

Teachers' Digital Literacy and Its Associations with Job Performance and Instructional Strategies: A Cross-Sectional Study

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ABSTRACT

Background: The increasing adoption of digital technologies in educational environments has reshaped teachers' professional responsibilities. Digital literacy is now recognized as a key professional competency that may influence teachers' job performance and instructional practices. Nevertheless, research examining the associations between digital literacy, including its various dimensions, and these professional outcomes remains insufficient, particularly among secondary school teachers in developing educational contexts. Therefore, this study sought to investigate these associations.

Methods: This cross-sectional correlational study involved 98 lower secondary school teachers in Aghajari County, Khuzestan Province, Iran, between September 2024 and February 2025. Participants were recruited using a census sampling method. Data were collected using the Digital Literacy Questionnaire, the Job Performance Questionnaire, and the Teachers' Instructional Strategies Questionnaire. Pearson correlations were used to examine associations between digital literacy and the outcome variables. Simple linear regression models were conducted for the overall digital literacy score to estimate its association with job performance and instructional strategies. Data were analyzed using SPSS version 24.

Results: Overall digital literacy was positively associated with job performance ($r=0.724$, $p<0.001$) and instructional strategies ($r = 0.732$, $p<0.001$). In simple linear regression models, the overall digital literacy score accounted for 52.4% of the variance in job performance ($R^2 = 0.524$; adjusted $R^2 = 0.520$) and 53.6% of the variance in instructional strategies ($R^2 = 0.536$; adjusted $R^2 = 0.532$). All four digital literacy dimensions were also positively associated with job performance and instructional strategies (all $p < 0.001$). The correlations with job performance were 0.50, 0.61, 0.68, and 0.57 for technical, cognitive, attitudinal, and socio-emotional literacy, respectively; corresponding correlations with instructional strategies were 0.53, 0.61, 0.67, and 0.59.

Conclusion: Higher levels of overall digital literacy and its individual dimensions were associated with better reported job performance and instructional strategies. These findings support the importance of comprehensive digital literacy development in teacher professional development, while the cross-sectional design limits causal interpretation.

Keywords: Computer Literacy; Students; Work Performance; Teaching; Schools

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Introduction

Digital transformation has deeply changed educational systems worldwide, influencing how teaching, learning, and professional practices are designed and conducted (1). In present educational contexts, instructors are increasingly expected to merge digital technologies into instructional processes, manage digital learning environments, and support students in developing essential twenty-first-century skills (2). As a result, digital literacy has become as a critical professional competence for instructors, extending beyond basic technical skills to encompass cognitive, attitudinal, and socio-emotional dimensions (3).

Digital literacy is generally understood as the capacity to use digital technologies effectively, critically, and responsibly for managing information, communicating, collaborating, and addressing problems (4). Among the various theoretical perspectives, Ng's (2012) multidimensional framework is widely acknowledged for describing digital literacy as an integration of technical, cognitive, attitudinal, and socio-emotional competencies (5). According to this framework, digital literacy extends beyond the practical ability to operate digital tools, encompassing critical reflection, ethical engagement in digital environments, and constructive attitudes toward the integration of technology in educational contexts.

Previous research has demonstrated that teachers' digital literacy plays a significant role in shaping instructional quality and professional performance (5, 6). Teachers with higher levels of digital literacy are more likely to adopt innovative teaching strategies, effectively integrate digital tools into classroom practices, and adapt instructional methods to diverse learner needs (7). These relationships are particularly important in secondary education settings, where teachers face increasing curricular demands and rapidly evolving technological expectations (8).

Instructional strategies represent another key dimension of effective teaching, reflecting how teachers design learning activities,

engage students, manage instructional processes, and create supportive learning environments (9). Contemporary pedagogical approaches increasingly prioritize student-centered learning, collaborative teaching, motivational techniques, and adaptive instructional practices, all of which often depend on teachers' ability to integrate digital technologies effectively into their teaching (10). Consequently, digital literacy may play an important role in shaping teachers' instructional strategies and influencing their overall job performance (11).

Nevertheless, the association between digital literacy and instructional strategies may vary across its different dimensions. Possessing technical skills alone does not necessarily ensure the effective integration of technology into teaching practices. Teachers also need cognitive competencies to critically assess and utilize digital information, favorable attitudes toward technology adoption, and socio-emotional skills to facilitate effective communication and collaboration in digital settings. Therefore, examining these dimensions individually may provide a more comprehensive understanding of the associations between digital literacy and teachers' professional practices.

Despite growing international interest in teachers' digital literacy, empirical evidence examining its relationship with job performance and instructional strategies remains limited, particularly in non-Western and developing educational contexts (12). In Iran, most existing studies have focused on students' digital literacy or general technology acceptance, with comparatively fewer studies investigating teachers as the focal population (13-15). Furthermore, research that simultaneously examines digital literacy, job performance, and instructional strategies within a single empirical model is scarce.

More importantly, the existing literature has often examined digital literacy in relation to a single outcome, such as technology acceptance, digital competence, or instructional quality, rather than examining

multiple dimensions of teachers' professional functioning simultaneously. In addition, much of the available evidence has focused on students, preservice teachers, or specific aspects of technology integration, leaving less clear evidence regarding how teachers' multidimensional digital literacy relates to both their professional performance and their day-to-day instructional strategies. This limitation is important because effective technology-enhanced education depends not only on teachers' ability to operate digital tools, but also on their ability to use these tools critically, confidently, responsibly, and pedagogically.

To address these gaps, the present study examined the associations between teachers' digital literacy, job performance, and instructional strategies among lower secondary school teachers. Particular attention was given to both overall digital literacy and its four dimensions—technical, cognitive, attitudinal, and socio-emotional literacy—and their associations with teachers' professional outcomes. Drawing on Ng's (2012) digital literacy framework (5), the study conceptualized digital literacy as a construct encompassing multiple interrelated competencies and assessed the extent to which both overall digital literacy and its individual dimensions were associated with teachers' job performance and instructional practices.

Clarifying these relationships is particularly important because professional digital competence is increasingly expected to support not only the use of technology itself, but also the quality of teachers' professional performance and the pedagogical decisions they make in technology-rich learning environments.

Although much of the existing empirical research on digital literacy has been conducted within general education and technology-supported learning environments, these competencies have become increasingly important in health professions education. In this context, educators are similarly required to incorporate digital technologies into instructional practices, student assessment,

simulation-based learning, and professional communication. While the present study focused on secondary school teachers in Aghajari, its implications extend to medical education and virtual learning in the health sciences, given the interdisciplinary importance of digital literacy and socio-emotional competencies. Digital competence is increasingly recognized as an essential skill across educational disciplines, particularly in medical education, where online learning environments, virtual simulations, and telemedicine-based training are becoming more prevalent. Examining the digital and psychological factors associated with teachers' engagement in technology-enhanced instruction may offer valuable insights for developing effective faculty training and professional development initiatives in medical education. Furthermore, socio-emotional literacy supports effective communication and collaboration, which are essential not only in educational settings but also in clinical instruction, patient-centered care, and interprofessional healthcare teamwork. Therefore, the findings of this study may provide both theoretical and practical insights into educator preparedness and faculty development in digitally enriched learning environments, including those within the medical sciences.

Accordingly, this study aimed to examine the associations between teachers' overall digital literacy and its four dimensions—technical, cognitive, attitudinal, and socio-emotional literacy—and two professional outcomes: job performance and instructional strategies. It also examined whether overall digital literacy was significantly associated with job performance and instructional strategies using simple linear regression models.

Method

Study Design and Setting

The study employed a cross-sectional correlational design to examine the relationships between teachers' digital literacy and two key outcomes: job

performance and instructional strategies. Data were collected from 98 teachers using standardized questionnaires. Demographic characteristics, including age, gender, and teaching experience, were collected but were not incorporated as covariates in the simple linear regression models. This parsimonious analytical approach aligned with the study's primary objective of assessing the unadjusted associations between overall digital literacy and the two professional outcomes in a sample of 98 teachers. The research was carried out among lower secondary school teachers in Aghajari County, Khuzestan Province, Iran, between September 2024 and February 2025.

Participants and Sampling

The study population comprised all lower secondary school teachers employed in Aghajari County, Khuzestan Province, Iran, during the 2024–2025 academic year. Based on official records obtained from the local Department of Education, the total population consisted of 98 eligible teachers. Given the relatively small and accessible population, a census approach was adopted, whereby all eligible teachers were invited to participate. Consequently, no separate sampling technique was employed, as the study aimed to include the entire target population.

Demographic data were gathered on participants' age, gender, teaching experience, educational attainment, teaching discipline, and familiarity with educational technologies. These characteristics were summarized to describe the study population but were not included as covariates in the statistical analyses.

Eligibility criteria required participants to be lower secondary school teachers employed in Aghajari County, Khuzestan Province, Iran, during the 2024–2025 academic year and to be actively involved in classroom instruction at the time of data collection. Additionally, participation was contingent upon providing informed consent and completing the study questionnaires.

Teachers were excluded if they failed to complete the study questionnaires or

provided responses with substantial missing information that prevented their inclusion in the planned statistical analyses. Additionally, teachers who were on prolonged leave or were not actively involved in teaching activities during the data-collection period were considered ineligible for participation.

Tools/Instruments

Data were collected using three standardized questionnaires assessing teachers' digital literacy, job performance, and instructional strategies.

Digital Literacy Questionnaire

Digital literacy was measured using the Digital Literacy Questionnaire developed by Ng (2012) (5). The questionnaire consists of 17 items organized into four dimensions: technical, attitudinal, socio-emotional, and cognitive literacy. The instrument was designed to assess teachers' multidimensional digital literacy, including their practical, cognitive, attitudinal, and socio-emotional competencies in using digital technologies. Items are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Accordingly, the total possible score ranges from 17 to 85, with higher scores indicating higher levels of digital literacy.

The four dimensions capture complementary aspects of digital literacy. The technical dimension focuses on practical skills in using hardware, software, and digital tools, including activities such as creating web pages and editing digital media. The cognitive dimension assesses the ability to search for, evaluate, interpret, and create digital information critically. The attitudinal dimension addresses teachers' comfort, awareness, willingness, and positive dispositions toward the use of digital technologies. The socio-emotional dimension concerns social interaction, ethical behavior, communication, and emotional responses in digital environments, including the management of online interactions and privacy-related issues.

A standardized Persian version for the Digital Literacy Questionnaire was not available in the literature. Therefore, the original instrument developed by Ng (5) was translated into Persian using a forward–backward translation procedure.

Validity and Reliability - The initial Persian version was reviewed by a panel of experts in educational technology and curriculum studies to assess content validity. The content validity index (CVI) of the items was found to be acceptable ($CVI > 0.80$).

The four digital-literacy dimensions—technical, cognitive, attitudinal, and socio-emotional literacy—were scored according to the original structure proposed by Ng (5).

Regarding internal consistency, Cronbach's alpha coefficients available in the original study records were 0.83 for technical literacy, 0.81 for cognitive literacy, and 0.78 for attitudinal literacy. The reliability coefficient for the socio-emotional dimension could not be retrieved from the available original records and therefore could not be independently verified. Accordingly, no reliability coefficient is reported for the socio-emotional dimension, and no blanket claim that all four digital-literacy subscales achieved $\alpha > 0.70$ is made.

Job Performance Questionnaire

Teachers' job performance was evaluated using the 15-item Job Performance Questionnaire developed by Patterson (1970) (16) and subsequently translated into Persian by Arshadi and Shekarkan (1997) (17). Each item was rated on a four-point Likert scale, ranging from 0 to 3, yielding a total score between 0 and 45. Higher scores indicated better reported job performance. The total questionnaire score was used in the statistical analyses.

Validity and Reliability - Previous research in an Iranian context has reported acceptable face, content, and criterion validity for the 15-item Patterson Job Performance Questionnaire. Pashaei Yousef Kandi reported high internal consistency, with a Cronbach's alpha coefficient of 0.97 (18).

Teachers' Instructional Strategies Questionnaire

Teachers' instructional strategies were assessed using the Teachers' Instructional Strategies Questionnaire developed by Azimpour (2015) (19). In the analyzed dataset, the total score comprised 28 items rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), yielding a possible total score range of 28 to 140; higher scores indicate greater reported use of the assessed instructional strategies.

The questionnaire comprises seven dimensions:

Student-centered instructional strategies: Items assessing the extent to which teachers use learner-centered approaches and actively involve students in the learning process.

Group-based instruction: Items assessing the use of collaborative, group-based, and cooperative learning activities.

Motivation and attention strategies: Items assessing teachers' strategies for increasing students' motivation, attention, and engagement during instruction.

Optimal learning environment preparation: Items assessing teachers' efforts to create and organize a supportive and appropriate environment for learning.

Direct instruction: Items assessing teachers' use of explicit explanation, presentation, demonstration, and teacher-directed instructional practices.

Instructional process control: Items assessing teachers' monitoring, organization, and management of the instructional process.

Preparation strategies: items assessing teachers' planning and preparation of instructional activities, materials, and lessons before teaching.

Validity and Reliability - The content validity of the questionnaire was evaluated by a panel of experts in educational technology and educational sciences. Internal consistency was assessed using Cronbach's alpha, with coefficients of $\alpha > 0.70$ considered acceptable for the instructional-strategies instrument.

Data Collection

Data collection was conducted through in-person distribution of paper-based questionnaires. Following coordination with school administrators, the questionnaires were distributed to all eligible teachers. Data were collected from September 2024 to February 2025. Before distribution, the purpose of the study was explained to the participants, and informed consent was obtained. Participants were provided with instructions on how to complete the questionnaires and were informed about the voluntary nature of participation. All distributed questionnaires were collected upon completion, resulting in a complete response rate.

The questionnaires consisted of two sections: the first section gathered demographic information, and the second section assessed the main study variables. Participants were assured of the confidentiality and anonymity of their responses. All questionnaires were distributed and collected during the same academic term.

After obtaining the necessary permissions from relevant educational authorities, the researchers coordinated with school administrators to facilitate data collection. The questionnaires were distributed to all eligible teachers and completed voluntarily. Completed questionnaires were reviewed to ensure completeness before data entry. The collected data were then coded and entered into the Statistical Package for the Social Sciences (SPSS) software for analysis.

Data Analysis

Data were analyzed using the SPSS version 24. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize participant characteristics and the main study variables. Before inferential analysis, distributional assumptions were examined using the Kolmogorov–Smirnov test together with skewness and kurtosis. Most variables showed no statistically significant departure from normality; socio-emotional literacy was an exception and was therefore interpreted alongside skewness and kurtosis.

Given the overall distributional characteristics and the sample size, parametric analyses were retained.

Demographic characteristics, including age, gender, and teaching experience, were gathered solely for descriptive purposes and were not included as control variables in the statistical models.

Pearson correlation coefficients were calculated to examine the strength and direction of associations between overall digital literacy, its four dimensions (technical, cognitive, attitudinal, and socio-emotional literacy), job performance, and instructional strategies. Simple linear regression analyses were then conducted only for overall digital literacy to quantify its unadjusted association with job performance and instructional strategies. Model fit was assessed using R^2 and adjusted R^2 , while standardized beta (β) coefficients were reported. The Durbin–Watson statistic was used to assess the independence of residuals, and statistical significance was determined at $p < 0.05$.

Ethics - This study was approved by the Ethics Committee of Islamic Azad University, Behbahan, Iran. All participants were provided with information about the study's purpose. Participation was entirely voluntary, and informed consent was obtained from each teacher prior to completing the questionnaires. Participants were assured of the confidentiality and anonymity of their responses, and no personally identifiable information was collected.

Results

Demographic Characteristics of Participants

All 98 teachers included in the study completed and returned the questionnaires, resulting in a response rate of 100%. Table 1 presents the demographic and professional characteristics of the participants. Female teachers accounted for 57.1% of the participants, and the largest age group was 41–50 years (35.7%). Regarding educational level, the largest proportion of participants held a master's degree (38.8%), while 10.2% did not report their educational level.

Table 1: Demographic and professional characteristics of the participants

Variable	Category	n	%
Gender	Female	56	57.1
Gender	Male	42	42.9
Age (years)	20–30	12	12.2
Age (years)	31–40	24	24.5
Age (years)	41–50	35	35.7
Age (years)	≥51	27	27.6
Educational level	Associate degree or below	10	10.2
Educational level	Bachelor's degree	28	28.6
Educational level	Master's degree	38	38.8
Educational level	Doctoral degree	12	12.2
Educational level	No response	10	10.2
Teaching experience (years)	1–5	15	15.3
Teaching experience (years)	6–10	40	40.8
Teaching experience (years)	11–15	22	22.4
Teaching experience (years)	≥16	21	21.4

Table 2: Descriptive statistics for the main study variables

Variable	Mean	SD	Observed Min–Max
Overall digital literacy	54.01	10.73	20–85
Technical literacy	20.11	04.39	7–30
Cognitive literacy	05.89	01.95	2–10
Attitudinal literacy	22.70	05.09	9–35
Socio-emotional literacy	05.31	01.59	2–10
Job performance	45.07	10.03	17–73
Instructional strategies	82.99	17.68	32–134

SD: Standard Deviation

In terms of teaching experience, the largest proportion of participants had 6–10 years of teaching experience (40.8%).

Handling of Missing Data

Missing data were identified and transparently reported in the present study. As presented in Table 1, 10.2% of participants did not report their educational level. These responses were treated as missing values without recoding or imputation. Educational level was used solely for descriptive purposes to characterize the participants and was not included in the main inferential analyses. Given the relatively low proportion of missing data and the descriptive nature of this variable, advanced missing-data techniques, such as multiple imputation, were not employed. Instead, the proportion of missing responses was clearly reported in the results to ensure transparency.

Normality of Data Distribution

Before conducting the inferential analyses, the distributions of the study variables were assessed using the Kolmogorov–Smirnov test. Most variables did not show statistically significant deviations from normality ($p > 0.05$); however, socio-emotional literacy showed a significant deviation ($p = 0.007$). Skewness and kurtosis values were also examined and fell within the acceptable range of ± 2 , suggesting approximately normal distributions. Table 2 presents the descriptive statistics for the main study variables, including the mean, standard deviation, and observed minimum and maximum values. Considering the overall distributional characteristics of the variables and the robustness of Pearson correlation and linear regression to moderate deviations from normality, parametric analyses were considered appropriate for the sample of 98 participants.

Accordingly, Pearson correlation and linear regression analyses were conducted.

Association of Overall Digital Literacy with Job Performance

Simple linear regression analysis was performed to examine the association between overall digital literacy and teachers' job performance. The results revealed a strong positive association ($R = 0.724$), with overall digital literacy explaining 52.4% of the variance in job performance ($R^2 = 0.524$; adjusted $R^2 = 0.520$). The regression model was statistically significant ($F(1,97) = 105.90$, $p < 0.001$). The Durbin–Watson statistic of 1.705 suggested no substantial autocorrelation among the residuals. Furthermore, the standardized regression coefficient confirmed a strong positive association between overall digital literacy and job performance ($\beta = 0.724$, $t = 10.29$, $p < 0.001$). Table 3 presents the detailed results of the regression analysis.

The unstandardized coefficient ($B = 0.677$) indicates that, in this unadjusted model, each one-point increase in overall digital literacy was associated with an average 0.68-point higher job-performance score.

Association of Overall Digital Literacy with Instructional Strategies

A separate simple linear regression analysis quantified the association between overall digital

literacy and instructional strategies. The findings indicated a strong positive association ($R = 0.732$), with overall digital literacy accounting for 53.6% of the variance in instructional strategies ($R^2 = 0.536$; adjusted $R^2 = 0.532$).

The regression model was statistically significant ($F(1,97) = 111.14$, $p < 0.001$), and the Durbin–Watson statistic (1.742) supported the assumption of independent residuals. The standardized coefficient indicated a strong positive association between overall digital literacy and instructional strategies ($\beta = 0.732$, $t = 10.54$, $p < 0.001$). Table 4 presents the detailed results of the regression analysis.

The unstandardized coefficient ($B = 1.206$) indicates that, in this unadjusted model, each one-point increase in overall digital literacy was associated with an average 1.21-point higher instructional-strategies score.

Associations of Digital Literacy Dimensions with Job Performance and Instructional Strategies

Pearson correlation analyses showed that all four dimensions of digital literacy were positively and significantly associated with job performance and instructional strategies (all $p < 0.001$). As presented in Table 5, technical, cognitive, attitudinal, and socio-emotional literacy were positively correlated with job performance ($r = 0.50$, 0.61 , 0.68 , and 0.57 , respectively).

Table 3: Simple linear regression of job performance on overall digital literacy

Predictor	B	SE	β	t	P-Value	R^2	Adjusted R^2
Constant	8.533	3.619	—	2.36	0.020	—	—
Overall digital literacy	0.677	0.066	0.724	10.29	<0.001	0.524	0.520

R^2 and adjusted R^2 are model-level statistics; SE: Standard Error; β : Standardized coefficient; B: Unstandardized coefficient.

Table 4: Simple linear regression of instructional strategies on overall digital literacy

Predictor	B	SE	β	t	P-Value	R^2	Adjusted R^2
Constant	17.829	6.301	—	2.83	0.006	—	—
Overall Digital Literacy	1.206	0.114	0.732	10.54	<0.001	0.536	0.532

R^2 and adjusted R^2 are model-level statistics; SE: Standard Error; β : Standardized coefficient; B: Unstandardized coefficient

Table 5: Pearson correlations between digital literacy dimensions and job performance

Digital Literacy Variable	Job Performance (r)	P-Value
Overall Digital Literacy	0.724	< 0.001
Technical Literacy	0.501	< 0.001
Cognitive Literacy	0.611	< 0.001
Attitudinal Literacy	0.682	< 0.001
Socio-emotional Literacy	0.574	< 0.001

Pearson correlation coefficients are reported; All associations were positive and statistically significant.

Table 6: Pearson correlations between digital literacy dimensions and instructional strategies

Digital Literacy Variable	Instructional Strategies (r)	p
Overall Digital Literacy	0.732	<0.001
Technical Literacy	0.527	< 0.001
Cognitive Literacy	0.609	<0.001
Attitudinal Literacy	0.673	< 0.001
Socio-emotional Literacy	0.587	< 0.001

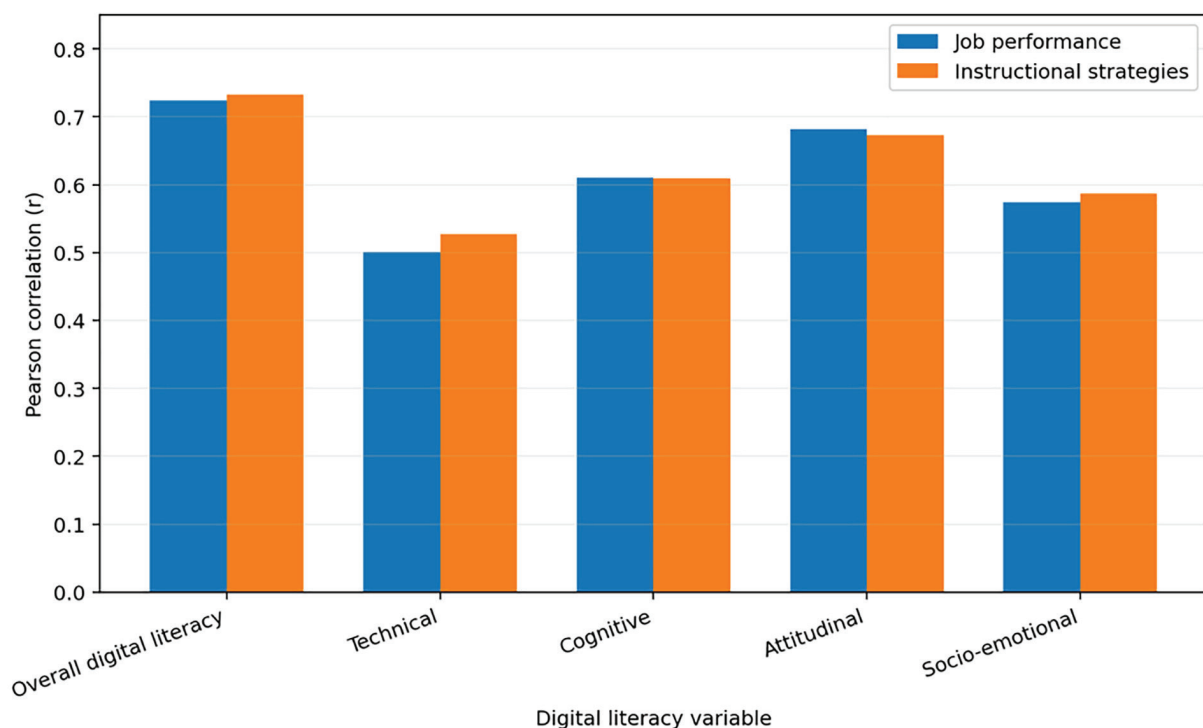
Pearson correlation coefficients are reported; All associations were positive and statistically significant.

Attitudinal literacy showed the largest observed correlation with job performance among the four dimensions.

Similarly, all four dimensions were significantly and positively associated with instructional strategies (Table 6). The correlation coefficients were 0.53 for technical literacy, 0.61 for cognitive literacy, 0.67 for attitudinal literacy, and 0.59 for socio-emotional literacy. These findings indicate

consistent positive associations between digital literacy dimensions and teachers' reported instructional strategies. Because the dimensional analyses were correlational, these results do not establish causal effects or permit conclusions about the relative strength of the associations across dimensions.

The correlations between overall digital literacy, its dimensions, and the two outcome variables are visually illustrated in Figure 1.

**Figure 1:** Associations of digital literacy dimensions with job performance and instructional strategies

The figure highlights the strength of the associations between digital literacy variables, job performance, and instructional strategies, providing a visual complement to the detailed correlation coefficients presented in Tables 5 and 6.

Discussion

The present study investigated the relationships between teachers' digital literacy, job performance, and instructional strategies among lower secondary school teachers. Overall, the findings revealed significant positive associations between digital literacy and both job performance and instructional strategies. Teachers with higher levels of digital literacy reported better job performance and greater use of diverse instructional strategies. Additionally, the four dimensions of digital literacy demonstrated varying strengths of association with these professional outcomes.

The findings further revealed a significant positive association between teachers' digital literacy and their reported job performance. Teachers with higher levels of digital literacy also reported higher job-performance scores within this cross-sectional sample. This finding is consistent with existing literature highlighting digital literacy as an essential professional competence for teachers in contemporary educational settings (20, 21).

These findings align with previous research demonstrating positive associations between teachers' digital literacy and job performance (11, 22). Prior research has linked digital literacy with instructional effectiveness, classroom management, and adaptability to educational innovations (7, 20). Previous studies in educational and organizational settings have also highlighted associations between digital competence and work performance, particularly in relation to information access, communication, and problem-solving processes (23). The present study contributes to this body of literature by providing additional cross-sectional evidence from the Iranian secondary education context.

In addition to job performance, digital

literacy was significantly associated with teachers' instructional strategies. Teachers with higher digital-literacy scores reported greater use of student-centered, collaborative, and motivational teaching practices. This pattern is consistent with the view that digital competence may support richer and more interactive learning environments, although the present cross-sectional design cannot establish directionality or causation.

The observed association between digital literacy and instructional strategies is consistent with previous research on digital competence and pedagogical innovation (24). Several studies have reported positive relationships between teachers' digital literacy and active learning methods (25), technology-enhanced instruction (26), and learner-centered pedagogies (27). The present findings are compatible with these patterns but should be interpreted as associations rather than evidence that digital literacy causes changes in instructional practice.

All four dimensions of digital literacy were positively associated with the two professional outcomes. However, the dimensional analyses used Pearson correlations rather than separate regression models; therefore, the present study does not permit conclusions about the independent contribution or relative strength of association of individual dimensions.

Some patterns differ from earlier research emphasizing technological skills and Information and Communication Technology (ICT) competencies in teachers' technology integration and instructional practices (28-31). In the present data, attitudinal literacy showed the largest observed correlations, while cognitive and socio-emotional literacy also showed moderate to strong positive associations. These differences may reflect contextual factors such as educational infrastructure, access to technology, professional development opportunities, measurement approaches, or population characteristics. Because the dimensions were not entered simultaneously in a multivariable model, the present findings should not be used to rank them by independent association

strength.

Another possible explanation for divergent findings lies in differences in measurement tools and research populations. Studies employing narrower definitions of digital literacy may overemphasize technical skills, whereas multidimensional frameworks, such as Ng's model used in this study, capture a broader range of competencies that are more closely aligned with pedagogical practice. Additionally, cultural and institutional factors specific to the Iranian educational context may shape how teachers perceive and utilize digital technologies in their professional roles.

Overall, the findings highlight the importance of digital literacy as a multidimensional construct positively associated with teachers' job performance and instructional strategies. Among the four dimensions, attitudinal literacy demonstrated the strongest observed correlations with both outcomes. However, these findings should not be interpreted as evidence of a stronger independent association, as the dimensions were not examined simultaneously in a multiple regression model.

The results suggest that educational administrators and policymakers should consider developing professional development programs that extend beyond basic technical skills to address the cognitive, attitudinal, and socio-emotional dimensions of digital literacy. Such programs may help strengthen teachers' digital competencies and support more effective technology integration in educational settings.

Future research should employ longitudinal and experimental designs to clarify the direction of these relationships and determine whether improvements in digital literacy lead to changes in teachers' professional outcomes. Additionally, studies involving larger and more diverse samples across different educational contexts are recommended to improve the generalizability of the findings.

Limitations and Suggestions

A key limitation of this study is the

inability to fully control for potential confounding variables because the analyses were limited to bivariate correlations and simple linear regression. Future research should employ multivariable models to estimate the independent association of digital literacy with teachers' job performance and instructional strategies while accounting for factors such as age, gender, teaching experience, educational level, and technology access.

An important psychometric limitation of the present study was that the factorial validity of the Persian version of the Digital Literacy Questionnaire was not independently assessed. Although the instrument underwent forward-backward translation and expert review to establish content validity, findings related to the dimensions of digital literacy should be interpreted with caution. Future research should examine the factor structure of the Persian version using larger, independent samples to provide further evidence of its construct validity.

Furthermore, the cross-sectional design of the study precludes causal inference, and future longitudinal studies are recommended to further investigate the observed associations.

Conclusion

This study found significant positive associations between teachers' digital literacy and both job performance and instructional strategies. All four dimensions of digital literacy were also positively associated with the two professional outcomes. However, because the study used a cross-sectional correlational design, these findings should be interpreted as associations rather than causal effects. The findings support the value of comprehensive digital literacy development in teacher professional development, with attention to technical, cognitive, attitudinal, and socio-emotional competencies.

Abbreviations

CVI: Content Validity Index

SD: Standard Deviation

SE: Standard Error

β: Standardized Regression Coefficient

R²: Coefficient of Determination

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Authors' Contribution

GhZ conducted the study design, data collection, data analysis, and drafted the manuscript. LA supervised the research process, contributed to the conceptualization of the study, and critically reviewed and revised the manuscript. All authors reviewed and approved the final manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

Ethical Considerations

Prior to data collection, permission was obtained from the relevant educational authorities, and ethical approval was granted by the Ethics Committee of Islamic Azad University, Behbahan, Iran (IR.IAU.BEHBAHAN.REC.1404.074). All participants were informed about the purpose of the study,

and informed consent was obtained before completing the questionnaires. Participation was entirely voluntary, and participants were assured of the confidentiality and anonymity of their responses. No personally identifiable information was collected, and all data were used exclusively for research purposes. All study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

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Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. Due to ethical and privacy considerations, some data may be restricted or anonymized to protect participant confidentiality.

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