strategies, consists of (6) items. This scale is a 5-point Likert-type scale with anchors of 1 (Never use it) to 5 (Always use it).

To achieve scale validity, first: specialists were consulted to check the content. Their comments included the following: paraphrasing some statements to clarify the meaning, suggesting items for some dimensions, and delete some statements that do not belong to its dimension. Second: Factor analysis method was adopted using the Principal Component Analysis (PCA) with Varimax rotation. Kaiser – Mayer – Olkin Measure of Sampling

Adequacy (KMO) value = 0.75, which indicates a high fit. After deleting saturations less than (0.3), the researcher obtained saturations higher than (0.3) in (29) items with only three of the four factors as following: (11) items are saturated with the second factor, which is stress management strategies. (11) items are saturated with the third factor, which is motivation management strategies. (7) items are saturated with the fourth factor, which is impulse control strategies.

The final form of the scale consists of (29) items, with three dimensions, the first dimension: stress management strategies, and it consists of (11) items, the second dimension: motivation management strategies, and it consists of (11) items, and the third dimension: impulse control strategies, and it consists of (7) items.

The instrument has yielded an acceptable reliability. Cronbach's alpha coefficients for the full scale ($\alpha = .91$) as well as the subscales of stress management strategies ($\alpha = .81$), motivation management strategies ($\alpha = .84$), and impulse control strategies ($\alpha = .76$).

Cognitive Load Scale: is designed to measure each of the dimensions of cognitive load: intrinsic cognitive load, extraneous cognitive load, and germane cognitive load. The scale consists of 21 items, 7 items for each dimension. This scale is a 5-point Likert-type scale with anchors of 5 (strongly disagree) to 1 (strongly agree).

To achieve scale validity, first: specialists were consulted to check the content. Their comments included the following: paraphrasing some statements to clarify the meaning, suggesting items for some dimensions, and delete some statements that do not belong to its dimension. Second: Confirmatory Factor Analysis was performed in order to test the theoretical model of cognitive load. Goodness-of-fit indices are as follows: chi squared ($\chi 2 = 120.6$), was statistically not significant, the root mean square error of approximation (RMSEA) = .05, the comparative fit index (CFI) = .95, the goodness of Fit Index (GFI) =.90, and Tucker-Lewis index

(TLI)=.94, indicating that the empirical model fits well with the theoretical model.

After deleting saturations less than (0.3), the researcher obtained saturations higher than (0.3) in (15) items with three dimensions as following: intrinsic cognitive load (4) items, extraneous cognitive load, (4) items, and germane cognitive load (7) items.

The instrument has yielded an acceptable reliability. Cronbach's alpha coefficients for the full scale (α = .89). The subscales also yielded acceptable reliabilities (intrinsic cognitive load, α = .70; extraneous cognitive load, α = .84; germane cognitive load, α = .80).

Statistical Analysis

Central tendency measures (Mean: M), dispersion measures (Standard Deviation:SD), Exploratory Factor Analysis (EFA), Cronbach's alpha coefficient, analysis of variance ANOVA. In addition to the Confirmatory Factor Analysis (CFA).

Results

Research Question 1: What are the most used affective strategies among students of the general diploma in the College of Education in learning situations?

To identify the affective strategies used by students of the General Diploma, mean, standard deviation, and percentages were calculated for each item of the affective strategies scale and for the total score of the scale, in addition to the degree of each dimension of the scale. To estimate the level of students' use of strategies, the criterion that was applied in Oxford (1990) based on percentages was used as follows: (20.0: 49.9) low level, (69.9: 50.0) medium level, (100: 70.0) high level.

Table (1): mean, standard deviation, and estimates for affective strategies

Item number	M	SD	%	Estimate
1	4.21	.892	84.1	high
2	3.00	1.218	60.0	medium
3	3.99	.997	79.7	high
4	3.83	1.004	76.5	high
5	4.29	.803	85.8	high
6	3.49	1.075	69.9	medium
7	3.94	1.024	78.8	high
8	3.87	1.084	77.3	high
9	4.14	.974	82.8	high
10	3.92	1.003	78.3	high
11	4.31	.833	86.3	high
12	3.12	1.144	62.4	medium
13	4.30	.876	86.0	high
14	4.44	.755	88.7	high
15	4.31	.906	86.2	high
16	3.79	1.117	75.9	high
17	4.08	.930	81.7	high
18	3.97	.999	79.4	high
19	4.46	.773	89.1	high
20	4.01	1.029	80.3	high
21	4.35	.810	87.1	high
22	4.28	.877	85.5	high
23	3.64	1.130	72.8	high
24	3.67	1.091	73.5	high
25	3.59	1.015	71.8	high
26	3.40	1.237	67.9	medium
27	3.58	1.102	71.5	high
28	2.88	1.334	57.7	medium
29	3.67	1.137	73.5	high
Dimension 1	42.9	6.736	78.1	high
Dimension 2	45.1	6.233	82.0	high
Dimension 3	24.4	5.562	69.8	medium
Total degree	112.5	16.498	77.6	high

Table (1) shows that the general level of using affective strategies among students of general diploma in the Faculty of Education, Ain Shams University is a high level of (77.6%). The level of the sub-dimensions appears between high and medium, where the first dimension, which is stress management strategies, was at a high level (78.1%), and the second dimension, which is motivation management strategies, was the most frequently used strategies at a high level (82%), and the third dimension, which is impulse control strategies was at a medium level with a percentage of (69.8%).

It also shows that the least used strategy is strategy No. (28) (I write down the impulsive situations I went through so I can learn from them later) with a rate of (57.7%), followed by strategies No. (2, 6, 12, 26) with a medium level of use. As for the strategies that were used at a high level among the students, there were (24) strategies. It is noted from the previous presentation that general diploma students have a strong orientation regarding all affective strategies in learning situations. This illustrates the importance of affective strategies and their role in improving students' academic performance and increasing their motivation to learn.

Research Question 2: Does the level of cognitive load differ according to the level of using affective strategies among students of the General Diploma in the College of Education in learning situations?

To answer this question, the analysis of variance ANOVA was used between affective strategies (stress management - motivation management - impulse control) and cognitive load (Intrinsic, Extraneous, and Germane) as following:

1- ANOVA between stress management strategies and cognitive load (intrinsic, extraneous, and germane).

Table (2) ANOVA results between stress management and intrinsic, extraneous, and germane load

	source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Intrinsic load	Between Groups	65.778	1	65.778	6.955	0.05	0.08
	Within Groups	775.508	82	9.457			
	Total	841.286	83				
Extraneous load	Between Groups	56.969	1	56.969	4.873	0.05	0.06
	Within Groups	958.697	82	11.691			
	Total	1015.667	83				
Germane load	Between Groups	285.099	1	285.099	14.104	.001	0.15
	Within Groups	1657.603	82	20.215			
	Total	1942.702	83				

Table (2) shows that:

There are statistically significant differences in intrinsic cognitive load according to the different level of using stress management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using stress management strategies was 8% in the variance of intrinsic load, which indicates an average effect according to Cohen's criterion.

There are statistically significant differences in extraneous cognitive load according to the different level of using stress management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using stress

management strategies was 6% in the variance of extraneous load, which indicates an average effect according to Cohen's criterion.

There are statistically significant differences in germane cognitive load according to the different level of using stress management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using stress management strategies was 15% in the variance of germane load, which indicates a high effect according to Cohen's criterion.

2- ANOVA between motivation management strategies and cognitive load (intrinsic, extraneous, and germane).

Table (3) ANOVA results between motivation management and intrinsic, extraneous, and germane load

	source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Intrinsic load	Between Groups	59.201	1	59.201	6.077	0.05	0.07
	Within Groups	828.063	85	9.742			
	Total	887.264	86				
Extraneous load	Between Groups	132.690	1	132.690	13.628	.001	0.14
	Within Groups	827.586	85	9.736			
	Total	960.276	86				
Germane load	Between Groups	243.453	1	243.453	12.667	.001	0.13
	Within Groups	1633.605	85	19.219			
	Total	1877.057	86				

Table (3) shows that:

There are statistically significant differences in intrinsic cognitive load according to the different level of using motivation management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using motivation management strategies was 7% in the variance of

intrinsic load, which indicates an average effect according to Cohen's criterion.

There are statistically significant differences in extraneous cognitive load according to the different level of using motivation management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using motivation management strategies was 14% in the variance of extraneous load, which indicates a high effect according to Cohen's criterion.

There are statistically significant differences in germane cognitive load according to the different level of using motivation management strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using motivation management strategies was 13% in the variance of germane load, which indicates an average effect according to Cohen's criterion.

3- ANOVA between impulse control strategies and cognitive load (intrinsic, extraneous, and germane).

Table (4) ANOVA results between impulse control strategies and intrinsic, extraneous, and germane load

	source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Intrinsic load	Between Groups	27.682	1	27.682	3.010	0.05	0.03
	Within Groups	873.637	95	9.196			
	Total	901.320	96				
Extraneous load	Between Groups	36.059	1	36.059	3.062	0.05	0.03
	Within Groups	1118.580	95	11.775			
	Total	1154.639	96				
Germane load	Between Groups	216.436	1	216.436	12.563	.001	0.12
	Within Groups	1636.677	95	17.228			
	Total	1853.113	96				

Table (4) shows that:

There are statistically significant differences in intrinsic cognitive load according to the different level of using impulse control strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using impulse control strategies was 3% in the variance of intrinsic load, which indicates a low effect according to Cohen's criterion.

There are statistically significant differences in extraneous cognitive load according to the different level of using impulse control strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using impulse control strategies was 3% in the variance of extraneous load, which indicates a low effect according to Cohen's criterion.

There are statistically significant differences in germane cognitive load according to the different level of using impulse control strategies among students in favor of those with a high level of use. The effect size (Eta-squared) for the level of using impulse control strategies was 12% in the variance of germane load, which indicates an average effect according to Cohen's criterion.

Discussion

Stress management strategies are based on relieving students' tension and the level of pressure they are exposed to, through several sub-strategies, include taking a time-out during the performance of tasks, which helps reduce pressure, and good planning for the tasks to be performed, which in turn reduces the degree of stress, as well as dividing tasks into subtasks. The effect of this is shown in the level of the intrinsic load, as it helps to prepare the memory for the content of the educational material and facilitate its processing in the working memory.

Where Plass & Kalyuga (2019) stated that information encoding, storage and retrieval is affected by emotions even before awareness of the material, and that emotions may directly affect memory by expanding or narrowing cognitive resources, so these strategies make the student less tense and stressed, which has an expanded effect that

increases the amount of cognitive resources available for learning, and thus the student is able to deal with the elements of the subject without pressure, and provides working memory space to process information without being consumed by tension and pressure.

The impact of stress management strategies also appears on the student's ability to deal with educational technologies that are not directly related to the learner's cognitive building scheme, as they help him reduce stress and pressure resulting from dealing with inappropriate educational tools and designs, reduce tension in the learning environment and increase focus and attention, which keeps the extraneous load at a low level.

In contrast, stress management strategies contribute to raising the level of germane cognitive load that is effective or necessary load. It helps the student to participate actively in the learning process, which results in interaction with new information and processing it in his cognitive structure, and thus helps to build new cognitive schemes, and transfer them to long-term memory. These results agreed with the study of (Kareem, 2016), (Miendlarzewska et al, 2013) and (Garrison & Schmeichel, 2018).

The role of motivation management strategies appears in reducing the level of intrinsic load by motivating students and increasing their motivation, by setting specific goals for tasks and achieving them, creating lists of tasks and following up on their implementation, which helps the student to deal with the difficulty of the content of study materials, follow up on the content elements and its ability to simplify it, and monitor his progress in it, and thus increases the student's sense of achievement and his interest in the learning process. in addition, it encourages and motivates the student to deal with the methods used in presenting the educational material and related activities, which increases his demand for the educational process and prepares his mental abilities to process, encode and store information appropriately. This keeps the extraneous load at a low level.

On the other hand, the importance of motivation appears in determining the actual working memory resources allocated to the

learning task, because the amount of effort invested will depend on the students' beliefs about themselves and the learning task. If the learner does not believe that he can be successful, then the cognitive resources will not be invested in the task at hand and the learning will not occur. Likewise, learners with high motivation and high expectations of success choose more challenging tasks, persist more on difficulty, and achieve better learning outcomes than those with low expectations of success. This was pointed out by (Scheiter et al., 2009), (Wirth et al., 2009), (Hassanein, 2018) and (Plass & Kalyuga, 2019).

Emotions may start, end or disrupt information processing, and may lead to selective processing of information, so impulse control strategies are based on reducing students' potential emotion, emotional reactions and managing affective and intellectual barriers, which has an extended effect that increases the number of cognitive resources available for learning. Thus, the student is able to understand the elements and concepts of the educational material and realize its content and interrelationship in a smooth manner without burdening the working memory with intrinsic cognitive load.

Accordingly, the effort expended by the student in dealing with traditional educational designs and methods is reduced and he can deal with them in a better way, as well as he is able to participate in the educational environment effectively and thus the extraneous cognitive load is at a low level. This is confirmed by Pekrun et al., (2002). On the other hand, the student is able to generate meaningful learning, through active participation in the learning process, which allows building new knowledge schemes, which helps him to move from a novice learner to an expert learner, and this leads to a higher level of germane load, and thus achieves learning outcomes. This agrees with (Geertshuis, 2019).

Recommendations

Based on the findings of the current study, the researcher recommends the following:

1- The necessity of students' interest in using affective strategies in different learning situations.
2- The importance of taking into account affective strategies when developing educational programs and plans.
3- Holding workshops and training lectures explaining the importance of using affective strategies.
4- The use of multiple educational means that correspond to the cognitive level of the students.
5- Considering the mental ability of students when organizing and presenting the educational material.

Suggestions for Further Research

1- Differences in affective strategies according to gender and major.
2- A training program to enhance the use of affective strategies in learning situations.
3- The impact of affective strategies on other cognitive variables.

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