

Digital Leadership and Sustainable Teaching Practices: Examining the Mediating Role of Faculty Digital Competence in Northern Jordanian Higher Education

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Received: December 31, 2025

Accepted: April 10, 2026

Online Published: April 12, 2026

doi:10.11114/jets.v14i3.8343

URL: <https://doi.org/10.11114/jets.v14i3.8343>

Abstract

This study aims to quantitatively examine the direct and indirect relationships between digital leadership and sustainable teaching practices in higher education institutions in Northern Jordan, using a cross-sectional research design. Specifically, the study employs structural equation modeling (SEM) to investigate the mediating role of faculty digital competence in the relationship between digital leadership and sustainable teaching practices. The results prove the importance of institutional strategy and present digital leadership as positively impactful as it affects faculty digital competence ($\beta = 0.983, p < 0.001$) and sustainable teaching practices ($\beta = 1.451, p < 0.001$). Most importantly, the mediating effects of faculty digital competence on were tested, and all the paths were shown to be statistically significant in the model. Nevertheless, there was one negative significant (but not unduly significant) path between competence and sustainable practices ($\beta = -0.633, p = 0.022$), which led to a significant but non-uniform mediation effect. Also, the fact that the negative path coefficient was found, and the mediating effect was inconsistent provides a theoretical addition, which challenges the linear assumptions of digital adoption models and reveals a key, hitherto undiscussed suppressor effect of advanced competence on sustainability. The paper concludes that although digital leadership can effectively lead to digital skills development, university leaders should have a strategic approach to the implementation of this competence in the direction of simplicity and institutional replicability to guarantee genuinely sustainable pedagogical results. This study offers important, context-driven knowledge pertaining to the digital transformation in the Middle East.

Keywords: digital leadership, sustainable teaching practices, faculty digital competence

1. Introduction

The international environment of higher education is experiencing a radical and irreversible change due to the dynamic development and adoption of digital technologies (Adaileh & Alshawawreh, 2021; Haleem et al., 2022). The period commonly referred to as the Fourth Industrial Revolution requires a fundamental transformation in how universities operate, are led, and deliver education. Increasingly, higher education institutions recognize that the mere availability of technology is insufficient; rather, a comprehensive institutional and strategic approach is essential to effectively leverage digital technologies in order to achieve long-term educational excellence and institutional sustainability (Trevisan et al., 2023). The need has propelled the idea of digital leadership to center stage, which is characterized by a

new paradigm where digital leaders should not only manage the digital resources but also develop a culture of innovation, agility, and constant digital upskilling for all members of the academic community (Muslim & Setyono, 2024). This transformation is dependent on how educational leaders have the capacity to conceptualize and implement a digital strategy that cuts across the entire institution, including the administration and the very core of the educational process, teaching and learning (Srivastava et al., 2023).

The higher education sector in the Middle East, particularly in the Hashemite Kingdom of Jordan, is actively responding to this global trend by implementing digital transformation initiatives and reforming institutional practices. (Ayasrah et al., 2025). Jordanian higher education institutions appear to be at the crossroads, torn between the necessity to preserve academic values and traditions and the pressing necessity to implement modern technologies and digitalization (Awadallah, 2022). The national strategic vision focuses on the aspect of technological use in improving the quality and competitiveness of its graduates. Nevertheless, the effective implementation of digital transformation initiatives in higher education is often constrained by infrastructural limitations, cultural resistance, and deficiencies in human capital (Afaishat et al., 2022; Alwaely et al., 2024). Consequently, understanding how institutional digital strategies are translated into effective and sustainable teaching practices at the classroom level—through leadership and faculty capabilities—has become a critical issue of national and educational concern. The main component of this change is the necessity of sustainable teaching. Sustainable teaching practices do not focus on short-term solutions or the momentary adoption of technology; rather, they emphasize pedagogical strategies that are environmentally friendly, socially just, and economically viable in the long term (Al Hazaima, 2021; Hassan et al., 2021). Learning in a digital environment requires the development of teaching strategies that are adaptable to rapidly changing technologies, promote students' lifelong learning, and support the continuous professional development of faculty members. Sustainability in teaching is essential for maintaining high-quality and relevant education that equips students to navigate a future characterized by complexity and rapid change. By embedding sustainable teaching practices, universities are better positioned to ensure consistent learning outcomes, demonstrate institutional responsibility, and strengthen their long-term reputation, credibility, and societal influence (Al Masadeh et al., 2024; Fazza & Mahgoub, 2021). These sustainable practices are not necessarily the automatic result of institutional investment but are in fact mediated by faculty capabilities. Although digital leadership generates the required vision, resources and favorable environment While faculty digital competence plays a pivotal role in translating institutional digital strategies into effective classroom practices, it is not the only factor influencing the success of digital leadership. Other organizational, cultural, and technological factors also contribute to the effectiveness of classroom implementation, and their interplay with faculty competencies determines the overall impact of digital leadership initiatives (Al Masadeh et al., 2024). Digital competence is the knowledge, skills, and attitudes that teachers need to know to successfully apply digital technologies in instructing, learning, assessing, and developing professionally. While a leader's ability to integrate technology is important, it alone does not guarantee effective teaching or improved student outcomes. Faculty digital competence is essential for translating the objectives of digital leadership into tangible and sustainable pedagogical practices, serving as the critical link that ensures institutional strategies are successfully enacted in the classroom. The hypothesis of this study is that the effect of digital leadership on sustainable teaching practices is largely indirect, operating primarily through the enhancement of faculty digital competence (AlRaggad et al., 2025; Muslim & Setyono, 2024).

The theoretical foundation of this study is grounded in Social Cognitive Theory (SCT), which posits that human behavior—here, sustainable teaching practices—results from a reciprocal interaction among personal factors (faculty digital competence), behavioral factors, and environmental factors (digital leadership) (da Silva-Jean & Kneipp, 2024). This study models the application of SCT by conceptualizing digital leadership as the environmental factor that fosters faculty digital competence (the personal factor), which in turn leads to the desired behavioral outcome of sustainable teaching.

The primary contribution of this research lies in empirically testing this mediation model in the underexplored context of universities in northern Jordan. By doing so, it provides actionable insights into the digital transformation process in a developing economy, offering guidance for policymakers and university administrators seeking to maximize the impact of their digital initiatives.

Specifically, the study examines both the direct effects of digital leadership on sustainable teaching practices and the indirect effects mediated by faculty digital competence within education colleges. Applying SCT consistently throughout the analysis highlights the dynamic interplay among leadership, competence, and teaching behavior, strengthening the theoretical and practical understanding of digital transformation in higher education.

Although considerable effort has been devoted to developing digital infrastructure, sustainable teaching remains a significant challenge in many universities in northern Jordan. A major obstacle is the limited empirical understanding of how the strategic vision of digital leadership is translated into classroom practices—one of the key drivers of institutional change. To address this gap, the present study examines the critical, yet largely unexplored, mediating role of faculty digital competence in the relationship between digital leadership and the adoption of sustainable teaching practices.

1.1 Research Gaps

Although research on digital transformation in higher education is growing, several critical gaps remain—particularly regarding how institutional digital leadership translates into sustainable (Fernández et al., 2023; Kayanja et al., 2025). To begin with, the notions of digital leadership and sustainable teaching practices as well as faculty digital competence have been examined separately, whereas there is a distinct shortage of empirical studies which combine all three variables in one and comprehensive model (Alsayed & Alassaf, 2023). The available literature seems to pay more attention to how leadership directly influences technology adoption, or how faculty competence and teaching effectiveness are connected, rather than how the institutional vision is being converted to lasting classroom change in a multi-layered process. Although previous studies have examined these three constructs independently, they cannot be fully understood in isolation. Investigating them simultaneously is necessary to comprehensively evaluate the effectiveness of digital transformation in higher education. (Fernández et al., 2023; Muslim & Setyono, 2024).

Second, there is a large gap in literature in terms of geographical location.

Despite the growing body of research on digital transformation in higher education, several critical gaps remain, particularly regarding the role of digital leadership and its impact on sustainable teaching practices. Most empirical research on digital leadership and faculty competence has been conducted in Western or developed Asian contexts, which differ substantially from the Middle East in terms of institutional structures, resource availability, and cultural factors (Ismail & Elsayed, 2025; López-Figueroa et al., 2025; Olabiyi et al., 2025). In contrast, studies examining the emergence of digital higher education in Jordan—especially within education colleges in universities of the northern region—are still in their infancy and predominantly descriptive (Muslim & Setyono, 2024). Context-bound, quantitative research is urgently needed to test global models and provide regionally specific insights for policymakers and higher education administrators.

Moreover, the mechanism through which digital leadership can influence sustainable teaching practices remains largely theoretical and untested. Existing literature suggests that it is the faculty's ability to implement change, rather than the environment or resources provided by leadership alone, that drives effective transformation. However, the mediating role of faculty digital competence in this relationship has not been rigorously examined (Alsayed & Alassaf, 2023; Liu et al., 2020). This study seeks to address this critical gap by empirically investigating whether faculty digital competence serves as the key conduit through which the strategic vision of digital leadership can be translated into tangible, sustainable improvements in teaching practice.

2. Theoretical Foundations

The theoretical framework of the current study is mainly based on the social cognitive theory, which was first theorized by Albert Bandura (Lyu, 2023). The Social Cognitive Theory (SCT) is a robust framework for understanding how individuals learn and maintain specific behavioral patterns, making it highly relevant for analyzing the adoption of new teaching practices. The core principle of the theory is reciprocal determinism, which posits that behavior, cognitive and personal factors, and environmental influences mutually and continuously shape one another (Liu et al., 2020; Lyu, 2023).

Within the framework of this research, the three fundamental components of the social cognitive theory are consistent with the research variables. Digital leadership provides an environment that represents environmental influences by creating a supportive, resource-rich, and visionary environment that would allow a digital transformation (Liu et al., 2020). Advanced digital leadership provides a supportive environment that fosters the development of faculty members' digital skills and rewards those who enhance their competencies. Within the framework of social cognitive learning theory, the personal factors contributing to faculty digital competence are those that reflect the concept of self-efficacy—the belief in one's ability to successfully complete a defined course of action. Faculty members with high levels of digital competence, or greater self-efficacy, are more likely to engage in and successfully implement innovative and sustainable digital teaching practices. This theoretical foundation enables us to explore the mediating role of faculty digital competence between digital leadership and sustainable teaching practices, capture the behavioral factors, and this entails the visible and regular activities that the faculty members take in the classroom to effect the digital and sustainable pedagogy (Lyu, 2023; Purworini et al., 2024).

While the hypothesis represents the central argument of this study, it is important to acknowledge that other factors may also influence the adoption and effectiveness of sustainable teaching practices. These include university finances, institutional policies, time constraints, competing priorities set by administrators, student enrollment numbers, availability of training opportunities, and funding for technological resources. Adoption of practices alone does not necessarily guarantee their successful or effective implementation.

2.1 Literature Review and Hypothesis Development

Social Cognitive Theory (SCT) provides a framework to explain the hypothesized mediation in this study: the environment, represented by digital leadership, positively influences faculty digital competence (the personal factor/self-efficacy), which in turn contributes to the adoption of sustainable teaching practices (behavioral outcome). This theoretical perspective enables a systematic exploration of the causal mechanisms linking institutional-level digital leadership with individual-level faculty behavior, and it provides insights into how digital transformation can be effectively integrated into teaching processes within higher education institutions.

2.1.1 Digital Leadership and Sustainable Teaching Practices

In order to situate this study within the broader field, it is important to clearly define the key concepts. Sustainable teaching practices in the context of Jordanian higher education refer to pedagogical strategies that are designed for long-term impact, incorporating environmentally conscious, socially equitable, and economically viable methods. These practices require continuous reflection, ongoing development of instructional methods, and the resilient, adaptive use of technology (Dede, 2014; Howard et al., 2021; Qawaqneh et al., 2023; Sterling, 2013).

Digital leadership can be described as the strategic and transformational application of digital technologies to achieve institutional objectives, foster innovation, and cultivate a digitally fluent organizational culture (Claassen et al., 2022). In higher education, effective digital leaders are not only those who invest in infrastructure but also those who articulate a clear vision for how technology can radically enhance the quality and sustainability of academic processes (Bauwens & Cortellazzo, 2024). Literature suggests a strong link between such leadership and educational outcomes: by providing clear digital strategies, allocating necessary resources, and modeling digital fluency, leaders create an environment of psychological safety and institutional support that enables faculty to explore and implement innovative pedagogical practices (Cortellazzo et al., 2019).

These facilitative conditions are particularly critical for the development of sustainable teaching practices, which require long-term commitment, iterative reflection, and technology use that is both resilient and adaptable. Therefore, proactive and forward-looking digital leadership is likely to play a key role in promoting the adoption of new, sustainable, technologically hybrid, and future-ready teaching practices in higher education.

H1: Digital Leadership has a significant positive influence on Sustainable Teaching Practices.

2.1.2 Faculty Digital Competence, Digital Leadership

Faculty digital competence is a central component of effective digital leadership, yet it is often treated as a broad and vaguely defined concept. For clarity, faculty digital competence refers to a dynamic combination of skills, knowledge, and attitudes that enable instructors to effectively integrate digital tools and technologies into their teaching. It is not a fixed attribute but requires continuous development through targeted training, supportive institutional policies, and access to appropriate resources (Gisbert Cervera & Caena, 2022; Redecker & Punie, 2017a).

Digital leaders play a pivotal role in cultivating this competence by clearly articulating expectations regarding digital proficiency, providing high-quality professional development opportunities, and fostering communities of practice where faculty can share knowledge and overcome barriers to technology adoption (Redecker & Punie, 2017a; Whalen, 2020). According to Social Cognitive Theory, such supportive leadership environments exert a direct positive influence on the personal factor of self-efficacy, which underpins competence. Faculty members are more likely to be motivated, confident, and proactive in using digital tools when they perceive that their leaders are committed to digital transformation and to their ongoing skill development (Bandura, 2018; Scherer et al., 2020; Tondeur et al., 2020).

Conversely, a lack of clear digital direction or insufficient leadership support can foster technophobia, resistance to change, and ultimately hinder the development of faculty digital competence (Enăchescu, 2025; Jomezai et al., 2023; König et al., 2020; Tondeur et al., 2020). In addition, differences between faculties—such as technology-focused versus humanities-focused departments—may influence how digital leadership is implemented and experienced, suggesting the need to consider contextual and disciplinary factors when evaluating faculty competence and the outcomes of sustainable teaching practices.

H2: Digital Leadership has a significant positive influence on Faculty Digital Competence.

2.1.3 Sustainable Teaching Practices and Faculty Digital Competence

The critical individual level of success with technology-enhanced teaching is the faculty digital competence. The faculty member is capable of choosing, applying, and incorporating digital tools in order to meet certain pedagogical objectives, deal with digital content, and make sure that students are interested (Bond et al., 2021; Falloon, 2020; Redecker & Punie, 2017b). Faculty digital competence and sustainable teaching practices are directly and causally related. Faculty with high digital competence are more likely to design flexible, accessible, and resilient courses—hallmarks of sustainable teaching practices. (Bond et al., 2021; Redecker & Punie, 2017b). Instead of merely replacing old approaches with technology (e.g., replacing a printout with a PDF), they can redefine the learning process (e.g., individualized, adaptive learning). Moreover, faculty digital competence enables instructors to critically evaluate new technologies, ensuring that their teaching practices remain relevant and sustainable over the long term, rather than becoming obsolete with subsequent technological shifts. (Bond et al., 2018; Falloon, 2020; Hermansah et al., 2024).

H3: Faculty Digital Competence has a significant positive influence on Sustainable Teaching Practices.

2.1.4 The mediating effect of Faculty Digital Competence

The main point of this paper is that the impact of digital leadership on sustainable teaching practices cannot be considered only direct, but its influence is heavily mediated by faculty digital competence (Falloon, 2020; Howard et al., 2021). A leader has the opportunity to enforce a new learning management system or a computerized assessment tool, but the real quality and permanence of the usage in the classroom lies in the competence of a faculty member (Dolch et al., 2021; Howard et al., 2021). Faculty digital competence offers the capacity to ensure that the change is executed in a proficient and constant manner, whilst digital leadership offers the possibility and the intent to change. According to the mediation model, the overall role of digital leadership is to establish the conditions (training, resources, culture) that optimize digital competence of the faculty, and the improved faculty digital competence in turn leads to adoption of sustainable teaching practices (Admiraal et al., 2021; Adnan et al., 2024). In the absence of the intermediating role played by competence, the investment and vision of digital leaders can lead to the superficiality or interim nature of adopting technology which is the opposite of sustainability (Farias-Gaytan et al., 2023; Gkrimpizi et al., 2023). While numerous factors may influence the successful implementation of institutional digital strategies such as university finances, policies, time constraints, competing administrative priorities, student enrollment numbers, access to training, and funding for technological resources this study focuses specifically on one central variable. Accordingly, the hypothesis is formulated that faculty digital competence serves as the key mechanism through which institutional digital strategies are translated into effective and sustainable pedagogical practices. **H4:** Faculty digital competence plays a significant role in mediating the relationship between digital leadership and sustainable teaching practices.

3. Methodology

3.1 Research Design

This study employed a cross-sectional, quantitative, correlational design to examine the relationships among digital leadership, faculty digital competence, and sustainable teaching practices, with a specific focus on the mediating role of faculty digital competence. Data were collected using a survey method, which is appropriate for capturing self-reported perceptions, attitudes, and behaviors from a large and diverse population of faculty members (Al-Awamrah et al., 2025; Al-Hatimi et al., 2024; Creswell & Creswell, 2017).

The cross-sectional nature of the design implies that data were gathered at a single point in time, which is suitable for testing the proposed structural model. The collected data were analyzed using structural equation modeling (SEM) to assess both the direct and indirect relationships among the study variables. This approach allows for a rigorous examination of the mediating effect of faculty digital competence within the relationship between institutional digital leadership and sustainable teaching practices.

3.2 Population and Sample

The population that will be used in this research will include all faculty members in the colleges of education of the public and private universities in the northern part of Jordan. The choice of this focus is because the education colleges play a central role in educating future teachers, and the implementation of sustainable digital practices is a crucial measure of the systemic change in education. The sampling method will be purposive in the selection of the participating universities, and the convenience in recruiting the faculty members in the respective universities.

This study employed a quantitative, correlational, cross-sectional design to examine the relationships between digital leadership, faculty digital competence, and sustainable teaching practices, with a particular focus on the mediating role of faculty digital competence. Data were collected using a survey methodology, enabling researchers to observe self-reported perceptions, attitudes, and behaviors among a broad and diverse cross-section of faculty members (Al-Awamrah et al., 2025; Al-Hatimi et al., 2024; Creswell & Creswell, 2017).

The research sample comprised faculty members from six universities in northern Jordan: Ajloun University (17 participants), Jerash University (20 participants), Jadara University (31 participants), Irbid Private University (33 participants), Yarmouk University (96 participants), and Al-Bayt University (45 participants), for a total of 242 participants. The sample size was deemed sufficient to ensure adequate statistical power and stable parameter estimates for the proposed structural equation model (Al-Awamreh et al., 2023; Hair, 2014).

Ethical approval was obtained from the institutional review boards of the respective universities (approval number: 125-8-220), and all participants provided prior informed consent. Participation was voluntary, and data were collected anonymously and confidentially. The study was conducted from 10 October 2025 to 1 November 2025, and data collection took three weeks to complete.

The collected data were analyzed using structural equation modeling (SEM) to examine the direct and indirect relationships between variables, thereby testing the mediating effect of faculty digital competence on translating digital leadership into sustainable teaching practices.

3.3 Instruments

The data collection for this study involved a structured, self-administered questionnaire designed to generate comprehensive information across four segments: demographic characteristics and three validated scales adapted to the Jordanian higher education context. All items were answered using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), measuring the extent to which participants agreed with each statement.

The first segment measured digital leadership, which served as the independent variable. This section was adapted from established instruments on digital and transformational leadership in educational environments (Ören & Atik, 2025) and consisted of seven items. These items addressed key leadership dimensions relevant to digital transformation within universities: vision and strategy (evaluating whether the administration has a clear plan for digital integration), resource management (assessing the sufficiency of digital infrastructure and institutional resources), and culture and empowerment (examining how leadership encourages faculty experimentation and innovation in digital pedagogies). The adaptation involved contextualizing the items to reflect the organizational and cultural characteristics of Northern Jordanian universities while maintaining the conceptual integrity of the original Turkish scale (Sukandi, 2024).

The second segment assessed sustainable teaching practices, which was the dependent variable. This scale was based on literature related to sustainable education and technology integration, emphasizing long-term, resilient, and innovative application of digital teaching methods (Çam-Tosun & Söğüt, 2024). It included six items measuring dimensions such as digital pedagogical innovation, frequent use of digital tools for personalized learning, and continuous improvement, which evaluated reflective teaching practices based on feedback and digital accessibility, ensuring equitable access to digital learning for all students.

The third segment measured faculty digital competence, the mediating variable. This scale was adapted from the European Digital Competence Framework for Teachers (DigCompEdu), a validated and widely recognized model (Redecker & Punie, 2017b). It comprised six items across five domains: Professional Engagement (collaboration with colleagues using digital tools), Digital Resources (searching, evaluating, and curating digital materials), Teaching and Learning (orchestration of instruction using digital tools), Assessment (using digital tools for formative and summative evaluation), and Empowering Learners (promoting critical thinking and active student engagement through digital tools). This scale enabled the measurement of faculty digital competence and its mediating role in translating digital leadership into sustainable teaching practices (Castañeda & Selwyn, 2018; Redecker & Punie, 2017b).

The choice of these scales was based on their established validity and relevance to the constructs of interest. Their adaptation involved contextual modifications to ensure alignment with the organizational, cultural, and technological characteristics of Northern Jordanian higher education institutions, while preserving the psychometric properties of the original instruments.

4. Results

In this study, the proposed research model was examined using structural equation modeling with partial least squares (PLS-SEM) to analyze the pooled data. Data were collected through a structured questionnaire distributed to 242 respondents, of which 185 were returned and deemed valid for analysis due to data completeness and participant responses to all measure items, representing a response rate of approximately 76.4%. This sample size meets the minimum requirements recommended for PLS-SEM, ensuring reliable estimation and sufficient statistical power. Data analysis was conducted in two phases according to established PLS-SEM guidelines. In the first phase, the measurement model was evaluated to assess indicator reliability, internal consistency, and convergence validity, ensuring that underlying structures were accurately and consistently measured. In the second phase, the structural model

was examined to test the assumed relationships between the study structures: digital leadership, faculty digital competence, and sustainable teaching practices. In this study, the proposed research model was examined using Partial Least Squares Structural Equation Modeling (PLS-SEM). Data were collected through a structured questionnaire from 242 respondents, with 185 valid responses (76.4% response rate), which meets the recommended minimum for reliable estimation and adequate statistical power.

The data were analyzed in two stages, following established PLS-SEM guidelines. First, the measurement model was assessed to evaluate indicator reliability, internal consistency, and convergent validity, ensuring accurate and consistent measurement of the constructs: digital leadership, faculty digital competence, and sustainable teaching practices. During this stage, indicators with factor loadings below 0.60 (FDC1, FDC2, DL2, DL3, STP4, and STP5) were removed, in line with standard PLS-SEM procedures, to improve construct reliability, convergent validity, and overall model quality. The final measurement model, shown in Figure 1 and summarized in Table 1, demonstrates satisfactory psychometric properties and provides a solid foundation for the second stage.

In the second stage, the structural model was examined to test the hypothesized relationships among the study constructs and assess the strength and significance of these relationships. This two-stage approach ensures both the validity of the measurement instruments and the robustness of the structural findings, paving the way for further in-depth analysis of the proposed research model.

4.1 Evaluation of Measurement Model

Variance Inflation Factor (VIF) values, commonly used to detect multicollinearity in regression analyses, were not included in this study's PLS-SEM analysis. This is because PLS-SEM is a variance-based structural equation modeling technique that is inherently less sensitive to multicollinearity among indicators compared to traditional covariance-based methods. In PLS-SEM, the algorithm focuses on maximizing explained variance of the dependent constructs, and the estimation of path coefficients remains robust even in the presence of moderate correlations among predictors. Additionally, the iterative nature of the PLS algorithm and the assessment of construct reliability, indicator loadings, and discriminant validity provide sufficient safeguards to ensure that collinearity does not compromise the validity or interpretability of the model. Therefore, VIF assessment was deemed unnecessary for the current analysis.

Figure 1 indicates the reflective measurement model following the elimination of weak indicators with factor loading less than the acceptable range of 0.60. The other indicators reveal acceptable to high factor loadings and most of them are above the recommended value of 0.70. This shows that there are very close relationships among the observed indicators with their corresponding latent constructs. Those indicators whose loadings were slightly over 0.60 were retained in case there was a theoretical justification that is acceptable in both exploratory and applied educational research.

The number also indicates that digital leadership is reflected through indicators that have moderate and high factor loadings, which validate the fact that the retained items are sufficient to reflect major dimensions of leadership practices in the digital realm. There are especially high indicators loading in faculty digital competence, which indicates the strength of this construct and emphasizes its centrality in the proposed model. Likewise, the indicators of Sustainable Teaching Practices have satisfactory loading values thus contributing to its conceptualization as a multidimensional construct that relates to sustainable and effective pedagogical practices. This removal of indicators that had low factor loadings increased the clarity, reliability, and parsimony of the measurement model. This minimization process minimized measurement error and enhanced convergent validity and thus enhanced the overall quality of the model. In aggregate, the findings depicted in Figure 1 prove that the measurement model is within the recommended evaluation criteria of PLS-SEM and can be conducted further to the structural model assessment and hypothesis testing.

Moreover, Table 1 presents the results of internal consistency reliability and convergent validity for the study constructs. Cronbach's alpha values range from 0.768 to 0.833, exceeding the recommended threshold of 0.70, indicating good internal consistency. In addition, the composite reliability values (ρ_A and ρ_c) for all constructs are above 0.80, further confirming that the measurement scales are reliable and suitable for use in the subsequent structural equation modeling analysis.

The criterion of convergent validity was the average variance extracted (AVE). All AVE values are bigger than the recommended value of 0.50, as demonstrated in Table (1), which means that the construct explains more than half of the variance in the indicators. Particularly, the AVE value of faculty digital competence (0.666) is high, whereas digital leadership (0.585) and sustainable teaching practices (0.587) have been satisfactory. Combined, the findings in Table 1 support the idea that the refined measurement model has sufficient reliability and convergent validity and can be used in the estimation of the structural model and hypothesis testing.

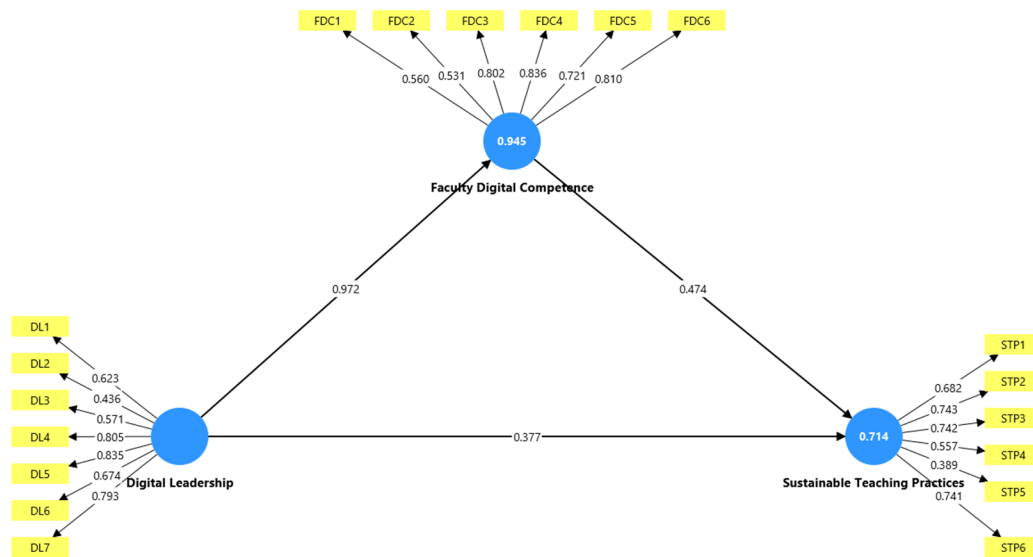


Figure 1. Evaluation of measurement model

Table 1. Construct reliability and validity

	Cronbach's alpha	Composite (rho_a)	reliabilityComposite (rho_c)	reliabilityAverage (AVE)	variance extracted
Digital Leadership	0.818	0.837	0.874	0.585	
Faculty Digital Competence	0.833	0.837	0.889	0.666	
Sustainable Teaching Practices	0.768	0.779	0.850	0.587	

Discriminant validity was measured with the help of Fornell-Larcker criterion as indicated in Table 2. The findings show that the square root of the Average Variance Extracted (AVE) of each construct is larger than the correlations of the construct with the other ones (Alawamreh, Almhasneh, et al., 2023; Fornell & Larcker, 1981). In particular, the digital leadership, faculty digital competence and sustainable teaching practices are all found to be more shared with individual indicators than with other latent variables. Although some of the inter-construct correlations are rather high, all the values do not exceed the respective square roots of AVE. The analysis followed the standard procedure for measurement model assessment, including evaluation of indicator reliability, internal consistency, convergent validity, and discriminant validity. The results indicate that the constructions are empirically distinct and that the measurement model demonstrates satisfactory psychometric properties. Based on these findings, the measurement model is deemed appropriate, providing a sound basis to proceed with the structural model analysis.

Table 2. Evaluating discriminatory validity using the Furnell-Larker criterion

	Digital Leadership	Faculty Digital Competence	Sustainable Teaching Practices
Digital Leadership	0.765		
Faculty Digital Competence	0.663	0.816	
Sustainable Teaching Practices	0.629	0.793	0.766

As reported in Table 3, H4 hypothesizing that faculty digital competence mediates the relationship between digital leadership and sustainable teaching practices is justified. The outcomes show that the effect (indirect) is statistically significant ($= -0.622$, $t = 2.286$, $p = 0.022$), which proves the existence of a mediation effect. The discovery reveals that faculty digital competence is a major factor in exerting the impact of digital leadership in the sustainable teaching practice. The negative value is an indication that the indirect relationship is negative (Al-Shaikh, Abu Al Wafa, Kanan, Al Assaf, & Alawamreh, 2025; Hair, 2014; Sarstedt, Ringle, & Hair, 2021). All in all, the findings offer empirical evidence to H4 in the postulated structural model.

Table 3. Specific indirect effect

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
H4: Digital Leadership -> Faculty Digital Competence -> Sustainable Teaching Practices	-0.622	-0.635	0.272	2.286	0.022

4.2 The Structural Model Evaluation

The structural model analysis, presented in Figure 2 and discussed in Table 4, gives a good idea of the dynamics between digital leadership, faculty digital competence, and sustainable teaching practices. The results show that the positive influence of digital leadership in faculty digital competence is very high. Particularly, the path coefficient is 0.983, the t-value is 394.952 and the p-value is 0.000 indicating a very strong relationship (Claassen et al., 2021; Philip & Gavrilova Aguilar, 2022). This indicates that members of the faculty with greater digital leadership abilities are probably to become more digitally competent. This result is further supported by Figure (2), the arrow between digital leadership and faculty digital competence is large and bold as it depicts the scale of the impact. On the same note, the direct impact of digital leadership on the sustainable teaching practices has a significant positive value of 1.451, the t-value is 5.443, and the p-value is 0.000. This shows that quality digital leadership is one of the driving forces of sustainable teaching, which means that leaders who adopt digital strategies are a direct factor of the enhancement of the teaching practices. This connection in the figure is emphasized with the help of a thick arrow between digital leadership and sustainable teaching practices (Enăchescu, 2025; Jogeza et al., 2023; König et al., 2020; Tondeur et al., 2020). Interestingly, the association between faculty digital competence and sustainable teaching practices is negative and statistically significant with a path coefficient of -0.633, t -value of 2.287, and p-value of 0.022. This implies that increasing the faculty digital competence in the framework of this model does not necessarily result in the improvement of sustainable teaching practices. This can also be seen in the figure which has the directional arrow but indicates that the coefficient is negative indicating that only competence cannot help in promoting sustainable practices without the effect of robust digital leadership (Basilotta-Gómez-Pablos, Matarranz, Casado-Aranda, & Otto, 2022; González-Medina, Gavín-Chocano, Pérez-Navío, & Maldonado Berea, 2025). To conclude, the structural model highlights the central place of the digital leadership in the development of faculty digital competence and sustainable teaching. Although it is a significant characteristic, digital competence seems to be the main driver of converting competence into effective, sustainable teaching outcomes.

Table 4. Evaluation of Structural Model - Path coefficient

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ((O/STDEV))	P values
Digital Leadership -> Faculty Digital Competence	0.983	0.983	0.002	394.952	0.000
Digital Leadership -> Sustainable Teaching Practices	1.451	1.465	0.267	5.443	0.000
Faculty Digital Competence -> Sustainable Teaching Practices	-0.633	-0.646	0.277	2.287	0.022

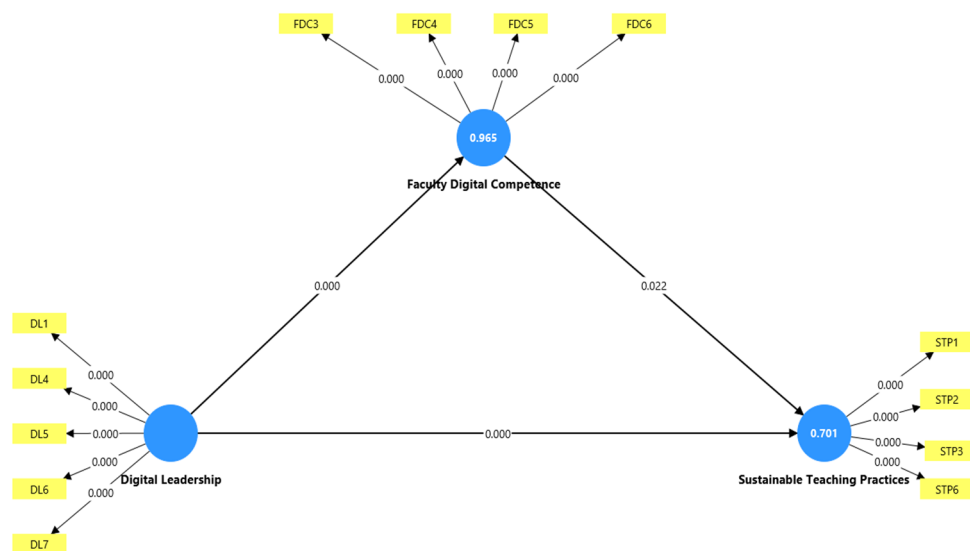


Figure 2. Evaluation of structural model

5. Discussion

The analysis of structural model proved the strong and dual role of digital leadership in the environment of Northern Jordanian universities, which can be seen as significant empirical evidence of two hypotheses. To begin with, the finding

that (H1) the supportive leadership as an environmental factor positively affects the self-efficacy and competence as a personal one ($\beta = 0.983$, $p = 0.001$) is strongly consistent with the social cognitive theory, according to which the former factor directly impacts the latter one. And this is consistent with previous studies (Claassen et al., 2021; Philip & Gavrilova Aguilar, 2022). The remarkably large path coefficient may indicate that the strategic determination of the leadership concerning the digital transformation is successfully converted to the perceived ability of the faculty regarding the digital aspect. Second, the research also made the finding that digital leadership positively affects sustainable teaching practices ($\beta = 1.451$, $p < 0.001$) which is in line with the literature regarding the ability of leaders to shape the strategic vision and resource allocation as a direct factor towards developing resilient and future-ready pedagogical models. Therefore, this is compatible with other studies (Enăchescu, 2025; Jomezai et al., 2023; König et al., 2020; Tondeur et al., 2020). Nonetheless, the most important and unanticipated result came about in the correlation between faculty digital competence and sustainable teaching practices that turned out to be distinctly negative ($\beta = -0.633$, $p = 0.022$). This counterintuitive finding is a direct contradiction of the assumption underpinning this study that the increased competence allows more sustainable practices. Moreover, this is compatible with other studies (Basilotta-Gómez-Pablos et al., 2022; González-Medina et al., 2025). The study cannot claim that faculty members were highly qualified and made specific choices, as no data were collected or presented to transparently support this assertion. However, the results can be interpreted within a potential framework of digital over-adoption or what is known as complexity bias, whereby some faculty members, regardless of their level of competence, may be inclined to adopt complex, non-standard, or rapidly changing digital solutions (Granić, 2022). These solutions are often difficult to maintain, replicate, or integrate into the existing institutional infrastructure, which may affect the sustainability of teaching practices and hinder the achievement of consistent, long-term educational outcomes. Based on this, the study can highlight this phenomenon as a possible explanatory point, while emphasizing the need for future research to verify its presence and directly measure its impact, with the aim of promoting strategies for the sustainable use of digital tools in education. As a result, the mediation hypothesis (H4) provided a conflicting mediation effect, in which the positive significant impact of digital leadership on sustainable practices is mediated by the negative effect of the highly competent faculty which is paradoxical. This brings out an indispensable predicament; the effective cultivation of personal digital ability has to be supported by tactical direction so that its use results in institutionally sustainable impacts (Falloon, 2020; Howard et al., 2021).

5.1 Theoretical and Practical Contributions

This research contributes to the field in many important ways as it has offered empirical validation and context-specific insights. On the one hand, the study theoretically confirms the relevance of the social cognitive theory in explaining digital transformation in higher education, specifically, the relationship between the environmental variable (digital leadership) and the personal variable (faculty digital competence) within a non-Western environment (Bandura, 1999, 2018). In practice, these findings provide critical and actionable insights for policymakers and university leaders in Jordan and other developing economies. They indicate that digital transformation is not merely about creating digital capabilities, but fundamentally about managing their use. Leaders should therefore focus on guiding highly competent faculty to prioritize simplicity, replicability, and institutional sustainability, ensuring that their advanced capabilities translate into truly sustainable pedagogical practices (Rasdiana et al., 2024; Sukandi, 2024).

6. Conclusion

This research examined the structural relationships between digital leadership, faculty digital competence, and sustainable teaching practices in Northern Jordanian universities, validating the dual role of digital leadership in both enhancing faculty competence and directly influencing sustainable practices. However, the study reveals a critical insight: a strong negative correlation exists between faculty digital competence and sustainable teaching practices, indicating that even advanced digital skills alone do not guarantee sustainable teaching outcomes. This finding underscores the need for university leaders to move beyond mere faculty training and implement strategic directions that guide highly competent faculty toward practices emphasizing simplicity, replicability, and institutional sustainability. For higher education institutions in North Jordan and similar developing contexts, the practical implication is clear: achieving true sustainability requires a combination of institutional vision and purposeful strategies that regulate the application of individual competencies.

Despite the robustness of the results, the study has several limitations that open avenues for future research. First, the reliance on a cross-sectional research design limits the ability to establish causality or to observe the evolution of sustainable teaching practices over time; future research should adopt longitudinal designs to track how these relationships, particularly the negative link between competence and sustainability, evolve as digital transformation matures in the region (Creswell & Creswell, 2017). Second, the use of self-reported data introduces the potential for common method bias, highlighting the need for future studies to triangulate perceptions with objective indicators of sustainable teaching practices, such as learning management system analytics or course design rubrics (Podsakoff et al., 2003).

The counterintuitive negative relationship between competence and sustainability also points to the importance of qualitative investigations, such as in-depth interviews with highly competent faculty, to explore the motivations behind the adoption of less sustainable practices. Such research could refine the operationalization of the sustainable teaching practices constructed to better reflect the balance between innovation and long-term viability. Finally, the current model does not account for potential moderating variables. Future studies should examine whether factors such as institutional support, access to high-speed internet, or faculty experience moderate the relationship between digital competence and sustainability (Podsakoff et al., 2003; Yulin & Danso, 2025).

In summary, while this study offers valuable insights into digital leadership and competence in relation to sustainable teaching, clearly defining these concepts in the context of digital technologies and sustainable practices—along with incorporating these considerations earlier in the methodology and literature review—would strengthen the rigor and applicability of the findings.

Acknowledgments

We would like to acknowledge all colleagues and collaborators who provided valuable assistance in conducting this study and offered insightful comments that helped improve the manuscript. We also extend our sincere appreciation to all participants who generously contributed their time and effort to this research. Special thanks are due to those who supported the preparation and organization of the manuscript.

The authors are grateful to the Deanship of Scientific Research at Ajloun National University and Jadara University for providing financial support for this publication.

Author contributions

The researcher extends sincere gratitude to Ajloun National University for its invaluable support and facilitation during the data collection process. Special thanks are also due to the dedicated teachers who generously contributed their time and insights, making this study both possible and meaningful.

The authors are grateful to the Deanship of Scientific Research at Jadara University for providing financial support for this publication.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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