Structural Equation Modeling of Virtual Education for Cyber Media Literacy (Case Study: Primary School Teachers in Zahedan)

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Purpose: This study aimed to design and validate a structural equation model for virtual media literacy education among primary school teachers in Zahedan.

Methods and Materials: The study employed an applied survey research design, targeting a statistical population of 2,170 primary school teachers in Zahedan. Using Cochran's formula and a random sampling method, a final sample of 327 participants was selected. Data were collected through a researcher-made questionnaire based on a theoretical framework and validated through face, content, and construct validity procedures. Reliability was confirmed using Cronbach's alpha and composite reliability. Exploratory and confirmatory factor analyses were conducted using SPSS 27 and LISREL 8.8, and the final structural equation model was tested for fit and significance across multiple dimensions.

Findings: Exploratory factor analysis revealed that six major components—central phenomenon, causal factors, strategies, contextual factors, intervening factors, and outcomes—adequately explain the structure of virtual media literacy education. Confirmatory factor analysis confirmed that all dimensions showed strong factor loadings and statistically significant t-values (all > 1.96). Model fit indices for each dimension (RMSEA < 0.06, GFI, AGFI, CFI, NFI > 0.90) indicated good fit. Path coefficients confirmed significant relationships among independent variables (causal, contextual, and intervening factors) and dependent variables (central phenomenon, strategies, and outcomes).

Conclusion: The validated model offers a comprehensive framework for understanding and implementing virtual media literacy education among primary school teachers. It demonstrates the interdependence of policy, pedagogical strategies, institutional support, and professional development in fostering media literacy. The model provides actionable insights for curriculum designers, policymakers, and educators seeking to enhance digital competencies in primary education.

Keywords: Virtual Education, Primary School, Zahedan, Media Literacy, Cyber Media Literacy, Teacher.

1. Introduction

In recent years, the increasing digitization of communication and education systems has fundamentally transformed the nature of teaching and learning. As digital technologies reshape the dissemination and consumption of information, media literacy has emerged as a pivotal educational competency that enables both teachers and students to navigate the complex information landscape of the 21st century. Media literacy refers to the ability to access, analyze, evaluate, and produce media content across diverse formats and platforms. With the expansion of virtual learning, particularly following the COVID-19 pandemic, integrating media literacy into online pedagogical frameworks has become an educational imperative, especially in primary education where foundational skills are developed (Chryssanthopoulou, 2025; Lee et al., 2023).

A growing body of literature underscores the evolving role of media literacy in shaping students' critical thinking, digital citizenship, and lifelong learning skills. Scholars argue that the infusion of media literacy into educational curricula not only enriches cognitive and social-emotional competencies but also addresses misinformation and ideological polarization in an age of algorithmic influence (Jamyly & Farran, 2023; Kutlu-Abu & Arslan, 2023). In this context, teacher education plays a central role in equipping educators with the skills required to foster media literacy among young learners. According to (Lähdesmäki & Maunula, 2023), student teachers must be empowered with new literacy competencies that go beyond traditional textual analysis and encompass the ethical, critical, and creative use of digital content. Given that primary school teachers often serve as students' first guides into the world of mediated communication, the need to understand their readiness, perceptions, and competencies in this domain is paramount.

The shift to virtual education has further intensified the demand for media literacy competencies. The digital transformation of classrooms necessitates that teachers not only utilize online platforms effectively but also embed media literacy principles into their instructional design (Davarpanah et al., 2023; Korona, 2024). As (Vuojärvi et al., 2021) suggests, the conceptualization of media literacy varies significantly depending on contextual and cultural factors, necessitating localized models that align with the specific educational needs and challenges of different communities. In the case of Zahedan, a diverse urban center with unique socio-economic dynamics, the implementation of a virtual media literacy model requires a nuanced understanding of teachers' professional backgrounds, institutional supports, and infrastructural resources.

Empirical studies have demonstrated the effectiveness of structured media literacy models in improving educational outcomes. For example, (Ebrahim Aziz Al-Zarji et al., 2024) developed a conceptual model of virtual education based on media literacy for the Iraqi education system, finding that a systematic approach improved student engagement and instructional quality in science education. Similarly, (Soleimani et al., 2021) introduced a media literacy model specifically tailored for physical education teachers, emphasizing the positive impact of such frameworks on class management and educational outcomes. These findings highlight the importance of designing and validating context-sensitive models through robust methodological approaches such as structural equation modeling (SEM), which enables researchers to examine the causal pathways and mediating relationships among multiple constructs simultaneously.

Despite its recognized importance, media literacy education still faces numerous barriers in implementation. Teachers often report limited training opportunities, unclear policy directives, and a lack of access to pedagogically aligned digital content (Panol et al., 2021; Yadollahi et al., 2021). As (Palero & Mutya, 2022) and (Rodriguez Jr, 2021) emphasize, teachers' readiness to adopt virtual media literacy education is shaped by both intrinsic and extrinsic variables, including personal motivation, institutional culture, and technological infrastructure. Furthermore, as (Devi et al., 2023) notes, religious and cultural contexts can shape the content and delivery of media literacy education, requiring a balance between global digital competencies and local values. Thus, the development of an effective media literacy model must account for contextual factors and accommodate diverse pedagogical philosophies.

In response to these challenges, recent research has focused on integrated models of media literacy that combine theoretical foundations with empirical validation. (Davarpanah & colleagues, 2023) proposed a media literacy education model grounded in the Iranian education system, emphasizing six key dimensions: the central phenomenon, causal factors, strategies, contextual conditions, intervening factors, and outcomes. This holistic approach enables educators and policymakers to identify leverage points for intervention and innovation. Similarly, (Golkari et al., 2022) employed grounded theory to develop a media literacy curriculum model for student teachers, reinforcing the

significance of evidence-based instructional design in teacher education programs. Such models are essential for bridging the gap between theory and practice and for translating abstract competencies into concrete pedagogical activities.

Moreover, advancements in research methodologies have strengthened the rigor of media literacy studies. Bibliometric analyses, such as those conducted by (Kutlu-Abu & Arslan, 2023), illustrate the expanding scope and interdisciplinary nature of media literacy research, encompassing fields as diverse as digital humanities, educational technology, sociology, and cognitive science. This trend reflects a broader epistemological shift toward the integration of media literacy with civic education, personal empowerment, and professional development. (Kwon & Sung, 2024), for instance, explores how media literacy in the revised home economics curriculum fosters citizenship education, highlighting its transformative potential beyond classroom settings. Likewise, (Robbets, 2023) emphasizes the role of parental media literacy in early childhood development, suggesting that educational interventions should not be confined to schools but extended to family environments.

To develop a robust model of virtual media literacy education in primary schools, it is also essential to consider the role of virtual training programs. (Nikkhah & Ghanbari, 2021) underscores the potential of online in-service training in enhancing teachers' digital competencies, provided that these programs are pedagogically relevant and contextually grounded. Furthermore, (Friolo & Mutya, 2022) highlights the emotional and cognitive challenges that teachers face in adapting to modular distance learning, suggesting that professional development should be holistic and supportive. This study seeks to investigate and model the structural equations of virtual media literacy education among primary school teachers in Zahedan, Iran.

2.   Methods and Materials

This study is applied in nature and was conducted using a survey method. The statistical population consisted of primary school teachers in the city of Zahedan (2,170 individuals). A random sampling method was employed. The sample size was determined to be 327 participants using Cochran's formula. The research instrument was a questionnaire based on the theoretical framework. For face validity, the questionnaire was reviewed by a focus group consisting of the academic advisor and supervisor, and structural flaws were rectified. For content validity, the questionnaire was provided to five experts in virtual education and media literacy, whose feedback led to the addition of relevant indicators. Construct validity (model validity) was assessed through factor analysis. To determine the reliability of the questionnaire, Cronbach's alpha and composite reliability were utilized. As the Cronbach's alpha for all dimensions exceeded 0.70, the questionnaire was deemed to possess adequate reliability. In this study, exploratory factor analysis (EFA) was used to identify the underlying model of virtual cyber media literacy education based on the theoretical framework, and confirmatory factor analysis (CFA) was employed to assess model fit and validity.

3.   Findings and Results

Prior to conducting the exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test were calculated. Since the KMO value for the research dimensions was significantly above 0.60, and the significance level of Bartlett's test was less than 0.05, the data were deemed appropriate for factor analysis. The following presents the results of the exploratory factor analysis.

Table 1

Exploratory Factor Analysis of the Model Derived from the Theoretical Framework

Dimension	Component	1	2	3	4	5	6
Central Phenomenon	Knowledge	0.84					
	Skills	0.92					
	Awareness	0.85					
	Attitude	0.77					
Causal Factors	Deficiency in Media Literacy Training		0.72				
	Emphasis in Policy Documents		0.79				
	Social Changes		0.84				
	Media Harms		0.92				
	Professional Requirements		0.88				
Strategies	Virtual Teaching Methods			0.77			

	Use of Pedagogical Models	0.84		
	Feedback and Evaluation Methods	0.75		
	Cultural Promotion	0.80		
Contextual Factors	Instructor Characteristics		0.85	
	Learner Characteristics		0.95	
	Relationships and Collaboration		0.87	
	Virtual Environment		0.93	
	ICT Infrastructure		0.67	
	Governmental Support and Endorsement		0.84	
	Educational Content		0.75	
Intervening Factors	Barriers to Virtual Education			0.91
	Facilitators			0.85
Outcomes	Individual Outcomes			0.86
	Professional Outcomes			0.91
	Social Outcomes			0.79

By applying the Varimax rotation command in analyzing the results of exploratory factor analysis on the model, it was shown that all dimensions, and consequently all components (research questions), had factor loadings above 0.30 and were categorized into six factors. Therefore, it can be asserted that all identified factors may be considered components of the cyber media literacy virtual education model.

This section presents the results of confirmatory factor analysis for each of the research dimensions using LISREL software. First, the second-order factor analysis for the "central phenomenon" dimension was conducted.

Figure 1

Measurement Model of the Central Phenomenon (Standardized Coefficients)
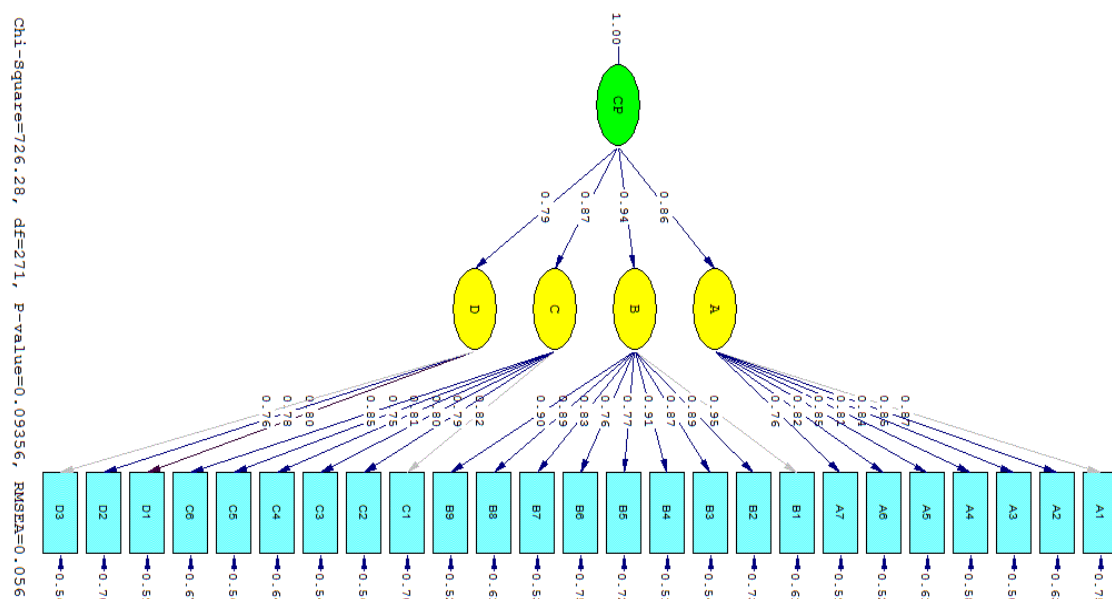

Figure 1 displays the factor loadings for each path in the measurement model. As observed, the factor loadings for all indicators are appropriate. Moreover, the measurement model of the central phenomenon in the significance mode (t-test) also shows that the t-values for all observed variables exceed 1.96. As a result, the relationships among variables and the obtained factor loadings are statistically significant.

In the next part of the study, the second-order factor analysis for the "causal factors" dimension was conducted.

Figure 2

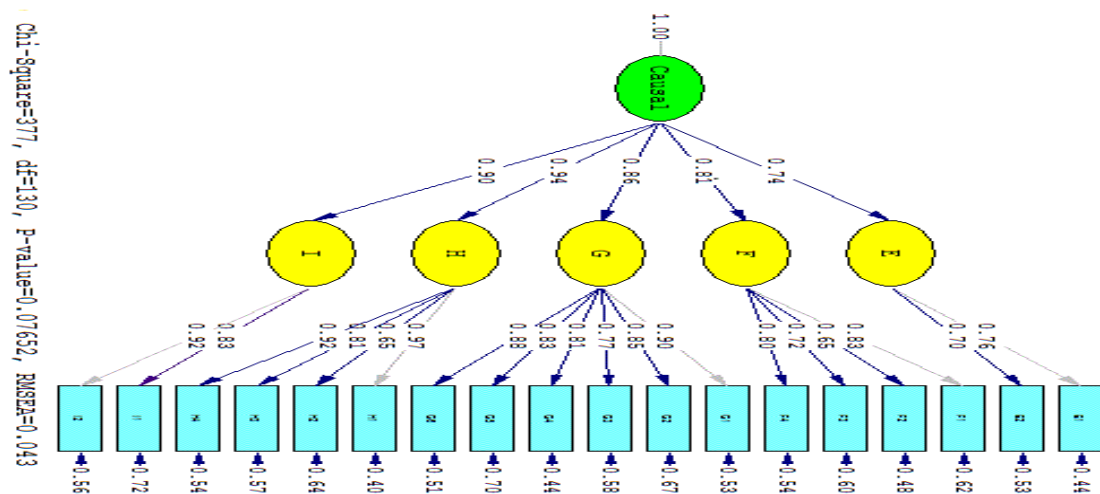*Measurement Model of Causal Factors (Standardized Coefficients)*

Figure 2 displays the factor loadings for each path in the measurement model. As observed, the factor loadings for all indicators are appropriate. Moreover, the measurement model of causal factors in the significance mode (t-test) also shows that the t-values for all observed variables exceed 1.96. Therefore, the relationships among variables and the obtained factor loadings are statistically significant.

In this section of the study, second-order factor analysis for the "strategies" dimension was conducted.

Figure 3

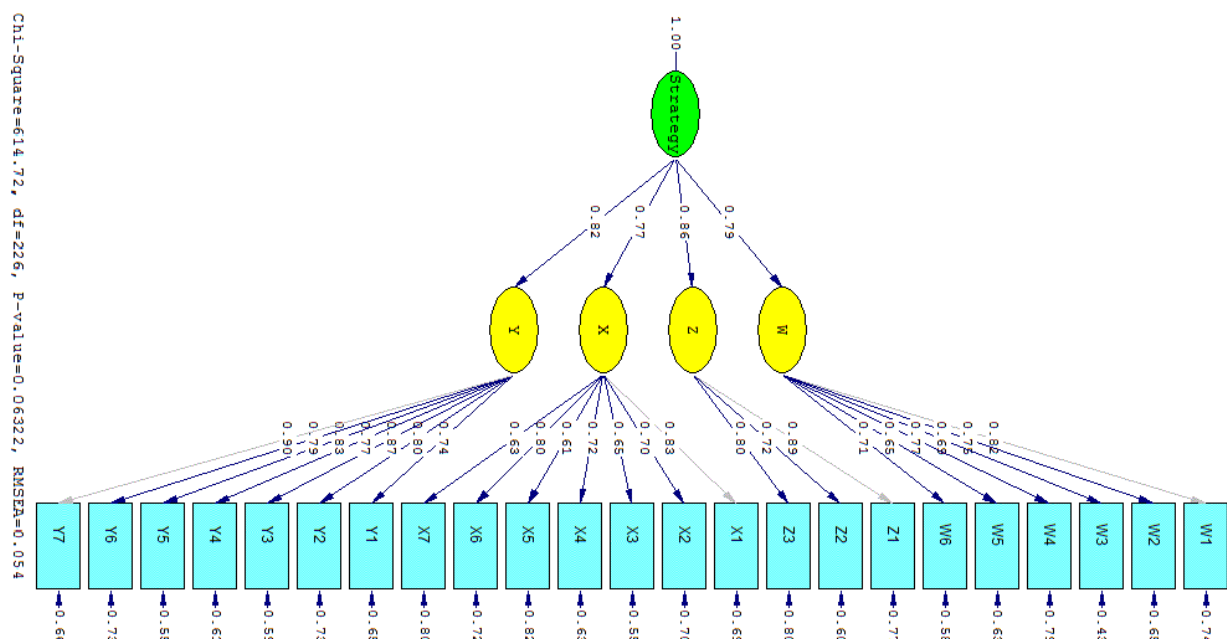*Measurement Model of Strategies (Standardized Coefficients)*

Figure 3 displays the factor loadings for each path in the measurement model. As observed, the factor loadings for all indicators are appropriate. Moreover, the measurement model of strategies in the significance mode (t-test) also shows that the t-values for all observed variables exceed 1.96. Hence, the relationships among variables and the obtained factor loadings are statistically significant.

In this section of the study, second-order factor analysis for the "contextual factors" dimension was conducted.

Figure 4

Measurement Model of Contextual Factors (Standardized Coefficients)
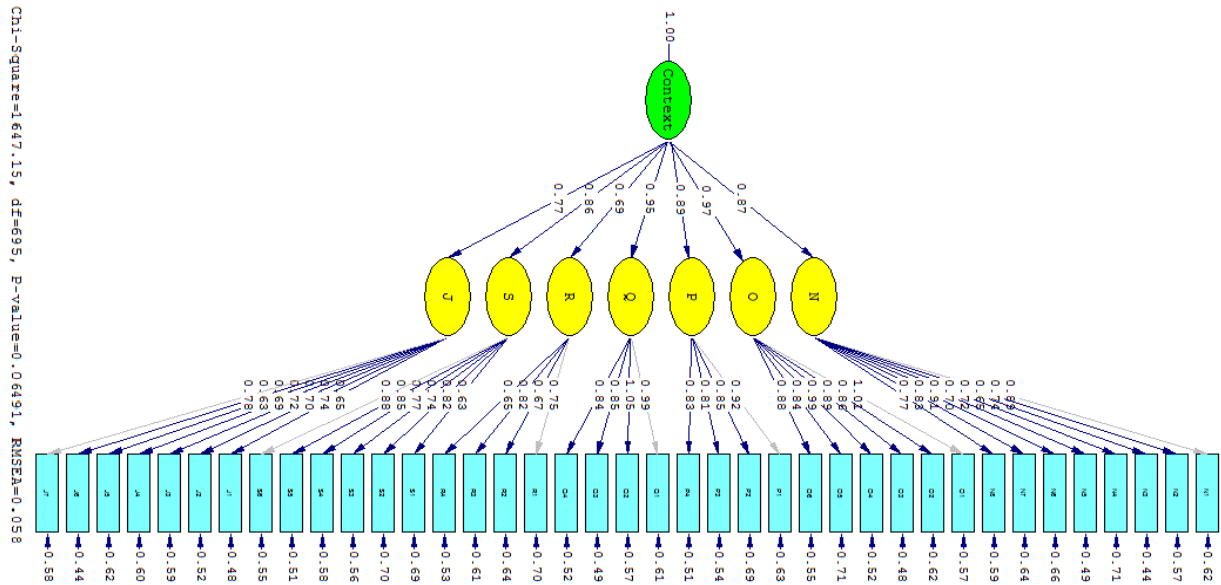

Figure 4 displays the factor loadings for each path in the measurement model. As observed, the factor loadings for all indicators are appropriate. Furthermore, the measurement model of contextual factors in the significance mode (t-test) also shows that the t-values for all examined variables exceed 1.96. Consequently, the relationships among variables and the obtained factor loadings are statistically significant.

In this section of the study, second-order factor analysis for the "intervening factors" dimension was conducted.

Figure 5

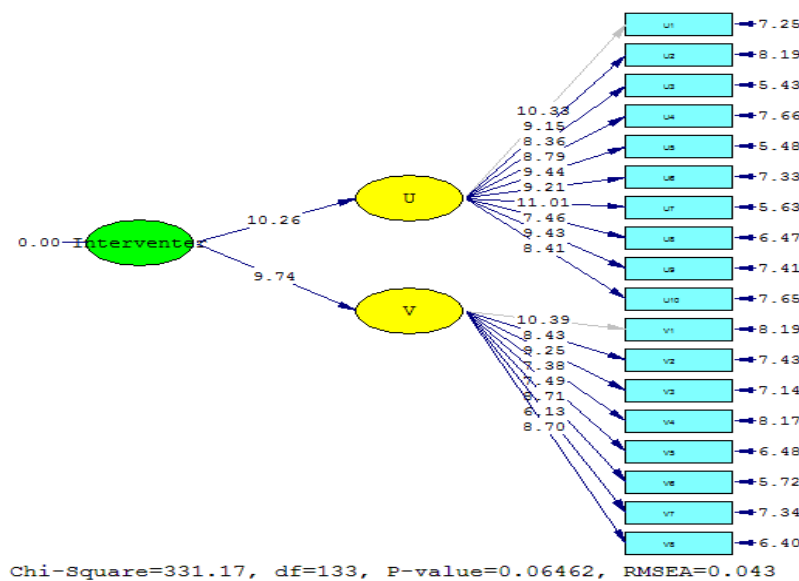*Measurement Model of Intervening Factors (Standardized Coefficients)*

Figure 5 displays the factor loadings for each path in the measurement model. As shown, the factor loadings for all indicators are appropriate. Furthermore, the measurement model for intervening factors in the significance mode (t-test) indicates that the t-values for all the examined variables are greater than 1.96. As a result, the relationships among variables and the derived factor loadings are statistically significant.

In this section of the study, second-order factor analysis for the **outcomes** dimension was conducted:

Figure 6

Measurement Model of Outcomes (Standardized Coefficients)

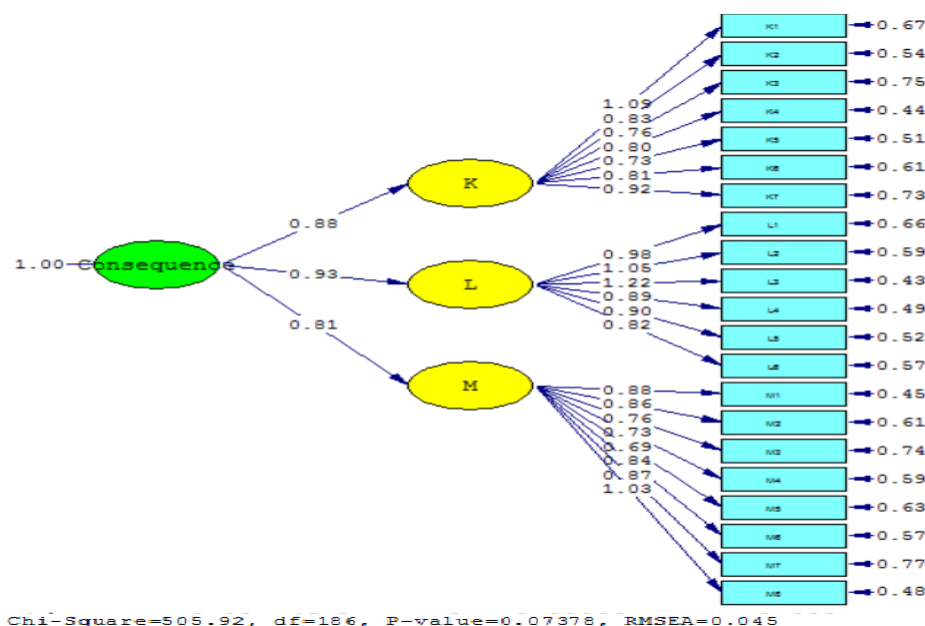Chi-Square=505.92, df=186, P-value=0.07378, RMSEA=0.045

Figure 6 shows the factor loadings for each path in the measurement model. As observed, the factor loadings for all indicators are appropriate. Additionally, the measurement model for outcomes in the significance mode (t-test) reveals that the t-values for all observed variables are greater than 1.96. Therefore, the relationships among variables and the obtained factor loadings are statistically significant.

Table 2

Model Fit Indices for the Factor Analysis of Research Dimensions
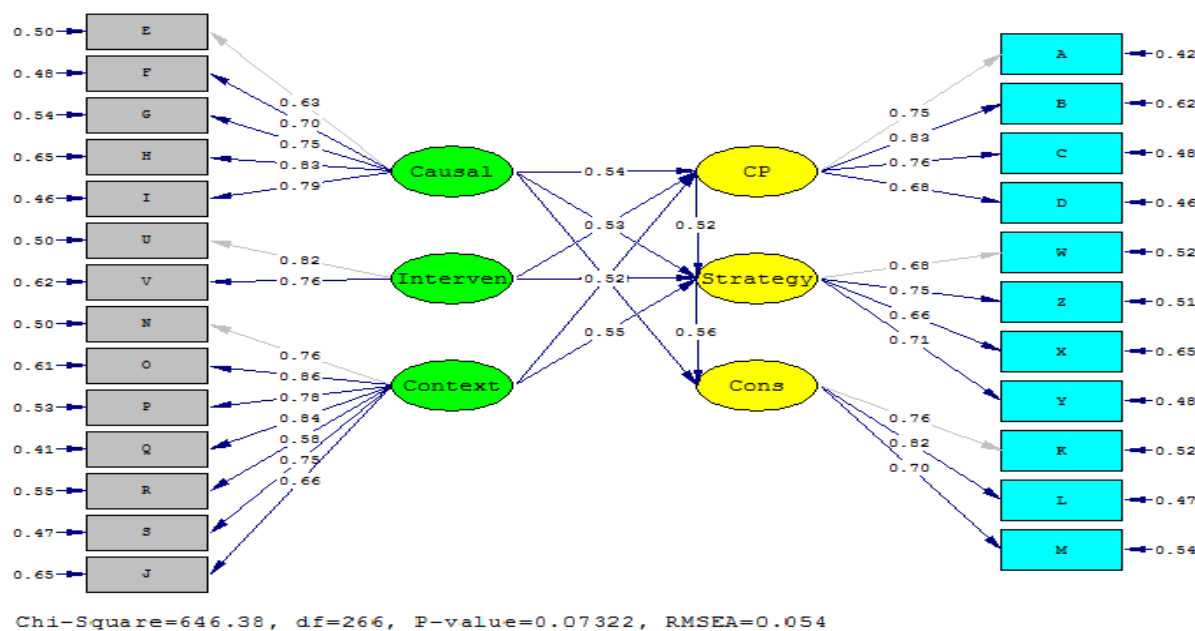
Fit Index	χ^2/df	RMSEA	GFI	AGFI	NFI	NNFI	CFI
Acceptable Range	< 3	< 0.10	> 0.90	> 0.90	> 0.90	> 0.90	> 0.90
Central Phenomenon	2.68	0.056	0.96	0.93	0.95	0.95	0.92
Causal Factors	2.90	0.043	0.97	0.94	0.98	0.99	0.99
Strategies	2.72	0.054	0.96	0.92	0.95	0.96	0.98
Contextual Factors	2.37	0.058	0.98	0.95	0.95	0.93	0.98
Intervening Factors	2.49	0.043	0.98	0.95	0.95	0.93	0.98
Outcomes	2.72	0.045	0.99	0.95	0.96	0.96	0.94

The values of the fit indices presented in Table 2 fall within the acceptable range, indicating a good fit for the measurement models of the central phenomenon, causal factors, strategies, contextual factors, intervening factors, and outcomes. Therefore, the models are confirmed.

Upon confirmation of the measurement models, it is now possible to examine the main model of the study. Accordingly, after designing the conceptual model and specifying the relationships between variables, structural equations were executed (Figure 7).

Figure 7

Structural Model Fit of the Study (Standardized Coefficients)

Chi-Square=646.38, df=266, P-value=0.07322, RMSEA=0.054

As shown in Figure 7, the variables of causal factors, intervening factors, and contextual factors were entered into the model as independent variables, while the variables of central phenomenon, strategies, and outcomes were entered as dependent variables. The path coefficient for each variable is indicated. The path coefficient demonstrates the extent to which one variable affects another.

Table 3

Model Fit Indices of the Structural Model

Fit Index	χ^2/df	RMSEA	GFI	AGFI	NFI	NNFI	CFI
Acceptable Range	< 3	< 0.10	> 0.90	> 0.90	> 0.90	> 0.90	> 0.90
Results	2.43	0.054	0.96	0.94	0.93	0.93	0.97

The values of the fit indices presented in Table 3 fall within the acceptable range, indicating a good fit for the structural model and confirming the research model.

As previously stated, the relationships among variables are statistically significant at the 95% confidence level. To validate the model, the reliability and validity of the instrument (questionnaire) were evaluated. Reliability was assessed using Cronbach's alpha and composite reliability. Convergent validity was assessed through the Average Variance Extracted (AVE) and Composite Reliability (CR), as presented in Table 4.

Table 4

Validity and Reliability of the Research Model

Dimension	Cronbach's Alpha	CR	AVE
Central Phenomenon	0.86	0.93	0.75
Causal Factors	0.78	0.88	0.73
Strategies	0.84	0.92	0.66
Contextual Factors	0.89	0.95	0.74
Intervening Factors	0.78	0.88	0.81
Outcomes	0.81	0.90	0.77

For convergent validity to be confirmed, the following conditions must be met:

• CR > 0.70
• AVE < CR
• AVE > 0.50

Table 4 demonstrates that all conditions are met for all dimensions. Therefore, the model possesses convergent validity. Moreover, Cronbach's alpha and composite reliability for all dimensions exceed 0.70, indicating that the model is reliable.

4. Discussion and Conclusion

The findings of this study offer valuable insights into the structural components of virtual media literacy education among primary school teachers in Zahedan. The results of both exploratory and confirmatory factor analyses confirmed the suitability and statistical significance of the proposed model. All constructs—central phenomenon, causal conditions, strategies, contextual factors, intervening factors, and outcomes—demonstrated acceptable factor loadings and model fit indices, indicating that the model accurately captures the interrelated dynamics influencing media literacy education in a virtual context. Fit indices such as RMSEA, GFI, AGFI, CFI, and NFI all fell within the recommended thresholds across dimensions, substantiating the validity of the model.

A key outcome of the study was the confirmation of the central phenomenon, which consisted of teachers' media literacy competencies—knowledge, skills, awareness, and attitudes—as the core dimension underpinning virtual education. This finding is consistent with earlier work by (Davarpanah & colleagues, 2023), who conceptualized media literacy in education through a multidimensional lens integrating cognitive, affective, and behavioral elements. The high factor loadings associated with these indicators reinforce the argument that effective virtual media literacy education must center on a balanced cultivation of critical understanding and positive dispositions toward media content. (Akmatova et al., 2025) likewise emphasized that fostering comprehensive media literacy among high school educators requires attention to both technical fluency and critical engagement.

The model also revealed that causal conditions such as deficiencies in media literacy training, emphasis in national policy documents, and changing social conditions significantly influence teachers' media literacy development. This aligns with the findings of (Golkari et al., 2022), who demonstrated that policy support and teacher education systems are foundational to media literacy implementation. Notably, the importance of professional obligations and media-related harms as causal conditions confirms that teachers perceive media literacy not just as a pedagogical asset but also as a professional necessity in a media-saturated educational environment. (Devi et al., 2023) similarly pointed out that the evolution of media literacy in curricula must reflect broader socio-cultural shifts, including increased exposure to ideological bias and digital misinformation.

Strategic components such as the use of virtual teaching methods, pedagogical models, feedback mechanisms, and awareness-raising strategies also emerged as critical dimensions. These findings echo those of (Lee et al., 2023), who reported that targeted media literacy training significantly improved teachers' integration of digital tools in the classroom. Furthermore, the significance of pedagogical strategies in this study validates the transdisciplinary approach advocated by (Jamyly & Farran, 2023), who stressed that media literacy must be delivered through innovative, learner-centered models that extend beyond rote instruction. The strong path coefficients for these strategic indicators suggest that effective virtual media literacy education requires a deliberate and reflective instructional design process.

The contextual factors—teacher characteristics, learner traits, collaboration, virtual environments, ICT infrastructure, governmental support, and educational content—also showed statistically significant effects on the overall model. This confirms the assertion by (Korona, 2024) that teachers' perceptions of their media literacy competence are shaped by both personal and environmental conditions, particularly in professional development settings. The findings are also in line with (Vuojärvi et al., 2021), who found that teacher candidates conceptualize media literacy differently based on their teaching context and institutional infrastructure. In the case of Zahedan, infrastructural challenges such as limited access to high-quality digital tools and content must be acknowledged and addressed to ensure the equitable implementation of virtual education models.

Intervening factors, such as the presence of barriers (e.g., lack of resources, time, and digital literacy) and facilitators (e.g., institutional support, peer collaboration), had significant relationships with the central phenomenon and outcomes. This supports previous literature emphasizing the mediating role of organizational and cultural supports in

facilitating teacher engagement with digital tools (Nikkhah & Ghanbari, 2021; Panol et al., 2021). Moreover, (Palero & Mutya, 2022) highlighted that teacher readiness is significantly influenced by the quality of school-level support and continuous professional development, both of which function as key enabling mechanisms in this study.

The outcomes dimension, which included individual, professional, and social effects, confirmed that a well-structured media literacy education program has far-reaching benefits. (Soleimani et al., 2021) noted that well-trained educators not only perform better in the classroom but also contribute to the broader development of digitally literate citizens. This is corroborated by (Kwon & Sung, 2024), who argued that embedding media literacy within broader educational frameworks fosters civic engagement and responsibility. Similarly, (Chryssanthopoulou, 2025) emphasized the role of media literacy as a bridge between education and communication, highlighting its potential for personal empowerment and social transformation.

The strong structural relationships found among causal factors, strategies, and outcomes highlight the interdependence of system-level and instructional components. These findings support the conceptual model proposed by (Ebrahim Aziz Al-Zarji et al., 2024), who validated a virtual media literacy education framework in Iraq that emphasized the interconnectedness of educational inputs and pedagogical results. Additionally, the findings confirm the holistic model advanced by (Davarpanah & colleagues, 2023), where interrelations among pedagogical strategies, institutional readiness, and learner outcomes form the backbone of media literacy integration.

From a methodological perspective, the application of structural equation modeling enabled the precise testing of hypothesized relationships and the validation of a multi-layered conceptual model. This approach mirrors that of (Robbets, 2023), who employed qualitative and quantitative tools to analyze parents' digital media practices, highlighting the usefulness of mixed methods and structural modeling in education research. Moreover, the study benefits from alignment with global trends, as mapped in the bibliometric review by (Kutlu-Abu & Arslan, 2023), which indicates a growing emphasis on empirical, theory-informed models in media literacy scholarship.

Despite its strengths, the present study has several limitations. First, the study was conducted in a specific geographic and cultural context—Zahedan—which may limit the generalizability of the findings to other regions with different socio-economic conditions or educational policies. Second, the reliance on self-reported data from teachers may introduce response biases, including social desirability or overestimation of competencies. Third, while structural equation modeling provides robust inferential insights, the cross-sectional nature of the data restricts the ability to make causal inferences over time. Lastly, although the model incorporates a wide range of constructs, it may not capture all relevant dimensions of media literacy education, such as students' perspectives or informal learning environments.

Future studies should explore the longitudinal impacts of virtual media literacy education to determine how competencies evolve over time with continuous professional development. Comparative studies across different provinces or countries could enrich the findings by highlighting cultural and institutional variations in the implementation of media literacy. Additionally, qualitative approaches such as interviews or case studies may offer deeper insights into teachers' lived experiences, challenges, and coping mechanisms in virtual classrooms. It is also recommended to integrate student performance and engagement metrics to assess the effectiveness of media literacy education from a learner-centered perspective. Lastly, future research could expand the model by incorporating technological innovations such as AI tools, gamified learning platforms, or adaptive feedback systems in virtual media literacy instruction.

Educational policymakers should consider institutionalizing media literacy as a core competency in teacher training curricula, supported by structured frameworks and national standards. School administrators must invest in infrastructure, including reliable internet access, digital devices, and content repositories, to facilitate the integration of media literacy into virtual education. Teachers should be provided with ongoing, contextually relevant professional development programs that focus not only on digital tools but also on pedagogical strategies tailored to media literacy. Collaborative practices such as peer mentoring, team teaching, and community of practice initiatives can enhance teachers' confidence and competence in this domain. Finally, curriculum designers should ensure that media literacy is embedded across subjects and grade levels, using interactive, student-centered methods that reflect real-world media challenges and opportunities.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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