Ilkogretim Online - Elementary Education Online, 2020; 19 (4): pp. 282-293
http://ilkogretim-online.org
doi:10.17051/ilkonline.2020.04.129

Psychological Barriers Predicting the Cognitive Load for Blackboard E-Learning Management System Users from University Students

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Abstract. The current study aimed at identifying the extent to which psychological barriers degrees contribute to predicting the degrees of perceived cognitive load for blackboard e-learning management system users at the prince Sattam bin Abdul-Aziz University**.** This study employs quantitative method with survey as main data collection tool. The research sample consisted of (240) male and female students from the Prince Sattam bin Abdul-Aziz University. For data collection, the researchers applied the psychological barriers scale and the perceived cognitive load scale prepared by the researchers. The survey data was analyzed through descriptive-analytic research approach to investigate the relationship between the study variables. Results demonstrated that there was a statistically significant correlative positive relationship between the psychological barriers and the cognitive load (intrinsic, extraneous, and the overall degree), and there was no statistically correlative relationship between psychological barriers and the Germane cognitive load. Finally, results revealed that the external psychological barriers were better at predicting the overall degree of the cognitive load. Psychological barriers and cognitive load must be considered within the e-learning settings, through making use of the results of the current study in developing training and counseling programs to reduce the students' psychological barriers and cognitive load levels.
Keywords: Psychological barriers, Cognitive load, Distance e-learning, university students, Blackboard system**.**

Received: 12.10.2020	Accepted: 02.11.2020	Published: 17.12.2020

INTRODUCTION

The world nowadays faces many risks and disasters and science is the main way to overcome. Technology also plays an important role in confronting such dangers. Coronavirus (COVID-19) is one of the most recent risks today as it increases unexpectedly. It forces the educational stakeholders to choose between either completely suspending the study or adapting alternative electronic methods to overcome this difficult crisis. Moreover, the necessity to resume the scheduled curricula and the attempt to bridge any educational gap forces most Saudi universities including Prince Sattam bin Abdul-Aziz University to use e-learning via the blackboard system. The Blackboard System relies on designing courses, assignments, tasks, tests, and corrections electronically, as well as communicating with students through the virtual environments and applications downloaded via smartphones or computers. It saves time and effort as it overcomes the spatial barriers (Melhem et al., 2018; Hew et al., 2018; Sivo et al., 2018). With the growing complexity of e-learning environments, a recent trend has emerged to study the cognitive load in such educational settings. Bedsides, the cognitive load theory research has shifted from studying paper-based learning to investigating web-based learning (Van Merriënboer & Ayres, 2005). It also has expanded to apply the CLT principles in complex e-learning environments to both individual and group learning (Kester et al., 2007). In this context, Hollender et al. (2010) revealed that there is a need to combine the concepts of cognitive load theory (CLT) with the concepts of human-computer interaction.

Despite the importance and necessity of this type of education at present, it may affect the learners negatively especially if the educational content presented through the blackboard program with a method or technique that may confuse the learners during the learning process or evaluation. However,

universities begin to use this type of education without adequate preparation, training for both students and professors to master it effectively. Mautone & Mayer (2001) explained that when information and basic content synchronizes with a confusing presentation, the learners' attention distracts as they try to process difficult information, and hence this causes negative effects through increasing the cognitive load. Mayer (2014) emphasized that if education is linked to media that is not related to the content of the targeted task; this will distract students and limits their level of understanding. Therefore, Çakiroğlu & Aksoy (2017) emphasized the need to study the cognitive load in e-learning settings.

Although e-learning can become the future methodology for university education some studies signified its relation to many psychological barriers that hinder the utilization of the facilities offered by e-learning. These barriers are a mental psychological process that obstacle the students from accomplishing his academic tasks and negatively affect his performance. Al-Hammadi (2019) mentioned that e-learning involves some psychological issues because the student cannot innovate, receive information and keep in mind if there are problems as the student sits alone and learns without direct personal interactions in the educational process. Psychological barriers appear in a form of rejection and lack of self-acceptance accompanying with certain psychological feelings like stress and emotion that the individual feels during exposure to these barriers (Choucair, 2002). The e-learning experience is enjoyable and the learner feels enthusiasm and motivation, but this interest quickly disappears and replaced by a feeling of frustration resulting from the learner's awareness of the gap between the expected results and what he can achieve. Consequently, every effective online education must take into consideration the aforementioned psychological dimensions (Al-Hammadi, 2019; Khokhlova et al., 2020). Hence, the current research seeks to identify the relationship of psychological barriers and cognitive load among university students.

To investigate the effectiveness of these two variables , the researchers noted that there is a logical relationship between the two variables of the research. Through reviewing literature researchers found that e-learning is associated with some learners' psychological barriers which can affect the educational process quality and increase the cognitive load such as Technophobia (Nwabufo et al., 2013; Katageri and Kullarni, 2015; Gutiérrez-Santiuste and Gallego-Arrufat ,2016; Hong et al., 2017 ; Bishop et al., 2007). Consequently, the researchers felt the necessity of e-learning at this time especially with the spread of Coronavirus and suspending the study all over the world. In light of the conflicting results related to the cognitive load and e-learning and with the emergence of some psychological barriers associated with e-learning that can affect the cognitive load of university students using the Blackboard e-learning management system, which are important and contemporary variables that haven't receive sufficient attention.

Problem statement

The necessity to resume the scheduled curricula and the attempt to bridge any educational gap forces most Saudi universities including Prince Sattam bin Abdul-Aziz University to use e-learning via the blackboard system. Therefore, the researchers seek to conduct this research with the objective of identifying the extent to which the degrees of psychological barriers and their dimensions contribute to predicting the degrees of the cognitive load among university students using the e-learning management system (Blackboard), besides identifying the differences between male and female students as well as the scientific and literary disciplines in both of the psychological barriers and the perceived cognitive load.

LITERATURE REVIEW

Psychological barriers are states that proceed from different stimuli and deposits in the individual's personality and hinder his goals and adjustment. They appear in a form of external barriers such as social and mental pressures as well as the internal barriers which are represented in psychological stress and may result in the appearance of some rumors in the individual's life. Aljawhari(2009) defined barriers as everything that stands between the individual and his goals either materially like a wall, socially like fear of blame, or psychologically like fear of failure. They are mental states which affect the individual negatively. They hinder him to be influenced by the surroundings and prevent performing certain actions (Choucair, 2002). Shaker (2015) regarded psychological barriers as a mental psychological phenomenon which affects players in training or competition. They hinder the player from achieving his goals and affect his performance negatively. They also refer to the internal barriers that affect human activity (Domyreva, 2019). Khokhlova et al. (2020) described these barriers as the factor that activate or inhibit the activity.

Related literature and previous studies revealed many psychological barriers that emerged in the technological educational settings. These studies demonstrated that low motivation of student, low

academic confidence, low self-efficiency, resistance to change, technophobia, computer anxiety, lack of awareness and attitudes towards ICT, self-motivation, the perceived benefit, the perceived ease of use, the perceived complexity of web browsing, lack of attention, early evaluation, poor retention, loss of communication, distrust, emotion or excitement, rumor, non-acceptance, psychological pressure, self-doubt, specific opportunities, unconcerned, fear of making mistakes and fear of difficulty are forms of the students' psychological barriers (Alajmi, 2014; Gutiérrez-Santiuste and Gallego-Arrufat, 2016; Andersson and Grönlund. 2009; Song and Keller , 2001; Nwabufo et al., 2013; Ali, et al., 2018; Clabby and Blez,1985 ; Elsherif,1994 ; Choucair, 2002; Yan and Massanov, 2019).

Psychological barriers include many dimensions that hinder the individual from achieving normal adjustment and which appear in the form of internal and external obstacles (Hammam, 2002; Davidov, 2002; Marzouk, 1995; Bogels, 2006; Elkordi, 2013). The current study defined the psychological barriers procedurally as a psychological and mental state that hinders the student from achieving his goals and academic adjustment. It results from a negative psychological experience that reflects in the students' negativity and sense of defeatism, lack of self-acceptance, influence by rumors, expecting failure, and fear of negative evaluation. It is measured procedurally according to the degree that the student obtains on the psychological barriers scale, prepared by the researchers. It consisted of two main dimensions the internal psychological barriers which the researchers defined procedurally as everything that hinders the individual internally from achieving adjustment and what he aspires academically. They contain three sub-dimensions as follows: lack of self-confidence, psychological rejection, and excessive emotional distress. The second dimension is the external psychological barriers. It refers to everything that hinders the individual externally from consensus and achieving what he aspires academically. It contains three sub-dimensions as follows: expecting failure, fear of negative evaluation, and realizing the rumors.

In this context, the cognitive load theory was concerned with interpreting the psychological and behavioral phenomena within the education process. It was one of the influencing theories in the field of clarifying the impact of the educational content design on the learning process. It was interested in illustrating the relationship between the learners' cognitive construct, the educational content, and how learning occurs (Park et al., 2014). Vogel-Walcutt et al., (2011) pointed out that the cognitive load theory incorporates a set of learning principles that can be utilized in the educational environment. They stated that this theory based on the learners' learning cognitive processes. Currie (2008) defined it as a multidimensional concept which represents the burden that a certain task places on the learner's cognitive system. While Na (2012) determined it as the total load that cognitive activities impose on the working memory during completing learning tasks. Moreover, Qatami (2013) insisted that cognitive load refers to the total amount of mental activity during working memory processing in a certain time. Abd al-Hayy et al. (2019) outlined it as the amount of mental activity a student consumes while tackling a specific school topic, solving a problem, or performing a specific educational task. While Mahmoud et al., (2019) defined it as the total effort performed by the learner to store information in the working memory when performing the educational activities. While the researchers defined this concept procedurally in the current study as a psychological and mental state that hinders student from achieving his goals and academic adjustment in the e-learning environment. It is measured procedurally according to the degree that students obtained in the psychological barriers scale, prepared by the researchers, which consisted of the following components: lack of self-confidence, psychological rejection, excessive emotional distress, expectation of failure, fear of negative evaluation, and awareness of rumors.

Processing new information in light of the cognitive load theory occurs in three types of cognitive load. The intrinsic cognitive load (ICL) or the real (core) load results from the number of information elements in a task and the interactions between them that the more number of such elements, the higher level of the intrinsic cognitive load. It is necessary to understand the material and build a cognitive construct. The intrinsic cognitive load plays a significant role in providing all the necessary resources without exceeding the limits of the working memory capacity. It is an intrinsic process and hence cannot be isolated from the information that learned. While the extraneous cognitive load (ECL), or the formalistic (non-real) load, is mainly generated through the education or teaching form. It is an unnecessary load on the working memory caused by the educational conditions and the learning environment. Although this external cognitive load is not part of the information being learned, it is part of the learning environment, and it represents indirect learning processes related to educational quality. Whereas Germane cognitive load (GCL) or the good cognitive load is a burden required to generate meaningful learning, and a closely related cognitive burden refers to the mental effort that a person makes to process the information that is learned and linked to the existing cognitive structure. It represents the "good" knowledge load required to generate meaningful learning. (Van Merrienboer and Ayres, 2005; Sweller et al., 2011; Korbach, et al., 2018; Lange and Costley, 2019).

Despite the effectiveness of using technology in education nowadays, Hassan (2016) study confirmed that despite the technical progress and increase of information that the world lives today and that affecting the nature of students 'lives, it is not necessary to have a positive role always. He stated that this effect can take a negative path as the presence of a state of cognitive dissonance that may hinder the student's ability to process information to determine its credibility, which constitutes a knowledge load on the student.

In light of e-learning system, Blackboard e-learning management system refers to an integrated system that manages the educational process synchronously and asynchronously and provides a safe and easy way to use the learning environment. It helps the faculty members to present their courses and lectures through attaching multimedia (text, images, audio, video, and graphics). Through which learners group to browse the content, each according to their needs, and communicate with each other with multiple communication tools (e-mail, forums, ...) without the limits of time and place, or through virtual classes from any type of smart device (AlSadhan, 2015). Although the significance of this learning environment, Çakiroğlu & Aksoy (2017) emphasized that in online learning systems there is a need for future work that outlines the effects that educational platforms have on the types of knowledge burden.

According to the researchers' knowledge, no study dealt with the psychological barriers of the e-learning management system (Blackboard) and its effect on the students' cognitive load. Most studies dealing with these variables in e-learning educational settings in general, and which indicated that it is a new idea, and that motivated the researchers to conduct this research. So that the current study hypotheses the following: there is no statistically significant difference between the means of male and female university students' scores in the psychological barriers and the cognitive load scales, there is no statistically significant difference between the means of the scientific and literary disciplines university students' scores in each of the psychological barriers and the cognitive load, there is no statistically significant correlative relationship between the scores of both the psychological barriers, its' dimensions and the cognitive load of university students , and that the cognitive load cannot be predicted with the university student scores on the scale of the psychological barriers and their dimensions in a statistically significant manner.

METHODS

In the light of the study objectives and hypothesis the researchers utilized the descriptive analytical research approach, specifically the predictive correlative method to shed light on the relationship between the study variables and to predict the relationships between them. To verify the study tools (100) (female= 60, male=40) university students from the Prince Sattam bin Abdul-Aziz University were selected to verify the validity and reliability of the study tools to be applied to the basic study. To apply the research tools the researchers selected (240) university students from the same university (female=100, male=140) (the literary disciplines= 132, the scientific disciplines= 108). The researchers utilized the psychological barriers scale and the cognitive load scale prepared by the researchers. This matter followed several procedures until it reached to the final for. They will be summarized as follows:

RESULTS

The first hypothesis" There is no statistically significant difference between the means of male and female university students' scores in the psychological barriers and the cognitive load scales" is tested. To verify this hypothesis, the researcher used t-test, and table (1) shows the results obtained:

Table 1. *Arithmetic Mean, Standard Deviation, (t) Value and Its Significance for the Differences between the Mean Scores of Males and Females in the psychological barriers and the cognitive load (n=240)*

Variables	**Male(n=140)**		**Female(n=100)**		**t-value**	**Sig.**
	Mean	Std.	Mean	Std.		
Internal psychological barriers	25.80	7.65	26.13	7.00	0.339	not significant
External psychological barriers	24.65	6.99	24.69	6.35	0.46	not significant
The total degree of psychological barriers	50.46	14.03	50.82	12.45	0.211	not significant
The intrinsic cognitive load	17.95	5.23	19.59	3.95	2.76	0.01
The extraneous cognitive load	16.90	5.26	19.00	3.67	3.63	0.01

The Germane cognitive load	15.12	4.56	14.31	3.83	1.50	not significant

Table (1) shows that there were no statistically significant differences between male and female university students in the psychological barriers and its dimensions, while there were statistically significant differences between male and female university students in the intrinsic cognitive load, the extraneous cognitive load and the total degree in favor of female students, but there are no differences between male and female university students in the Garmane cognitive load.

It is clear from the table (1) that there is no statistically significant difference in psychological barriers according to the gender variable (male-female). The researchers attribute this to the fact that both male and female students live in similar circumstances and expose to the same events. Moreover, university students are the most important sector in the society because of their sensitivity to problems and pressures they expose to. This result is consistent with the findings of Choucair (2002) and Abdul Samad (2002). While as regarding the differences between genders in the cognitive load variable results differ partially with Sweller(1988); AlShamsi and Hassan (2011) in the absence of statistically significant differences according to the gender variable, and also differ from the results of AlTikriti et al (2013), Al Dulaimi and Al-Jubaisi (2014) which stated that there are statistically significant differences in the cognitive load according to gender in favor of males. The researchers attribute the absence of gender differences in the Germane cognitive load to the consistency of the current research sample in terms of the intelligence level, the previous experience level, and the achievement level, in addition to the similarity in the curriculum and the teaching methods through which they learn. All these factors may lead to a similarity in the working memory capacity among the students and the cognitive load as well. This result is consistent with the results of Sweller's (2002) study which stated that the capacity, duration, and information retention affects students' cognitive loads and leads to the inability to process information.

Furthermore, The researchers attribute the statistically significant differences between male and female students in the intrinsic and extraneous cognitive load in favor of female students due to the fact that female students concerns with other duties as marriage, motherhood, and face many challenges during their learning. They also have limited contact with their professors and all these factors increase their cognitive load. While males dedicate their effort to achieve academic assignments accurately and they have enough time to communicate with professors. Besides, the increase of the intrinsic and the extraneous cognitive load among female students may be due to the differences between male and female students in thinking patterns. That male thinks logically while female think emotionally. In this context, Abdellatif (2020) mentioned that males are distinguished by logical thinking and scientific method in problem-solving more than females and that the psychological states of the female in situations that require important decisions lead to a high level of anxiety and emotional stimulation which in turn affect their cognitive load among females than males.

The second hypothesis" There is no statistically significant difference between the means of the scientific and literary disciplines university students' scores in each of the psychological barriers and the cognitive load "is tested. To test this hypothesis, the researcher used t-test, and table (2) shows the results obtained:

Table 2. *Arithmetic Mean, Standard Deviation, (t) value and Its Significance for the Differences between the Mean Scores of the Scientific and the Literary Disciplines in the Psychological Barriers and the Cognitive Load (n=240)*

Variables	**Literary Disciplines (n=137)**		**Scientific Disciplines (n=103)**		**t-value**	**Sig.**
	Mean	**Std.**	**Mean**	**Std.**		
Internal psychological barriers	26.21	6.61	25.58	8.29	0.63	not significant
External psychological barriers	24.32	5.75	25.16	7.83	0.86	not significant
The total degree of psychological barriers	50.54	11.49	50.59	15.58	0.08	not significant
The intrinsic cognitive load	19.30	4.52	17.73	5.04	2.49	0.01
The extraneous cognitive load	18.54	4.32	16.74	5.15	2.86	0.01
The Germane cognitive load	14.69	4.07	14.91	4.57	0.38	not

						significant
The total degree of cognitive load	52.54	8.00	49.39	9.62	2.69	0.01

Table (2) clarifies that there is no statistically significant difference between the scientific and literary disciplines in the psychological barriers and its dimensions, while there is difference between them in the intrinsic, the extraneous cognitive load and the overall degree of the cognitive load in favor of the literary disciplines, Moreover, there is no statistically significant difference between the scientific and literary disciplines in the Germane cognitive load.

The researches attribute this result that there is no statistically significant difference between the scientific and literary disciplines in the psychological barriers and its dimensions through the definition presented by Choucair (2002) who defined it as mental states that reflect the negativity of the individual and which prevent him from being affected by what surrounds him and hinder him from carrying out certain actions. The emotional mechanisms of these barriers are intensive negative emotional experiences and attitudes such as shame, stress, feeling of guilt, fear and anxiety, less self-esteem, rejection, lack of acceptance, increased sensitivity towards the self, and being affected by what he knows about self.

The results of the hypothesis regarding the difference between the literary and scientific disciplines in the cognitive load are partially inconsistent with Sweller (1988); AlSahmsi and Hassan (2011); and AlTikriti et al (2013) in the absence of the statistically significant difference according to the variable of discipline. Results also differ from the results of El-Sabab's (2016) study which revealed that there is a statistically significant difference in the cognitive load according to the variable of discipline in favor of the scientific one. The researchers attribute this difference to the discipline nature, teaching methods, and curricula characteristics which can increase the students' cognitive load. In this context, Sweller et al (1998) pointed out that the intrinsic cognitive load arises as a result of the difficulty and complexity of the academic content. He stated that if the course material contains many elements and concepts or suffers from weakness in the content organization, the learner finds it difficult to address them simultaneously in the working memory that makes the subject difficult to understand. These differences may be also due to the educational techniques that learners need to participate in the learning activities and which are not directly related to the learners' cognitive schema (Palincsar, 2003). This load generates as a result of traditional teaching methods that focus on providing learners with the amount of important and unimportant information that needs to preserve without paying attention to the students' mental ability to process information, coding, and storing it appropriately. These methods make the learner just a recipient or listener (Bruning 2003).

While there is no difference between the scientific and literary disciplines in the Germane cognitive load because this kind of load is required for both disciplines as it leads to successful learning and interactions in light of the transition towards distance e-learning. In an e-learning setting, this load generates as a result of useful cognitive processing such as abstract ideas and others, which are strengthened through educational aids. Building new and complex cognitive schemes successfully helps learners to move between the stimuli presented and save useful information, which helps them to think logically and critically and judge the information presented to him objectively (Chipperfield 2006). So that this kind of load contributes to learning rather than hindering it as it requires learners to build new cognitive schemes which generate the Germane cognitive load (Al Zoubi 2018).

The third hypothesis" There is no statistically significant correlative relationship between the scores of both the psychological barriers, its' dimensions and the cognitive load of university students "is tested. To test this hypothesis, the researcher used Pearson correlation coefficients between the psychological barriers and the cognitive load, and table (3) shows the results obtained:

Table 3. *Pearson Correlation Coefficients of the Psychological Barriers, Its dimensions, and the Cognitive Load of University Students*

Psychological Barriers	**Cognitive Load**			
	Intrinsic	**Extraneous**	**Germane**	**The Total Degree**
The internal Psychological Barriers	**0.344	**.310	0.059	**0.337
The external Psychological Barriers	**0.358	**0.358	0.100	**0.436
The Total Degree of Psychological Barriers	**0.364	**0.351	0.083	**0.427

** Significant at the (0.01) Level

Table(3) reveals that there is a statistically significant positive correlative relationship between the psychological barriers, its dimensions, the intrinsic and extraneous cognitive load, and the overall degree of the cognitive load among university students, while as there was no statistically significant positive correlative relationship between psychological barriers, its dimensions, and the Germane cognitive load of university students.

This result is inconsistent with Katageri and Kallarni's (2015) study which indicated that psychological barriers in the e-learning environment increase the intrinsic and extraneous cognitive load. Furthermore, the intrinsic cognitive load is negatively related to self-confidence and positively related to anxiety (Lange et al,. 2017). Other researchers revealed that emotions are a separate channel for processing information (Plass and Kaplan, 2016). So emotions and psychological factors are considered unnecessary cognitive load and negatively affecting the working memory. Besides storing and retrieving information are affected by emotions and that emotions directly affect memory (Plass & Kalyuga, 2019).
The researchers also see that psychological barriers are experiences and disincentives for mental flexibility that limit the students' ability to think and move towards their future as these barriers are obstacles to their thinking and capabilities. Hassan(2016) also mentioned that these barriers are reflected in the academic achievement and reduced mental capacity, which in turn leads to a feeling of cognitive load. Concerning the results which stated that there is no statistically significant correlative relationship between the psychological barriers and the Germane cognitive load, the researchers attribute this to the fact that the good educational process design and planning can reduce resorting to the Germane cognitive load. Moreover, students also found some facilities that relive their Germane cognitive load due to the novelty of the university experience and the sudden application. That psychological barrier doesn't lead to the Germane cognitive load.

The Fourth hypothesis" The cognitive load cannot be predicted with the university student scores on the scale of the psychological barriers and their dimensions in a statistically significant manner "is tested. To test this hypothesis, the researcher conducted multiple regression analyses using the stepwise method of selection. It is a method based on adding independent variables to the model one after the other. It includes building a complete model with all the independent variables and deleting the non-significant contributed variables one after the other. The results obtained using the previously mentioned method ended with the best model, which remained the second dimension the external psychological barriers and excluding the first dimension and the overall degree of psychological barriers due to their insignificant contribution to the dependent variable, and table (4) shows the results obtained:

Table 4. *Results of Variance Analysis of the Contribution of the External Psychological Barriers in Predicting the Total degree of the Cognitive Load*

Source of Variance	Sum of Squares	DF	Mean Squares	F	Sig.
Regression	2054.78	1	78.2054	55.899	0.01
Residual	8748.552	238	36.759		
Total	10803.333	238			

Table (4) shows that the fourth hypothesis, which stated that" The cognitive load cannot be predicted with the university student scores on the scale of the psychological barriers and their dimensions in a statistically significant manner ", as F=55.899 which is significant at 0.01 level.

Table 5. *Results of Variance Analysis of the Contribution of the Psychological Barriers and its Dimensions in Predicting the Cognitive Load*

Model	Beta	Regression Coefficient	t	Constant Variance	R	R2
Total Degree	0.436	0.436	7.477	7.715	0.436	0.190

Table (5) refers to Beta value and its significance which indicates that the second dimension (the external psychological barriers) is the best in predicting the overall degree of cognitive load. T value for the regression coefficient is (477.7) for the second dimension, which reflects that the relationship between the two variables is significant. In addition to that, it comes in the first order in terms of correlation with the dependent variable (cognitive load). From the previous table, we can conclude the regression equation as follows:

$$y = a + bx$$

Where(y) is the value of the dependent variable (cognitive load), (x) is the value of the independent variable (psychological barriers), (b) the regression coefficient of the independent variable and the value of (a) is the constant regression= (7.715). So the formula is as follows:
Predicted cognitive load (y) = 0.436 (the total degree of the second dimension) + 7.715
And because the external psychological barriers contain three sub-dimensions, the researchers conducted simple linear regression analysis to identify the extent to which these three sub-dimensions contribute to predicting the cognitive load of university students, and table (6) shows the results obtained:

Table 6: *Results of Regression Analysis of the Contribution of the Psychological Barriers and its Dimensions in Predicting the Cognitive Load*

Model	Beta	Regression Coefficient	t	Constant Variance	R	R2
Predicting Failure	0.385	0.385	6.427	2.081	0.385	0.148
fear of negative evaluation	0.347	0.347	5.711	3.502	0.347	0.121
realizing rumors	0.403	0.403	6.801	2.132	0.403	0.163

Results reveal that the arrangement of the sub-dimensions of external psychological barriers in terms of their ability to predict the overall degree of the cognitive load was as follows: realizing rumors, fear of negative evaluation, and expecting failure. The researchers attribute this result because university students are affected by rumors more than others due to the availability of social media among them. They also feel fear of failure as they about to graduate, looking for a job, and head towards the future, and that consequently affects their cognitive load. Moreover, the researchers attribute the students' failure of negative evaluation because the study sample is from the Bedouin community which cares about society and friends perceptions and that affects their cognitive load.

DISCUSSION

With the necessity of using e-learning in the current period that associated with the spread of the Coronavirus and suspending the educational process in every country in the world, and in light of the conflicting results related to the cognitive load and e-learning, in addition to the emergence of the psychological barriers related to e-learning that may the cognitive load of University students who use the Blackboard E-learning Management System; the researches prompted to conduct this research to identify the extent to which psychological barriers degrees contribute to predicting the degrees of perceived cognitive load for blackboard e-learning management system users at the Prince Sattam bin Abdul-Aziz University and the differences between genders and disciplines in these two variables. Results concluded that there were no statistically significant differences in the psychological barriers due to the gender and academic discipline variables. While there were statistically significant differences in the cognitive load variable (intrinsic, extraneous, and the overall degree) due to the gender variable in favor of female students, as well as differences due to the academic disciplines in favor of the literary discipline. Moreover, there were statistically significant differences in the Germane cognitive load due to gender or discipline. Besides, results demonstrated that there was a statistically significant correlative positive relationship between the psychological barriers and the cognitive load (intrinsic, extraneous, and the overall degree), and there was no statistically correlative relationship between psychological barriers and the Germane cognitive load. Finally, results revealed that the external psychological barriers were better at predicting the overall degree of the cognitive load.

Recommendations

- Further research should be conducted to contribute to the development of the Germane cognitive load among University students
- The necessity of employing the skills of dealing with the Blackboard system within the computer skills course and teaching it at the first levels of university students
- Providing students with the technical experiences necessary to develop their abilities to confront psychological barriers and the cognitive load through seminars, educational meetings, and workshops.
- Develop training and counseling programs to reduce the level of psychological barriers and the cognitive load for students during e-learning.
- Avoid providing redundant information during e-learning, the logical arrangement of learning activities and content from simple to complex and using practical examples.

- Work to enable students from the Blackboard system by allowing the learner to control the presentation through: pausing, accelerating, slowing, rewinding, and returning; to reduce the burden of knowledge on them.
- The necessity of synchronization between traditional and electronic education in the educational process.

Limitations and study forward

Study tools(the psychological barriers and the cognitive load scale) were applied during the second semester of the academic year 2019/2020 AD, on (240) male and female students from the Prince Sattam bin Abdul Aziz University in Wadi Al-Dawasir Colleges in the Kingdom of Saudi Arabia.

Authors' Contributions

Abdellatif. S. formulated the main study problem and was responsible for data collection, reviewing the literature, designing study tools, and interpreting the study results. Azmi. M. was responsible for reviewing the literature, conducting data statistical analysis, translating the article into English, and providing a conclusion.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ACKNOWLEDGMENT

We would like to thank all students participating in the study, and the Deanship of Scientific Research at Prince Sattam bin Abdul-Aziz University, Alkharj, Saudi Arabia.

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