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The Impact of Academic Workload on the Burnout of Architecture Students.

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Abstract: The research presents a definition of the academic workload as an important factor that affects students and how they perceive the nature of the curriculum and cope with the psychological pressures generated from it in architectural education. It also defines burnout in architectural education. An academic workload scale was constructed based on previous studies, along with a modified burnout scale according to the nature of the architecture department. A survey was conducted with 63 fourth-year students in the Department of Architecture at the College of Engineering at Al-Mustansiriya University.
The research aims to study the relationship between academic workload and its role in student stress, fatigue, and burnout. The data was statistically analyzed using partial least squares structural equation modeling with the Smart-PLS4 program and statistical analysis using SPSS v.28 for the study variables.
The results identified the dimensions of academic workload that affected the levels of fatigue among architecture students. It showed that all dimensions of academic workload influence burnout, with teaching methods and learning environment having the most impact on burnout, followed by course management, and personal characteristics ranking last.

Keywords*: Academic workload, Burnout, Architectural students, Architectural education, Perceived Academic Workload, quantitative workload, qualitative workload.*

1. Introduction:

Architectural education is one of the fields that draws its knowledge sources from technological, humanities, environmental, and social sciences. Therefore, architectural education must include the acquisition of knowledge about cultural, artistic, social, environmental, technical, design, and professional capabilities. The nature of the curriculum for the Department of Architecture is a combination of both deep and surface approaches, where the architectural design course focuses on deep learning by emphasizing the student's active role in education, which enhances the learning experience.

The research focuses on studying the impact of academic workload on students' feelings of exhaustion. Academic workload is a complex construct involving a wide range of variables, including student characteristics and the educational environment. It requires numerous skills, encompassing theoretical knowledge, design skills, creativity, as well as interpersonal skills.

There's limited research exploring the relationship between academic workload, psychological exhaustion, and academic burnout. Therefore, this study aims to identify the research problem by examining the relationship between academic workload and the feeling of academic burnout, based on a set of hypotheses that include:

There is a significant impact relationship between academic workload and burnout, branching into three sub-hypotheses:

• First secondary hypothesis:

There is a statistically significant relationship between lesson management and burnout.

• Second secondary hypothesis:

There is a statistically significant relationship between personal characteristics and burnout.

• Third secondary hypothesis:

There is a statistically significant relationship between teaching style, learning environment, and burnout.

2. The workload in academic and architectural education

The curriculum for architecture is one of the toughest as it combines theoretical subjects with practical lessons like architectural design and urban planning, not to mention other hands-on sessions within the studio environment. This results in an extremely demanding educational setting for students, with an intense academic schedule

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requiring profound physical skills and creative thinking to meet the study's needs and demands.

The concept of academic workload was introduced by Chambers in 1992. It refers to the time requirements and associated pressures, representing the effort someone invests to achieve a certain level of performance. This concept is centered on the individual, not the task. It gained further traction with the introduction of the European Credit Transfer and Accumulation System (ECTS). As part of the European system, ECTS links course credits to actual classroom hours and independent study time. It emerged from the Bologna Process in 1999, which emphasized the importance of workload. Since then, considering workload has become crucial when designing curricula, along with the significance of active learning and its role in motivation (Scully & Kerr, 2014) .

Student workload research has the potential to guide faculty and educational institutions towards best practices in teaching and reducing academic pressure (Kanwal.A Rafiq. Sh & Afzal. A,(2023)).

Upon reviewing previous studies, it was found that there is a lack of research addressing the academic workload of architecture students (Ahrentzen, 1996 & Anthony, 1993; Groat & Ahrentzen). A study by Bachman and Bachman (2006) explains that the reason for this lack of research is due to the nature of the teaching methodology. The study also aimed to describe what actually occurs by examining the perceptions of students working in such an environment.

Tampakis and Vitoratos (2009) believe that academic workload can be influenced by several factors. These include the learning environment, expected academic performance, curriculum design, teaching methods, and students' perceptions of workload. Other factors are the student-teacher relationship, student motivation, prior knowledge, personal situations, and how the student workload is measured (Ruiz-Gallardo, et al 2011).

Studies have focused on individual determinants of course workload and their alignment with student outcomes, as well as test anxiety in relation to students' perceptions of course workload and their ability to manage the time allocated for studying the course. This is because students' perceptions of academic workload experiences extend beyond credit hours or time-based load measures alone. Specifically, personal resources for dealing with course workload mitigate the effects of course workload. (Conrad Borchers & Zachary A. Pardos, 2023).

(Kember et al., 1996 Leung, 1998) presented a different perspective, emphasizing that simply spending more time studying doesn't necessarily lead to deeper learning. In fact, it might even encourage surface-level learning approaches. Overloading students with work has also been linked to things like skipping class and failing courses (E. 1994, Chambers) .

The previous argument is reinforced by the study of (Eva Kyndt, Inneke Berghmans, Filip Dochy & Lydwin Bulckens 2014) which presents another classification of workload through the category of perceived quantitative workload, while the second category emphasizes the qualitative aspects of workload. The first category includes the time-related aspects of workload or the amount of work required.

It is important to clearly distinguish between perceived quantitative and objective workload, as perceptions of available and required study time can differ from actual time investment. This is fundamental to understanding what students had to learn. In contrast, many personal characteristics affect students' perception of workload. Karjalainen and colleagues (2006) link the experience of excessive pressure to experiences of difficulty, anxiety, stress, wasted resources, and the desire to give up due to students' inadequate prior knowledge, incorrect study habits, and insufficient learning skills. (Nijhuis, Segers, & Gijselaers, 2005).

It is useful to study the complex function of a diverse set of variables that build a perception of qualitative workload. These components can be divided into three main categories: (1) characteristics of the learning and teaching environment, (2) teaching style, and (3) the personal characteristics of the learner (Kember & Leung, 2006). Figure (1) indicates the relationship between quantitative and qualitative workload based on the previous propositions.

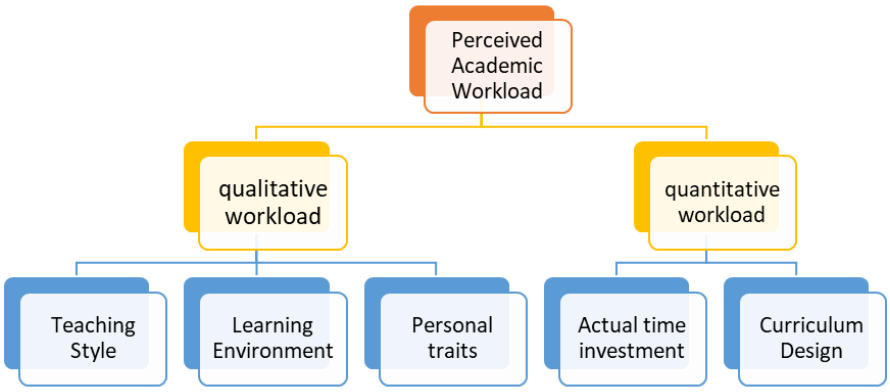

Fig (1) the Relationship between Quantitative and Qualitative Workload

We conclude from the above the importance of perceiving the academic workload in terms of the perceived quantitative and subjective levels, which deeply explain the true nature of the academic workload and its impact in multiple aspects .

3. Burnout and architectural Students.

Yang (2004) defines student burnout as: a state of emotional exhaustion that students experience in the learning process, due to psychological pressure, academic workload, or other psychological factors, as well as a tendency towards personality breakdown and a feeling of decreased personal achievement.

Burnout always occurs when there is a significant mismatch between the nature of the work and the nature of the person doing the work. The main factors of burnout include work overload, lack of control, value conflict, lack of fairness, which are clear indications of a mismatch between the person and their work (Maslach & Leiter, 1997).

Schön (1984a, 1984b) indicates that architectural design education is a process of reflection on work, and that real learning does not happen without the students' engagement in learning the design problem. Therefore, burnout among architectural students has more serious consequences in reducing study effectiveness, feelings of frustration, and consequently exhaustion and burnout. The three dimensions of burnout were defined as follows :

- Emotional exhaustion: This occurs when students have depleted their emotional resources and feel unable to give any more of themselves psychologically.
- Cynicism: This involves developing negative attitudes, feelings of resentment, and scorn towards work.
- lack of accomplishment: This is the tendency to evaluate oneself negatively, especially concerning one's work. Individuals often feel dissatisfied with themselves and their work accomplishments, leading to a lack of desire to complete tasks.

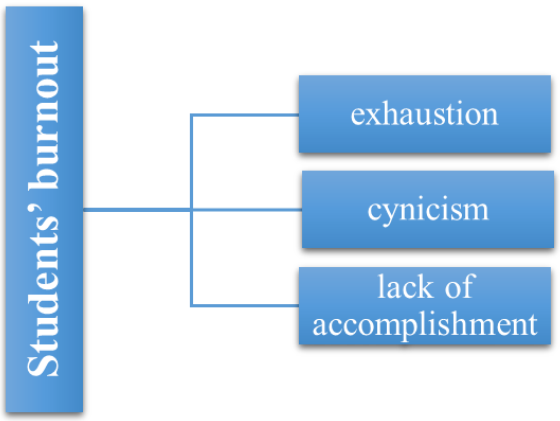

Fig (2) Components of Burnout

Burnout is also defined as a crisis in people's relationship with their studies (Maslach et al., 1996). A burned-out person is stuck in a destructive pattern of interacting with their work. They perceive, interpret, and react to work with hostility and alienation. This harmful relationship manifests in three syndromes: exhaustion, feeling stressed

because of work, and finally, cynicism and a sense of meaninglessness towards their studies, as well as inefficiency and a feeling of reduced ability to work (Schaufeli and Taris, 2005) .

It's clear from all this that student burnout is caused by the pressures they face during their studies. The workload can become overwhelming, leading to feelings of frustration, lack of focus, and a sense of imbalance. They may also feel the urge to withdraw and avoid completing their tasks .

4. Relationship between academic workload and burnout

The annual survey of the students of the Architectural Engineers Magazine for the year 2019 concluded that architecture students faced problems related to workloads, practical training, and concerns about stress-induced fatigue (Waite and Jessel, 2019).

The Bachman and Bachman (2006) study found that architecture students suffer from exhaustion, isolation, and stress. Severe sleep deprivation, reduced physical activity, and social inactivity are also common features in the lives of architecture students. The study also found that design coursework represents the majority of workload pressures, as the design process itself also caused a range of concerns that directly resulted in feelings of dissatisfaction, burnout, and depression among students. The excessive workload and pressure against performance and satisfaction can lead to sleep problems and time management issues, which may then impact individuals' perceptions of wellbeing and increase anxiety or depression (Bachman.L, Bachman.Ch.(2006)).

Studies by both (Ahuja, Chudoba, George, Kacmar, & McKnight, 2002; Dee Cuyper & De Witte, 2006) have illustrated the workload through personal survey assessments, often involving references to overload and work pressure stress leading to self-induced strain (Spector & Jex, 1998; Janssen, 2001; Bowling & Kirkendall, 2012). However, workload is more than just stress and multi-faceted (Bowling, Alarcon, Bragg, & Hartman, 2015).

Students' perceptions of academic, financial, or time pressures can lead to stress. It's known that stressed-out students may experience psychological symptoms that hinder learning and cause fatigue and feelings of frustration at times.

As indicated by both (Ahmed and Julius, 2015; Elias et al., 2011), personal relationships, workload, university standards, poor learning conditions, fear of the future, as well as the objective workload related to time management and scheduling, stimulate negative emotions such as depression, stress, and anxiety, which cause negative effects on their academic work. (Ayalp.G& Çivici.T(2021).

We conclude from the previous discussion that there is a relationship between burnout and academic workload, which is what this research aims to study and either prove or disprove through the practical study that will be explained in the following sections of the research.

Method and procedures

5.1. Curriculum:

The data collected through the questionnaire, which used the modified Maslach et al. (1996) scale and the academic workload scale built based on a set of previous studies, will be analyzed using the descriptive analytical method to verify the distinction of the paragraphs and internal consistency, and to determine the indicators of validity and reliability of the tools used in the statistical application.

5.2. The study population and its sample:

The study community consists of students from the Architecture Department at Al-Mustansiriyah University, focusing on a sample of fourth-year students, numbering (63) in total. The fourth year is characterized by a variety of practical lessons and a shift in the nature of the urban design course, as well as courses in interior design and the design of outdoor spaces. As for the theoretical subjects, they vary in complexity and difficulty, emphasizing philosophical aspects in addition to specialized technical subjects.

Tables (1) and (2) represent the academic workload items in terms of credit hours within the department, as well as hours outside the department.

Table (1) Academic Workload for the First Semester

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
	Seven	1	MU02083071	Architectural Design VII	تصميم معماري VII	English	2	0	0	8	2	0		180	170	350	14.00	C	Architectural Design VI
		2	MU02083072	Interior Architecture Design	تصميم عمارة داخلية	English	0	0	0	4	0	0		60	40	100	4.00	C	
		3	MU02083073	Theories of Architecture	نظريات عمارة	English	4	0	0	0	0	0	2	62	38	100	4.00	B	
		4	MU02083074	Theories of Urban Design	نظريات تصميم حضري	English	2	0	0	0	0	0	2	32	18	50	2.00	B	
		5	MU02083075	Architecture & Environment	عمارة ومناخ	English	2	0	0	0	0	0	2	32	18	50	2.00	B	
		6	MU02083076	Islamic Architecture	عمارة اسلامية	English	4	0	0	0	0	0	2	62	38	100	4.00	B	
						Total	14	0	0	12	2	0	8	428	322	750	30.0		

Table (2) Academic Workload for the Second Semester

UGIV	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
	Eight	1	MU02083081	Architectural Design VIII	تصميم معماري VIII	English	2	0	0	8	2	0		180	170	350	14.00	C	Architectural Design VII
		2	MU02083082	Landscape Architecture Design	تصميم عمارة خارجية	English	0	0	0	4	0	0		60	40	100	4.00	C	
		3	MU02083083	Housing	اسكان	English	4	0	0	0	0	0	2	62	38	100	4.00	B	
		4	MU02083084	Acoustic Architecture	عمارة صوتية	English	2	0	0	0	0	0	2	32	18	50	2.00	B	
		5	MU02083085	Contemporary Iraqi Architecture	عمارة عراقية معاصرة	English	2	0	0	0	0	0	2	32	18	50	2.00	B	
		6	MU02083086	ConstructionTechnique & Advanced Building Construction	انشاء تقني تقنيات بناء متقدم	English	4	0	0	0	0	0	2	62	38	100	4.00	B	
						Total	14	0	0	12	2	0	8	428	322	750	30		

5.3. Statistical analysis of the field aspect

5.3.1 Validity and reliability tests of the measuring instrument:

Table (3) shows the results of the internal consistency test using Cronbach's Alpha coefficient and the values of the Average Variance Extracted (AVE) and the Composite Reliability (rho_c), which are used to test the quality and reliability of the measurement tool in terms of reliability. Table (3) shows that the values of Cronbach's Alpha coefficient exceeded the accepted minimum threshold for reliability, which is (0.70) for the main variables and their sub-dimensions. Meanwhile, the values of the Average Variance Extracted (AVE), which should not be less than (0.50), exceeded the accepted minimum threshold for all variables and sub-dimensions. As for the values of the Composite Reliability for the dimensions and variables, they were all greater than the accepted threshold of (0.70), which is a good indicator and indicates the reliability of the scale, and indicates that the reliability coefficient for the measurement tool has an acceptable degree of reliability.

Table (3) Values of Cronbach's alpha coefficients, average extracted variance, and composite reliability coefficients for the measurement tool with its two main variables and sub-dimensions.

) rho_c(	)AVE(	Cronbach's Alpha	Number of items	Transaction value / Variables & dimensions	
0.773	0.512	0.761	4	Lesson Management	X1
0.896	0.684	0.848	4	Personal characteristics	X2
0.884	0.562	0.843	6	Teaching style and learning environment	X3
0.936	0.831	0.899	14	Academic workload	X
0.799	0.754	0.859	2	Emotional exhaustion	Y1
0.734	0.789	0.882	2	cynicism	Y2
0.840	0.859	0.924	2	Lack of accomplishment	Y3
0.737	0.578	0.804	6	Burnout	Y

Source: Prepared by the researcher based on the results of statistical analysis using the 4smart pls statistical program.

The figure (3) shows the factor loadings values for the items making up the dimensions and variables, all of which exceeded the acceptable factor loading threshold for latent variables, which should not be less than 0.40. This was done using partial least squares structural equation modeling (PLS-SEM) through the (smart-pls4) program for the study variables, which is a suitable statistical method for small samples that cannot be processed through the AMOS program, which requires large sample sizes. As the figure (3) clarifies, the factor loadings values for the latent variables of each item indicate that all the study variables' items, which consist of (20) items for the study's two variables, were above the value of (0.40), thus confirming the validity of the twenty (20) items that best represent the study variables and providing a favorable indication for conducting all subsequent statistical analyses.

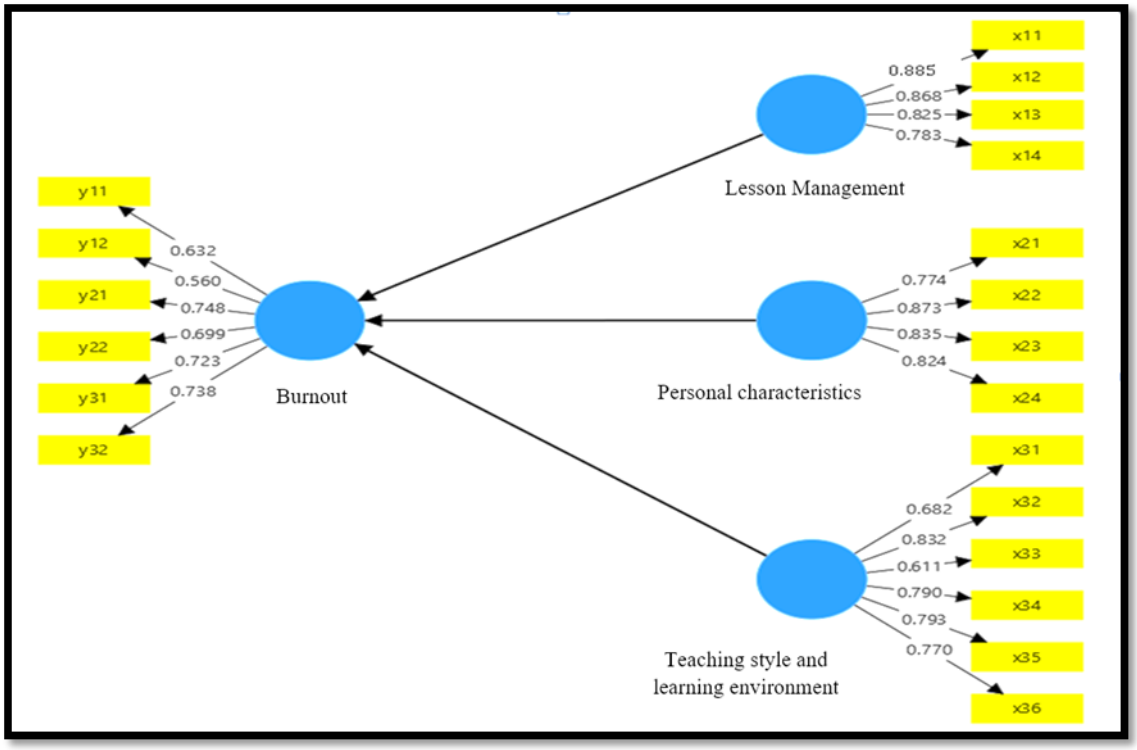

Fig (3) shows the factor saturation values for the latent variables for each item using the smart pls4 program.

5.3.2. Description and diagnosis of research variables, analysis of sample responses, and interpretation of results.

In the descriptive data analysis process, the researcher relies on measures of weighted means, standard deviations, and the relative importance applied to the dimensions of academic burden (independent variable and its dimensions) and psychological burnout (dependent variable). The results of the analysis, as shown in Table (4), are as follows:

Table (4) Statistical measures for the variables and dimensions of the study. n = 63

Relative importance	Standard Deviation	Arithmetic Mean	Dimensions of the Variables of Research	
76.5%	0.596	3.825	Lesson Management	X1
72.2%	0.832	3.611	Personal characteristics	X2
73.8%	0.697	3.688	Teaching style and learning environment	X3
74.2%	0.647	3.708	Academic workload	X
78,3%	0.840	3.913	Emotional exhaustion	Y1
76.2%	0.844	3.809	cynicism	Y2
74.4%	0.670	3.722	Lack of accomplishment	Y3
76.3%	0.603	3.815	Burnout	Y

Source: Results of statistical analysis using SPSS v.28

5.3.3Description and Diagnosis of Sections (Academic Workload):

Table (4) indicates the mean values, standard deviations, and relative importance related to the viewpoint of the studied sample concerning academic load and its sub-dimensions. The mentioned table shows an overall mean

higher than the standard mean, which is (3), where it reached (3.708). This value falls within the range of (3.4 to less than 4.2) in the matrix of response strength of the sample individuals, indicating that the level of importance of the sample's answers on the overall paragraphs (regarding the academic load) tended towards agreement with a high response level. The standard deviation was (0.647), and the relative importance was (74.2%), indicating an agreement in the responses of the sample individuals about the academic load and its sub-dimensions. Among these sub-dimensions, the "Curriculum Design" dimension achieved the highest mean values with (3.825) and a standard deviation of (0.596), implying little dispersion in the responses of the sample individuals with a relative importance of (76.5%), reflecting an agreement in the sample individuals' responses concerning the "Curriculum Design" dimension at a high level. Following this, the dimension of "Teaching Method and Learning Environment" had a mean value of (3.688) and a standard deviation of (0.697), indicating relatively little dispersion in the responses of the sample individuals with a relative importance of (73.8%), reflecting an agreement in the sample individuals' responses concerning the "Teaching Method and Learning Environment" dimension at a high level. Meanwhile, the "Personal Characteristics" dimension achieved the lowest mean values with (3.611) and a standard deviation of (0.832), indicating dispersion in the responses of the sample individuals with a relative importance of (72.2%), reflecting an agreement in the sample individuals' responses concerning the "Personal Characteristics" dimension at a high level.

5.3.4. Burnout: Description and Diagnosis:

The table (4) refers to the arithmetic means, standard deviations, and relative importance related to the viewpoint of the surveyed sample regarding the academic burden and its sub-dimensions. The table reflects a general arithmetic mean higher than the standard arithmetic mean of 3, reaching 3.815, which falls within the category from (3.4 to less than 4.2) in the response strength matrix, indicating that the level of importance of the sample's responses on the overall items (for burnout) tended towards agreement and at a high response level. The standard deviation reached 0.603, and the relative importance was 76.3%, which indicates an agreement in the responses of the sample members regarding burnout and its sub-dimensions.

As for the dimensions of this variable, the (emotional exhaustion) dimension achieved the highest arithmetic means of 3.913, with a standard deviation of 0.840, which means that there is relative dispersion in the responses of the sample members and a relative importance of 78.3%, reflecting an agreement in the responses of the sample members regarding the emotional exhaustion dimension and at a high level. This is followed by the (depersonalization) dimension with an arithmetic mean of 3.809 and a standard deviation of 0.844, which means that there is relative dispersion in the responses of the sample members and a relative importance of 76.2%, reflecting an agreement in the responses of the sample members regarding depersonalization and at a high level. Meanwhile, the (reduced personal accomplishment) dimension achieved the lowest arithmetic means of 3.722, with a standard deviation of 0.670, which means that there is little dispersion in the responses of the sample members and a relative importance of 74.4%, reflecting an agreement in the responses of the sample members regarding the reduced personal accomplishment dimension and at a high level.

5.3.5. Testing the impact between the research variables

To test the validity of the main hypothesis of the research regarding whether there is a significant impact of academic burden and its sub-dimensions on burnout in general, the Structural Equation Modeling (SEM) approach was used through the AMOS v.26 program to test the main hypothesis and the sub-hypotheses derived from it. This is a useful method for representing multiple relationships among a set of variables. Thus, the main hypothesis of the research and the associated sub-hypotheses will be tested as follows:

A. Examining the impact of academic workload on burnout

The statistical analysis reveals that the explanatory value of academic burden, according to the coefficient of determination (R^2), reached a level of 27.6%. This quantifies the extent of the change occurring in the dependent variable, burnout, of which 27.6% is attributed to changes in academic burden. Meanwhile, the remaining 72.4% of the explanatory variance can be attributed to other factors not included in the current research model.

It is also noted that the impact of the independent variable, academic burden, on burnout was measured at 0.490, which is a significant value, as the (C.R.) index achieved a level of significance with a value of 4.865, exceeding the critical value of 1.96 at a significance level of 0.000, as shown in Table (5). Therefore, the independent variable, academic burden, influences burnout by 0.490 at the level of the research sample. This means that a positive change of one unit in academic burden, in practical terms within the study field, will lead to an increase in the level of burnout by 0.490.

Based on the above, the main hypothesis of the research is accepted, indicating that there is a statistically significant effect of academic burden on burnout.

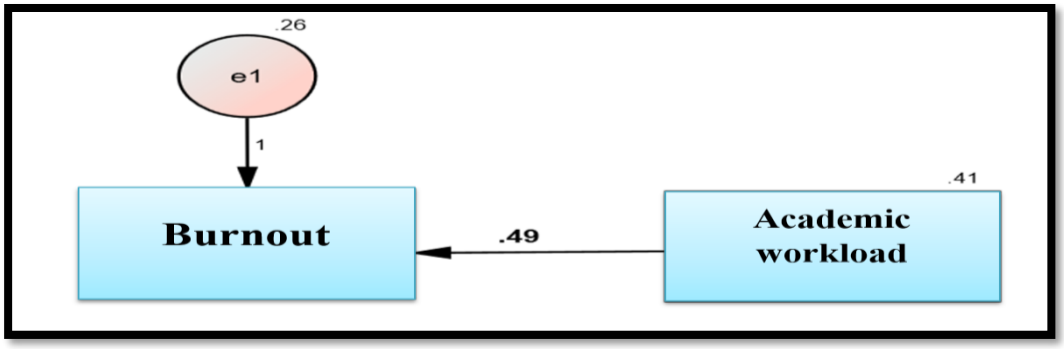

Fig (4): The effect of academic load on psychological burnout

Source: Outputs of the (Amos V.26) program

Table (5): Parameters of the academic workload impact test and its dimensions in burnout.

The paths			Regression Weights	S.E	C.R	P-value
Burnout Y	<---	Academic workload X	0.490	0.101	4.865	***
Burnout Y	<---	Lesson Management X1	0.480	0 .113	4.243	***
Burnout Y	<---	Personal characteristics X2	0.292	0 .084	3.467	***
Burnout Y	<---	Teaching style and learning environment X3	0.499	0.090	5.566	***

Source: Outputs of the program (Amos V.26)

Based on what has been mentioned, the hypotheses related to the secondary effects arising from the main research hypothesis will be tested as follows:

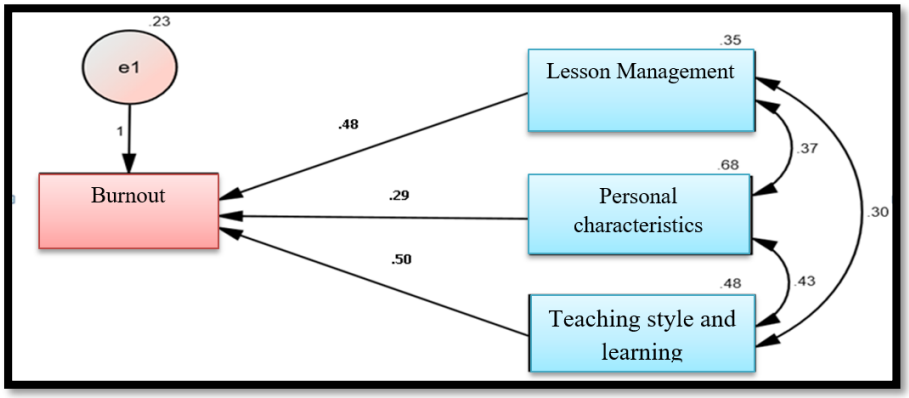

Fig (5): The impact of academic workload dimensions on burnout

Source: Outputs of the (Amos V.26) program

1. "Testing the impact of lesson management on burnout." "It is evident from Figure (5) that there is a statistically significant effect of the lesson management dimension on burnout, as reflected in the effect size of (0.480). This indicates that a one-unit change in lesson management in the field of application will lead to an effect of (0.480) on the level of burnout. The effect size here is significant since the (C.R.) value achieved a level of significance with a value of (4.243), which is greater than the critical value of (1.96) at a significance level of (0.000), with a confidence level of (100%)." "This confirms the acceptance of the first sub-hypothesis derived from the main hypothesis, which states that there is a statistically significant effect of lesson management on burnout."

2. "Testing the impact of personal characteristics on burnout." "It is evident from Figure (5) that there is a statistically significant effect of the personal characteristics dimension on burnout, as reflected in the effect size of (0.292). This indicates that a one-unit change in personal characteristics in the field of application will lead to an effect of (0.292) on the level of burnout. The effect size here is significant since the (C.R.) value achieved a level of significance with a value of (3.467), which is greater than the critical value of (1.96) at a significance level of (0.000), with a confidence level of (100%)." "This confirms the acceptance of the second sub-hypothesis derived from the main hypothesis, which states that there is a statistically significant effect of personal characteristics on burnout."

3. "Testing the impact of teaching style and learning environment on burnout." "It is evident from Figure (5) that there is a positive statistically significant effect of the teaching style and learning environment dimension on burnout, as reflected in the effect size of (0.507). This indicates that a one-unit change in teaching style and learning environment in the field of application will lead to an effect of (0.507) on the level of burnout. The effect size here is significant since the (C.R.) value achieved a level of significance with a value of (4.878), which is greater than the critical value of (1.96) at a significance level of (0.000), with a confidence level of (100%)." "This confirms the acceptance of the hypothesis."

6. Results and Discussion:

The research confirms the complex nature of the concept of academic workload and highlights the need to distinguish between perceived quantitative and qualitative workload and their impact on students' burnout. The statistical analysis showed a positive relationship between lesson management and students' feelings of burnout. It appears that an architecture student's ability to manage their time can vary from one student to another based on personal characteristics and their response to the learning environment. This underscores the negative impact of workload on feelings of frustration and boredom, often resulting from pressure generated by both quantitative and qualitative academic demands.

Moreover, the results of the impact test of the educational environment showed variability in its effects on feelings of boredom, stress, and the inability to engage with the learning environment and teaching methods, which differ based on the nature of practical and theoretical lessons. This increases feelings of rejection and a lack of desire to continue studying. Based on the above, it is clear that all dimensions of academic workload have an impact on burnout, with teaching style and the learning environment being the most influential on burnout, followed by lesson management, and then personal characteristics in last place.

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