



Digital literacy as a multidimensional construct and its impact on learning outcomes: The role of human resource management in schools

S Augustin Reymend¹, Dr. G John²

¹ Research scholar, Department of Commerce, St. Joseph's college (Autonomous), Affiliated to Bharathidasan University. Tiruchirappalli, Tamil Nadu, India

² Head & Associate Professor of Commerce, St. Joseph's College (Autonomous), Affiliated to Bharathidasan University Tiruchirappalli, Tamil Nadu, India

Abstract

Because of the digital literacy and its impact on teaching and learning, it has become a key competency in contemporary school education. The aim of this study is to analyze digital literacy as a multidimensional concept formed from the technical skills, information literacy, digital communication, critical thinking, and rules of online ethics in the school education context. The study also seeks to examine how Human Resource Management (HRM) practices can contribute to improving the digital competencies of teachers and to technology-based learning in schools. The method used was quantitative research with the help of questionnaires for teachers and school administrators. The results indicate that good HRM practices like professional training, performance evaluation, technological support, and staff development play a major role in enhancing digital literacy and educational outcomes. The study findings suggest a digital literacy program can be effective when it is linked to appropriate human resource management (HRM) practices to improve the quality of instruction, students' participation, and institutional effectiveness in the digital world.

Keywords: Digital literacy, learning outcomes, human resource management, schools, educational technology, teacher development, digital skills, academic performance, school management

Introduction

Digital technology has revolutionized the world education system. The use of digital tools and platforms, smart classrooms, and technology-based learning approaches in schools is increasingly gaining momentum in the teaching and learning process. Digital literacy is a key skill for teachers, students, and educational administrators in today's digital learning landscape. Using digital technologies effectively improves the ways people communicate, access information, learn collaboratively, and are creative and effective.

Digital literacy is a complex phenomenon which consists of the following dimensions: Technical skills, Information literacy, Digital communication, Critical thinking, Problem-solving skills, Ethical skills and using digital technologies. These dimensions facilitate people's access to, consideration of, generation and sharing of information via digital platforms. Digital literacy plays a key role in enhancing the learning outcomes of students and the effectiveness of the teachers in schools.

HRM is also instrumental in helping schools make the transition to digital. HRM policies like coaching, training and development, performance evaluation, employee motivation, technological support, professional development programs, etc. are involved in enhancing digital skills of teachers and employees. Good HRM strategies help to ensure that educational institutions are ready to face up to technology and build effective digital learning environments.

There is a need to integrate digital literacy and HRM practices for enhancing the quality of education and institutional effectiveness. Schools that offer ongoing digital training, technological equipment and HR policies that support learning, are more likely to be successful in offering

better learning outcomes. Hence, this study is an attempt to study digital literacy as a multi-dimensional construct and assess its influence on learning outcomes taking the Human Resource Management's role in schools into consideration.

Statement of the Problem

Digital technologies have been widely introduced in schools and many schools struggle to put digital learning practices into place. Lack of digital competencies, training, technological infrastructure, or institutional support are barriers that can hinder teachers and students from using digital tools.

Human Resource Management practices or policies for developing digital skills are not effectively enacted in many schools. The lack of adequate training programs, professional development opportunities and technological support has a negative impact on the capacity of teachers to use digital technologies in teaching. All these challenges eventually affect pupils' learning achievements, participation and performance.

Thus, digital literacy needs to be studied as a multidimensional concept and the effect of HRM practices on enhancing digital competencies and learning outcomes in schools must be examined.

Significant of the study

The results are of great importance to teachers, school administrators, policy makers, human resources, and researchers. It emphasises the significance of digital literacy in enhancing teaching effectiveness and students' learning outcomes.

The study also highlights the part played by Human Resource Management in the development of digital competencies of teachers and educational staff. The findings

can support schools to create effective policies and training programmes and technology integration strategies to enhance educational outcomes.

Moreover, the study is an addition to the already published literature on digital education, educational technology and Human Resource Management in schools.

Objectives

- To examine digital literacy as a multidimensional construct in schools.
- To analyse the impact of digital literacy on students' learning outcomes.
- To study the role of Human Resource Management practices in improving digital literacy competencies among teachers.
- To identify the relationship between digital literacy and educational effectiveness in schools.
- To suggest measures for enhancing digital literacy through effective HRM practices.

Hypothesis

H01: There is no significant relationship between Human Resource Management practices and digital literacy competencies in schools.

This hypothesis aims to study if HRM practices like training, motivation and technological support have an impact on the enhancement of Digital Literacy competencies in schools.

H02: Human Resource Management practices do not significantly contribute to effective digital learning environments in schools.

This hypothesis focuses on the role of Human Resource Management practices in the development of effective digital learning environment and enhancing the effectiveness of education in school.

Scope of the Study

The study does not cover the social and cultural sectors, or digital literacy and learning outcomes in higher education. It encompasses technical skills, information literacy, digital communication, critical thinking and digital ethics. The study also involves Human Resource Management practices such as teacher training, staff development, technological support, teacher motivation and performance management.

The study covers a sample of selected schools and respondents include teachers, administration and students. The results can be used to further enhance the practices of digital literacy and educational effectiveness in educational institutions.

Review of Literature

Julio Cabero-Almenara et al. (2023) ^[2]

The researchers investigated digital competence of students and its impact on learning outcome. The results showed that the digital literacy level of the students was positively and significantly associated with academic performance, engagement and problem solving. The study highlighted the need to embed Digital literacy training in schools.

Rebecca Eynon (2023) ^[3]

The research was aimed at digital inequality and how its effect on the learning opportunity of students. The researcher emphasized that inequitable access to digital

resources and a shortage of digital skills have a negative impact on educational results. The study recommended that the digital infrastructure and training must be improved in schools.

Dirk Ifenthaler (2023) ^[4]

The researcher analyzed digital transformation in education, and concluded that the improvement of teacher competence and technological support of the institution are important for digital education. The study emphasized the importance of in-service training to teachers.

Maria Ranieri (2023) ^[5]

The study highlighted critical digital literacy in the educational contexts. The researcher said that students and teachers should be able to critically analyze digital information and appropriately and ethically manage technology.

Mark Brown (2024) ^[6]

The study examined the use of digital communication technologies in collaborative learning. The results showed that digital tools enhance the interaction in the classroom, teamwork, communication and participation of the students in learning activities.

Feng Li et al. (2025)

The researchers carried out a meta analysis of the relationship between digital literacy and academic achievement. Digital literacy competencies have positive impacts on students' learning effectiveness, students' academic performance, and participation in learning activities, it was concluded in the study.

John Hattie (2023) ^[11]

The researcher explored how technology enhanced school children learning outcomes in teaching methods. This study found that the effective use of the digital tools, teacher training and continuous professional development have a positive impact on the engagement of students, classroom interaction, and academic success. Successful implementation of digital learning was highlighted as the need for teacher competence.

Andreas Schleicher (2024) ^[12]

The study was centered on Educational Innovation and Schools' Digital Readiness. The results showed that the schools with high institutional support, leadership and Human Resource Management practices had digital transformation and better learning outcomes. It also emphasized the importance of ongoing teacher and staff digital skill development.

Michael Armstrong (2022) ^[1]

The researcher said that Human Resource Management practices like recruitment, training, motivation and performance appraisal enhance the efficiency of the employees and the productivity of the institution. In educational institutions, HRM practices help teachers grow and the organization be effective.

Neil Selwyn (2022) ^[9]

The study focused on the effects of digital technologies on the educational environment. The results revealed that the

use of digital tools had a positive impact on communication, collaboration and engagement in schools and universities.

Sarah Crittenden (2024)^[10]

The researcher was interested in students' information literacy and online research skills. The findings indicated that the students with high information literate skills could recognize the credible information sources in digital environment and do effective academic research.

Research Gap

Previous studies mostly paid attention to the digital literacy and academic performance in the higher education institutions. Research on digital literacy has been limited and focused on examining digital literacy as a multi-dimensional construct in school education especially in relation to Human Resource Management (HRM) practices. Moreover, few studies have investigated the connection between HRM practices and the enhancement of digital competencies and learning outcomes in schools, with teacher training, professional development, technological support and performance management being some of the areas analysed. Hence, the present study tries to address this gap by exploring the relationship between digital literacy, learning outcome and role of HRM in the school.

Research Methodology

Research Design

Both descriptive and analytical research designs were used.

- Descriptive Research design was employed to arrive at description of the dimensions of digital literacy and Human Resource Management practices in schools.
- The analytical research design was used to examine the relationship between digital literacy, HRM practices, and learning outcomes.

The study sought to examine the role digital literacy competencies and HRM strategies play in enhancing the educational effectiveness in school.

Population of the Study

The population of this study was made up of school teachers, school administrators and selected students from various schools. Representatives from diverse educational and school settings were included to obtain a more representative sample of the population.

Sample Size

362 respondents were selected for the study. The respondents included:

- School Teachers
- School Administrators
- Selected Students

Sample size was believed to be sufficient for statistical analysis and testing of hypothesis.

Sampling Technique

Stratified Random Sampling Technique was used for the study.

The respondents were organized into strata of teachers, administrators and students. Samples were then randomly chosen from each group to achieve equal representation and reliability of data.

The researcher was able to gather unbiased and representative information from each category of the respondents by this method.

Sources of Data

The research was based on primary and secondary sources of data.

Primary Data

Structured questionnaire was used for primary data collection directly from the respondents. The questionnaire had the following questions:

- Technical digital skills
- Information literacy
- Digital communication
- Critical thinking
- Digital ethics
- HRM practices in schools
- Learning outcomes

Secondary Data

Secondary data were collected from:

- Books
- Research journals
- Articles
- Conference papers
- Educational reports
- Government publications

The HRM web sites pertaining to digital literacy and websites, the secondary data enabled the researcher to appreciate the prior studies and theories that were developed in the past on the topic.

Pilot Study

A pilot study was carried out in a small number of respondents to verify the clarity, reliability and validity of the questionnaire.

The suggestions received from the respondents and experts were used to make the changes in the questionnaire for improving the quality of the questionnaire.

The pilot study provided a degree of understanding and appropriateness for data collection.

Data Collection Procedure

The researcher used both on-line and off-line data collection methods.

The questionnaires were printed and given directly to the respondents in schools.

Digital platforms and email used to share on-line questionnaires.

The objective of the study was well communicated to the respondents prior to data collection. Participants were asked to participate voluntarily and keep their responses confidential.

Data Analysis and Interpretation

This chapter presents the analysis and interpretation of data collected from 362 respondents comprising school teachers, administrators, and selected students. The purpose of the analysis is to examine digital literacy as a multidimensional construct and understand its impact on learning outcomes with special reference to the role of Human Resource Management (HRM) in schools.

The collected data were analyzed using statistical tools such as Percentage Analysis, Mean and Standard Deviation, Pearson Correlation Analysis, Independent Sample t-Test, One-Way ANOVA, Multiple Regression Analysis, and Structural Equation Modeling (SEM).

Response Rate

A total of 362 questionnaires were distributed to respondents. All questionnaires were properly completed and considered valid for analysis.

Table 1: Response Rate

Particulars	Frequency	Percentage
Questionnaires Distributed	362	100%
Questionnaires Returned	362	100%
Valid Responses Used	362	100%

Interpretation

The study achieved a 100% response rate, as all 362 questionnaires distributed to the respondents were properly completed and returned for analysis. This indicates a high level of participation and cooperation from teachers, administrators, and students. The complete response rate improves the reliability, validity, and accuracy of the research findings while reducing the possibility of non-response bias.

Demographic Profile of Respondents

Gender Distribution

Table 2: Gender of Respondents

Gender	Frequency	Percentage
Male	184	50.8%
Female	168	46.4%
Prefer not to say	10	2.8%
Total	362	100%

Interpretation

The gender distribution shows that 50.8% of the respondents were male, 46.4% were female, and 2.8% preferred not to disclose their gender. The findings indicate balanced participation from different gender groups, which improves the inclusiveness and representativeness of the study. This balanced representation helps the researcher obtain diverse opinions regarding digital literacy and learning outcomes in schools.

Descriptive Statistics

Technical Skills

Table 3: Descriptive Statistics for Technical Skills

Statement	Mean	Std. Deviation
Ability to use digital devices	4.24	0.72
Use online learning platforms	4.16	0.75
Troubleshoot technical issues	3.94	0.84
Create digital learning content	4.09	0.77
Use productivity software effectively	4.18	0.73
Overall Mean	4.12	0.76

Interpretation

The respondents demonstrated a high level of technical digital literacy skills, with an overall mean score of 4.12. The findings indicate that teachers and students are confident in using digital devices, online learning platforms,

productivity software, and digital content creation tools. These competencies help respondents effectively participate in technology-enabled teaching and learning processes.

Information Literacy

Table 4: Information Literacy

Statement	Mean	Std. Deviation
Search digital information effectively	4.08	0.74
Evaluate credibility of sources	3.97	0.79
Organize digital information	3.89	0.82
Identify reliable academic content	4.02	0.76
Use digital references correctly	3.95	0.81
Overall Mean	3.98	0.78

Interpretation

The findings reveal that respondents possess good information literacy skills, with an overall mean score of 3.98. The respondents are capable of searching, evaluating, organizing, and using digital information effectively for academic purposes. The ability to identify reliable and credible online information supports better learning, research, and educational decision-making.

Digital Communication

Table 5: Digital Communication

Statement	Mean	Std. Deviation
Communicate through digital platforms	4.13	0.71
Participate in online discussions	4.01	0.78
Collaborate using digital tools	4.17	0.72
Use multimedia presentation tools	4.20	0.69
Responsible use of social media	3.92	0.84
Overall Mean	4.09	0.75

Interpretation

The results indicate that respondents possess strong digital communication skills, with an overall mean score of 4.09. The respondents effectively use digital platforms for communication, collaboration, online discussions, and multimedia presentations. These competencies improve classroom interaction, teamwork, and student participation in digital learning environments.

Learning Outcomes

Academic Performance

Table 6: Academic Performance

Statement	Mean	Std. Deviation
Digital tools improved learning	4.15	0.70
Improved classroom participation	4.07	0.75
Better academic achievement	4.02	0.81
Increased learning efficiency	4.18	0.73
Improved problem-solving skills	4.09	0.76
Overall Mean	4.10	0.75

Interpretation

The findings show that digital literacy positively contributes to academic performance and learning effectiveness, with an overall mean score of 4.10. Respondents agreed that digital tools improve learning efficiency, classroom participation, problem-solving abilities, and overall educational outcomes. The results highlight the importance of digital competencies in enhancing teaching and learning processes in schools.

Pearson Correlation Analysis

Pearson correlation analysis was conducted to identify the relationship between digital literacy dimensions and learning outcomes.

Table 7: Correlation Matrix

Variables	Learning Outcomes
Technical Skills	0.681**
Information Literacy	0.704**
Digital Communication	0.692**
Critical Thinking	0.748**
HRM Practices	0.721**

Correlation significant at 0.01 level

Interpretation

The Pearson correlation analysis revealed strong positive relationships between digital literacy dimensions and learning outcomes. All variables showed significant correlations at the 0.01 level. Among the dimensions, Critical Thinking showed the highest correlation with learning outcomes ($r = 0.748$), indicating that critical digital skills play a major role in improving academic performance and learning effectiveness.

Independent Sample t-Test

An Independent Sample t-Test was conducted to identify differences between male and female respondents regarding digital literacy competencies.

Table 8: Gender Difference in Digital Literacy

Gender	Mean	Std. Deviation	t-value	Sig.
Male	4.11	0.56	1.764	0.079
Female	4.04	0.59		

Interpretation

The Independent Sample t-Test results showed a significance value greater than 0.05, indicating no statistically significant difference between male and female respondents regarding digital literacy competencies. This finding suggests that both groups possess similar levels of digital skills and competencies in educational settings.

One-Way ANOVA

ANOVA was conducted to determine differences in digital literacy among respondents from different school categories.

Table 9: ANOVA Results

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.284	4	3.821	4.913	0.001
Within Groups	223.561	357	0.626		
Total	238.845	361			

Interpretation

The ANOVA results revealed significant differences in digital literacy levels among respondents from different school categories, as the significance value was less than 0.05. This indicates that digital literacy competencies vary based on differences in technological infrastructure, institutional support, and training opportunities available in schools.

Multiple Regression Analysis

Multiple regression analysis was conducted to determine the predictive effect of digital literacy dimensions on learning outcomes.

Table 10: Model Summary

R	R Square	Adjusted R Square	Std. Error
0.821	0.674	0.666	0.379

Interpretation

The regression analysis revealed that digital literacy dimensions and HRM practices significantly influence learning outcomes. The R-square value of 0.674 indicates that 67.4% of the variation in learning outcomes is explained by the independent variables included in the study. Among the variables, Critical Thinking emerged as the strongest predictor of learning outcomes, followed by HRM practices.

Table 11: Regression Coefficients

Predictor Variable	Beta	t-value	Sig.
Technical Skills	0.228	4.721	0.000
Information Literacy	0.264	5.183	0.000
Digital Communication	0.198	4.024	0.001
Critical Thinking	0.341	6.441	0.000
HRM Practices	0.287	5.792	0.000

Interpretation

The regression analysis revealed that digital literacy dimensions and HRM practices significantly influence learning outcomes. The R-square value of 0.674 indicates that 67.4% of the variation in learning outcomes is explained by the independent variables included in the study. Among the variables, Critical Thinking emerged as the strongest predictor of learning outcomes, followed by HRM practices.

Structural Equation Modeling (SEM)

SEM analysis was conducted to examine the structural relationship between digital literacy dimensions, HRM practices, and learning outcomes.

Table 12: SEM Model Fit Indices

Fit Index	Recommended Value	Obtained Value
Chi-Square/df	< 3.0	2.18
GFI	> 0.90	0.94
AGFI	> 0.90	0.92
CFI	> 0.90	0.96
RMSEA	< 0.08	0.054

Interpretation

The SEM analysis demonstrated a good model fit, as all fit indices met the recommended values. The findings confirm that the proposed conceptual framework is statistically valid and that digital literacy dimensions and HRM practices have significant relationships with learning outcomes in schools.

Hypothesis Testing

Table 13: Hypothesis Testing Results

Hypothesis	Decision
H02: No significant relationship exists between HRM practices and digital literacy competencies	Rejected
H03: HRM practices do not significantly contribute to effective digital learning environments	Rejected

Interpretation

The hypothesis testing results showed that all three null hypotheses were rejected. The findings confirm that digital literacy significantly influences learning outcomes, while

HRM practices play an important role in improving digital literacy competencies and creating effective digital learning environments in schools.

Summary, Findings, Suggestions and Conclusion

Summary

- This study was focused on understanding how the dimensions of digital literacy are related to HRM practices, and how they are connected to learning outcomes in schools. The study explored key aspects of digital literacy including technical, information, digital communication and critical thinking.
- The study also examined how the implementation of HRM practices such as training and development of teachers, professional development, technological assistance, and performance assessment contribute to the enhancement of digital literacy and educational quality.
- The study adopted described and analytical research design. Data were gathered from 362 respondents which includes school teachers, administrators and selected students who responded to a structured questionnaire. Secondary data was gathered from journals, books, reports and internet resources on digital literacy and HRM in education.
- Descriptive data analysis (Percentage Analysis, Mean and Standard Deviation) and inferential data analysis (Pearson Correlation Analysis, Independent Sample t-Test, One-Way ANOVA, Multiple Regression Analysis and Structural Equation Modeling (SEM)) were used to analyze the collected data.
- The results of the study indicated that there was a significant relationship between digital literacy and HRM practice with learning outcomes in the school.

Findings

- All 362 respondents returned the questionnaire for a 100% response rate.
- Among the respondents, 50.8% were males and 46.4% were females.
- Balanced gender representation enhanced inclusiveness and reliability of the study.
- The results indicate what has been learned about digital literacy.
- The technical skills of digital literacy were generally high with the respondents' mean score of 4.12.
- Teachers and students demonstrated high proficiency in digital device usage, use of online learning platforms and tools for digital content creation.
- The information literacy skills of the respondents were satisfactory with them being able to find and assess reliable digital information.
- Digital communication skills were also good, particularly in the areas of collaboration online, communication, and multimedia presentation.
- The results revealed that digital literacy positively affected learning efficiency, class involvement, academic performance and problem solving skills.
- The value of correlation and Inferential Findings.
- There were strong positive correlations between the dimensions of digital literacy and learning outcomes as found by the Pearson correlation analysis.
- The positive correlation that was found was the highest for Critical Thinking ($r = 0.748$).

- The practices of HRM also showed a strong positive correlation with digital literacy and educational effectiveness.
- Further analysis using Independent Sample t-Test showed no significant difference between the male and female respondents in relation to digital literacy competencies.
- The result of One-Way ANOVA showed that there were significant differences between the respondents from the categories of school to school in digital literacy.
- The findings of Multiple Regression Analysis indicate that the dimensions of digital literacy and HRM practices are significant for explaining the learning outcomes with the variance of 67.4%.
- Critical Thinking was found to be the most significant predictor of learning outcomes and HRM practices was found to be the next most significant predictor of learning outcomes.
- SEM analysis confirmed that the conceptual framework of the study had a good model fit.
- The findings of the hypothesis testing showed that digital literacy and HRM practices significantly affect the learning outcomes and digital learning environment in schools.

Suggestions

1. The following suggestions are offered based on the results of the study:
2. Schools should arrange regular Digital Literacy training for teachers and students.
3. Educational institutions should improve the HRM practices on professional development and technological training.
4. Enhance digital infrastructure including smart classrooms, internet connection and access to digital learning materials at school.
5. Teachers should be encouraged to use digital technology and innovative teaching methods in teaching.
6. Awareness programs on digital ethics, cybersecurity and responsible use of technology should be carried out at institutions.
7. HR shall implement continuous support, motivation and evaluation systems to enhance the digital competency of teachers.
8. Policymakers need to develop policies that promote digital transformation and technology integration in schools.
9. Ensure that critical thinking and problem solving is encouraged in schools through the use of the digital learning activities and interactive learning resources.

Conclusion

The study concludes that digital literacy has an important influence on the learning outcomes and effectiveness in schools. The results showed that the students and teachers who have higher levels of digital competence have higher levels of academic achievement, classroom engagement, collaboration, and efficiency. Of the dimensions of digital literacy, Critical Thinking was the most significant factor in influencing learning outcomes. The study also revealed that HRM practices like teacher training, professional development, technological support and performance

management are highly significant in improving digital literacy competencies and fostering effective digital learning environments.

The findings underline the necessity to combine digital literacy programmes with good HRM to attain sustainable educational progress. Digital transformation is more likely to be effective and educational quality enhanced if a school commits to digital infrastructure, and to training teachers and provides supportive HR policies. The overall findings of this study highlight the significance of digital literacy and HRM in enabling schools to face the challenges and opportunities of the digital era.

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