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Learning strategies on the students' performance of iraqi science students: mediating role of academic self-efficacy

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ABSTRACT

Objective: The main objective of this study is to examine the effects of several learning strategies, including surface, deep, and strategic approaches, on the academic achievement of science students in Iraq. In addition, the present study has investigated the potential mediating influence of academic self-efficacy on the association between learning techniques, specifically surface, deep, and strategic approaches, and the academic performance of science students in Iraq. **Methodology:** In order to achieve the research objectives, which involve investigating the direct and mediating relationships between learning techniques, academic self-efficacy (ASE), and academic performance, the study has utilized a quantitative methodology. A questionnaire survey was employed to collect data from participants, with the aim of attaining the study's objectives. The current study exhibits a response rate of 62.23%. The Structural Equation Modeling-Partial Least Squares (SEM-PLS) and the Statistical Package for the Social Sciences (SPSS) are commonly employed for conducting data analysis. **Results:** The findings suggest that there is a significant and favorable relationship between learning strategies and academic self-efficacy. Furthermore, academic self-efficacy acts as a mediator between learning strategies and the academic performance of science students in Iraq. The results indicate that the utilization of surface learning strategies has a discernible impact on the acquisition of adaptive self-regulated learning skills, thereby influencing overall academic achievement. **Implications:** Educators and policymakers can employ these findings to devise more efficacious programs aimed at facilitating students' acquisition of academic competencies and bolstering their self-assurance. **Novelty:** This study is a pioneering investigation into the interplay between learning practices, academic self-efficacy, and the academic performance of science students in Iraq.

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Background

The implementation of efficient educational methodologies has consistently been recognized as a fundamental aspect in the development of curriculum design (Peiró, Lorente, & Vera, 2020). In the realm of instructional material design, it is imperative for educators to take into account the varied learning modalities exhibited by students, as this is a widely recognized pedagogical tenet known for its high effectiveness (Cho, Lee, & Herner-Patnode, 2020). However, the introduction of truly adaptive teaching methodologies in public schools poses a formidable undertaking due to the inherent heterogeneity in students'individualized preferences for educational modalities, which might vary greatly among them (Bernacki, Greene, & Lobczowski, 2021). As a result, instructional designers have recognised learning techniques as a substantial and pressing concern. Educators bear the obligation of creating educational environments that take into account the distinct learning styles of individual students, thereby fostering favorable conditions for the process of learning. Educators have increasingly utilized a wide array of technological resources (Li, Gao, & Xu, 2020) since the onset of the 21st century. This adoption aims to improve the effectiveness of instructional practices and better the overall educational experience for students.

Over a period of several decades, there has been a significant rise in the integration of technology in higher education. This increase can be primarily attributed to its utilization in various areas such as visual presentations, simulations, accessing online course materials and resources, and fostering interactive learning experiences. The students exhibit a high level of competency in using electronic media for communication, which can be attributed to their cultural background that places significant emphasis on technology (Adipat, 2021). It is frequently observed that students often express their inclination towards enrolling in courses taught by instructors who utilize a range of media, including PowerPoint presentations, class-specific websites, and diverse multimedia formats, in order to proficiently communicate fundamental topics. According to Simamora (2020), students who face difficulties in efficiently gaining knowledge through traditional instructional methods can also derive benefits from the utilization of technology resources. Through the utilization of computer-assisted instruction, instructors have the ability to provide their pupils with an educational experience that surpasses the traditional classroom environment. When faced with challenges in understanding the subject matter due to language limitations or lack of enthusiasm, instructors can utilize PowerPoint's visual aids to enhance the student's capacity to build connections between different concepts.

Educators and instructional designers are aware that students have a variety of learning modalities available to them. However, there exists a dearth of clarity concerning the criteria utilized by students in the selection of various methods, as well as the underlying rationale behind their preference for certain strategies over others (Al-Seghayer, 2021). Despite the presence of numerous strategies available to pupils. Does the academic discipline of an individual have an impact on the variety of strategic alternatives that they have at their disposal? Is it imperative to take into account an individual's gender when making a decision on strategy selection? Moreover, it is apparent that educators possess a keen interest in evaluating the degree to which the implementation of instructional methodologies aligns with the progress of diverse

outcomes, such as academic achievement, resilience, and student dispositions. There exists a notable interest among individuals regarding the potential impact of students' previous levels of achievement on their selection of strategies, as well as the presence of a substantial association between the utilization of specific strategies and academic performance (Ansley et al., 2021). These inquiries are of considerable significance, and gaining prior knowledge of their answers can substantially help the process of information retention.

The research conducted by Brown et al. (2020) has resulted in the discovery of diverse teaching approaches within distinct categories. Within the domain of learning strategies, Akande et al. (2023) differentiate between deep, surface, and attaining methods. Similarly, Zimmerman, Greenberg, and Weinstein (2023) differentiate between cognitive, motivational, and self-regulation strategies in the context of strategic learning. Both writers prioritize the examination of learning strategies. The taxonomy of learning methods established by Waldeyer et al. (2022) has gained widespread acceptance. It has three separate groups, namely cognitive strategies, metacognitive strategies, and resource management strategies. According to Vithayathil et al. (2020), resource management tactics comprise a range of measures, including the regulation of effort. This involves the ability to persist in one's job even when faced with tough or unstimulating material. Furthermore, the proficient management of resources encompasses the adept distribution of time and the careful choice of suitable learning environments (Abbasi et al., 2022). The utilization of help from educators and peers, together with active participation in collaborative study sessions, exemplifies further techniques for managing resources.

Academic self-efficacy (ASE) pertains to a student's confidence in their capacity to acquire new knowledge, effectively organize acquired knowledge, and proficiently apply it to real-life scenarios. Consequently, the student has exhibited a certain level of competence in regulating their own emotions and behaviors (Fan, 2022). ASE, or academic self-efficacy, pertains to an individual's perceived level of confidence in their own talents within the context of education. Academic Self-Efficacy (ASE) pertains to an individual's subjective assessment of their capacity to effectively attain the objectives and desired results they have set for their educational endeavors (Senin et al., 2023). Academic self-efficacy (ASE) pertains to the degree to which a student holds the belief in their capacity to successfully complete academic assignments and overcome the inherent difficulties associated with these tasks. The Academic Self-Efficacy (ASE) of a student is seen as a significant factor that might influence their intended academic behaviors. This, in turn, has the potential to affect various aspects of their cognitive processes, emotional responses, and behavioral inclinations (Le, Doan, & Duong, 2023). It is proposed that students' self-efficacy (ASE) indirectly influences their levels of commitment, academic resolve, and attitudes toward the problems and opportunities they meet while striving to achieve their academic goals. Thus the study is planned to achieve the following objectives

- To examine the mediating role of ASE impact of learning strategies on student performance.

Hypothesis Development

Learning Strategies and Students performance

It is not unexpected to discover that students have access to a diverse range of resources and methodologies that might aid them in achieving their educational objectives. There are other ways that can be employed, potentially equivalent in quantity to the number of individuals presently enrolled in the class. The presence of diverse instructional variables, such as student characteristics, domain types, teaching methodologies, time availability, learning technologies, feedback modalities, required level of mastery, and measurement techniques, plays a significant role in the selection and utilization of strategies among students (Smale-Jacobse et al., 2019). It is crucial to recognize the importance of taking into account these aspects while contemplating the development of captivating and efficacious instructional sessions. Education comprises a wide range of pedagogical approaches, which vary from classic methods that emphasize memorization to progressive ways that promote self-directed learning among students. Hoidn and Reusser (2020) undertake a systematic categorization of each entity, assigning them to one of five separate classifications. Exemplary examples of strategies falling under these categories are rehearsal, elaboration, organization, metacognition, and motivation. Within the context of this particular taxonomy, the basic three groups are further separated into elementary and advanced subcategories. Within the framework of the ongoing inquiry, the adoption of a comprehensive set of tactics encompassing the five primary categories as outlined by Weiss and Kanbach (2023) was carried out.

One approach to effectively interacting with the material involves the identification and comprehensive analysis of its pivotal passages. This category comprises a range of strategies, including as memorizing, oral reading of texts, creation of concept lists, highlighting and underlining, employment of mnemonics, and note-taking (Lahodynskyi et al., 2019). When a student partakes in the process of elaboration, they are actively combining the material they have obtained through instructional means with their individual knowledge and experiences, so augmenting its importance and applicability to their own comprehension. Various techniques can be employed to further develop ideas, including but not limited to broadening one's vocabulary, restating concepts, summarising information, aligning related concepts, utilizing analogies, creating metaphors, comparing and contrasting, questioning assumptions, and employing visual aids.

The category of activities referred to as "organization" involves the examination and restructuring of the information that is made available (Olanipekun & Sutrisna, 2021). The student concludes that the existing organization of the content is ineffective and proposes an alternative strategy. Various procedures come within this category, including outlining, generating tables, classifying, reorganizing, establishing linkages, developing concept maps, and applying unorthodox listing approaches. The fundamental emphasis of metacognition as an educational approach is on the student's capacity to identify and comprehend their own cognitive capabilities (Rivers, Vallance, & Nakamura, 2021). The student evaluates their present standing within their educational trajectory and explores innovative avenues to augment their academic aptitude. Metacognitive methods comprise a range of practices, including self-evaluation, acknowledging and assuming responsibility, introspective contemplation,

monitoring one's own progress, and adapting study habits. The effectiveness of tactics aimed at motivating students is contingent upon the conscious efforts made by students to improve their academic performance and emotional well-being, taking into account both cognitive and physical components (Mickelsson, 2023). This broad category comprises a range of strategies, which may include but are not limited to enhancing one's ability to concentrate, effectively coping with worry, efficiently managing time, diminishing stress levels, cultivating internal motivation, and establishing personally significant objectives.

There is a substantial body of academic literature that investigates the efficacy of different instructional methods in accommodating students' unique learning strategies. This literature also evaluates the effectiveness of these methods across a range of academic disciplines and evaluates the observed outcomes in real-world educational environments. Various instructional approaches can be utilized, such as personalized education, collaborative learning, and project-based learning (Lai, 2021). The cumulative findings of all the conducted investigations exhibit significant promise. Existing research has demonstrated that students who attain better levels of achievement in their academic pursuits tend to employ a wider range of learning strategies, distinguished by a superior degree of quality when compared to their less successful peers (Elmi, 2020). The correlation between the specific attributes of students and their preferred modes of learning is a crucial aspect that warrants careful consideration. There is no single technique that can ensure positive outcomes when adopted in any educational context. Suson et al. (2020) contend that it is imperative to offer students instructional interventions that foster their understanding and competence in employing strategies that cater to their specific needs. This approach facilitates the optimization of their educational experiences. Research has shown that constructivist tactics exhibit greater effectiveness and are generally more captivating when compared to behaviorist strategies in terms of addressing the distinct learning styles of individual students. According to the research conducted by Badilla-Quintana, Sepulveda-Valenzuela, and Salazar Arias (2020), the integration of interactive technologies resulted in increased academic achievement and more positive student attitudes. In the words of Szymkowiak et al. (2021), the alignment between teaching tactics and learning strategies is crucial for attaining both academic achievement and learner satisfaction in educational settings.

A multitude of studies has been undertaken to assess the effectiveness of various instructional approaches, utilizing both controlled and experimental research procedures. The research done by Smith et al. (2021) sought to examine the impact of text highlighting on students' comprehension and recall of information. The researchers have concluded that the use of strategies such as underlining important passages, applying italics for emphasis, and engaging in note-taking alone is insufficient to guarantee the effectiveness of studying.

Adzima's (2020) study demonstrated significant discrepancies in the learning approaches utilized by students who participate in conventional in-person education against those who choose distant education. With respect to the instruction of male pupils, no discernible differentiation was observed between the two techniques. As reported by Joosten and Cusatis (2019), a study revealed that female students who participated in online degree programs exhibited higher levels of academic accomplishment compared to their peers who were enrolled in traditional programs. The research results suggest that students participating in online courses demonstrate elevated levels of motivation and apply more sophisticated learning strategies in comparison to their counterparts in traditional classroom settings.

H1: Deep learning strategy has positive and significant impact on the student' academic performance
H2: Surface learning strategy has positive and significant impact on the student' academic performance
H3: Strategic learning strategy has positive and significant impact on the student' academic performance

ASE as mediator

The level of self-efficacy exhibited by a student is a significant factor in determining their level of achievement in academics. Academic self-efficacy (ASE) is a construct that pertains to the level of confidence a student holds in their capacity to achieve academic success (Li, 2020). This pertains to the pupils' level of self-assurance in their capacity to proficiently complete academic tasks, as well as their aptitude to recall knowledge imparted throughout classroom lectures.

The existence of self-efficacy beliefs is of paramount importance in promoting heightened productivity through the provision of essential incentives for commitment, exertion, and perseverance (Farooq et al., 2022). Based on existing research investigations, it has been shown that persons who possess a robust sense of self-efficacy are inclined to ascribe their failures to insufficient effort rather than an inherent lack of talent (Amoa-Danquah, 2023). This is in contrast to students who exhibit a reduced level of self-efficacy. The development of an individual's feeling of self-efficacy holds great relevance due to its substantial influence on the selection of tasks and the ability to persevere. Empirical studies have demonstrated that students who possess low self-confidence in their own capabilities exhibit a higher tendency to engage in procrastination behaviors when confronted with the task of finishing their projects (Lao et al., 2023).. In certain instances, these individuals may even opt to completely abandon their assignments. On the other hand, persons with a considerable degree of self-efficacy are more inclined to engage in introspective thinking when confronted with difficult challenges. Moreover, individuals demonstrate heightened levels of patience, exert increased levels of effort, and persevere in their pursuits until they achieve fulfillment (Preusser & van den Bent, 2023). Therefore, it may be deduced that there exists a positive relationship between students' self-confidence in their own capabilities and their academic achievements. An investigation carried out by Ergün and Şeşen (2021) demonstrated a strong correlation between college freshmen's self-perceived skills to achieve academic success and their subsequent academic achievement in college.

Xu, Lem, and Onghena (2021) conducted a study that investigated the correlation between students' self-perceived academic ability and their academic achievement. The ultimate effect is an augmentation in the process of learning knowledge, leading to an increase in academic achievements (Celik, 2022; Faqih & Jaradat, 2021; Hayat & Shateri, 2019; Wang, Olivier, & Chen, 2020). On the other hand, persons who possess reduced levels of self-efficacy often exhibit a tendency to actively pursue tasks that are relatively less demanding, with the intention of avoiding the potential for encountering failure. Furthermore, it is seen that individuals often resort to superficial strategies rather than actively engaging in deeper modes of knowledge acquisition (Liu et al., 2020).

In a subsequent study, Hayat et al. (2020) discovered a robust association between self-efficacy and metacognitive learning techniques, hence providing further support for the aforementioned results. Pintrich asserts that the students' evaluations of their own talents

significantly influence their use of these tactics. The acquisition of cognitive and metacognitive methods is of utmost importance for students in order to effectively employ these techniques. Moreover, it is imperative that individuals demonstrate an inherent drive to attain exceptional levels of performance (Karimi & Sotoodeh, 2019). The recommendation described above is in accordance with theories that support the concept of self-regulated learning.

The study conducted by Liu, Du, and Lu (2023) offers a comprehensive explanation of the concept of Academic Self-Efficacy (ASE). This research presents a theoretical framework that allows for a deeper understanding of how an individual's behavior, internal factors, and external circumstances interact to influence their degree of performance. Prior studies have established that students' academic self-efficacy (ASE) beliefs have a significant impact on multiple dimensions of their academic engagement and performance. These dimensions include task selection, amount of effort, perseverance, and overall academic attainment. Based on the empirical study conducted by Wang et al. (2020), it can be deduced that students who possess a high level of self-efficacy tend to actively participate in classroom activities, exhibit increased diligence in their academic tasks, maintain a strong commitment to completing their assignments and demonstrate a decrease in negative emotional responses when faced with challenging situations. According to Voica, Singer, and Stan (2020), there exists a negative correlation between an individual's self-perceived competence in an educational environment and their personal degree of accomplishment. This link ultimately reduces the likelihood of experiencing stress and sadness. Based on the results of a reputable study conducted by Hayat et al. (2020), it has been established that ASE plays a substantial role as a motivating factor in the learning process. Individuals who have a strong belief in their ability to succeed academically are more likely to achieve their scholastic goals and are also more prepared to make positive changes in their personal lives. In accordance with the research conducted by Kalyani et al. (2019), it was noted that students cultivate a sense of self-assurance that empowers them to effectively address academic challenges, while also acquiring the requisite knowledge to navigate potential barriers in their pursuit of achieving their objectives.

Zysberg and Schwabsky (2021) propose that the perceptions held by students regarding their own academic self-efficacy (ASE) have a notable influence on their emotional, cognitive, adaptive, and behavioral reactions to academic stimuli. The level of self-efficacy that students possess regarding their academic success significantly influences their dedication of time and effort towards the learning process, their selection of learning activities, and the approaches they adopt to overcome academic obstacles. As a result, students are provided with the ability to establish either ambitious or moderate objectives for their academic pursuits. According to Goulet-Pelletier, Gaudreau, and Cousineau (2022), the authors propose that the concept of ASE may be broken down into three essential elements. These elements include the ability to maintain focus and concentration, possessing effective communication skills, and demonstrating a strong motivation to strive for excellence. When talking about a discussion about attention, the phrase pertains to the cognitive process of directing one's cognitive resources toward academic work. It is crucial to consider and retain this definition. Based on the study conducted by Atherley et al. (2019), this specific methodology enables students to recognize the challenges they face, so encouraging them to concentrate on improving their areas of weakness. According to Karagiozi et al. (2022), the development of communicative abilities in the domains of psycho-education, meta-cognition, psycholinguistics, and socio-

cultural awareness has the potential to facilitate the learning process in many settings. On the other hand, the attainment of excellence in academia is contingent upon the possession of the necessary knowledge and skills to conform to the established rules and regulations that cultivate outstanding academic achievements.

The following are the contributing factors to the attainment of excellence. According to Bryson, George, and Seo (2022), the achievement of excellence is reliant on the formation of attainable targets and the development of appropriate strategies and plans to support the actualization of these desired aims. There are multiple elements that influence a student's perception of Academic Self-Efficacy (ASE), including their school orientation, educational encounters, personal obstacles, interpersonal connections, evaluation procedures employed by educational institutions, students' study approaches, and institutional assessment practices (Tus, 2020). Research findings have indicated that the cognitive talents and self-perceived academic efficacy of students have a significant role in shaping their academic performance. Blanco et al. (2020) discovered a significant positive association between students' self-efficacy and their capacity to proficiently complete challenging tasks to the maximum extent of their skills.

H4: ASE has positive and significant impact on the student' academic performance.
H5: Deep learning strategy has positive and significant impact on the student' ASE.
H6: Surface learning strategy has positive and significant impact on the student' ASE
H7: Strategic learning strategy has positive and significant impact on the ASE
H8: Student' ASE mediates between the deep learning and student' academic performance.
H9: Student' ASE mediates between the surface learning and student' academic performance.
H10: Student' ASE mediates between the strategic learning and student' academic performance.

The conceptual framework of the current study is shown in the Figure 1 below:

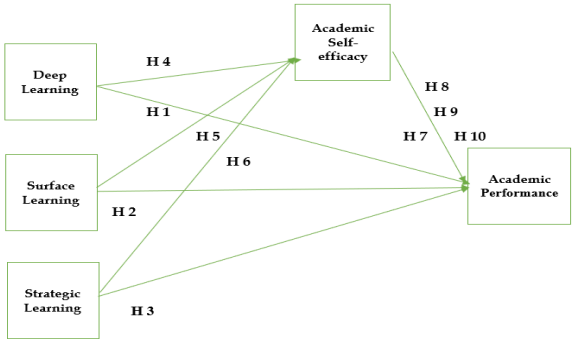


Figure 1. *Conceptual Framework*

Methodology

In order to examine the relationships between learning techniques, academic self-efficacy (ASE), and academic performance, this study utilized a quantitative research methodology. Data was collected through a questionnaire survey, which served as the primary method for obtaining information from participants and ultimately achieving the study's aims. This study

utilizes a closed-ended questionnaire consisting of two sections. The initial component of the study presented background information pertaining to the respondents. The subsequent section encompassed the independent variables of the study. The questions were formulated with a Likert scale with a range of 1 to 5. A rating of one signifies complete disagreement, whilst a rating of five signifies complete agreement. In order to establish the instrument's validity, expert opinions were sought with regard to its content and visual presentation. The survey instrument was developed in the English language. Furthermore, a preliminary investigation was carried out, and data was collected from a sample of 55 participants. High Cronbach's Alpha values indicate that the obtained results possess a high level of internal consistency, hence implying that they can be considered reliable and dependable.

The questionnaire was later disseminated to the study's real participants through the utilization of snowball sampling. The study involved the participation of employees from diverse sports-related industries. A survey comprising 654 questionnaires was disseminated to participants via an Internet platform, specifically through social media channels and Google Forms. A total of 407 questionnaires were obtained, deemed appropriate for subsequent analysis. The data revealed a response rate of 62.23 percent, indicating its level of effectiveness. In their study, Mohd Thas Thaker et al. (2021) employed social media platforms as a means of data collection, taking advantage of the ease with which data can be gathered using contemporary technology. In this work, the data analysis was conducted using Smart PLS 3 and SPSS. The researchers employed a modified version of the structural equation modeling-partial least squares (SEM-PLS) technique, which consisted of two stages (3.2.9). The initial analysis was built using the foundation provided by the structural and measurement models. The measurement model serves as the primary step in the analytical process. This is employed in assessments of construct validity and reliability. Meanwhile, the structural model of the investigation is employed to analyze the variables of the study and their direct and indirect associations. The hypothesis under consideration was assessed through the utilization of the bootstrapping method, employing a total of 500 samples.

Prior to doing the Partial Least Squares (PLS) analysis, we performed an examination of the demographic information of the sample using the Statistical Package for the Social Sciences (SPSS). The study's respondents consisted of 68.4% men and 31.6% women. Approximately 34.6% of the participants fell within the age range of 18 to 30 years. Additionally, 22.7% of the respondents were aged between 21 and 30, while another 22.7% fell within the age range of 31 to 40. The remaining portion of the participants consisted of those who were older than 40 years.

Results

The initial stage of SEM-PLS analysis involves evaluating the measurement model. The measuring model utilized in the present study is depicted in Figure 2. The measurement model encompasses the assessment of the proposed framework's reliability and validity. To evaluate the reliability and validity of the components, the researchers performed analyses to examine both discriminant and convergent validity (Hair, Ringle, & Sarstedt, 2013). According to Hair et al. (2017), an assessment of convergent validity in the data may be made by assessing the factor loading of each item, with a minimum threshold of 0.70. The outer loading values for the present investigation can be found in Table 1 and are visually shown in Figure 2.

Note: *DL=deep learning; SL= surface learning; STL= strategic learning; ASE= ASE; SAP= student' academic performance*

Figure 1: *Measurement Model*

Table 1 presents the outer loading values of the existing framework. Items with loadings below 0.70 have been excluded from the analysis.

Table 1

Outer Loading

	ASE	Deep Learning	Strategic Learning	Student academic Performance	Surface Learning
ASE1	0.904				
ASE2	0.867				
ASE3	0.838				
ASE4	0.887				
ASE5	0.902				
ASE6	0.878				
DL1		0.899			
DL2		0.908			
DL3		0.902			
DL4		0.891			
SAP1				0.824	
SAP2				0.843	
SAP3				0.788	
SAP4				0.822	
SAP5				0.776	
SAP6				0.794	
SAP7				0.730	
SAP9				0.783	
SL1					0.927
SL2					0.890
SL3					0.920
STL1			0.895		
STL2			0.944		
STL3			0.915		

Note: *DL=deep learning; SL= surface learning; STL= strategic learning; ASE= ASE; SAP= student' academic performance*

According to Hair et al. (2017), it is recommended that the values of Average Variance Extracted (AVE) exceed 0.50. The results displayed in Table 2 demonstrate that the Average Variance Extracted (AVE) in our study exceeds the designated threshold of 0.50. Additionally, this study assessed the composite reliability of the variables in order to further substantiate their validity. Table 2 illustrates that the coefficient of reliability (CR) for all constructions surpasses the threshold of 0.70. In the given situation, Hair et al. (2017) proposed a recommended threshold value of 0.70 for the coefficient of reliability (CR). The data shown in Table 2 demonstrate that the stated objective has been successfully achieved.

Table 2

Reliability

	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
ASE	0.941	0.942	0.953	0.773
Deep Learning	0.922	0.922	0.945	0.810
Strategic Learning	0.907	0.910	0.941	0.843
Student academic Performance	0.918	0.922	0.932	0.633
Surface Learning	0.899	0.902	0.937	0.833

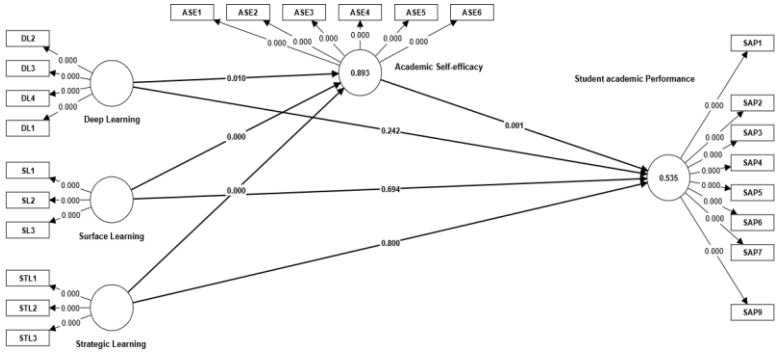
In order to establish the discriminant validity, the study utilized criteria provided by Fornell and Larker. As stated by Fornell and Larcker (1981), it is necessary for the diagonal values of a matrix to be greater than the values found at other positions within the matrix. Table 3 provides evidence that the research meets the established criteria, hence substantiating the validity of the model.

Table 3

Reliability

	ASE	Deep Learning	Strategic Learning	Student academic Performance	Surface Learning
ASE	0.879				
Deep Learning	0.855	0.900			
Strategic Learning	0.08	0.858	0.918		
Student academic Performance	0.727	0.685	0.676	0.796	
Surface Learning	0.717	0.624	0.605	0.699	0.912

The measuring approach employed in the present study demonstrates both reliability and validity, rendering it suitable for evaluating the direct and indirect correlations among the variables. The subsequent phase of Structural Equation Modeling-Partial Least Squares (SEM-PLS) entails establishing connections between variables through the utilization of a structural model, which incorporates the bootstrapping technique. The structural model of the present study is depicted in Figure 3 below. To confirm the data's accuracy, the bootstrapping technique was employed, utilizing a total of 5000 samples.



Note: *DL=deep learning; SL= surface learning; STL= strategic learning; ASE= ASE; SAP= student' academic performance*

Figure 3: *Structural Model*

The findings pertaining to the direct pathways of the present study are presented in Table 4. The findings of the study suggest that strategic learning is a significant factor of students' academic self-efficacy, as evidenced by a t-value of 4.96 and a p-value of 0.000. In a similar vein, the analysis of structural equation modelling (SEM) reveals that the coefficient estimate for the association between ASE and students' academic performance is statistically significant at a t-value of 3.247, with a corresponding p-value of 0.001. Furthermore, it was found that the deep learning strategy (t-value=2.567, p-value=0.010) and the surface learning strategy (t-value=4.637, p-value=0.010) were observed to have a substantial impact on ASE.

Table 4

Direct Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ASE -> Student academic Performance	0.512	0.510	0.158	3.247	0.001
Deep Learning -> ASE	0.205	0.207	0.080	2.567	0.010
Deep Learning -> Student academic Performance	0.240	0.237	0.127	1.894	0.058
Strategic Learning -> ASE	0.350	0.353	0.070	4.965	0.000
Strategic Learning -> Student academic Performance	0.213	0.211	0.129	1.645	0.100
Surface Learning -> ASE	0.423	0.418	0.091	4.637	0.000
Surface Learning -> Student academic Performance	0.285	0.292	0.167	1.702	0.089

The results of the mediation analysis are shown in the Table 5. The results indicate that the mediation path namely Strategic Learning -> ASE -> Student academic Performance (t-value=2.606, p-value=0.009), and Surface Learning -> ASE -> Student academic Performance (t-value=2.795, p-value=0.005).

Table 5

Mediation results

	(O)	(M)	(STDEV)	(|O/STDEV|)	P values
Strategic Learning -> ASE -> Student academic Performance	0.179	0.180	0.069	2.606	0.009
Surface Learning -> ASE -> Student academic Performance	0.216	0.211	0.077	2.795	0.005
Deep Learning -> ASE -> Student academic Performance	0.105	0.107	0.056	1.864	0.062

Upon concluding the analysis using the structural model, this study assessed the R square value. The R square of the study is also depicted in Table 6 and Figure 1. The findings of this study indicate that the R square value meets the acceptable criteria as suggested by Rahi and Abd. Ghani (2019).

Table 6

R-Square

	R-square	R-square adjusted
ASE	0.893	0.892
Student academic Performance	0.535	0.526

Discussion

The findings of the study suggest that there is a statistically significant association between students' strategic learning and ASE, as indicated by a t-value of 4.96 (p=0.000). This finding implies that students who actively participate in effective learning strategies exhibit higher levels of self-assurance in their academic competencies. The results of the study are consistent with the research conducted by Almusharraf and Bailey (2021). In a similar vein, it was discovered that ASE exhibited a favorable correlation with academic performance (t-value = 3.24, $p < 0.001$). This also suggests that students who possess a high level of self-assurance in their own capabilities are likely to achieve higher academic performance. The phenomenon of deep learning, which is characterized by comprehensive and thorough learning, has been found to exhibit a statistically significant positive relationship with ASE (t-value = 2.56, p=0.010). It is evident that the utilization of deep learning tactics by students results in the enhancement of their academic confidence. In addition, there was a strong and statistically significant correlation between ASE and surface learning, as indicated by a t-value of 4.63 and a p-value of 0.010. Surface learning is defined by the tendency to engage in rote memorization and exhibit superficial knowledge. This implies that even learning practices that may appear trivial have the potential to enhance students' self-assurance in their academic competencies.

Two out of three mediation paths are accepted with statistical significance. The initial mediation pathway, which encompasses strategic learning, ASE, and student academic achievement, exhibits a t-value of 2.60 and a p-value of 0.009. The present study's findings elucidate the relationship between strategic learning and students' views of academic success,

as well as its impact on their academic progress. One could propose that the utilization of successful learning strategies by students leads to an increase in academic self-efficacy (ASE), thus enhancing their overall academic performance. The relationship between surface learning techniques, academic self-efficacy (ASE), and student academic performance demonstrates a positive and statistically significant mediation effect. The mediation analysis yielded a t-value of 2.79 and a p-value of 0.005, indicating that the utilization of superficial learning strategies may lead to an increase in students' ASE.

Conclusion And Policy Implications

In summary, the findings of this study offer significant evidence to support the claim that students' learning techniques and academic self-efficacy (ASE) have a considerable impact on their academic accomplishment. Both modes of education have the potential to indirectly impact academic achievement through the use of Active Self-Exploration (ASE) and metacognition. The findings highlight the significance of utilizing strategic learning approaches that bolster the self-efficacy of Iraqi students in academic areas, thus resulting in advancements in their academic achievements. The findings of the research also suggest that the academic achievements of Iraqi students are frequently impacted by their optimistic mindset and diligent work ethic. Additionally, the implementation of efficient learning strategies, which equip students with the essential abilities and resources for attaining academic success, is fundamentally a contributing element to this phenomenon. A favourable association has been observed between the acquisition of knowledge using less effective methods, such as surface learning, and the subsequent growth of academic self-efficacy (ASE). This suggests that the improvement of a student's self-confidence may have the ability to positively impact their academic performance, regardless of their level of commitment to their studies. The research findings indicate that the Academic Skills Examination (ASE) is a reliable and valid assessment tool for evaluating academic achievement. Students that have a high level of self-assurance are more likely to display tenacity when confronted with challenging situations, therefore promoting the development of resilience and perseverance. Educational institutions possess the capacity to empower students in achieving their academic objectives and optimizing their accomplishments through the use of purposeful learning methodologies and the cultivation of students' self-belief. It is imperative to consider that the findings may lack generalizability outside the specific population and methodologies employed in the study. The relationship between learning techniques, ASE (academic self-efficacy), and academic performance is interconnected. However, it is important to explore potential mediating or moderating factors that could influence this relationship in future studies.

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