



# A Study on the Impact of E-Service Quality in E-Learning Satisfaction

Min-Jung KANG<sup>1</sup>

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## Abstract

**Purpose:** This study investigates the impact of e-learning service quality—specifically content, system, and service quality—on e-learning satisfaction. It further explores the mediating effects of perceived consistency and personalization in the relationship between e-service quality and learning satisfaction, as well as the moderating effects of online learning self-efficacy. **Research design, data and methodology:** A research model was developed based on previous studies, incorporating hypotheses about the relationships among e-learning service quality (content, system, and service), perceived consistency, perceived personalization, online learning self-efficacy, and e-learning satisfaction. Data were collected through surveys administered to e-learning users. Statistical analyses, including regression and mediation/moderation tests, were performed to validate the hypotheses. The collected data were analyzed using Smart PLS and SPSS Macro version 3.5 to test the research model. **Conclusion:** The results revealed that e-service quality (content quality and service quality) significantly influences learning satisfaction. The mediating effects of perceived consistency and perceived personalization were partially significant. Furthermore, online learning self-efficacy was found to significantly moderate the relationship between content quality and learning satisfaction, emphasizing its critical role in enhancing user engagement and satisfaction.

**Keywords:** E-learning Platform, E-learning Service Quality, Perceived Consistency, Perceived Personalization, Online learning self-efficacy, E-learning satisfaction

**JEL Classification Code:** M15, M30, M31, L86, I21

## 1. Introduction

The rapid advancements in technology have significantly transformed various aspects of human life, including education (Jun & Cai, 2001). As a result, numerous innovative tools and methods have been integrated into teaching and learning processes to enhance educational experiences (Smart & Cappel, 2006). Among these, e-learning has emerged as a prominent instructional approach, leveraging digital devices such as computers and smartphones along with internet connectivity. This method

has quickly gained popularity due to its efficiency and accessibility (Clark & Mayer, 2003).

E-learning is particularly thriving in higher education, offering advanced learning opportunities to both instructors and students (Tsai et al., 2013). It utilizes a variety of devices and technologies to improve the learning process (Fazlollahtabar & Muhammadzadeh, 2012). Additionally, it equips learners with valuable technical skills, preparing them for career development and real-world applications (Fazlollahtabar & Muhammadzadeh, 2012).

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<sup>1</sup> First Author, Professor, Department of Business and Management, Mokpo National University, Korea. Email: 7minjeong@hanmail.net

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The appeal of e-learning lies in its unique features. First, it provides the flexibility for learners to access education from any location (Khan, 2001). Second, it fosters active and dynamic engagement through meaningful interactions among educators, learners, administrators, and content (Moore & Kearsley, 1996). Third, it allows for the rapid updating and integration of new knowledge to meet evolving societal demands (Hannum, 2001). Fourth, e-learning creates an effective environment for both collaborative and self-directed learning (Jonassen, Peck, & Wilson, 1999). Lastly, it transcends temporal and spatial limitations by utilizing synchronous and asynchronous communication tools (Barron & Lyskawa, 2001).

Despite these advantages, the success of e-learning is heavily influenced by the quality of the service it provides. E-learning service quality refers to students' perceptions of the overall quality of an e-learning platform, encompassing factors such as system functionality, content delivery, and support services (Mulhem, 2020). Studies have employed various models to evaluate service quality in e-learning, including SERVQUAL (Parasuraman et al., 1988), SERVPERF (Cronin & Taylor, 1992), E-S-QUAL (Parasuraman et al., 2005), and the DeLone and McLean IS Success Model (DeLone & McLean, 2003).

This study aims to examine the impact of e-learning service quality on satisfaction. Specifically, it explores the mediating roles of perceived consistency and personalization, along with the moderating effect of online learning self-efficacy on the relationship between e-learning service quality and satisfaction. The findings offer valuable insights for e-learning platform developers and educational institutions, enabling them to enhance service quality and foster a more learner-centered educational environment.

## **2. Literature Review and Hypothesis**

Service products are inherently intangible, and their production and consumption occur simultaneously, making quality management and control more challenging than with tangible goods. Additionally, the high dependency on human interaction makes it difficult to maintain consistency. Factors such as the service provider's knowledge, level of training, willingness to act, problem-solving ability, and emotional state can significantly influence the perceived quality of the service experienced by customers.

When purchasing a service, customers often aim to minimize perceived risks by choosing services that offer predictability. Therefore, maintaining perceived quality consistency is a critical factor in acquiring and retaining customers. It not only prevents customer churn but also positively impacts both business performance and customer satisfaction.

The quality of services plays a pivotal role in establishing strong customer relationships. As Romi Ilham (2018b) suggests, high-quality services are fundamental to building customer trust and satisfaction. Service quality cannot be developed instantaneously; rather, it must be meticulously designed and refined over time to leave a lasting impression. According to Kotler and Keller (2015), customer satisfaction is intrinsically linked to service quality, as quality directly influences both the performance of a service and the satisfaction it delivers. Companies that prioritize customer satisfaction often define quality as the ability to meet or exceed user expectations, moving beyond the narrow definition of "freedom from defects" to focus on the overall customer experience.

Information quality in e-learning is commonly defined as the degree to which students perceive the information retrieved from an e-learning platform as valuable and reliable (Cheng, 2020). It encompasses the quality of the content available to students, evaluated across factors such as readability, clarity, format (e.g., text, audio, video), adequacy, relevance, and transferability (DeLone & McLean, 2003, 2016). High-quality information not only supports learning but also ensures that the content is up-to-date and relevant to the needs of users.

As a measure of the perceived effectiveness of system outputs, information quality reflects the utility of the content students access on e-learning platforms (Chang, 2013). Nugroho et al. (2019) further emphasize that information quality represents the value and practical benefit the information provides to students in an online learning environment. Key attributes include availability, timeliness, currency, authenticity, and relevance, all of which play essential roles in how students assess the platform's resources (DeLone & McLean, 2016).

Additionally, factors such as the organization of information, presentation style, and sequence of delivery significantly influence students' evaluation of e-learning content. These dimensions are crucial in fostering a seamless and effective learning experience, as highlighted by Marandu et al. (2019) in their studies on online learning environments.

When applied to e-learning systems, service quality becomes a critical determinant of user satisfaction. If the quality of an e-learning service meets or surpasses user expectations, it can be regarded as a high-quality service (Romi Ilham & Siregar, 2021). This perspective aligns with Pham et al. (2019), who demonstrated through their research that system quality, information quality, and service quality all have positive impacts on user satisfaction with e-learning platforms. Similarly, Purwanto and Pawirosumarto (2017) confirmed that these three dimensions significantly influence the satisfaction levels of e-learning users.

However, there are instances where e-learning service quality falls short of meeting user expectations. Larasati and Andayani (2019) observed that certain e-learning platforms have yet to adequately address the needs of students, highlighting an ongoing challenge in delivering consistently high-quality services. These findings underscore the importance of continuously improving e-learning service quality to ensure that it not only meets technical and informational standards but also aligns with user expectations for a seamless and satisfying learning experience.

In conclusion, service quality is a cornerstone of user satisfaction in e-learning systems. Meeting or exceeding expectations through well-designed and reliable service offerings can enhance user experiences, build trust, and foster long-term engagement with e-learning platforms.

Contents quality refers to the quality of educational materials and information provided through e-learning platforms, which directly influences the learning experience. It emphasizes the importance of delivering accurate, relevant, and up-to-date content to meet learners' needs (DeLone & McLean, 1992). Well-designed course content, including clear learning objectives, appropriate assessments, and engaging materials, has been shown to significantly enhance the success of online learning systems (Si, 2022).

Service quality in e-learning encompasses the technical and administrative support provided to learners, ensuring a seamless learning experience. The SERVQUAL model, adapted for e-learning, measures the gap between learners' expectations and their perceptions of service quality (Parasuraman et al., 1988). Additionally, the E-S-QUAL model focuses specifically on the evaluation of online service quality, including its applicability in e-learning environments (Martínez-Argüelles et al., 2009). Furthermore, service quality is recognized as a critical factor in determining the success of e-learning platforms (DeLone & McLean, 1992).

System quality refers to how users perceive the overall performance and functionality of an information system (DeLone & McLean, 2003, 2016). System quality refers to the technical aspects of e-learning platforms, such as performance, usability, and reliability, which directly affect learners' experiences. The Technology Acceptance Model (TAM) highlights the role of perceived ease of use and usefulness in influencing learners' acceptance of e-learning systems (Davis, 1989). Moreover, the system quality of e-learning platforms plays a pivotal role in their overall success (DeLone & McLean, 1992). User interface design theories further underscore the importance of creating user-friendly interfaces that facilitate efficient navigation and accessibility (Limbu & Pham, 2023). In the context of e-learning, system quality encompasses both the hardware

available to students and the software applications that facilitate their educational needs (Pham et al., 2019). It emphasizes the operational characteristics of the system being evaluated, including its efficiency and effectiveness in meeting user expectations (Yosep, 2015).

Key attributes used to assess the system quality of e-learning platforms include ease of access, system availability, secure login processes, flexibility, and appealing design. Additional factors such as intuitive navigation, fast download speeds, and consistent availability further contribute to a positive perception of system performance (Lee & Jeon, 2020). These attributes collectively determine the usability and reliability of e-learning systems, playing a critical role in shaping user satisfaction and engagement.

Consistency, in a general sense, refers to the systematic activities of setting rational standards and ensuring that the majority adhere to these principles to achieve convenience and benefits. Services, as intangible products, are difficult to materialize or store. The simultaneous occurrence of production and consumption creates unique challenges in quality management and control, further complicated by the reliance on human factors. Additionally, standardizing service specifications to ensure consistent quality is challenging, and measuring the outcomes of quality management activities is often imprecise. These factors contribute to a heightened risk of service failure. Thus, ensuring perceived service consistency is a crucial determinant in attracting and retaining customers, ultimately influencing the performance of service-oriented businesses.

Academic self-efficacy refers to the confidence and belief that students have in their ability to succeed in learning tasks and achieve academic goals. It encompasses their sense of control over their learning process, problem-solving skills, and decision-making abilities in various educational contexts. This concept is closely tied to a student's perception of their success, interest, and satisfaction with their academic pursuits.

According to Bandura (1986), academic self-efficacy serves as a motivational, cognitive, and behavioral resource that guides students in achieving academic success. It represents a learner's belief in their capacity to mobilize physical, intellectual, and emotional resources necessary for academic achievement. Students with high academic self-efficacy are more likely to engage in continuous effort, overcome challenges, and demonstrate persistence in completing tasks effectively.

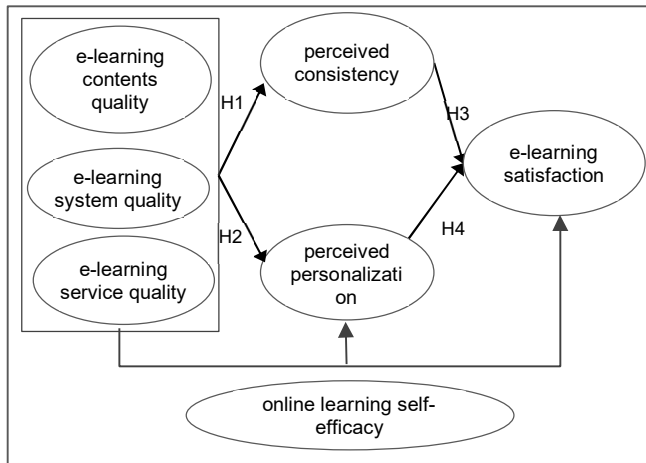
Academic self-efficacy also develops through experiences within the learning process. Students build this confidence as they plan, execute, and evaluate their learning activities. Successful experiences foster a sense of accomplishment and mastery, which reinforces their belief in their ability to succeed academically. Moreover, the

problem-solving and decision-making skills exercised during both academic activities and broader school life contribute to the development of academic self-efficacy.

In essence, academic self-efficacy is the degree to which students perceive satisfaction and confidence in their learning journey. It arises from the interplay of confidence in learning tasks, past experiences of success, and the ability to navigate challenges within educational settings.

Dogham et al. (2022) defined online learning self-efficacy as an individual's belief in their ability to effectively take the necessary steps to solve tasks and complete work in an online environment. They also highlighted a strong connection between high levels of online learning self-efficacy and academic achievement.

The model is described in detail in <Figure 1> below, along with some possibilities.



**Figure 1: Research Model**

**H1:** E-learning service quality will significantly affect e-learning satisfaction.

**H1-1:** E-learning contents quality will significantly affect e-learning satisfaction.

**H1-2:** E-learning system quality will significantly affect e-learning satisfaction.

**H1-3:** E-learning service quality will significantly affect e-learning satisfaction.

**H2:** Perceived consistency will mediate the relationship between e-learning service quality and satisfaction.

**H2-1:** Perceived consistency will mediate the relationship between e-learning information quality and satisfaction.

**H2-2:** Perceived consistency will mediate the relationship between e-learning system quality and satisfaction.

**H2-3:** Perceived consistency will mediate the relationship between e-learning service quality and satisfaction.

**H3:** Perceived personalization will mediate the relationship between e-learning service quality and satisfaction.

**H3-1:** Perceived personalization will mediate the relationship between e-learning information quality and satisfaction.

**H3-2:** Perceived personalization will mediate the relationship between e-learning system quality and satisfaction.

**H3-3:** Perceived personalization will mediate the relationship between e-learning service quality and satisfaction.

**H4:** Online learning self-efficacy will moderate the relationship between e-learning service quality and satisfaction.

**H4-1:** Online learning self-efficacy will moderate the relationship between e-learning information quality and satisfaction.

**H4-2:** Online learning self-efficacy will moderate the relationship between e-learning system quality and satisfaction.

**H4-3:** Online learning self-efficacy will moderate the relationship between e-learning service quality and satisfaction.

## 3. Methodology

### 3.1. Operational Definitions

#### 3.1.1. E-learning Contents Quality

The information presented in e-learning is measured as part of e-learning content quality, focusing on its accuracy, trustworthiness, and professionalism.

#### 3.1.2. E-learning Service Quality

The items measuring e-learning service quality focused on the promptness of feedback, the responsiveness to learners' complaints and opinions, and the availability of channels for learners to express their concerns or feedback.

#### 3.1.3. E-learning System Quality

The items measuring e-learning system quality focused on the ease of use of menus and buttons, the accessibility of the platform, and the overall convenience of navigation within the system.

#### 3.1.4. Perceived Consistency

The items measuring perceived consistency in e-learning services focused on the platform's ability to respond to users

courteously, consistently provide accurate information through sufficient knowledge, and actively work to resolve users' issues.

### 3.1.5. Perceived Personalization

The items measuring perceived personalization of e-learning services focused on the platform's ability to identify and provide what the user needs, recommend services tailored to individual demands, and deliver customized services based on user information.

### 3.1.6. E-learning Satisfaction

Learning satisfaction was measured using items that assessed whether engaging with the e-learning program was a valuable experience, whether the program provided significant learning and benefits, and whether users would recommend the e-learning program to others.

### 3.1.7. Online Learning Self-efficacy

Online learning self-efficacy was measured using items that assessed the ability to focus on lectures and avoid distractions during study, the capability to participate in various course activities (such as discussions, quizzes, and assignments), and the confidence to promptly ask questions through email or discussion boards when needed during online learning.

## 3.2. Data Collection

The participants of this study consisted of 100 college students who had experienced online learning, recruited through a convenience sampling method. Among the participants, 50 were male (50%), and 50 were female (50%). The survey results indicated that 71 respondents (71%) reported using the e-learning platform for less than six months, 9 respondents (9%) for 7 months to 1 year, 9 respondents (9%) for 1 to 2 years, 6 respondents (6%) for 2 to 3 years, and 5 respondents (5%) for more than 3 years. Regarding daily usage time, 49 students (49%) used e-learning for less than 30 minutes, 27 students (27%) for 30 minutes to 1 hour, 18 students (18%) for 1 to 2 hours, and The results indicated that the number of respondents who reported an average daily usage of the e-learning platform for more than 2 hours and more than 3 hours was 3 (3%) each, respectively. In terms of the primary e-learning courses utilized, 7 students (7%) focused on IT-related content, 33 students (33%) on certification courses, 37 students (37%) on university-level education, 10 students (10%) on college entrance preparation, 4 students (4%) on language learning content, and 9 students (9%) on other categories.

## 3.3. Analysis Method

To analyze the research model of this study, data were collected and analyzed using PLS-SEM (Partial Least Squares Structural Equation Modeling) with the software Smart PLS 3.0. SEM refers to Structural Equation Modeling, a method used to estimate causal relationships by simultaneously considering latent variables, observed variables, and measurement errors. There are two main approaches to structural equation modeling: CB-SEM (Covariance-Based SEM) and PLS-SEM.

CB-SEM estimates covariances using the maximum likelihood method, while PLS-SEM focuses on reducing prediction errors through the partial least squares method. PLS-SEM can analyze both reflective and formative measurement models, making it applicable even in cases with numerous factors or severe multicollinearity. Additionally, it is particularly advantageous for the development of new theories or exploratory research (Hair et al., 2021).

## 4. Empirical Analysis Results

### 4.1. Reliability & Validity Analysis

In this study, the reliability of the measurement tools was assessed using Cronbach's alpha coefficient, which is commonly employed for scales consisting of multiple items measuring a single construct. Generally, an alpha coefficient of 0.6 or higher is considered to indicate acceptable reliability. The reliability values for all variables were found to be 0.9 or higher, confirming a reliable level of consistency (Table 1).

The reliability of a measurement refers to the consistency of results when the same construct is repeatedly assessed using similar or identical tools (Peter, 1981). To evaluate reliability, Cronbach's Alpha, rho\_A, Composite Reliability (CR), and Average Variance Extracted (AVE) were analyzed. Cronbach's Alpha is considered acceptable when its value is 0.7 or higher (Nunnally, 1978). Similarly, AVE values of 0.5 or above and CR values of 0.7 or above are deemed acceptable indicators of reliability (Fornell & Larcker, 1981). The results of the reliability analysis are summarized in Table 1. Furthermore, each measurement item demonstrated a factor loading of 0.7 or higher, as shown in Table 1, indicating that the items substantially represent their respective constructs. This suggests that the measurement items effectively reflect the conceptual components to which they are assigned.

**Table 1:** Reliability Analysis

Factor	Variable Name	Factor loadings	AVE	Composite Reliability	Rho_A	Cronbach's Alpha
Contents quality	1	0.956	0.924	0.973	0.960	0.959
	2	0.971				
	3	0.956				
Service quality	1	0.931	0.843	0.941	0.907	0.906
	2	0.936				
	3	0.886				
System quality	1	0.948	0.896	0.963	0.944	0.942
	2	0.939				
	3	0.952				
Perceived consistency	1	0.966	0.897	0.963	0.945	0.943
	2	0.954				
	3	0.921				
Perceived personalization	1	0.924	0.874	0.954	0.928	0.928
	2	0.946				
	3	0.933				
E-learning satisfaction	1	0.951	0.894	0.962	0.943	0.941
	2	0.967				
	3	0.918				
Online learning self-efficacy	1	0.904	0.862	0.949	0.924	0.920
	2	0.955				
	3	0.925				

**Table 2:** Determinant Validity (Fornell and Larcker)

	Construct Concept	1	2	3	4	5	6	7
1	Contents quality	(0.961)						
2	Service quality	0.589	(0.918)					
3	System quality	0.736	0.703	(0.946)				
4	Perceived consistency	0.734	0.768	0.830	(0.947)			
5	Perceived personalization	0.719	0.776	0.802	0.853	(0.944)		
6	Online learning self-efficacy	0.665	0.678	0.716	0.739	0.709	(0.928)	
7	E-learning satisfaction	0.727	0.795	0.791	0.863	0.845	0.799	(0.946)

※ The value in diagonal brackets is the mean variance extraction (AVE) value.

### 4.3. Verification of Hypothesis

#### 4.3.1. The Impact of E-learning Services on E-learning Satisfaction

To analyze the impact of e-learning services on learning satisfaction, a multiple regression analysis using Smart PLS was conducted with content quality, service quality, and system quality as independent variables and learning satisfaction as the dependent variable.

As shown in <Table 3>, examining the specific effects of e-learning contents quality on e-learning satisfaction revealed that contents quality ( $\beta=0.125$ ,  $p<0.10$ ) was statistically significant. E-learning service quality also had a significant positive impact on e-learning satisfaction ( $\beta=0.235$ ,  $p<0.05$ ). However, e-learning system quality ( $\beta=0.072$ ,  $p>0.10$ ) did not have a significant impact on e-learning satisfaction. These findings suggest that more

favorable perceptions of contents quality and service quality are associated with higher levels of e-learning satisfaction, supporting hypotheses 1-1 and 1-3. Notably, perceived service quality had a relatively greater impact on learning satisfaction compared to contents quality, highlighting the importance of service quality in online services.

**Table 3:** PLS Analysis Results and Hypothesis Test

Direct Effect	coefficients	t-value	Results
E-learning contents quality e-learning satisfaction	0.125	1.719*	supported
E-learning system quality e-learning satisfaction	0.072	0.538	unsupported
E-learning service quality e-learning satisfaction	0.235	2.410**	supported

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$



### 4.3.2. Mediation Effect of Perceived Consistency and between E-learning Services Quality and E-learning Satisfaction

The indirect effect of e-learning content quality on e-learning satisfaction through perceived consistency was found to be not significant. Similarly, the indirect effect of e-learning content quality on e-learning satisfaction through perceived personalization was also not significant.

On the other hand, e-learning system quality was shown to have a positive indirect effect on e-learning satisfaction through perceived consistency. The indirect effect of e-learning system quality on e-learning satisfaction through perceived consistency was .146 ( $p < .05$ ), indicating significance. However, the indirect effect of e-learning system quality on e-learning satisfaction through perceived personalization was not significant.

Finally, the indirect effect of e-learning service quality on e-learning satisfaction through perceived consistency was .112 ( $p < .05$ ), showing significance. Additionally, the indirect effect of e-learning service quality on e-learning satisfaction through perceived personalization was .090 ( $p < .05$ ), also significant. This indicates that e-learning service quality positively influences e-learning satisfaction through both perceived consistency and perceived personalization as mediating variables.

**Table 4:** Results of Bootstrapping with the Mediation Effect

Path Analysis	Coefficients	t-value	Results
E-learning contents quality → perceived consistency → e-learning satisfaction	0.072	1.311	unsupported
E-learning system quality → perceived consistency → e-learning satisfaction	0.146	2.296**	supported
E-learning service quality → perceived consistency → e-learning satisfaction	0.112	2.054**	supported
E-learning contents quality → perceived personalization → e-learning satisfaction	0.051	1.403	unsupported
E-learning system quality → perceived personalization → e-learning satisfaction	0.085	1.541	unsupported
E-learning service quality → perceived personalization → e-learning satisfaction	0.090	2.047**	supported

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

### 4.3.3. Moderation Effect of Online Learning Self-efficacy between E-learning Services Quality and E-learning Satisfaction

To examine the moderating effect of online learning self-efficacy on the relationship between e-learning service quality and e-learning satisfaction, a sequential analysis was conducted by pairing the moderating variable with each

independent variable and examining its impact on the dependent variable. Hayes' (2022) proposed moderation model (Model 1) was selected as the analytical framework to determine whether the moderating variable influences the relationship between the independent and dependent variables.

For this study, the moderating effect of online learning self-efficacy was analyzed using the Process Macro moderation analysis (Model 1) in three stages, allowing for a detailed assessment of the moderating effect of online learning self-efficacy in each case.

As shown in Table 5 & 6, the moderating effect of online learning self-efficacy on the relationship between e-learning content quality and e-learning satisfaction was found to be significant, as both the overall model and the interaction term between e-learning content quality and online learning self-efficacy ( $\beta = .133$ ,  $p = .034^{**}$ ) were significant. The conditional effects of the independent variable on the dependent variable were calculated at different levels of the moderating variable (low: -1SD, average: Mean, high: +1SD) based on Aiken and West's (1991) approach, revealing that the simple slopes for the independent and dependent variables were  $\beta = .224$  ( $p = .000^{***}$ ) for the low group,  $\beta = .335$  ( $p = .000^{***}$ ) for the average group, and  $\beta = .476$  ( $p = .000^{***}$ ) for the high group. As shown in [Figure 2], the slope increased progressively from the low group to the high group, indicating that the positive moderating effect of online learning self-efficacy becomes stronger with higher levels of the moderating variable. This finding suggests that as the level of online learning self-efficacy increases, the influence of e-learning content quality on e-learning satisfaction is significantly enhanced.

**Table 5:** Analysis Results of the Moderating Effect of Online Learning Self-efficacy on the Relationship between E-learning Contents Quality and E-learning Satisfaction

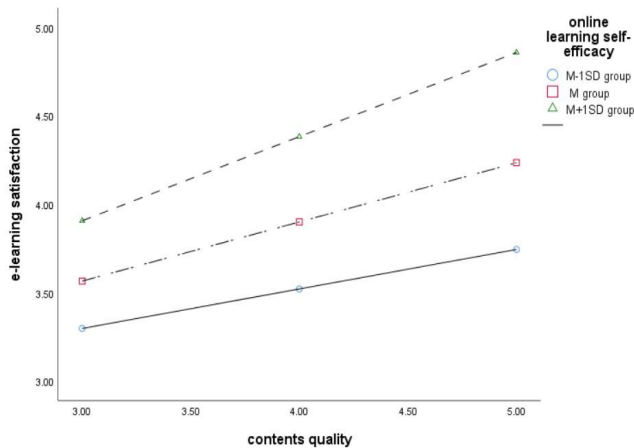
Variable	B	S.E.	t	LLCI	ULCI
constant	2.86	.94	3.05***	1.00	4.72
e-learning contents quality (independent variable)	-1.76	.24	-.72	-.66	.31
online learning self-efficacy (moderating variable)	-.08	.25	-.31	-.58	.43
(independent variable) * (moderating variable)	.13	.06**	2.16	.01	.26
F	81.43***				
R <sup>2</sup>	.72***				
ΔR <sup>2</sup>	.01***				

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

**Table 6:** Conditional Effect test of the Moderating Variable

Variable	Effect	S.E.	t	LLCI	ULCI
-1SD	.23	.08	2.70***	.06	.39
Mean	.33	.07	4.99***	.20	.47
+1SD	.48	.10	4.98***	.29	.67

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$



**Figure 2:** The Relationship between Content Quality and E-learning Satisfaction Based on Online Learning Self-efficacy

## 5. Conclusion

This study offers valuable insights into the combined impact of e-learning service quality, perceived consistency, perceived personalization and online learning self-efficacy on e-learning satisfaction. These insights align with and expand upon existing research, offering both theoretical and practical contributions to the field of e-learning.

The study enriches the existing literature on e-learning by emphasizing the multidimensional nature of service quality—comprising information quality, system quality, and service quality—as a critical determinant of learner satisfaction. By confirming the mediating role of perceived consistency and personalization, the research highlights a key psychological mechanism that links service quality to satisfaction. This insight extends the theoretical framework of e-learning studies, suggesting that consistency fosters trust and reliability in the learning experience, which are essential for achieving sustained user satisfaction. Specifically, perceived consistency was found to mediate the relationship between e-learning system quality and service quality on satisfaction. Notably, in the case of system quality, perceived consistency served as a complete mediator in its impact on satisfaction. These findings underscore the critical role of perceived consistency in enhancing satisfaction with e-learning platforms. For educators and platform designers, this highlights the importance of creating systems that ensure consistent experiences across various aspects of the e-learning process. By prioritizing seamless integration and reliability in system quality, they can foster higher levels of learner satisfaction and engagement. On the other hand, perceived personalization was found to play a partial mediating role in the relationship between e-learning service quality and

satisfaction. These findings highlight the importance of incorporating personalized elements into e-learning services to enhance learner satisfaction. Educational institutions and platform developers should focus on tailoring the learning experience to individual needs and preferences, such as offering customizable content or adaptive learning paths. By doing so, they can create a more engaging and effective learning environment that meets the diverse expectations of users.

The study confirms the importance of service quality dimensions—contents quality, system quality, and service quality—in shaping e-learning satisfaction. This result is consistent with the findings of DeLone and McLean (2003), who emphasized the significance of service quality in their Information Systems Success Model, and Pham et al. (2019), who identified system quality, information quality, and service quality as critical factors influencing user satisfaction in e-learning environments.

The mediating role of perceived consistency builds on prior research by shedding light on the psychological mechanisms that link system quality to satisfaction. Unlike earlier studies, such as Chang (2013) and Marandu et al. (2019), which focused on the importance of consistency in information quality, this study broadens the scope to encompass system quality. It reveals that consistency in system functionality enhances trust and provides a sense of reliability, ultimately contributing to a more stable and satisfying learning experience.

Furthermore, the moderating effect of online learning self-efficacy provides a novel perspective on the interplay between contents quality and e-learning satisfaction. It demonstrates that learners' confidence in their abilities amplifies the benefits of high-quality e-learning services, aligning with self-regulation and motivation theories in education. These findings suggest a dynamic relationship where both external service quality and internal learner traits shape the overall e-learning experience. The moderating effect of online learning self-efficacy offers a fresh perspective on how content quality influences e-learning satisfaction. This finding suggests that enhancing learners' confidence in their ability to navigate and succeed in an online environment can amplify the positive effects of high-quality content. Educators and platform developers should consider integrating features such as skill-building resources, interactive tutorials, and support systems to boost learners' self-efficacy, thereby maximizing the overall effectiveness of e-learning content.

Additionally, the moderating effect of academic self-efficacy aligns with Bandura's (1986) social cognitive theory, which underscores the role of self-efficacy in motivation and performance. The findings complement research by Zimmerman and Martinez (1988) and Pintrich and De Groot (1990), who demonstrated that self-efficacy is



a critical driver of academic success. By showing that self-efficacy amplifies the relationship between service quality and satisfaction, this study integrates these theories into the e-learning context, offering a comprehensive view of how internal and external factors interact.

The practical applications of these findings are equally valuable. For e-learning platform developers, the study underscores the importance of delivering consistently high-quality content, robust system performance, and responsive support services. Platforms that prioritize consistency across these dimensions are more likely to foster user satisfaction and long-term engagement. To achieve this, developers should focus on creating user-friendly interfaces, maintaining the accuracy and relevance of content, and ensuring system reliability.

Educators and instructional designers should recognize the value of perceived consistency in the learner experience. Clear communication of learning objectives, seamless transitions between course modules, and predictable support mechanisms can significantly enhance the learners' sense of stability and trust in the platform.

Moreover, the critical role of online learning self-efficacy suggests that e-learning environments should be designed to build and reinforce learners' confidence. This can be achieved through personalized feedback, adaptive learning systems, and opportunities for incremental success within the platform. For instance, incorporating self-assessment tools and goal-setting features can empower learners to take ownership of their educational journey, leading to improved satisfaction and outcomes.

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