

The Influence of Social Interaction and Collaborative Learning on Information Digital Literacy Skills Development in Rural Primary Schools

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Abstract

Information digital literacy skills are essential competencies for learners in the twenty-first century. However, their development among learners in rural primary schools continues to be constrained by inadequate ICT infrastructure, limited access to digital learning resources, insufficient teacher preparedness, and inadequate opportunities for collaborative technology-enhanced learning. This study examined the influence of social interaction and collaborative learning on Information Digital Literacy Skills Development in selected rural primary schools in Nyeri County, Kenya. The study adopted a positivist research philosophy and employed a quantitative research design. Data were collected from 2,894 learners using structured questionnaires and analysed using exploratory factor analysis, confirmatory factor analysis, structural equation modelling, and path analysis. The findings revealed that the measurement model demonstrated excellent fit ($\chi^2 = 247.9$, $df = 242$, $p = .383$; $CMIN/DF = 1.024$; $RMSEA = .003$; $CFI = 1.000$; $TLI = 1.000$; $GFI = .993$; $AGFI = .999$). The results further established that social interaction and collaborative learning had a positive and statistically significant influence on Information Digital Literacy Skills Development ($\beta = .130$), indicating that increased learner interaction, collaborative engagement, and shared learning experiences significantly enhance learners' Information Digital Literacy Skills. The study concludes that fostering social interaction and collaborative learning is fundamental to improving Information Digital Literacy Skills Development in rural primary schools. The study recommends strengthening collaborative learning practices, improving ICT infrastructure, and enhancing teachers' digital pedagogical competencies to create interactive learning environments that promote Information Digital Literacy Skills Development among learners in rural primary schools.

Keywords: Social interaction, collaborative learning, Information Digital Literacy Skills Development, rural primary schools, structural equation modelling.

Introduction

Information digital literacy skills have become essential competencies for learners in the twenty-first century, enabling them to locate, evaluate, create, and communicate information effectively using digital technologies. These skills are increasingly recognized as fundamental for academic achievement, lifelong learning, workforce preparedness, and participation in the digital economy (European Commission, 2023; OECD, 2023; UNESCO, 2023).

International initiatives, including Sustainable Development Goal 4 (SDG 4), emphasize the need to provide inclusive and equitable quality education while equipping learners with digital competencies required for the rapidly evolving knowledge society (United Nations, 2023; UNESCO, 2023). Despite these global commitments, significant disparities in Information Digital Literacy Skills Development persist, particularly among learners in rural and resource-constrained educational environments where access to digital technologies, infrastructure, and quality instructional support remains limited (UNESCO, 2023; UNICEF, 2023; World Bank, 2023).

Social interaction and collaborative learning have emerged as effective pedagogical approaches for enhancing information digital literacy skills. Rooted in social constructivist theory, collaborative learning promotes active learner engagement through peer interaction, shared problem-solving, knowledge construction, and collaborative decision-making (Dillenbourg, 1999; Johnson & Johnson, 2009; Vygotsky, 1978). Technology-supported collaborative learning environments further enable learners to exchange ideas, critically evaluate digital information, co-create knowledge, and develop higher-order thinking skills required for effective participation in digital learning (Falloon, 2020; Stahl et al., 2021; Voogt et al., 2021). Previous studies have shown that meaningful learner interaction enhances engagement, motivation, communication, critical thinking, and digital competence, making collaborative learning an important determinant of Information Digital Literacy Skills Development (OECD, 2023; Redecker, 2022; Voogt et al., 2021).

In Kenya, the integration of digital technologies into primary education through the Competency-Based Curriculum (CBC) and the Digital Literacy Programme (DLP) has expanded opportunities for technology-supported learning (Kenya Institute of Curriculum Development [KICD], 2023; Ministry of Education, 2023). Nevertheless, many rural primary schools continue to experience challenges that hinder the effective development of Information digital literacy skills, including inadequate ICT infrastructure, limited access to digital learning resources, unreliable internet connectivity, insufficient teacher preparedness, and restricted opportunities for collaborative technology-enhanced learning (UNESCO, 2023; UNICEF, 2023; World Bank, 2023). Consequently, many learners in rural schools remain disadvantaged in acquiring the digital competencies required for effective learning and meaningful participation in the digital society.

Although previous studies have examined digital literacy, ICT integration, and technology-supported learning (Falloon, 2020; Ng, 2021; Voogt et al., 2021), relatively limited empirical evidence exists regarding the influence of Social Interaction and Collaborative Learning on Information Digital Literacy Skills Development among learners in rural primary schools in Kenya. Existing research has predominantly focused on technology availability, ICT infrastructure, and teacher preparedness, with comparatively less attention given to learner interaction, collaboration quality, collaborative learning experiences, and learner satisfaction as determinants of information digital literacy skills development (Ng, 2021; UNESCO, 2023; World Bank, 2023). Addressing this knowledge gap is important for informing instructional practices and educational policies aimed at strengthening digital learning outcomes in resource-constrained schools.

This study therefore examined the influence of social interaction and collaborative learning on information digital literacy skills development among learners in selected rural primary schools in Nyeri County, Kenya. Specifically, the study evaluated how interaction frequency, collaboration quality, collaborative learning experiences, and learner satisfaction contribute to learners' information digital literacy skills development. The findings provide empirical evidence to guide educators, school administrators, curriculum developers, and policymakers

in designing collaborative technology-supported learning environments that strengthen Information Digital Literacy Skills among learners in rural primary schools

Literature Review

Information digital literacy skills have become fundamental competencies for learners in the twenty-first century, enabling them to access, evaluate, create, communicate, and use digital information responsibly in academic and everyday contexts. The increasing integration of digital technologies into education has transformed the way learners acquire knowledge, emphasizing the need to develop competencies that support critical thinking, problem-solving, communication, and lifelong learning (European Commission, 2023; OECD, 2023; UNESCO, 2023). Sustainable Development Goal 4 (SDG 4) further advocates for inclusive and equitable quality education by promoting digital competencies that prepare learners for participation in an increasingly knowledge-based and digital society (United Nations, 2023). Despite these global initiatives, considerable disparities in information digital literacy skills development persist, particularly among learners in rural and resource-constrained educational settings where access to digital technologies and quality learning opportunities remains limited (UNESCO, 2023; UNICEF, 2023; World Bank, 2023).

Social Interaction and Collaborative Learning have increasingly been recognized as effective pedagogical approaches for enhancing information digital literacy skills. Grounded in social constructivist theory, collaborative learning enables learners to construct knowledge through peer interaction, shared experiences, collaborative problem-solving, and reflective dialogue (Dillenbourg, 1999; Johnson & Johnson, 2009; Vygotsky, 1978). Contemporary educational technology research further demonstrates that collaborative digital learning environments improve learner engagement, critical thinking, creativity, communication, and digital competence by encouraging active participation and knowledge sharing (Falloon, 2020; Redecker, 2022; Stahl et al., 2021; Voogt et al., 2021). Effective collaboration therefore provides learners with opportunities to evaluate digital information critically, create digital content collaboratively, and develop higher-order Information Digital Literacy Skills necessary for success in modern learning environments.

Across Sub-Saharan Africa, governments have increasingly invested in integrating digital technologies into education to improve teaching and learning outcomes. However, implementation has been uneven because of persistent challenges, including inadequate ICT infrastructure, limited internet connectivity, insufficient digital learning resources, and inadequate teacher capacity to facilitate technology-supported collaborative learning (UNESCO, 2023; UNICEF, 2023; World Bank, 2023). These constraints are particularly evident in rural schools, where learners often have limited opportunities to participate in collaborative digital learning experiences that foster Information Digital Literacy Skills. Consequently, disparities between urban and rural schools continue to affect equitable access to quality digital education across the region (African Union, 2024; UNESCO, 2023).

In Kenya, the implementation of the Competency-Based Curriculum (CBC) and the Digital Literacy Programme (DLP) reflects the government's commitment to equipping learners with digital competencies required for the twenty-first century. These initiatives emphasize learner-centred instruction, collaboration, creativity, communication, and critical thinking as key educational outcomes (Kenya Institute of Curriculum Development [KICD], 2023; Ministry of Education, 2023). Despite these reforms, many rural primary schools continue to experience inadequate ICT infrastructure, insufficient digital devices, unreliable internet connectivity, limited teacher preparedness, and restricted opportunities for collaborative technology-enhanced learning (Kenya Institute of Curriculum Development, 2023; Ministry of Education,

2023; UNESCO, 2023). These challenges limit learners' opportunities to engage in meaningful social interaction and collaborative learning, thereby constraining Information Digital Literacy Skills Development.

Previous studies have largely examined ICT integration, digital infrastructure, technology adoption, and teacher preparedness as determinants of digital learning outcomes (Falloon, 2020; Ng, 2021; Voogt et al., 2021). Comparatively fewer studies have investigated how Social Interaction and Collaborative Learning influence Information Digital Literacy Skills Development among learners in rural primary schools. Specifically, limited empirical evidence exists regarding the contribution of interaction frequency, collaboration quality, collaborative learning experiences, and learner satisfaction with collaboration to Information Digital Literacy Skills Development within resource-constrained learning environments (Ng, 2021; UNESCO, 2023; World Bank, 2023). Addressing this gap is important for informing educational policy and classroom practice aimed at strengthening collaborative digital learning and improving Information Digital Literacy Skills among learners in rural primary schools.

Methodology

This study adopted a cross-sectional survey design using a quantitative research approach to examine the influence of social interaction and collaborative learning on information digital literacy skills development among learners in selected rural primary schools in Nyeri County, Kenya. The cross-sectional design enabled the collection of data from respondents at a single point in time and was considered appropriate for examining relationships between the study variables and testing the proposed conceptual model (Saunders et al., 2019; Creswell & Creswell, 2023).

The target population comprised learners enrolled in selected rural primary schools in Nyeri County. A sample of 2,894 learners was drawn using a multistage sampling procedure to ensure adequate representation of the study population. Primary data were collected using structured questionnaires designed to measure the Social Interaction and Collaborative Learning construct through four dimensions: Interaction Frequency, Collaboration Quality, Impact on Learning Outcomes, and Learner Satisfaction with Collaboration. Information Digital Literacy Skills Development was measured using Critical Thinking Development, Technological Proficiency, Media Literacy Skills, and Improvement in Digital Literacy Skills. The questionnaire was subjected to pilot testing to establish its validity and reliability before the main data collection exercise.

Data were analysed using both descriptive and inferential statistics. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarise respondents' characteristics and study variables. Inferential analysis involved exploratory factor analysis, confirmatory factor analysis, structural equation modelling, and path analysis to validate the measurement model and examine the influence of social interaction and collaborative learning on information digital literacy skills development. Diagnostic tests for normality, multicollinearity, homoscedasticity, linearity, and independence of errors were conducted to verify the assumptions underlying the statistical analyses. The measurement model demonstrated satisfactory reliability and validity, while the structural model exhibited excellent goodness-of-fit indices, confirming its suitability for hypothesis testing ($\chi^2 = 247.9$, $df = 242$, $p = .383$; CMIN/DF = 1.024; RMSEA = .003; CFI = 1.000; TLI = 1.000; GFI = .993; AGFI = .999).

Results

The study examined the influence of Social Interaction and Collaboration on Information Digital Literacy Skills Development among learners in selected rural primary schools in Nyeri County, Kenya. Descriptive statistics indicated that learners generally perceived Social Interaction and Collaborative Learning positively. The composite mean score for the construct was 3.617, reflecting a moderate to high level of collaborative engagement among learners. Among the sub-constructs, Collaboration Quality recorded the highest mean ($M = 3.667$), followed by Impact on Learning Outcomes ($M = 3.634$), Interaction Frequency ($M = 3.585$), and Learner Satisfaction with Collaboration ($M = 3.583$). The relatively low standard deviations across the sub-constructs (approximately 0.97–0.99) indicate consistency in learners' responses. Overall, the findings suggest that learners frequently engaged in collaborative learning activities, experienced positive peer interactions, and expressed satisfaction with collaborative digital learning experiences, indicating that Social Interaction and Collaborative Learning was well established within the study context.

Table 1

Descriptive Statistics for SIC

Parameters	Mean	Std. Deviation	Parameters	Mean	Std. Deviation
IF1	3.58	.983	IL1	3.64	.990
IF2	3.59	.992	IL2	3.63	.997
IF3	3.56	.979	IL3	3.64	.997
IF4	3.60	.975	IL4	3.64	.984
IF5	3.60	.998	IL5	3.63	.986
CQ1	3.67	.987	LSC1	3.59	1.004
CQ2	3.66	.987	LSC2	3.59	1.023
CQ3	3.67	.989	LSC3	3.58	1.014
CQ4	3.65	.990	LSC4	3.59	1.011
CQ5	3.67	.989	LSC5	3.57	1.004

Regression analysis was conducted to examine the influence of Social Interaction and Collaborative Learning on Information Digital Literacy Skills Development. The results revealed that Social Interaction and Collaborative Learning had a positive and statistically significant effect on Information Digital Literacy Skills Development ($B = 0.131$, $\beta = 0.130$, $t = 7.049$, $p < .001$). The unstandardized coefficient indicates that a one-unit increase in Social Interaction and Collaborative Learning was associated with a 0.131-unit increase in Information Digital Literacy Skills Development.

The positive regression coefficient demonstrates that increased learner interaction, collaboration quality, collaborative learning experiences, and learner satisfaction contribute significantly to the development of Information Digital Literacy Skills. Although the standardized effect size was relatively modest ($\beta = 0.130$), the findings confirm that Social

Interaction and Collaborative Learning is a significant predictor of Information Digital Literacy Skills Development among learners in rural primary schools.

Based on these findings, the null hypothesis that Social Interaction and Collaborative Learning has no significant influence on Information Digital Literacy Skills Development was rejected. The study therefore concludes that Social Interaction and Collaborative Learning exerts a statistically significant positive influence on Information Digital Literacy Skills Development.

Table 2

Regression Coefficients: SIC

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.111	.068		45.806	.000
1	Social Interaction and collaboration	.131	.019	.130	7.049	.000

a. Dependent Variable: Digital Information Literacy Skills Development

Structural Equation Modelling (SEM) was employed to examine the influence of Social Interaction and Collaborative Learning on Information Digital Literacy Skills Development. The measurement and structural models in Fig 1 demonstrated excellent goodness-of-fit, indicating that the hypothesised model adequately represented the observed data ($\chi^2 = 247.9$, $df = 242$, $p = .383$; CMIN/DF = 1.024; RMSEA = .003; CFI = 1.000; TLI = 1.000; NFI = .989; GFI = .993; AGFI = .999). These indices confirm that the proposed structural model was appropriate for examining the relationship between the study constructs.

The structural model established a positive and statistically significant relationship between Social Interaction and Collaborative Learning and Information Digital Literacy Skills Development ($\beta = .130$, $p < .001$). The findings indicate that increased learner interaction, collaboration quality, positive collaborative learning experiences, and learner satisfaction significantly enhance Information Digital Literacy Skills Development among learners in rural primary schools.

The latent construct of Social Interaction and Collaborative Learning was adequately represented by four dimensions. Learner Satisfaction with Collaboration recorded the highest standardized loading ($\lambda = .557$), followed by Collaboration Quality ($\lambda = .548$), Interaction Frequency ($\lambda = .529$), and Impact on Learning Outcomes ($\lambda = .516$). These findings suggest that learners' positive collaborative experiences and the quality of peer interaction are the strongest contributors to collaborative learning within digital learning environments.

Similarly, Information Digital Literacy Skills Development was well represented by four dimensions. Improvement in Digital Literacy Skills ($\lambda = .555$) and Technological Proficiency ($\lambda = .550$) exhibited the highest standardized loadings, followed by Media Literacy Skills ($\lambda = .527$) and Critical Thinking Development ($\lambda = .526$). The observed indicator loadings for both latent constructs exceeded the recommended threshold, confirming satisfactory convergent validity and reliable measurement of the study variables.

The coefficient of determination showed that Social Interaction and Collaborative Learning explained 1.7% of the variance in Information Digital Literacy Skills Development ($R^2 = .017$).

Although the explanatory power was modest, the statistically significant positive path coefficient confirms that collaborative learning is an important predictor of Information Digital Literacy Skills Development. The findings further suggest that other constructs within the broader adaptive digital storytelling framework also contribute to learners' digital literacy outcomes.

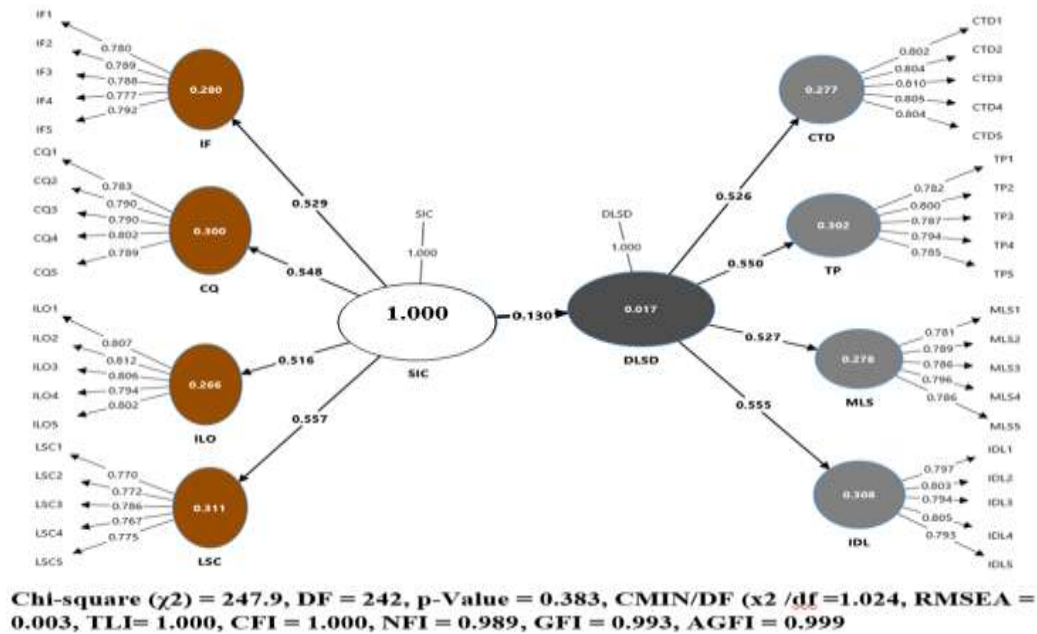


Figure 1

Path diagram

Discussion of Results

The findings of this study demonstrate that Social Interaction and Collaborative Learning positively and significantly influence Information Digital Literacy Skills Development among learners in rural primary schools. The positive regression coefficient ($\beta = .130$, $p < .001$) indicates that increased learner interaction, collaborative engagement, and shared learning experiences contribute to improved Information Digital Literacy Skills. These findings affirm the importance of collaborative learning environments in enabling learners to acquire digital competencies through peer discussion, knowledge sharing, collaborative problem-solving, and active participation in technology-supported learning activities.

The findings support social constructivist perspectives, which posit that learning is enhanced through interaction with peers and collaborative knowledge construction (Vygotsky, 1978). They further concur with Johnson and Johnson (2021), who observed that cooperative learning promotes learner engagement, critical thinking, communication, and academic achievement. Similarly, Stahl et al. (2021) argued that computer-supported collaborative learning environments strengthen learners' ability to construct knowledge collectively while enhancing digital competencies. The findings are also consistent with UNESCO (2023), which identifies collaborative digital learning as a key strategy for developing digital competencies required for lifelong learning and participation in the knowledge economy.

The positive influence of collaboration quality, interaction frequency, collaborative learning experiences, and learner satisfaction suggests that learners benefit most when they actively participate in collaborative digital learning environments. These findings imply that simply

providing digital technologies is insufficient; meaningful learner interaction and well-designed collaborative learning activities are equally important in promoting Information Digital Literacy Skills Development. This observation supports Falloon (2020), who argued that effective digital learning depends not only on access to technology but also on pedagogical approaches that encourage learner engagement and collaboration.

The study contributes to the growing body of literature on digital learning by providing empirical evidence that Social Interaction and Collaborative Learning are significant predictors of Information Digital Literacy Skills Development in rural primary schools. The findings provide practical implications for educators, curriculum developers, and policymakers by demonstrating that collaborative technology-supported learning environments can enhance learners' digital competencies despite the resource constraints commonly experienced in rural schools. These findings also extend previous studies conducted in Kenya, which have largely focused on ICT infrastructure and technology integration while giving comparatively less attention to collaborative pedagogical practices as determinants of Information Digital Literacy Skills Development.

Conclusion

This study established that Social Interaction and Collaborative Learning significantly influence Information Digital Literacy Skills Development among learners in selected rural primary schools in Nyeri County, Kenya. The findings demonstrate that learner interaction, collaboration quality, collaborative learning experiences, and learner satisfaction collectively contribute to the development of Information Digital Literacy Skills. The positive and statistically significant relationship between Social Interaction and Collaborative Learning and Information Digital Literacy Skills Development confirms that collaborative pedagogical approaches enhance learners' ability to access, evaluate, create, and communicate information using digital technologies.

The study concludes that fostering collaborative technology-supported learning environments is essential for improving Information Digital Literacy Skills in rural primary schools. While access to digital technologies remains important, the effectiveness of digital learning largely depends on creating opportunities for meaningful learner interaction, collaborative knowledge construction, and active engagement in digital learning activities. Strengthening collaborative learning practices therefore offers an effective strategy for improving digital competencies among learners in resource-constrained educational settings.

Recommendations

Based on the findings, the study recommends that teachers integrate collaborative learning strategies into technology-supported classroom instruction to promote learner interaction, peer learning, and collaborative problem-solving. Learning activities should be designed to encourage learners to work together in locating, evaluating, analysing, and creating digital information, thereby strengthening Information Digital Literacy Skills.

The Ministry of Education, the Kenya Institute of Curriculum Development, and school administrators should strengthen the implementation of collaborative digital learning by providing adequate ICT infrastructure, reliable internet connectivity, and appropriate digital learning resources, particularly in rural primary schools. Continuous professional development programmes should also be provided to equip teachers with the pedagogical competencies required to facilitate collaborative technology-enhanced learning effectively.

Finally, curriculum developers and education policymakers should embed collaborative digital learning activities within the Competency-Based Curriculum to promote learner-centred instructional practices that enhance Information Digital Literacy Skills Development. Future studies should examine the influence of other adaptive digital storytelling constructs on Information Digital Literacy Skills Development and replicate the study in different educational contexts to improve the generalisability of the findings.

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