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Article

Effect of Business Student academic Motivation, Teacher Support, Learning Environment and Attitude on Knowledge Retention: Moderating Role of E-learning support

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Abstract

Given the growing need to enhance learning outcomes in business education, it is important to identify factors that shape business students' attitude and their knowledge retention. The present research investigates how learning environment, teacher support and business student academic motivation together influence business student attitude and strengthen knowledge retention. This study also assesses the moderating effect of e-learning support and the mediating effect of business student attitude. Present research adopted quantitative research methodology. Data of the present study was collected from business students by using convenience sampling. Developed questionnaire was distributed among 350 business students. Questionnaire was developed using seven-point Likert scale. Response rate of the present research was 74.57%. Collected data was analysed using Smart PLS 4. Results show that business student attitude has positive effect on knowledge retention. Also, teacher support, business student academic motivation and learning environment have positive effect on business student attitude. Also, mediating effect of business student attitude is statistically supported. Results also support moderating effect of e-learning support. Present study is among few ones that highlight the moderating effect of e-learning support. Additionally, present research is among limited ones that sheds light on mediating effect of business student attitude.

Keywords

Business Student Attitude, Business Student Academic Motivation, Learning Environment, Teacher Support, Knowledge Retention.

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Introduction

Knowledge retention has a very important role to play in learning capacity for business students. It helps in the transformation of business students into experts by improving their capability to understand innovation and enhance their performance (Iqbal et al., 2025). Knowledge retention is one of the vital elements for the high performance of the students. Knowledge retention is important for business students as it ensures that required experience, skills and information gathered over time are preserved (Capatina et al., 2024). Moreover, knowledge retention ensures that acquired skills and knowledge by the business students are effectively used by them. On the other hand, knowledge retention enhances the learning efficiency of students by minimizing the need to learn any business-related concept again, leading to reduced effort and saving time for both students and faculty members. In academic settings, decision making ability, innovation capability and problem-solving capacity of the business students support strong knowledge retention. Furthermore, development of confidence and skills among business students is also mainly dependent on knowledge retention factors (Kottara, Asonitou, & Kavalieraki-Foka, 2025). Ultimately, knowledge retention is important to improve the overall performance of the business students.

Attitude plays a very important role in altering the educational life of business students. Attitude of the business students determines their willingness, ability and interest to learn. In fact, it is highly likely that the student of business studies will perform well in all subjects if he or she possesses a positive attitude. The attitude of the student is important to determine the interest in business studies. Later, it affects the overall performance of students (Chu, 2025). Whereas negative attitude of business students limits their academic performance as their motivation to learn is derailed. In other words, negative attitude of the business students discourages students from getting engaged in learning activities (Dajuela, Baes, & Naparota, 2024). Therefore, it is vital for business institutions to understand their attitude to shape their behavior on a long-term basis.

Motivation of students is important as it affects their practical and theoretical approach. Motivation is the explanatory factor that describes why business students act in a certain way (Murayama & von Keyserlingk, 2025). Motivation among business students plays a triggering role in learning. Lack of motivation reflects lack of mobility among business students, making it difficult for students to achieve their goals. Academic motivation of business students is a basic factor that determines their academic performance and success. Academic motivation is vital because it has a positive impact on the way business students approach any assigned tasks, their spending of energy and time (Sharif et al., 2025). Learning from business students is dependent upon academic motivation. Thus, understanding academic motivation helps in improving the behavior of students towards education.

Teacher support is very important in higher education system, particularly in the context of business studies. Support by the teacher improves the academic achievements of the business students. An enjoyable and relaxed learning environment is developed in the case of strong relationships among students and teachers (Pérez Estébanez & Pastor Estébanez, 2025). Moreover, teachers provide proper guidance in understanding business concepts to the students. Teachers also provide timely feedback and foster motivation among students of business studies, enhancing engagement towards business subjects (Prananto et al., 2025). Teachers provide support to students in different forms to improve their academic and non-academic performance. Indeed, teachers are the essential actors that shapes students' academic achievements and psychological behaviors (Zhang et al., 2025).

The learning environment is the pedagogical, psychological, physical and social context in which learning of business students occurs. In the long run, it impacts the attitudes and achievements of business students. Learning environment plays a vital role in students' engagement and achievement in business education. Learning environment creates a stimulating and positive learning environment for students (Ibragimov et al., 2023). The environment in which learning of business students takes place is very important as it has the ability to impede or enhance learning capacity of students. Hence, positive learning of business students is mainly dependent on a conducive learning environment (Ribadeneira-Pazmiño et al., 2025).

Another factor that determines the knowledge retention among business students is usage of technology. This is the age of digitalization where learning through different e-learning systems is very important. E-learning helps in the progress of business students by using different communication and information technologies (Maisha & Shetu, 2023). E-learning support is important for business students as they can have access to learning materials, case studies and lectures anytime by using it. As a result, it becomes

easier for them to achieve their assigned tasks. The learning experience of business students is also enhanced by using different simulations and digital tools (Parusheva et al., 2025). Moreover, students get the opportunity of real-time feedback that strengthen their decision making and analytical skills that are vital for business education. Students of business studies develop proficiency in using latest technology tools through it as well. The purpose of this study is to examine the effect of business student academic motivation, teacher support, learning environment and business student attitude on knowledge retention along with moderation of e-learning support.

Literature Review

Business Student Attitude and Knowledge Retention

Knowledge retention is the process of preserving and managing knowledge of an individual and ensuring that a student can use it again in future. Knowledge retention involves retrieving, storing and acquiring knowledge. Whereas knowledge retention also minimizes the risk of losing a knowledge. Literature has described knowledge retention as the student's ability to understand the knowledge given in the learning process and apply that knowledge later (Agwu Udu et al., 2022). Similarly, knowledge retention is also described by Sanz and Hovell (2021) assimilation of information that is available during process of learning and ability of students to apply and recall the assimilated knowledge over time. Scholars have discussed that low level of knowledge retention among students is result of lack of interest of students in education (Keane, Heinz, & Lynch, 2023). Moreover, less effective strategies adopted by the teachers who are teaching business related subjects develop inability among students to retain knowledge.

Scholars have defined student attitude as level to which a students have belief regarding education as a major factor in education research (Hidayatullah & Csikos, 2024). Studies have referred to student education as perspective and emotional response towards educational institutions that has significant effect on academic achievement of students. There are a number of different factors that shape the attitude of students towards education. Attitude is based on self-esteem, incitement, emotions, reverence, and information design the outlook of an individual towards certain discipline (Nja et al., 2022). Students show certain attitude towards education through their reactions as per their understanding. Attitude also shows the mind and feeling of a student towards a certain institute or subject. Term students' attitude is discussed in literature regarding education studies. Attitude of students is described as learned ability to respond negatively or positively towards educational institute, faculty members, learning environment, and academic tasks. A number of different factors shape attitude of students including prior academic experiences, peer interactions, parental support, teaching quality and classroom environment (Rafiq, Hussain, & Abbas, 2020).

Students attitude has a number of different outcomes in terms of learning. The learning experience and academic success of students is mainly dependent on behavior and attitude of students (Malala, Onderi, & Ajowi, 2021). The research of Mashwama et al. (2025) have shown that positive attitude of students in terms of emotional orientation, interests, values and beliefs have positive influence on retention of knowledge. When students are open minded, confident and curious, they get process information more deeply, participate actively, and pay more attention towards studies. On the other hand, negative attitude limit cognitive engagement of the students, making it hard to recall educational content. Study by Uzezi and Jonah (2017) mentioned that student attitude has positive effect on knowledge retention of students.

H1: *There exists a significant association between Student Attitude and Knowledge Retention.*

Business student Academic Motivation and Business Student Attitude

Motivation plays very important role in shaping learning behavior and attitude of the students. Academic motivation is an important driving force for learners to get engaged and put efforts on daily basis for deep learning (Shuhidan, Dangi, & Noor, 2025). Motivated students take active participation in course learning impacting their knowledge gain from the class. Motivated students make extra effort when they face any challenge. Such students use technology for their assigned projects, solve puzzles and problems, read books when they have spare time and complete their assigned tasks well in time. Motivation is considered as one of the sources of power that determines stability, severity, and direction of the student. Additionally, it also determines the speed at which a student achieve desired goals (Lo & Lin, 2020).

Students develop positive attitude towards learning when they are highly motivated because of any extrinsic reward or intrinsic reason (Rahmi & Neviyarni, 2022). Such motivated students perceive challenges as a chance to grow. Therefore, they show consistency in studies and attend classes with proactive mindset. Motivation develops enthusiasm, strengthens sense of purpose and reduces anxiety among students. All these factors contribute towards academic achievements of the students. Increase in motivation among students contributes towards creation of awareness towards their responsibilities, developing positive attitude and thinking towards the educational institute and enjoyment of educational activities by the students. Therefore, motivation is one of the factors that leads towards the nonperforming and performing of a certain task.

For the above-mentioned reasons, motivation plays direct role in shaping the attitude of students towards education (Imsa-ard, 2020). Motivation plays the role of foundational psychology in order to influence overall academic experience, influence behavior and engagement and shape the attitude of students. It is highly likely that motivated students will adopt committed, responsible and optimistic attitude that develop the long-term success among students (Ferrer et al., 2022). Research by Tasgin and Coskun (2018) revealed that academic motivation enhances the positive attitude of students towards learning. So, we assume that

H2: *There exists a significant association between Business student Academic Motivation and Business Student Attitude.*

Past research mentioned that motivation alone may not have sustainable outcome in terms of learning. Whereas students' emotional and evaluative orientation towards educational activities shows the way motivation is converted into cognitive management. When students have positive extrinsic, and intrinsic motivation along with positive attitude are most more likely to outcomes as long term, memory consolidation (Al Shuaili, 2025). Studies further show that attitude develops willingness among students to connect, reflect and participate in different concepts of past knowledge.

Therefore, attitude of students plays as important psychological process by which academic motivation improves retention of knowledge in business school. In other words, when students are motivated towards their studies it is more likely that they will develop positive attitude towards their studies (Rožman, Vrečko, & Tominc, 2025). As a result of this positive attitude, students will be involved in cognitive strategies that will improve knowledge retention among them. Therefore, attitude connect motivation will knowledge retention indirectly. Past studies have discussed the mediating role of student attitude in their studies (Carcueva, 2025; Dutt et al., 2025). Thus, we assume that

H3: *Business Student Attitude is a mediator between Academic Motivation and Knowledge Retention.*

Teacher Support and Business Student Attitude

Studies has discussed teacher support as one of the important factor to facilitate students engagement towards learning. Teacher support is discussed as behavior and attitude of the teachers towards academic activities of the students. Academic support given by the teachers to the students impact perception of student towards the teacher and impacts commitment of student towards education. The support from teacher include respect, encouragement, trust, and care towards the student. Some of the studies discussed teacher support in the form of emotional and academic support provided by the faculty member (Ansong et al., 2024). Teacher support plays very important role in developing positive relationship between teachers and students. This relationship is the base to develop academic and interactive capacity in a student. As a result, students are motivated to take part in class activities and improve their perception regarding education (Shao et al., 2025)

Teacher support shapes the attitude of students by developing an engaging, encouraging and safe learning environment. When students feel understood, guided and valued by the teachers their participation, motivation and confidence increases. Supportive teacher reduce anxiety and improve trust among the students. It promotes positive outlook of student towards education ultimately strengthening overall academic attitude of student (Xu, Wang, & Xu, 2025). Emotional support from teacher develop positive classroom environment, later encouraging participation from students. Additionally, support from teacher strengthen engagement towards learning activities (Guo et al., 2025). Teachers have major influence on the learning of students as they provide guidelines to acquire skills and knowledge required by the students. Research by Ober et al. (2021) demonstrated that quality of interaction among teacher and student influence the attitude of students towards education. In other words, teacher support has positive effect on student attitude. So, this study assume that

H4: *There exists a significant association between Teacher Support and Student Attitude.*

When support is provided by teachers to students in the form of encouragement, guidance and feedback, they develop positive attitude towards learning. These development attitudes of students towards learning include confidence, engagement, and motivation towards studies. Persistence and attention among students are enhanced because of constructive attitudes that later impacts learning strategies of students. These learning strategies help students to retain their knowledge (Zhang, Yang, & Liu, 2024). Therefore, student knowledge plays the role of pathway that link supportive teaching practices towards positive outcomes.

When students feel encouraged and valued, they show greater willingness to invest, ask questions and participate in academic efforts. This improved engagement of students leads to deeper processing of information that ultimately encourage in retention of knowledge (Weiland, 2024). Therefore, attitude of students serves as important bridge between teacher support and knowledge retention. In past, Clavero and Edna (2023) and Jiayin and Saidin (2024) revealed mediating role of student attitude in their studies. Therefore, it is hypothesized that **H5: Business Student Attitude is a mediator between Teacher Support and Knowledge Retention.**

Learning Environment and Student Attitude

Studies have defined learning environment as social and physical context where learning and teaching take place (Rusticus, Pashootan, & Mah, 2023). It is based on culture, interaction between teachers and students and physical environment of classroom. Scholars have categorized learning environment as psychological environment, physical environment and academic environment. Environment of classrooms and school is vital resource input. All indicators of classroom and school environment produce academic environment that plays vital role in the development of students' attitude. Scholars mentioned that students learning environments, motivation and cognitive abilities impacts academic success (Werang et al., 2025).

Scholars mentioned that school learning environments are important in learning and teaching of business and science related subjects. The learning environment of educational institute are based on material and human resources that facilitate learning. Learning environment takes the shape of classroom characteristics, teaching characteristics and teacher characteristics (Kassab et al., 2024). Academic performance of students was explained by past studies by using these factors separately.

Positive learning environment shapes attitude of students by creating sense of motivation, support and safety. When classrooms are engaging, inclusive and well-structured, students feel valued (Julien, 2023). They become more willing to learn and participate in learning activities. Supportive interactions of students with peers and teachers encourage confidence and reduce anxiety. On the other hand, stressful or negative environments can lead to poor attitude and disengagement. It shows learning conditions have direct effect on the student's attitude (Hatane et al., 2020). Learning environment includes classroom, lecturing and lecturer characteristics. On the basis of characteristics of teachers, studies have shown that factors in the form of learning environment play important role in academic performance of students. Findings have asserted that learning environments have strong effect on learning outcomes and student attitude (Yahya & Nur, 2023). Research of Zaid et al. (2019) revealed that suitable learning environment has positive effect on students attitude. Therefore, this study assumed that

H6: There exists a significant association between Learning Environment and Student Attitude.

Positive learning environment is characterized as opportunities of collaborative learning, organized structure of classrooms and supportive teachers. All these are important factors to shape attitude of students. When students assume their learning environment as well managed and encouraging, it is highly likely that they will develop confidence, engagement and motivation to learn (Schweder & Raufelder, 2024). These students will also participate in different learning activities. As a result of this positive attitude, concentration of students towards learning strategies is enhanced that signifies their retention of knowledge.

On the other hand, if learning environment is poor and unsupportive, negative attitude is fostered among the students that leads to weak knowledge retention (Closs, Mahat, & Imms, 2022). This unsupportive environment also lead to disengagement of students from learning activities, causing weak knowledge retention. Therefore, attitude of students has ability to operate as mediator between learning environment and knowledge retention. The research by Carcueva (2025) also discussed mediating role of student attitude in their study. Therefore,

H7: Student Attitude is a mediator between Learning Environment and Knowledge Retention.

E-Learning Support as moderator

E-learning is discussed in literature as educational approach that utilizes communication and information technologies with purpose of delivering resources and content by using online platforms. E-learning enables learning of students in unprecedented manner (Liu & Yu, 2023). By using different educational platforms, data analysis techniques and algorithms, e-learning can design an effective study plan that is needed by the students. It encourages more efficient and effective learning of the students, leading to improved academic performance. On the other hand, e-learning reduces stress that is caused by the classroom environment for both students and teachers. Furthermore, it saves the huge amount of time and energy of the teachers and students (Singh & Mishra, 2020).

E-learning resources are very important for students and teachers. The main aim to introduce e-learning facilities into education system is to prepare students for age of information technology and improve delivery of education. In order to meet the future needs of education sector, it is important for students to handle the challenges of ever-changing world. E-learning has ability to provide immediate feedback and improve knowledge retention among students. The research of Uyar (2023) revealed that e-learning support strengthens the relationship between attitude of student and knowledge retention. When online resources, guidance and digital resources are easily available to students, they will develop positive attitude and process information more quickly. As a result, students will retain knowledge for a longer period of time. The research by Elfaki, Abdulraheem and Abdulrahim (2019) mentioned that e-learning amplifies the relationship between attitude and retention of knowledge. The research by Uyar (2023) discussed moderating role of e-learning support in their study. So, we hypothesize that:

H8: *E-Learning Support is a significant moderator between Student Attitude and Knowledge Retention.*

Above discussion lead to development of Figure 1, the proposed hypothesis of the study illustrating antecedents of knowledge retention.

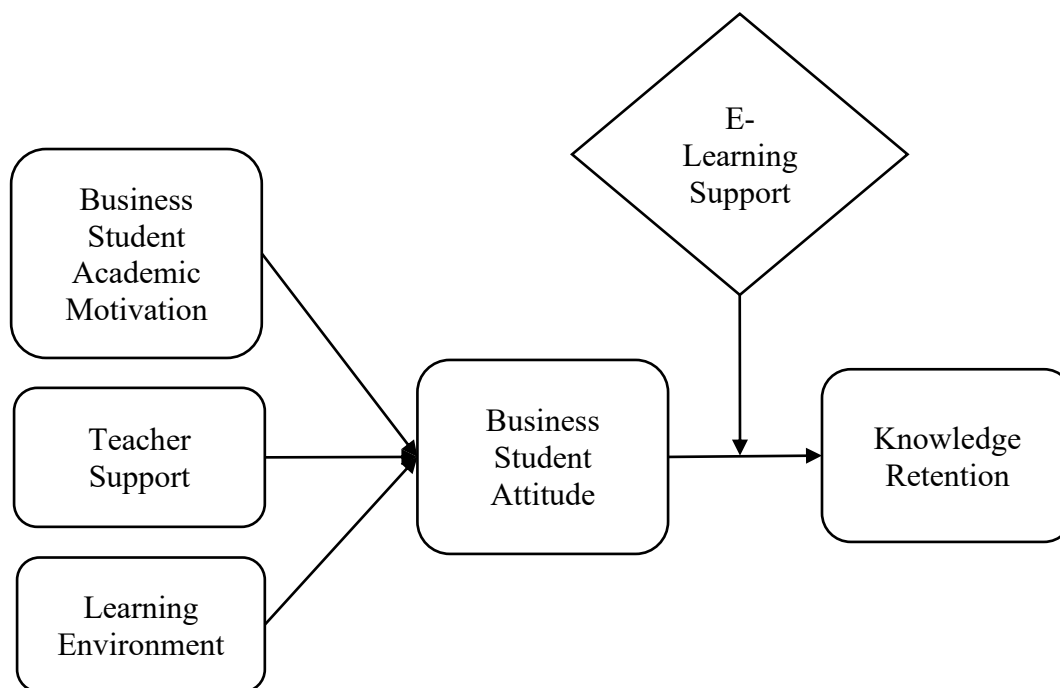


Figure 1: *Framework.*

Methodology

This research used quantitative methodology with purpose to explore relationships between proposed variables. This research is comprised of three IVs, One DV, one mediator and one moderator. Respondents of present research are students of business studies who are studying in different business schools. Structured

questionnaire on the basis of literature review was developed. This questionnaire was developed in seven-point Likert scale which was used for the collection of data from business students by using convenience sampling. The developed questionnaire was distributed among 350 students. Scholars of present research received 261 usable questionnaires from respondents. The usable response rate was 74.57%.

The questionnaire was divided in two sections namely demographic section and variables section. The second half was developed from the past literature review. This research adopted items of knowledge retention from [Hande, Mohammed and Komattil \(2015\)](#), scale of teacher support was adapted from [Bibou \(2007\)](#), scale of student attitude was adapting using questionnaire of [Tajudeen Shittu et al. \(2011\)](#), measurement scale of e-learning support was adapted from [Mohammed Noori and Ozdamli \(2022\)](#), questionnaire of learning environment was adapted by [Serrano et al. \(2021\)](#), and items of academic motivation was adapted from [Zaccone and Pedrini \(2019\)](#). This developed questionnaire was distributed among respondents personally by the researcher. The collected questionnaire analysed using Smart PLS 4.

Results and Analysis

The demographic analysis as per the first half of questionnaire state that 87.12% of respondents were male, and 12.88% were females. Moreover, 91.87% of respondents were married and remaining were not married. As per the education level of students, 61.17% of students were from bachelor's degree and remaining were students of master's level. After demographic analysis, this study proceeded to analysis from Smart PLS.

Table 1: Loading.

	Academic Motivation	Knowledge Retention	Learning Environment	Student Attitude	Teacher Support	e-learning support
AM1	0.864					
AM2	0.851					
AM3	0.851					
AM4	0.864					
ELS1						0.854
ELS2						0.848
ELS3						0.857
ELS4						0.870
KR1		0.872				
KR2		0.810				
KR3		0.828				
KR4		0.898				
KR5		0.672				
KR6		0.888				
KR7		0.900				
LE1			0.977			
LE2			0.794			
LE3			0.867			
LE4			0.848			
LE5			0.865			
LE6			0.864			
SA1				0.868		
SA2				0.856		
SA3				0.867		
SA4				0.880		
TS1					0.808	
TS2					0.730	
TS3					0.768	
TS4					0.763	

This research used smart PLS 4 in order to answer research questions and research hypothesis. Measurement model was the first part of the analysis through Smart PLS. Researchers stated that measurement model state the relationship between proposed variables whereas structural model examined the relationship among independent variables and dependent variables (Joseph F. Hair et al., 2017). Additionally, measurement model examines convergent validity, discriminant validity and factor loading of the variables. The factor loading analysis was the first examination in this research. Byrne (2013) recommended the retention of variables that have loading of 0.60 or more. Table 1 shows that all items of the study that are retained for further analysis have loading more than 0.60.

Table 2: CR, Alpha and AVE.

	Cronbach's alpha	CR	AVE
Academic Motivation	0.880	0.917	0.735
Knowledge Retention	0.930	0.944	0.708
Learning Environment	0.935	0.949	0.758
Student Attitude	0.890	0.924	0.753
Teacher Support	0.768	0.851	0.589
e-learning support	0.880	0.917	0.735

Later, this study examined convergent validity through assessment of composite reliability, Cronbach Alpha and AVE. As per findings stated in Table 2, all values of CR and Cronbach Alpha are more than 0.70 (Joe F. Hair et al., 2017). Moreover, Fornell and Larcker (1981) proposed the values of AVE to be more than 0.50. The findings mentioned in Table 2 demonstrate that AVE values are more than 0.50, meeting the criteria.

Table 3: Discriminant Validity.

	Academic Motivation	Knowledge Retention	Learning Environment	Student Attitude	Teacher Support	e-learning support
Academic Motivation	0.857					
Knowledge Retention	0.687	0.842				
Learning Environment	0.635	0.670	0.871			
Student Attitude	0.648	0.793	0.638	0.868		
Teacher Support	0.508	0.527	0.481	0.549	0.768	
e-learning support	0.542	0.681	0.595	0.645	0.464	0.857

Next, this research examined discriminant validity through HTMT, and Fornell and Larker criteria. Beginning from Fornell and Larcker (1981) criteria, all items in Table 3 at the diagonal are higher than the non-diagonal items. Therefore, requirements discriminant validity through Fornell and Larker approach is fulfilled.

Table 4: HTMT.

	Academic Motivation	Knowledge Retention	Learning Environment	Student Attitude	Teacher Support	e-learning support
Academic Motivation						
Knowledge Retention	0.755					
Learning Environment	0.700	0.716				
Student Attitude	0.730	0.871	0.698			
Teacher Support	0.616	0.620	0.567	0.661		
e-learning support	0.614	0.752	0.655	0.728	0.563	

Moreover, by using HTMT criteria, requirement of discriminant validity is also fulfilled as all figures of Table 4 are less than 0.90 (Henseler, Ringle, & Sarstedt, 2015). At this stage, discriminant validity is confirmed using both HTMT and Fornell and Larker criteria.

Table 5: R Square.

	R-Square
Knowledge Retention	0.683
Student Attitude	0.542

Later, R square value of the proposed model was examined showing the effect of exogenous variables on the outcome variables. Falk and Miller (1992) stated that the value of R square should be more than 0.10. Figure 2 and Table 5 states that the values of R square are more than 0.10, meeting the threshold level of R square. Now, the measurement model of the present study is successfully evaluated, and this research will proceed to structural model analysis.

Table 6: Moderating and Direct Results.

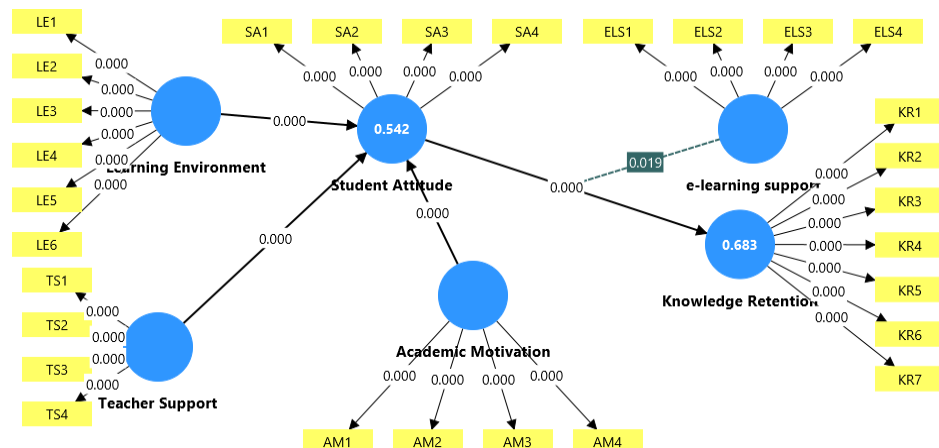
	B	SD	T value	P values
Academic Motivation -> Student Attitude	0.329	0.061	5.348	0.000
e-learning support x Student Attitude -> Knowledge Retention	0.076	0.037	2.084	0.019
Learning Environment -> Student Attitude	0.320	0.063	5.065	0.000
Student Attitude -> Knowledge Retention	0.612	0.046	13.290	0.000
Teacher Support -> Student Attitude	0.228	0.052	4.371	0.000

The structural model analysis is used to explore relationship among proposed variables. The significance of relationship is determined on the basis of P and t values. Whereas, nature of relationship is assessed on the basis of Beta value. Table 6 discusses the direct results of the study. The statistical findings reflect that teacher support has significant effect of student attitude with $t=4.371$. Results demonstrate that student attitude has positive impact on knowledge retention with $t=13.290$. Likewise, learning environment has positive effect on student attitude having $t=5.065$, academic motivation has positive influence on student attitude with $t=5.348$. Table 6 of the research also shows the moderation findings, illustrating that e-learning support moderate the relationship of student attitude and knowledge retention with $t=2.084$.

Table 7: Indirect Results.

	B	SD	T	P values
Teacher Support -> Student Attitude -> Knowledge Retention	0.139	0.033	4.224	0.000
Academic Motivation -> Student Attitude -> Knowledge Retention	0.201	0.043	4.696	0.000
Learning Environment -> Student Attitude -> Knowledge Retention	0.196	0.041	4.751	0.000

The results in Table 7 shows the indirect results of the study. Statistical figures show that student attitude mediates the relationship between academic motivation and knowledge retention ($t=4.696$), teacher support and knowledge retention ($t=4.224$) and learning environment and knowledge retention ($t=4.751$).

**Figure 2: Structural Model.**

Discussion

This research investigated the effect of teacher support, learning environment, business students academic motivation and business students student attitude on knowledge retention along with moderation of e-learning support among the students of business studies. The findings of the study demonstrate that business student attitude has positive effect on knowledge retention among business students. There can be multiple reasons for the findings in the present study. The construct of business student attitude is denoted by multiple factors like confidence, interests and motivation that have indirect effect on knowledge retention among business students. Business students having positive attitude are encouraged to have close attention to their lectures and to participate in different class activities like discussions. Such students of business studies get involved in understanding business related course material. All these factors improve the memory formation and improve knowledge retention with the passage of time.

Furthermore, student attitude impacts the way a business student handles academic challenges. Business students having positive student attitude have more probability to stick to their academic planning when they are facing difficult analytical and theoretical tasks that allow the business students to reinforce their understanding. Similarly, positive emotional state as part of student attitude reduces mental fatigue and stress. It allows business students to enhance knowledge retention by concentrating better. From the perspective of business education, application of concepts and critical thinking are very important. At this stage student attitude becomes critical. The student attitude grows stronger when students have the ability to link learning of classroom with future goals. It results in deeper information processing and improved knowledge retention. This result is inline with research of [Uzezi and Jonah \(2017\)](#) in past.

The findings also illustrated that teacher support has positive effect on business student attitude of business studies ([Ober et al., 2021](#)). In other words, teacher support has important role to shape business student attitude, specifically in case of business studies in which learning mostly needs confidence, participation and critical thinking. When teachers of different business subjects provide encouragement, constructive feedback and guidance to the business students, they feel supported and valued. Business student attitude is strengthened as a result of this sense of academic security that makes business students attentive and motivated. These business students also become willing to be engaged with business courses in future. Business students reduce confusion and anxiety when frequent teacher support is provided. Therefore, business students develop positive attitude towards their business studies because they perceive educational institutes environment as helpful and fair.

Additionally, trust is promoted among students through teacher support, which is important to develop students attitude. When students perceive that their business teacher is worried about their progress, it is highly likely that these students will make active participation in academic activities. Positive interaction of business students with teacher enhances emotional well being that further leads to stronger focus towards business studies. Not only is classroom experience improved because of this continuous teacher support but it also develops positive student attitude among business students.

The findings of the study also show that business student academic motivation has positive effect on business student attitude. When business students show strong academic motivation, they are more committed and focused towards their business studies. The internal drive of students encourages them to take part in classroom discussion and business case studies with greater interest. Therefore, business student attitude is naturally strengthened through business student academic motivation, creating academic and learning responsibilities. Motivated business students often view academic challenges as growth and learning opportunities. This mindset further improves business students attitude, making them curious to achieve academic goals. On the other hand, students show willingness to learn complex business concepts because of high academic motivation that later contributes to constructive business student attitude.

Additionally, when there is strong business student academic motivation, students are more likely to collaborate and seek clarification from different peers. It also leads to improved learning experience. Positive business student attitude is developed because of this proactive behavior of business students. The attitude of business students is marked by engagement and enthusiasm. Hence, results of this study assured that business student academic motivation is one of important driver of business student attitude. These results are inline with the findings in past ([Tasgin & Coskun, 2018](#)).

The findings of the research shows that learning environment has positive effect on business student attitude as mentioned in the research of [Zaid et al. \(2019\)](#). When classrooms of the business students are encouraging, resourceful and well-organized, business students feel motivated and comfortable to participate in academic activities. The stimulating learning environment having accessible learning materials and interactive activities with clear instructions helps students stay confident and focused. As a result, this sense of support and structure directly improves business student attitude, making business students open and enthusiastic towards academic tasks.

Free exchange of ideas, peer interaction and collaboration are promoted among business students by positive learning environment. Engagement of business students is strengthened because of these factors, which further improves business student attitude as students perceive learning as non-stressful and more enjoyable. When business students feel included and respected by all stakeholders, they develop trust towards the academic system, improving their contribution to the academic activities. Furthermore, academic anxiety and distraction are reduced because of well-designed learning environment that enables students to handle complex business concepts. Business student attitude is fostered because of this clarity, characterized by active involvement. As a nutshell, research of this study confirms learning environment has very important role to play in elevation of business student attitude.

The results of the study confirm the mediating results of business student attitude between business student academic motivation and knowledge retention. When business students show high level of academic motivation, it is more likely that they will show confidence and enthusiasm towards their studies, reflecting positive business student attitude. Business students remember and process information because of this constructive attitude. In absence of positive business student attitude, it will be hard for students to develop interest and focus on their studies. So, business student attitude plays the role of important bridge that transforms academic motivation into lasting and meaningful knowledge retention.

The findings also show mediation of business student attitude between teacher support and knowledge retention. When business students receive teacher support on regular basis through encouragement, feedback and guidance, it is highly likely that they will develop positive business student attitude. Concentration of business students is improved because of this improved attitude, which will lead towards understanding of complex business concepts and higher knowledge retention. In absence of positive business student attitude, effective learning is not possible despite strong teacher support. Therefore, business student attitude plays the role of bridge between teaching practices and knowledge retention.

The statistical results also confirm the mediating effect of business student attitude between learning environment and knowledge retention. A well structured and supportive learning environment helps business students feel engaged and comfortable. More constructive and strong business student attitude is developed because of this positive learning environment. Business students process and retain knowledge effectively when they develop positive attitude. Therefore, business student attitude plays the role of important link that converts learning environment into long term knowledge retention. These mediating results are similar to the findings of [Carcueva \(2025\)](#).

The results also show that e-learning support moderates the relationship among business student attitude and knowledge retention. The possible reason of this result can be that when business students have positive student attitude, they get engaged with academic content naturally. Whereas the level to which attitude is translated into knowledge retention is mainly dependent on e-learning support. High quality of e-learning support in the form of interactive learning tools and user-friendly platforms improves the process of learning. Later, the impact of positive attitude is also strengthened. In presence of strong e-learning support, business students with positive attitude can reinforce business concepts, access academic material anytime and can revise business related concepts effectively with the help of digital tools, leading to development of knowledge retention.

On the other hand, in absence of weak e-learning support, impact of business student attitude on knowledge retention gets weaker. In this situation, motivated students face difficulty in retention of academic information because of limited resources. Thus, moderating findings show that e-learning support plays important role to enhance the outcome of business student attitude by ensuring conversion of motivation into long term knowledge retention This moderation result is similar to the results of [Uyar \(2023\)](#).

Limitations

This section highlights few limitations of the study. Present study highlights the factors that are important for knowledge of business students. Whereas it is also important to know the factors that can improve knowledge retention of students of other fields. Therefore, it is recommended that researchers may use same model for the knowledge retention of medical and business students. Additionally, this study used e-learning support as the moderating variable. whereas inclusion of such variables as independent variables can be helpful in improving R square values. So, it is recommended to add such technology-oriented variables as independent variables in upcoming research.

Moreover, this research used e-learning support as moderating variable on second half of the proposed model. It is proposed to use same moderating variable on the first half of the proposed model. Also, present study used Smart PLS 4 as tool to analyse collected data. This study recommends to use AMOS for the analysis of data of similar studies. In the end, seven point likert scale was used for development of questionnaire. It is proposed to use six point likert scale in future studies.

Theoretical and Managerial Implications

Present section highlights the contribution of the present study. This research contributes to behavioral and educational literature by showing importance of learning environment, teacher support, and business student academic motivation as key factors to improve business student knowledge retention. Present research also confirmed mediating role of business student attitude on the above-mentioned relationships. Moreover, moderating effect of e-learning support shows importance of digital tools to improve relationship between student attitude and knowledge retention.

For strategists of business studies, these results highlights the factors that are important to shape business student attitude through motivation, learning environment and supportive teacher practices. It also highlights the importance of using e-learning support by the educational institutes in the form of digital materials to improve the performance of students. Improving these areas will have positive effect on the business student attitude and knowledge retention. Further, scholars can use these studies for future research as well.

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References

- Agwu Udu, D., Nmadu, J., Uwaleke, C. C., Anudu, A. P., Chukwunonso Okechineke, B., Attamah, P. C., et al. (2022). Innovative Pedagogy and Improvement of Students' Knowledge Retention in Science Education: Learning Activity Package Instructional Approach. *Pertanika Journal of Social Sciences & Humanities*, 30(3), 1405-1426. <https://doi.org/10.47836/pjssh.30.3.25>
- Al Shuaili, A. S. T. (2025). Intrinsic and Extrinsic Motivation as Predictors of Academic Achievement and Learning Attitudes: Evidence from Omani Schools. *Educational Research and Reviews*, 20(6), 86-100. <https://doi.org/10.5897/ERR2025.4474>
- Ansong, D., Okumu, M., Amoako, E. O., Appiah-Kubi, J., Ampomah, A. O., Koomson, I., et al. (2024). The role of teacher support in students' academic performance in low- and high-stakes assessments. *Learning and Individual Differences*, 109, 102396. <https://doi.org/10.1016/j.lindif.2023.102396>
- Bibou, I. (2007). *Needs Assessment and Awareness Raising Programme for Bullying in Schools* (No. IKEERPT-2020-083). Aristotle University of Thessaloniki. <https://ikee.lib.auth.gr/record/324633>

- Byrne, B. M. (2013). *Structural Equation Modeling with Mplus: Basic Concepts, Applications, and Programming*. Routledge. <https://doi.org/10.4324/9780203807644>
- Capatina, A., Juarez-Varon, D., Micu, A., & Micu, A. E. (2024). Leveling up in corporate training: Unveiling the power of gamification to enhance knowledge retention, knowledge sharing, and job performance. *Journal of Innovation & Knowledge*, 9(3), 100530. <https://doi.org/10.1016/j.jik.2024.100530>
- Carcueva, R. (2025). Attitude in Learning as a Mediator for Engagement and Academic Performance in Mathematics. *Journal of Interdisciplinary Perspectives*, 2(6), 188-196. <https://doi.org/10.69569/jip.2024.0097>
- Chu, P. K. K. (2025). Attitudes toward statistics among business students: Do majors, mathematical background, sex, and field of secondary education matter? *Teaching Statistics*, 47(1), 63-74. <https://doi.org/10.1111/test.12390>
- Clavero, D. B., & Edna, O. B. (2023). Academic Attitude as Mediator between the Relationship of Blended Learning Environment and Student's Performance in Technology and Livelihood Education. *Journal of General Education and Humanities*, 2(4), 299-312. <https://doi.org/10.58421/gehu.v2i4.133>
- Closs, L., Mahat, M., & Imms, W. (2022). Learning environments' influence on students' learning experience in an Australian Faculty of Business and Economics. *Learning Environments Research*, 25(1), 271-285. <https://doi.org/10.1007/s10984-021-09361-2>
- Dajuela, S. A., Baes, J. O., & Naparota, L. C. (2024). Attitudes, Motivations and Academic Performance in English among the Junior High School Students in Sulangon National High School. *International Journal of English Literature and Social Sciences*, 9(1), 169-185. <https://doi.org/10.22161/ijels.91.24>
- Dutt, A., Tewari, V., Rai, S., & Shankar, S. (2025). Exploring the Mediating Role of Student Attitudes in the Relationship between Dysfunctional Teams and Student Team Performance. *Acta Psychologica*, 252, 104665. <https://doi.org/10.1016/j.actpsy.2024.104665>
- Elfaki, N. K., Abdulraheem, I., & Abdulrahim, R. (2019). Impact of e-learning vs traditional learning on students' performance and attitude. *International Medical Journal*, 24(03), 225-233. <https://www.seronijihou.com/article/impact-of-e-learning-vs-traditional-learning-on-students-performance-and-attitude>
- Falk, R. F., & Miller, N. B. (1992). *A Primer for Soft Modeling*. University of Akron Press.
- Ferrer, J., Ringer, A., Saville, K., A Parris, M., & Kashi, K. (2022). Students' motivation and engagement in higher education: the importance of attitude to online learning. *Higher Education*, 83(2), 317-338. <https://doi.org/10.1007/s10734-020-00657-5>
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
- Guo, W., Wang, J., Li, N., & Wang, L. (2025). The impact of teacher emotional support on learning engagement among college students mediated by academic self-efficacy and academic resilience. *Scientific Reports*, 15(1), 3670. <https://doi.org/10.1038/s41598-025-88187-x>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science*, 45(5), 616-632. <https://doi.org/10.1007/s11747-017-0517-x>
- Hair, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107-123. <https://doi.org/10.1504/ijmda.2017.087624>
- Hande, S., Mohammed, C. A., & Komattil, R. (2015). Acquisition of knowledge, generic skills and attitudes through problem-based learning: Student perspectives in a hybrid curriculum. *Journal of Taibah University Medical Sciences*, 10(1), 21-25. <https://doi.org/10.1016/j.jtumed.2014.01.008>
- Hatane, S. E., Setiono, F. J., Setiawan, F. F., Semuel, H., & Mangoting, Y. (2020). Learning environment, students' attitude and intention to enhance current knowledge in the context of choosing accounting career. *Journal of Applied Research in Higher Education*, 13(1), 79-97. <https://doi.org/10.1108/jarhe-06-2019-0156>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>

- Hidayatullah, A., & Csikos, C. (2024). The Role of Students' Beliefs, Parents' Educational Level, and The Mediating Role of Attitude and Motivation in Students' Mathematics Achievement. *The Asia-Pacific Education Researcher*, 33(2), 253-262. <https://doi.org/10.1007/s40299-023-00724-2>
- Ibragimov, G. I., Murkshtis, M., Zaitseva, N. A., Kosheleva, Y. P., Sadykova, A. R., & Shindryaeva, N. N. (2023). Research trends on learning environment in science education. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(11), em2351. <https://doi.org/10.29333/ejmste/13680>
- Imsa-ard, P. (2020). Motivation and Attitudes towards English Language Learning in Thailand: A Large-Scale Survey of Secondary School Students. *rEFlections*, 27(2), 140-161. <https://doi.org/10.61508/refl.v27i2.247153>
- Iqbal, S., Bashir, M., Bureš, V., Zanker, M., Ullah, S., & Rizwan, A. (2025). Impact of knowledge sharing and innovation on performance of organization: evidence from the pharmaceutical industry of Pakistan. *Cogent Business & Management*, 12(1), 2471536. <https://doi.org/10.1080/23311975.2025.2471536>
- Jiayin, L., & Saidin, K. (2024). International Students' Attitudes as a Mediator Affecting the Decision to Study in Chinese Higher Education Institutes: A Conceptual Paper. *International Journal of Interdisciplinary Organizational Studies*. <https://ssrn.com/abstract=4855954>
- Julien, G. (2023). Creating a Positive Learning Environment. *American Research Journal of Humanities and Social Sciences*, 9(1), 73-80. <https://doi.org/10.21694/2378-7031.23012>
- Kassab, S. E., Rathan, R., Taylor, D. C. M., & Hamdy, H. (2024). The impact of the educational environment on student engagement and academic performance in health professions education. *BMC Medical Education*, 24(1), 1278. <https://doi.org/10.1186/s12909-024-06270-9>
- Keane, E., Heinz, M., & Lynch, A. (2023). Factors impacting on the retention of students from under-represented groups in initial teacher education in Ireland. *Tertiary Education and Management*, 29(1), 5-23. <https://doi.org/10.1007/s11233-022-09108-5>
- Kottara, C., Asonitou, S., & Kavalieraki-Foka, D. (2025). A Conceptual Framework for Student Retention in an Advanced Financial Accounting Course: Traditional vs. Blended Learning Environments. *Trends in Higher Education*, 4(3), 30. <https://doi.org/10.3390/higheredu4030030>
- Liu, M., & Yu, D. (2023). Towards intelligent E-learning systems. *Education and Information Technologies*, 28(7), 7845-7876. <https://doi.org/10.1007/s10639-022-11479-6>
- Lo, C.-F., & Lin, C.-H. (2020). The Impact of English Learning Motivation and Attitude on Well-Being: Cram School Students in Taiwan. *Future Internet*, 12(8), 131. <https://doi.org/10.3390/fi12080131>
- Maisha, K., & Shetu, S. N. (2023). Influencing factors of e-learning adoption amongst students in a developing country: the post-pandemic scenario in Bangladesh. *Future Business Journal*, 9(1), 37. <https://doi.org/10.1186/s43093-023-00214-3>
- Malala, G., Onderi, H. L. N., & Ajowi, J. O. (2021). Effect of Student Attitude on Academic Performance of Chemistry Subject: A Case of Bondo Sub-County, Kenya. *South Asian Research Journal of Humanities and Social Sciences (SARJHSS)*, 3(4), 186-191. <https://doi.org/10.36346/sarjhss.2021.v03i04.006>
- Mashwama, X. N., Mpahla, N., Mtshatsha, N., & Makena, B. (2025). The Impact of Student Attitude and Behaviour on Subject Performance – A Systematic Review. *Journal of Education and Learning Technology*, 6(9), 855-868. <https://doi.org/10.38159/jelt.20256911>
- Mohammed Noori, N., & Ozdamli, F. (2022). Evaluating E-learning system success in higher education during the Covid-19. *Cypriot Journal of Educational Sciences*, 17(12), 4884-4913. <https://doi.org/10.18844/cjes.v17i12.8615>
- Murayama, K., & von Keyserlingk, L. (2025). A critical analysis of the current motivation theories in educational psychology: Why the same theories continue to dominate. *Educational Psychologist*, 1-16. <https://doi.org/10.1080/00461520.2025.2473894>
- Nja, C. O., Orim, R. E., Neji, H. A., Ukwetang, J. O., Uwe, U. E., & Ideba, M. A. (2022). Students' attitude and academic achievement in a flipped classroom. *Heliyon*, 8(1), e08792. <https://doi.org/10.1016/j.heliyon.2022.e08792>
- Ober, T. M., Coggins, M. R., Rebouças-Ju, D., Suzuki, H., & Cheng, Y. (2021). Effect of teacher support on students' math attitudes: Measurement invariance and moderation of students' background characteristics. *Contemporary Educational Psychology*, 66, 101988. <https://doi.org/10.1016/j.cedpsych.2021.101988>

- Parusheva, S., Klancnik, I. S., Bobek, S., & Sternad Zabukovsek, S. (2025). Enhancing Sustainability of E-Learning with Adoption of M-Learning in Business Studies. *Sustainability*, 17(8), 3487. <https://doi.org/10.3390/su17083487>
- Pérez Estébanez, R., & Pastor Estébanez, M. (2025). Shaping the Future Through Business Education: Teaching Business Administration for Sustainable Higher Education. *Administrative Sciences*, 15(8), 325. <https://doi.org/10.3390/admsci15080325>
- Prananto, K., Cahyadi, S., Lubis, F. Y., & Hinduan, Z. R. (2025). Perceived teacher support and student engagement among higher education students – a systematic literature review. *BMC Psychology*, 13(1), 112. <https://doi.org/10.1186/s40359-025-02412-w>
- Rafiq, F., Hussain, S., & Abbas, Q. (2020). Analyzing Students' Attitude towards E-Learning: A Case Study in Higher Education in Pakistan. *Pakistan Social Sciences Review*, 4(1), 367-380. [https://doi.org/10.35484/pssr.2020\(4-1\)29](https://doi.org/10.35484/pssr.2020(4-1)29)
- Rahmi, T. S., & Neviyarni, S. (2022). The role of Learning Motivation (Extrinsic and Intrinsic) and its Implications in the Learning Process. *International Journal of Educational Dynamics*, 5(1), 147-152. <https://doi.org/10.24036/ijeds.v5i1.378>
- Ribadeneira-Pazmiño, D., Noboa-Torres, M., Váscónez-Torres, M., & Tamayo-Arellano, V. (2025). Learning Environment: A Key for Academic Success in Business Administration Students at a Higher Education Institution. *International Journal of Interactive Mobile Technologies*, 19(7), 118-135. <https://doi.org/10.3991/ijim.v19i07.49867>
- Rožman, M., Vrečko, I., & Tominc, P. (2025). Psychological Factors Impacting Academic Performance Among Business Studies' Students. *Education Sciences*, 15(2), 121. <https://doi.org/10.3390/educsci15020121>
- Rusticus, S. A., Pashootan, T., & Mah, A. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, 26(1), 161-175. <https://doi.org/10.1007/s10984-022-09410-4>
- Sanz, R., & Hovell, J. (2021). Knowledge retention framework and maturity model: improving an organization or team's capability to retain critical knowledge. *Knowledge Management for Development Journal*, 16(1), 8-27. <https://km4djjournal.org/index.php/km4dj/article/view/514>
- Schweder, S., & Raufelder, D. (2024). Why does a self-learning environment matter? Motivational support of teachers and peers, enjoyment and learning strategies. *Learning and Motivation*, 88, 102067. <https://doi.org/10.1016/j.lmot.2024.102067>
- Serrano, C. M., Lagerweij, M. D., de Boer, I. R., Bakker, D. R., Koopman, P., Wesselink, P. R., et al. (2021). Students' learning environment perception and the transition to clinical training in dentistry. *European Journal of Dental Education*, 25(4), 829-836. <https://doi.org/10.1111/eje.12662>
- Shao, Y., Feng, Y., Zhao, X., Liu, G., & Zhang, L. (2025). Teacher support and secondary school students' learning engagement: A moderated mediation model. *Scientific Reports*, 15(1), 2974. <https://doi.org/10.1038/s41598-025-87366-0>
- Sharif, Z. M., Ali, R., Zahid, M. H., & Siddique, A. (2025). Motivation and Teachers' Performance: Empirical Evidence From Primary Level. *Kashf Journal of Multidisciplinary Research*, 2(02), 22-36. <https://doi.org/10.71146/kjmr282>
- Shuhidan, S. M., Dangi, M. R. M., & Noor, R. M. (2025). Students' Perceptions on Extrinsic Motivation Strategies to Enhance Learning Experience and Fostering Academic Excellence: A Qualitative Study. *International Journal of Research and Innovation in Social Science*, 9(3), 3985-3999. <https://doi.org/10.47772/IJRISS.2025.90300317>
- Singh, D., & Mishra, S. (2020). Role of e-Learning education and e-Resources; Its Impact on Academic Performance of the Students. *Aegaeum Journal*, 8(7), 1401-1420. <https://www.researchgate.net/publication/344331428>
- Tajudeen Shittu, A., Madarsha Basha, K., Suryani Nik AbdulRahman, N., & Badariah Tunku Ahmad, T. (2011). Investigating students' attitude and intention to use social software in higher institution of learning in Malaysia. *Multicultural Education & Technology Journal*, 5(3), 194-208. <https://doi.org/10.1108/17504971111166929>
- Tasgin, A., & Coskun, G. (2018). The Relationship between Academic Motivations and University Students' Attitudes towards Learning. *International Journal of Instruction*, 11(4), 935-950. <https://doi.org/10.12973/iji.2018.11459a>

- Uyar, A. (2023). Exploring the Students' Attitudes towards E-Learning at Territory Level: A Focus on Türkiye. *International Journal of Curriculum and Instruction*, 15(2), 1327-1353. <https://ijci.net/index.php/IJCI/article/view/1294>
- Uzezi, J., & Jonah, K. (2017). Effectiveness of Brain-based Learning Strategy on Students' Academic Achievement, Attitude, Motivation and Knowledge Retention in Electrochemistry. *Journal of Education, Society and Behavioural Science*, 21(3), 1-13. <https://doi.org/10.9734/JESBS/2017/34266>
- Weiland, K. (2024). *The Impact Student Engagement Has on Academic Achievement* [Thesis, Concordia University, St. Paul]. https://digitalcommons.csp.edu/teacher-education_masters/124
- Werang, B. R., Agung, A. A. G., Leba, S. M. R., & Asaloei, S. I. (2025). School Environment, Student Learning Motivation, and Academic Achievement among the State Junior High School Students. *IRASS Journal of Arts, Humanities and Social Sciences*, 2(5), 85-91. <https://doi.org/10.5281/zenodo.15362885>
- Xu, F., Wang, L., & Xu, J. (2025). The impact of teachers' motivating style and student-teacher relationships on adolescents' class participation: The indirect role of learning motivation. *Acta Psychologica*, 257, 105105. <https://doi.org/10.1016/j.actpsy.2025.105105>
- Yahya, M., & Nur, H. (2023). The Impact of a Conducive Learning Environment on Learning Motivation and Student Achievement in Vocational Schools. In *2nd World Conference on Social and Humanities Research (W-SHARE 2022)* (pp. 199-206). Atlantis Press. https://doi.org/10.2991/978-2-38476-084-8_27
- Zaccone, M. C., & Pedrini, M. (2019). The effects of intrinsic and extrinsic motivation on students learning effectiveness. Exploring the moderating role of gender. *International Journal of Educational Management*, 33(6), 1381-1394. <https://doi.org/10.1108/ijem-03-2019-0099>
- Zaid, C. M., Ismail, Z., Ab Majid, M. R., Othman, M. A., & Salleh, A. W. (2019). The Effect of Physical Learning Environment on Students' Achievement, and the Role of Students' Attitude as Mediator. *International Journal of Innovation, Creativity and Change*, 7(9), 197-209. https://www.ijicc.net/images/vol7iss9/7914_Zaid_2019_E_R.pdf
- Zhang, H., Yang, J., & Liu, Z. (2024). Effect of teachers' teaching strategies on students' learning engagement: moderated mediation model. *Frontiers in Psychology*, 15, 1475048. <https://doi.org/10.3389/fpsyg.2024.1475048>
- Zhang, Y., Guan, X., Wang, J., Yin, S., Li, X., Li, Y., et al. (2025). The impact of perceived teacher support on students' learning approach: the chain mediating role of academic engagement and achievement goal orientation. *Frontiers in Psychology*, 16, 1513538. <https://doi.org/10.3389/fpsyg.2025.1513538>