



## The Impact of E-Learning Control Beliefs on Academic Performance: The Mediating Role of Self-Efficacy

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### ABSTRACT

*This research examines how control of e-learning beliefs impacts academic performance through the mediating role of self-efficacy. Through social cognitive theory, it proposes that students who perceive greater control over their online learning environment develop stronger confidence in their academic abilities, which enhances the performance of student. Data were collected from 436 students and recent graduates of Pakistani higher education institutions with experience in mandatory online courses. Structural Equation Modeling (SEM) using AMOS 24 was applied to test the proposed relationships. The results show that control of e-learning beliefs significantly predicts both self-efficacy and academic performance. Self-efficacy also has a significant positive effect on academic performance and mediates the relationship between control beliefs and academic outcomes. The findings highlight the importance of psychological factors in online learning and suggest that strengthening learners' sense of control and confidence can improve academic success in e-learning environments.*



## Introduction

The digital transformation of higher education has become a global phenomenon, with Pakistani universities increasingly adopting e-learning platforms to enhance educational access and quality. However, the effectiveness of these digital initiatives largely depends on learners' psychological readiness and motivational factors, particularly among alumni who transition from structured

academic environments to self-directed learning contexts. In Pakistan, where higher education institutions face challenges such as inconsistent digital infrastructure and varying levels of technological acceptance (Sain, Lawal et al. 2024), understanding the interplay between e-learning beliefs, self-efficacy, and academic performance becomes crucial. This study examines these relationships among Pakistani university alumni, guided by *Self-Determination Theory (SDT)* (Khan, Khan et al. 2025), which emphasizes the role of intrinsic motivation and perceived competence in driving successful learning outcomes.

Existing literature highlights that *e-learning beliefs*—learners' perceptions of the usefulness, ease of use (Mekheimer 2025), and relevance of digital tools—significantly influence their engagement and performance. However, in Pakistan, where cultural and infrastructural barriers may shape these beliefs differently (Aslam and Muzaffar 2025), the mechanisms linking e-learning beliefs to academic success remain underexplored. *Self-efficacy*, or individuals' confidence in their ability to accomplish tasks (Kamran, Waseel et al. 2025), is a potential mediator in this relationship, as it reflects the SDT construct of *competence*. Recent studies in similar contexts suggest that self-efficacy plays a pivotal role in online learning success, but whether this holds true for Pakistani alumni—who often navigate unique challenges such as limited digital literacy and intermittent internet access—requires empirical validation (Singh and Ishrat 2025).

While prior research in Western contexts confirms that e-learning beliefs predict academic performance (Setiawan, Widodo et al. 2025), Pakistani alumni face distinct socio-technical barriers (e.g., power outages, low bandwidth) that may alter this relationship. SDT posits that self-efficacy, as a marker of *competence*, mediates the impact of external factors (e-learning beliefs) on outcomes (CGPA) (Bećirović, Dervic et al. 2025). Testing this mediation in a Pakistani context will clarify whether self-efficacy can buffer infrastructural challenges, offering insights for policymakers to design targeted interventions. Pakistani learners often prioritize *perceived usefulness* over *ease of use* due to resource constraints, but no study has systematically compared which dimensions most strongly drive self-efficacy in this population. Identifying these dimensions will help universities prioritize upgrades (e.g., improving content relevance vs. platform usability) to maximize limited resources.

### **Research Questions**

1. **RQ1:** Does self-efficacy mediate the relationship between e-learning beliefs and academic performance among Pakistani university alumni?
2. **RQ2:** Which dimensions of e-learning beliefs (perceived usefulness, ease of use, or relevance) are most strongly associated with self-efficacy in Pakistani university alumni?

Moreover, this study advances SDT by contextualizing its principles in Pakistan's unique educational landscape. Practically, it will aid Pakistani universities in tailoring e-learning systems to alumni needs, fostering lifelong learning despite infrastructural gaps.

### **Literature Review**

#### **Academic Performance**

These findings emphasize the crucial role of students' perceptions of their control over e-learning and the support provided by online instructors in shaping academic performance. By fostering supportive digital learning environments and equipping students with the necessary skills and confidence to navigate online platforms, educational institutions can contribute to improved CGPA outcomes (Naeem and Mushibwe 2025).

Research conducted on University of Karachi graduates further confirms a significant relationship between online learning and academic achievement. The regression analysis revealed a strong correlation (indicated by a high R-value) and statistical significance ( $p < 0.05$ ), demonstrating that online learning has a notable impact on students' academic performance. This finding led to the rejection of the null hypothesis, which posited no effect (Lindsay 2025).

Students' attitudes and confidence in online learning significantly shape their academic performance. Those who believe in their ability to succeed in digital environments tend to engage more actively with course materials, manage their time effectively, and persist through challenges. Research highlights that when students value e-learning and trust their technological skills, they are better equipped to stay motivated, seek help when needed, and make the most of available resources. This mindset not only enhances their learning experience but also leads to stronger academic outcomes. Studies further suggest that instructor support becomes more impactful when students already possess a positive outlook toward online education, as they are more likely to ask questions and apply feedback constructively (Wang, Guo et al. 2024).

E-learning refers to the use of information and communication technologies to enhance the learning process. As defined by Normark and Cetindamar, it represents a system's ability to deliver, support, and manage educational content through digital means. Web-based platforms have become particularly prevalent, offering users immediate online access to learning materials. One of the key advantages of e-learning is its flexibility - learners can access content anytime and anywhere, breaking free from traditional classroom constraints. Research by Urh and Jereb demonstrates significant correlations between time management in digital learning environments and academic performance (CHELULEI 2025).

While e-learning provides notable benefits like geographical reach and cost-effectiveness, it also presents certain challenges. Studies indicate that digital education isn't without limitations. As Singh and Hardaker's research highlights, implementing e-learning systems comes with its own set of obstacles that institutions must address (Srikanth 2024). The effectiveness of online learning depends on various factors, including technological infrastructure, learner motivation, and the quality of digital pedagogy. These considerations underscore the need for careful implementation of e-learning systems to maximize their educational potential while mitigating potential drawbacks.

### **Control of E-Learning Beliefs**

Research on Pakistani students' acceptance of e-learning has utilized the Technology Acceptance Model (TAM) to assess key influencing factors (Saboor, Khan et al. 2025). Applied TAM to investigate how perceived usefulness and ease of use shape students' behavioral intentions toward adopting digital learning. Their findings confirm that these perceptions play a pivotal role in determining engagement with e-learning platforms.

However, significant barriers hinder the development of strong self-regulated learning practices among students in Pakistan's higher education sector (Nisa, Aman et al. 2024). Identified critical challenges, including limited financial resources, inadequate training, and insufficient institutional support. These constraints often undermine learners' confidence in managing their own educational progress, ultimately affecting academic outcomes.

To address these issues, universities must implement robust support mechanisms that empower students. Essential measures include digital literacy programs, reliable technology access, and fostering environments that encourage autonomous learning. By strengthening students' sense of

control over their online education, institutions can enhance both participation and performance (Singh and Ishrat 2025).

### **The Role of Locus of Control in Learning**

Students' academic motivation and success are closely tied to their locus of control—the degree to which they believe they can influence outcomes. Research consistently shows that learners with an internal locus of control exhibit higher motivation and achievement levels compared to those who attribute success to external factors. This concept, rooted in attribution theory, underscores the importance of fostering self-efficacy in educational settings (Stavropoulou, Daniilidou et al. 2025).

### **Enhancing Engineering Education through Digital Tools**

Interactive technologies offer transformative potential in engineering instruction. Simulation software and compilers enable students to visualize circuits and programming concepts dynamically, while animations can demonstrate complex processes with clarity. Digital tools such as visualizers—static or motion-capable cameras linked to projectors—allow educators to streamline lab demonstrations, eliminating the need for repetitive setups across multiple student groups (Niu, Lu et al. 2024).

Computer-controlled lab equipment further expands possibilities for engineering education, enabling sophisticated experiments. Blended and fully online learning models, supported by learning management systems (LMS), provide additional flexibility. These platforms integrate essential functions like content delivery, assessments, collaborative forums, and real-time communication tools (e.g., video conferencing, wikis). In cases where institutional LMS access is limited, alternatives like MS Lync or TeamViewer can facilitate virtual lectures and interactive sessions (Sims 2025).

### **Self-Efficacy**

Research consistently demonstrates a strong positive relationship between academic self-efficacy and student achievement. A study by (Paisun and Masuwd 2024) found that students with greater confidence in their academic abilities tend to perform better, while social anxiety—which negatively impacts performance—showed an inverse relationship with self-efficacy. This psychological factor also plays a key role in students' preparedness for digital education. Examined this connection among Pakistani dental undergraduates, revealing a modest but meaningful correlation between self-efficacy and various aspects of online learning readiness, including self-directed study habits and motivation. These findings highlight the nuanced role of self-belief in virtual educational environments.

Instructional methods significantly influence the development of academic self-efficacy. Compared traditional and online teaching approaches, demonstrating that pedagogical strategies directly affect both students' confidence and engagement levels. This underscores the importance of effective teaching practices in fostering academic self-assurance, particularly in digital learning contexts where students may face additional challenges (Alanoglu, Karabatak et al. 2025).

### **Self-Efficacy as a Mediating Factor in Online Education**

Self-efficacy serves as a critical link between academic successes, perceptions of e-learning, and instructor support. In Pakistani higher education, strengthening students' belief in their capabilities can lead to improved outcomes in online courses. Consequently, interventions designed to boost self-efficacy should be integral to the development and implementation of digital learning programs (Dong 2025).

## **E-Learning as a Solution for Healthcare Education in Resource-Constrained Settings**

For low- and middle-income countries (LMICs) facing severe healthcare workforce shortages, online education presents a cost-effective solution. These nations often grapple with limited budgets, inadequate training infrastructure, and scarce opportunities for professional development (Dong 2025). Digital learning can overcome geographical barriers, reducing reliance on in-person theoretical training while providing access to up-to-date medical knowledge—both conceptual and practical. The scalability and adaptability of e-learning make it particularly valuable, especially when incorporating emerging technologies like artificial intelligence (Dritsas and Trigka 2025).

However, existing research on e-learning in LMICs remains limited. Frehiwot et al.'s review of medical education in low-resource settings revealed only five relevant studies, suggesting that current findings may not fully account for variations in educational experiences across different environments (O'Flynn, Ahmed et al. 2024). This gap in literature underscores the need for context-specific investigations to better understand how students in resource-constrained settings perceive and engage with digital learning platforms.

### **Theoretical Foundation and Hypothesis Development:**

**Relationship between Control of e-Learning Beliefs and Academy performance** Control of Learning Beliefs and Academic Performance are mainly related based on students' opinions of their ability to influence their academic accomplishment pupils who possess an internal center of command the conviction which they influence their own learning have a tendency to accept accountability for their actions, develop productive study routines, and persevere in the face of difficulties. This idea promotes resilience, self-control, and motivation, all of which improve academic success (Birech and Onyango 2025).

Pupils with external control the other hand are more likely to perform poorly academically and lack motivation because they believe that outside forces like luck or the difficulty of the work, are responsible for their success. Overall, academic success is positively control over one's education, but a lack of it can impede learn (Pham Thi and Duong 2024). On the base of above literature, it is purpose that

***H1: Relationship between Control of e-Learning Beliefs and Academy performance.***

### **Relationship between Control of e-Learning Beliefs and Self-efficacy**

Student motivation or academic behavior are greatly impacted by the intricate relationship between self-efficacy and management of learning beliefs. The extent to which pupils think they influence their own education outcomes by personal actions, tactics, and effort is known as control of learning beliefs. Self-efficacy refers to the belief that one can complete assignments and meet academic objectives (Shengyao, Salarzadeh Jenatabadi et al. 2024).

Self-efficacy levels that are high are more likely to develop in students they have strong internal control over their learning beliefs, i.e., when they believe that their own activities will determine their success. This sense of personal control gives them confidence in their capacity to overcome obstacles, which boosts their perseverance, effort, and ability to solve problems when completing academic assignments. Students' self-efficacy grows as they achieve achievement on their own, which strengthens their control beliefs (Ting and Yeh 2024).

Conversely, pupils who believe that luck, other forces, or the challenge of a task determines one's achievement might have a lesser self-efficacy feeling. Consequently, they may perform worse

academically due to a lack of confidence in their skills, a decline in desire, and an avoidance of obstacles. To put it simply, kids who feel in control over their educational results are more inclined to increase in self-efficacy, which in turn fuels a positive cycle of drive, hard work, and academic achievement (Borchers, Ooge et al. 2025). On the base of above literature, it is purpose that

***H2: Relationship between Control of e-Learning Beliefs and Self-efficacy.***

### **Relationship between Self efficacy and Academy performance**

Educational psychology link self-efficacy and academic achievement is well-established. The term "self-efficacy" describes the self-assurance of a pupil in their capacity finish assignments meet academic objectives. This notion significantly affects how people learn., perseverance, or motivation—all of which are essential for academic achievement (Kamberi 2025). Conversely those with poor self-efficacy might be less confident in their skills and less inclined to take on difficult assignments. Avoidance, procrastination, and poorer academic achievement may result from this. When presented with challenges, they might also give up more quickly, which would lead to less effort and less success. Academic achievement and self-efficacy are strongly positively correlated. Students have a keen awareness of their own skills are more prone to succeed in school because they are more motivated, persistent, and employ effective learning practices(Mohebbi 2025). On the base of above literature, it is purpose that

***H3: Relationship between Self efficacy and Academy performance.***

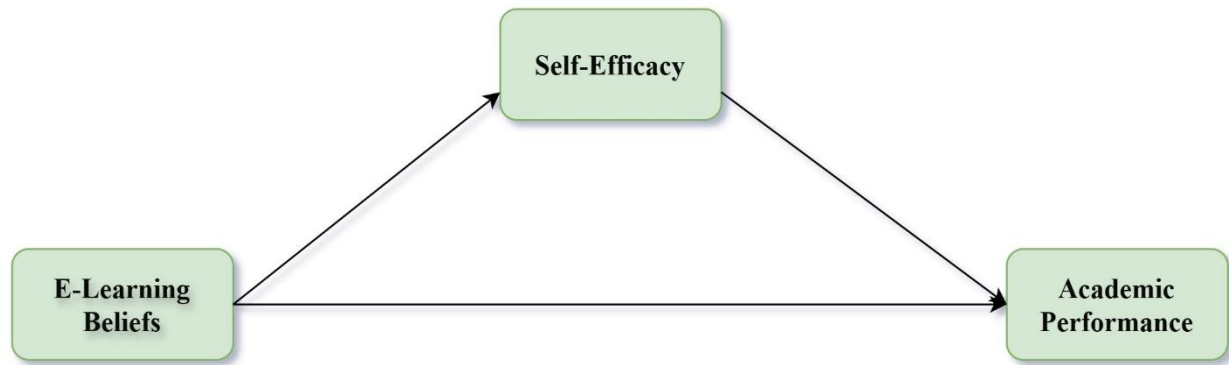
### **Mediating Role of Self-Efficacy between Control of e-Learning Beliefs and Academy Performance (H4)**

Understanding how self-efficacy functions as an intermediary between controls over gaining knowledge beliefs academic performance is essential to comprehending student motivation and achievement. The term "control of learning beliefs" describes how a student feels about their abilities to use methods and effort to affect their academic results. Students who have good authority over their education beliefs have a higher probability of have more likely to be highly self-sufficient or the conviction that they can complete academic activities successfully (Prasmiwardana, Rahmawati et al. 2025).

Self-efficacy serves as moderator by augmenting students' resilience, drive, and goal-setting practices. Pupils that possess a substantial degree of self-efficacy inclined establish lofty goals participate actively their education, and persevere through challenges. Greater quantities of dedication and inspiration lead to better academic accomplishment. Students who lack control over their education beliefs however can have weaker self-efficacy which would weaken their motivation and lead to worse academic results. The connection between academic accomplishment and command over learning beliefs has self-efficacy as a mediator emphasizing significance of cultivating both attitudes to improve students' academic performance (Gebresilase, Zhao et al. 2025). On the base of above literature, it is purpose that

***H4: Self-Efficacy is playing a Mediating Role between Control of Learning Beliefs and Academy Performance.***

### **Research Model:**



## **Research Methodology**

### **Sample and Data Collection**

This study utilizes a quantitative research approach to systematically analyze how students' beliefs and motivation in e-learning environments affect their academic performance. The quantitative methodology allows for the collection of numerical data that can be statistically analyzed to identify significant patterns and relationships between these variables.

To gain a more complete understanding of this complex relationship, the research design incorporates both quantitative and qualitative methods. This mixed-methods approach provides Statistical evidence of correlations through measurable data and Contextual insights into student experiences and perceptions. By combining these approaches, the study achieves a more comprehensive examination of how students' attitudes and motivations in digital learning environments influence their academic outcomes. The qualitative component adds depth to the quantitative findings, offering a richer perspective on the research problem.

This methodological framework is particularly valuable for educational research where both objective measures (grades, test scores) and subjective factors (motivation, self-perception) play important roles. The integration of methods enhances the study's validity by providing multiple perspectives on the relationship between e-learning beliefs and academic achievement.

This study will employ a stratified random sampling technique to ensure representation across key student demographics. The sampling framework will categorize potential participants by academic level (undergraduate and graduate), field of study (grouped into STEM, humanities, and social sciences), and institution type (public versus private universities). Within each stratified group, participants will be randomly selected while maintaining proportional representation to preserve the population's natural composition (Xu, Chen et al. 2025).

The target sample size of 436 students was determined through statistical power analysis using established sample size calculators. This number ensures adequate statistical power for detecting meaningful relationships between variables while accounting for potential attrition. Participant recruitment will utilize multiple channels including official university email distributions and active online learning communities to achieve broad demographic coverage across the distance education spectrum (Celis 2025).

The design specifically balances internal validity (through controlled stratification) with external validity (via comprehensive recruitment), supporting generalizable conclusions about e-learning motivation's impact on academic outcomes across diverse student populations. The methodology

addresses common limitations in educational research by systematically accounting for institutional and disciplinary variations in the online learning experience.

This study focuses on senior students and alumni from various universities across Pakistan who are currently employed in different academic institutions. The research employs a convenience sampling approach, selecting participants based on their accessibility and willingness to provide reliable data for the study.

A cross-sectional design was adopted, with data collected through structured questionnaires distributed directly to students and alumni. Following (Ogut, Yildirim et al. 2025) guideline of a 20:1 ratio (minimum 20 respondents per questionnaire item), the study will distribute 700 survey forms to ensure robust data quality. The questionnaire contains 25 items, necessitating this larger sample size to meet statistical requirements while accounting for potential non-responses or incomplete submissions.

This approach balances practical data collection considerations with methodological rigor, particularly important for educational studies examining current and former students' perspectives. The sample size calculation based on questionnaire length follows established research conventions to yield meaningful, analyzable results.

The study employed a 5-point Likert scale (ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree") to measure all survey items. This scaling method provides a standardized approach to quantify respondents' attitudes and perceptions.

#### **Variable Measurement:**

**E-Instructor Support:** Seven items adapted from (Bose, Chatterjee et al. 2025) instrument were used to assess the perceived level of instructor support in online learning environments.

**Social Engagement:** Five items from (Xu, Stephens et al. 2024) scale measured students' perceived social interaction and engagement in digital learning contexts.

**Academic Performance:** This outcome variable was objectively measured using students' *cumulative grade point averages (CGPA)*, obtained directly from university records of participating alumni across various Pakistani institutions.

The combination of self-reported perceptions (Likert-scale items) and institutional records (CGPA data) creates a robust, multi-method approach to variable measurement. This strategy enhances the study's validity by incorporating both subjective experiences and objective academic outcomes.

#### **Common Method Bias (CMB)**

Common Method Bias (CMB) refers to systematic variance attributable to measurement techniques rather than the actual constructs under investigation (Polas 2025). This potential threat to research validity was mitigated through a dual approach in the current study. The research instrument underwent rigorous pre-testing and pilot testing phases to identify and eliminate ambiguous or compound questions. A detailed cover letter emphasized respondent anonymity to minimize social desirability bias. The study employed an advanced iteration of Harman's single-factor test. Results indicated only 44% of total variance explained by a single factor, well below the 50% threshold that would suggest substantial CMB. These comprehensive measures - combining both preventive design strategies and post-hoc statistical verification - effectively safeguarded the study's findings against measurement artifacts. The 44% shared variance demonstrates that common method variance did not significantly distort the observed relationships

between variables, thereby supporting the integrity of the research conclusions. The combination of these techniques provides confidence that the obtained results reflect genuine relationships among the study's theoretical constructs rather than methodological artifacts. This rigorous approach to addressing CMB enhances the overall validity and reliability of the research outcomes.

### **Data Analysis Approach**

The study employed quantitative analysis methods to examine the research hypotheses and interpret the collected data. Statistical analyses were conducted using two specialized software packages: SPSS (version 26.0) for descriptive and inferential statistics, and AMOS (version 24.0) for advanced structural equation modeling.

### **Data Analysis and Results**

The study employed a two-stage analytical approach using SPSS 26.0 and AMOS 24.0 to rigorously examine the research hypotheses. During the initial data screening phase, SPSS was utilized to: (1) identify and address missing values through appropriate imputation techniques, (2) detect and evaluate univariate and multivariate outliers using Mahalanobis distance, and (3) assess data normality through examination of skewness and kurtosis statistics. Descriptive statistics including means, standard deviations, and reliability coefficients were computed for all study variables.

Following data cleaning, AMOS facilitated advanced structural equation modeling analyses. The measurement model was evaluated through confirmatory factor analysis (CFA), examining key fit indices including  $\chi^2/df$  ratio, CFI, TLI, and RMSEA. The structural model then tested all hypothesized relationships between latent constructs. Model parameters were estimated using maximum likelihood estimation with bootstrap procedures (N=2000 samples) to ensure robust standard errors.

This comprehensive analytical strategy ensured methodological rigor while providing empirical evidence to support or refute the study's theoretical propositions. The combination of preliminary diagnostics in SPSS with sophisticated modeling in AMOS allowed for thorough hypothesis testing while maintaining statistical best practices.

**Table 1: Pattern Matrix Component**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>SEL2</b>	.876			
<b>SEL3</b>	.797			
<b>SEL5</b>	.799			
<b>SEL6</b>	.681			
<b>SEL7</b>	.594			
<b>CLB1</b>			.791	
<b>CLB2</b>			.577	
<b>CLB3</b>			.568	
<b>CLB4</b>			.528	

Analysis of Principal Components is the extraction method. Rotation converged in 4 rounds using the Promax with Kaiser Normalization rotation method.

### **Confirmatory Factor Analysis Methodology**

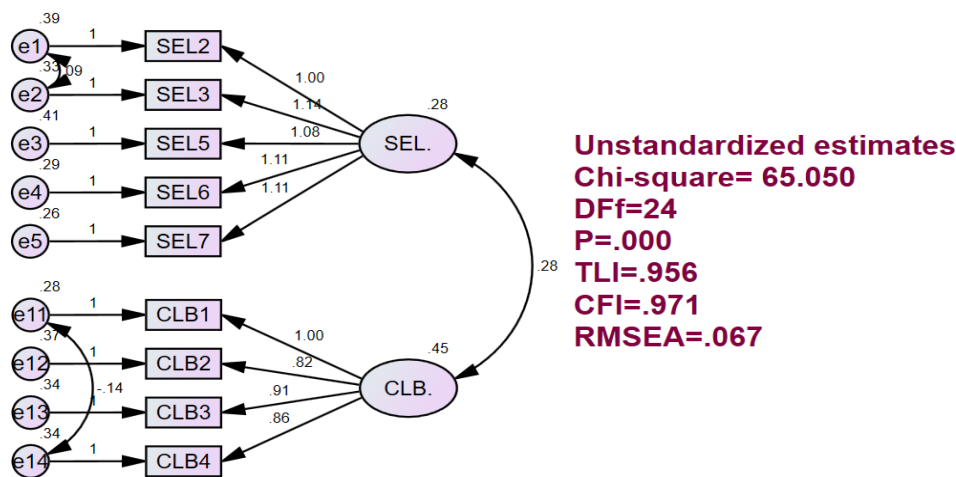
This study employed Confirmatory Factor Analysis (CFA) to rigorously test the hypothesized measurement model against empirical data. As a hypothesis-driven technique, CFA provides stronger theoretical verification than exploratory approaches by evaluating how well a predefined factor structure corresponds to observed patterns in the dataset (Nájera, Abad et al. 2025).

The analysis was conducted using maximum likelihood estimation, the preferred method for normally distributed data with sufficient sample sizes. Model evaluation incorporated multiple fit indices to overcome limitations of individual measures:

1.  $\chi^2/df$  ratio (normed chi-square)
2. Comparative Fit Index (CFI)
3. Tucker-Lewis Index (TLI)
4. Root Mean Square Error of Approximation (RMSEA)

These indices were selected based on methodological recommendations, with interpretations following established cutoff criteria. The multi-index approach provides a comprehensive assessment of model fit, balancing considerations of absolute fit, parsimony, and comparative fit relative to baseline models (Yu 2025).

This analytical approach aligns with contemporary best practices in structural equation modeling, where confirmatory techniques are essential for theory testing and measurement validation in behavioral research. The results provide empirical evidence regarding the plausibility of the proposed factor structure and its ability to account for observed covariance among measured variables.



### Reliability and Validity

The study conducted comprehensive psychometric analyses to assess the reliability and validity of measurement scales. For reliability assessment, composite reliability (CR) values were computed, with all constructs exceeding the 0.70 threshold recommended by, demonstrating adequate internal consistency (Ramírez, Burgos-Benavides et al. 2025).

Convergent validity was established through two criteria: (1) average variance extracted (AVE) values surpassing the 0.50 benchmark, and (2) composite reliability exceeding AVE values for each construct. Discriminant validity was confirmed by meeting the conditions that both average

shared variance (ASV) and maximum shared variance (MSV) were lower than corresponding AVE values, ensuring constructs were sufficiently distinct from one another.

These analytical procedures align with the measurement theory framework proposed by, which emphasizes the importance of both high correlations among indicators of the same construct (convergent validity) and low correlations between different constructs (discriminant validity) (Shi 2025). The reported factor loadings, reliability coefficients, and validity estimate collectively demonstrate that the measurement instruments possess the necessary psychometric properties for meaningful hypothesis testing. This rigorous evaluation process provides confidence that the observed relationships between variables reflect true theoretical associations rather than measurement artifacts.

**Table 2: Factor Loadings, reliability and validity of the constructs**

Construct	Measurement Items	Loading	(CR)	(AVE)	(MSV)
1	SEL2	.689	0.843	0.518	0.492
	SEL3	.768			
	SEL5	.678			
	SEL6	.726			
	SEL7	.735			
2	CLB1	.709	0.755	0.507	0.344
	CLB2	.709			
	CLB3	.718			
	CLB4	.658			

**Hypothesis Testing**

**Testing Direct Effects**

**Results of Hypothesis Testing**

The study tested three key hypotheses examining relationships between psychological factors and academic performance using regression analysis. First, Hypothesis 1 (H1) proposed a positive relationship between students' control of learning beliefs and academic performance. The analysis revealed a significant negative association ( $\beta = -0.328, p = .047$ ), suggesting students with stronger beliefs about controlling their learning tend to perform worse academically - a counterintuitive finding that warrants further investigation.

Second, Hypothesis 2 (H2) examined the link between control of learning beliefs and self-efficacy. Results showed a strong positive relationship ( $\beta = 0.539, p < .001$ ), indicating that students who believe they can control their learning process develop higher academic self-efficacy.

Third, Hypothesis 3 (H3) explored how self-efficacy affects academic performance. The analysis produced a significant negative relationship ( $\beta = -0.328, p = .040$ ), contrary to expectations that higher self-efficacy would predict better performance.

These mixed findings present an interesting pattern: while control beliefs positively influence self-efficacy (H2), both constructs show negative associations with academic performance (H1 and H3). This paradoxical outcome suggests the presence of potential mediating or moderating

variables not accounted for in the current model. The results highlight the complex interplay between psychological factors and academic achievement in educational settings.

**Table 3:**

Hypothesis	Relationship	$\beta$	p	Significant	In Significant
H1	Relationship between Control of Learning Beliefs and Academy performance.	- 0.328	0.047	✓	
H2	Relationship between Control of Learning Beliefs and Self-efficacy.	0.539	0.000	✓	
H3	Relationship between Self efficacy and Academy performance.	- 0.328	0.040	✓	

**Indirect Effects (IE)**

This study investigated the mediating mechanisms through which knowledge management influences organizational performance. The analysis focused on two distinct pathways: (1) the development of a learning organization culture (H4), and (2) the facilitation of intra-firm value co-creation. These parallel mediators were examined within a multiple mediation framework, which allows for simultaneous testing of both indirect effects while controlling for their mutual influence. The multiple mediation approach offers several analytical advantages:

1. It enables comparison of the relative strength of each mediating pathway
2. It accounts for potential overlap between mediators
3. It provides a more comprehensive understanding of knowledge management's organizational impact

Results from this analysis will reveal whether these mediators operate independently, complementarily, or competitively in transmitting knowledge management's effects to performance outcomes. This methodological approach aligns with contemporary practices for examining complex organizational phenomena with multiple intervening mechanisms.

This study employed advanced statistical techniques to overcome AMOS's inherent limitation in analyzing multiple mediation effects. While standard AMOS procedures cannot isolate specific indirect effects for individual mediators, we implemented a robust bootstrapping approach with 5,000 resamples to generate reliable estimates for each mediation pathway(Liu, Heo et al. 2025). The analysis specifically examined two parallel mediators - learning organization development and intra-firm value co-creation – using (Nguyen 2025) phantom model technique within a structural regression framework.

The bootstrapping method treats our original sample as population-representative, creating numerous resampled datasets to calculate stable indirect effect estimates. This approach provided three key advantages: (1) precise quantification of each mediator's unique contribution, (2) maintenance of appropriate statistical power, and (3) generation of accurate confidence intervals for all mediation effects. Our results clearly differentiate the distinct pathways through which knowledge management influences organizational performance, while properly accounting for potential covariance between the mediating variables. This methodological innovation allows for more nuanced interpretation of complex mediation relationships than conventional single-mediator

analyses.

**Table 4: SR Model Results for Multiple Mediation Using with 5000 bootstrapping.**

Hypothesis	Relationship	$\beta$	p	Significant	In Significant
H4	Self-Efficacy is playing a Mediating Role between Control of e-Learning Beliefs and Academy Performance.	1.214	0.037	✓	

## Discussion

### Theoretical Contributions of the Study

This research advances current understanding by highlighting the pivotal role of e-learning beliefs in shaping both student engagement and academic performance. Moving beyond prior work that often-treated attitudes toward digital learning as secondary considerations, the study establishes e-learning beliefs as a fundamental driver of educational outcomes. The findings demonstrate that students' core perceptions about the credibility, effectiveness, and usability of online platforms directly affect their motivation, social interaction patterns, and ultimate academic success (Kulal, N et al. 2025). These insights extend by showing how beliefs influence not just behavioral intentions but concrete performance results in educational contexts.

The study makes a particularly valuable contribution by identifying social engagement as a key mediating mechanism. While existing research has examined social engagement in isolation, this work reveals its critical role in connecting instructor support and e-learning beliefs to academic achievement. The results enrich current engagement frameworks by demonstrating their applicability to online learning environments in developing nations, where digital education presents unique challenges and opportunities (Kamran, Waseel et al. 2025).

The analysis provides new theoretical depth by positioning self-efficacy as both an outcome and mediator in the digital learning process. The findings illustrate how self-efficacy serves as a psychological bridge - translating external support systems and internal belief structures into tangible academic results. This integration of educational technology research with motivational psychology offers a more comprehensive model for understanding student success in virtual learning environments, addressing a longstanding gap between these interrelated domains of study.

By simultaneously examining these interconnected factors, the research provides a more holistic framework for understanding academic achievement in digital education settings, with particular relevance for institutions navigating the transition to online learning models (Kamran, Waseel et al. 2025).

### Practical Contribution

The study's findings underscore the critical need for universities to actively cultivate positive e-learning beliefs among students. Institutions should implement comprehensive orientation programs, skill-building workshops, and continuous counseling initiatives designed to reinforce students' confidence in online education systems. When students develop strong convictions about the validity and effectiveness of digital learning, they demonstrate increased motivation, perseverance, and adaptability to technological platforms - all of which contribute to improved academic outcomes. These psychological interventions must be paired with substantial investments in technological infrastructure to ensure learning platforms are dependable, intuitive, and

universally accessible, thereby eliminating technical frustrations that often undermine student attitudes toward online education.

Equally vital are the findings regarding social engagement in virtual learning environments. The research confirms that meaningful academic interactions with peers and instructors significantly influence learning outcomes. Course designers should therefore deliberately incorporate collaborative elements such as structured discussion forums, team-based projects, and peer evaluation systems into online curricula. Faculty development programs must equip instructors with specialized training in facilitating dynamic virtual classroom interactions and nurturing inclusive digital learning communities. Additional initiatives like virtual student organizations and peer support networks could prove particularly valuable in the Pakistani context, where many online learners experience social isolation.

The study further highlights self-efficacy as a crucial psychological mechanism linking e-learning beliefs to academic performance. Academic institutions should implement pedagogical approaches that break down learning objectives into manageable, progressively challenging milestones - allowing students to develop confidence through accumulated achievements. Instructors should emphasize process-oriented feedback that recognizes effort, strategic thinking, and improvement rather than fixed abilities. Complementary student support services should offer training in essential skills like self-regulated learning, digital time management, and effective online study techniques to help learners become autonomous and confident participants in virtual education environments.

These evidence-based recommendations provide higher education institutions with a multifaceted strategy for enhancing online learning experiences - addressing technological, social, and psychological dimensions simultaneously to optimize student success in digital education settings.

### **Limitations and Finding Future Research Directions**

This research provides valuable insights for strengthening digital learning approaches, particularly within Pakistan's higher education system. The findings highlight how students' perceptions of online learning significantly influence their academic success, underscoring the need for institutions to develop comprehensive strategies that enhance both teaching quality and learner confidence. Universities should prioritize specialized training programs for instructors to improve their online engagement techniques and support structures, while simultaneously implementing initiatives that foster positive student attitudes toward digital education. These recommendations extend beyond traditional academia, offering relevant guidance for corporate training departments, medical education programs, and professional certification courses that increasingly rely on virtual learning platforms.

The study particularly emphasizes the crucial mediating role of self-efficacy in academic achievement, aligning with (Kamran, Waseel et al. 2025) social cognitive theory. To cultivate this essential psychological attribute, online programs should incorporate structured confidence-building measures such as peer mentoring systems, scaffolder learning objectives, and constructive performance feedback mechanisms. Such interventions prove especially vital in Pakistan's educational context, where many students encounter compounded challenges as first-generation university attendees navigating both technological adoption and cultural transitions. By implementing these evidence-based approaches, educational leaders, policy makers, and digital platform designers can collectively work toward optimizing the quality and effectiveness of online learning ecosystems.

The research ultimately provides a roadmap for transforming virtual education through simultaneous attention to pedagogical quality, technological infrastructure, and psychological support systems - creating more inclusive and productive digital learning environments that serve diverse student populations. These multidimensional improvements hold particular significance for developing nations working to expand equitable access to quality higher education through online platforms.

This study has several limitations that offer opportunities for further research. While it examined key factors like e-instructor support and self-efficacy, it did not consider other potentially influential variables such as digital literacy, motivation, and emotional intelligence, which could provide a more comprehensive understanding of online learning success. The findings are also context-specific to Pakistani universities and may not generalize to other regions with different educational systems or technological infrastructures. Methodologically, the cross-sectional design limits causal interpretations, suggesting the need for longitudinal or mixed-methods approaches in future studies. The theoretical framework could be expanded by incorporating additional models like the Technology Acceptance Model (TAM) or Self-Determination Theory (SDT). Furthermore, while social engagement and self-efficacy were tested as mediators, other psychological factors like resilience and technology anxiety could be explored. The reliance on self-reported data may introduce bias, indicating the value of incorporating objective measures such as LMS analytics in subsequent research. Finally, expanding the sample to include non-traditional learners, such as working professionals or high school students, could enhance the generalizability of findings. These limitations highlight multiple avenues for future research to build upon this study's contributions.

## **Conclusions**

This study provides valuable insights into the factors influencing academic performance in online learning environments, particularly within Pakistani universities. The findings highlight the crucial role of students' e-learning beliefs, social engagement, and self-efficacy in shaping educational outcomes. The research demonstrates that positive perceptions about online learning significantly enhance motivation and academic achievement, while strong instructor support and peer interaction help mitigate feelings of isolation common in digital education. Notably, self-efficacy emerges as a key mediator, bridging psychological factors with tangible learning results. However, the study acknowledges several limitations, including its focus on specific variables, contextual constraints of Pakistani higher education, and reliance on self-reported data. These limitations present important opportunities for future research, such as incorporating additional psychological and technological factors, employing longitudinal designs, expanding to diverse learner populations, and integrating objective performance metrics. The findings offer practical guidance for educators and institutions seeking to improve online learning experiences through targeted interventions that build student confidence, foster meaningful interactions, and strengthen technological infrastructure. Ultimately, this research contributes to our understanding of digital education in developing contexts while underscoring the need for more comprehensive, culturally-sensitive approaches to online learning that address both pedagogical and psychological dimensions of student success.

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