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Upper Secondary School Student Digital Information Fluency: A Second-Order Confirmatory Factor Analysis

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Abstract

This research aimed to investigate the components of digital information fluency (DIF) skills among high school students. The sample comprised 354 teachers from schools supervised by the Office of the Basic Education Commission (OBEC) Secondary Educational Service Area Offices (SEAOs), selected through multiple-stage random sampling. Their opinions concerning student DIF skills were collected via a questionnaire and analyzed using descriptive statistics and a 2nd -order confirmatory factor analysis (CFA). Results revealed a high overall level of opinion among technology teachers regarding student DIF skills, with Digital Data Communication (DDC) exhibiting the highest weight (β = 1.00, R^2 = 1.00), followed by Digital Literacy (DL) (β = 0.97, R^2 = 0.95), and Digital Information Management (DIM) (β = 0.91, R^2 = 0.83). This study contributes to the literature by providing insights into the perception of DIF skills among teachers, shedding light on areas of emphasis in digital fluency education. Additionally, it offers valuable implications for curriculum development and teacher training programs aimed at enhancing students' digital literacy in today's information-rich environment.

Introduction

In the wake of rapid technological advancement and the pervasive influence of the digital age, education stands at the threshold of transformation. The evolving landscape of technology is reshaping the fundamental paradigms of education, compelling schools to evolve into dynamic learning organizations. These organizations must forge robust partnerships with society and external entities, recalibrating curriculum development and teaching methodologies to align with the exigencies of technological progress and cater to the diverse needs of individual learners (Office of the Education Council, 2017).Athreya and Mouza (2016) illuminate the imperative for recalibrating our cognitive toolkit in response to the twenty-first-century milieu. They delineate three key factors—about the future, present, and past—that underscore the exigency of this cognitive overhaul. The future, shrouded in uncertainty, portends a terrain dominated by technology and human-machine interactions, alongside profound advancements in our understanding of cognition and learning. In the present, we stand amidst a digital revolution in communication reminiscent of epochal shifts heralded by the advent of writing and the printing press. Concurrently, globalization has ushered in unprecedented interconnectedness, juxtaposed with palpable polarization on historical narratives. Against this backdrop, the interplay of faith, reason, and emotion often obfuscates cogent reasoning, necessitating a recalibration of cognitive frameworks.

In this milieu, digital information fluency emerges as a linchpin skill set for upper secondary school students (Figure 1). Acknowledged as vital for navigating the complexities of the contemporary world, digital fluency encompasses proficiency in consuming, comprehending, and leveraging digital media and tools (da Costa et al., 2021; Massler et al., 2022; Okka, 2024). Alcívar (2022) underscores its indispensability in confronting the daily deluge of technological challenges, while Toleuzhan et al. (2023) emphasize the burgeoning demand for high-level digital literacy skills in the workforce. Indeed, the cultivation of digital fluency not only augments academic pursuits but also enriches other domains, such as music education, by fostering autonomy and collaboration (Murtadho et al., 2023; Paramita et al., 2023; Resnick (2002) prognosticates that in the foreseeable future, digital fluency will be a sine qua non for employment, civic engagement, and lifelong learning.

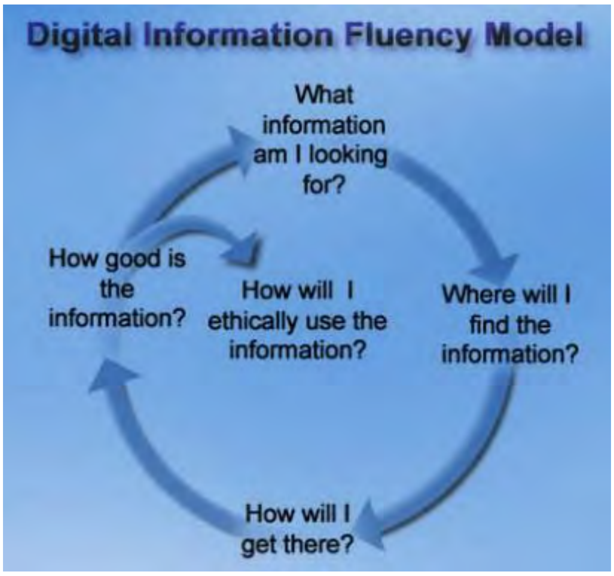

Figure 1. Digital Information Fluency (DIF) Model
Source: Information Fluency. (2024)

Beyond digital fluency, information fluency emerges as a cornerstone competency for enterprise learning in future-oriented contexts (Barrow et al., 2020; Eisenberg 2008). Nenkov et al. (2014) underscore its pivotal role in equipping students with enterprising behaviors essential for adapting to evolving employment paradigms. As employers increasingly prize traits such as innovation, adaptability, and resilience, an enterprising mindset becomes imperative (Ehlers, 2022). The imperative to prepare students for the exigencies of life and employment underscores the urgency of imbuing them with future-ready skills (Ward, 2004).

In light of these imperatives, the cultivation of digital information fluency skills emerges as an imperative for learners to navigate an ever-changing society and harness innovations and technologies with safety and creativity. As education becomes increasingly synonymous with empowerment, the acquisition of digital fluency and information literacy emerges as linchpins in shaping students' capacity to thrive in a dynamic, digitally driven world.

Related Literature

Chou and Chiu (2020) developed a multidimensional scale for assessing digital fluency in Taiwanese sixth-grade preadolescents, finding that digital fluency consisted of collaboration and research, digital citizenship, critical thinking, and innovation design. Female preadolescents scored higher than males. Wang et al. (2013) additionally explored differences between "digital natives" and "digital immigrants," suggesting a continuum of digital fluency rather than a strict dichotomy, emphasizing the ability to creatively express oneself in a digital environment. Miller and Bartlett (2012) investigated the challenge of internet information literacy in the UK, proposing the integration of digital fluency - consisting of critical thinking, net savviness, and diversity - into learning to navigate the digital age effectively. Li et al. (2018) examined the relationship between Chinese WeChat users' digital fluency, gratifications, and social media use, finding a positive association between digital fluency and social media use. Digital fluency moderated the impact of various gratifications on social media use differently. Durmus Çemçem et al. (2023) explored 841 pre-service teachers' levels of digital citizenship, digital wisdom, and digital fluency, finding that male pre-service teachers had higher digital fluency scores. Digital citizenship significantly predicts digital fluency and digital wisdom.

Furthermore, the discourse on digital fluency in K-12 education encompasses a range of perspectives and suggestions for curriculum development. White (2013) proposed a comprehensive curriculum covering topics such as critical thinking, collaboration, online safety, and legal issues like copyright and privacy. This holistic approach reflects the diverse skill set necessary for effective engagement with digital technologies. Wang et al. (2012) emphasized the importance of the concept of digital fluency, suggesting it offers a more nuanced understanding of learners' interactions with technology compared to simplistic categorizations like *Net Generation* or *New Millennium Learners*. They highlighted the complex and dynamic nature of learning contexts, advocating for research that recognizes these complexities through fieldwork and interventions.

His (2007) introduced a framework for examining digital fluency, focusing on competencies, design sensibilities, and strategic expertise gained through using digital tools. This framework underscores the active engagement and skill development involved in utilizing digital technologies for learning and communication. The concept of information fluency, as highlighted by various scholars and educational institutions, underscores the essential fusion of critical thinking, information literacy, and computer skills. According to the Associated Colleges of the South, information fluency represents the optimal outcome when these skills are combined, emphasizing the importance of critical thinking in navigating information landscapes (Beile, 2007). Similarly, Rettig and Hagen (2003) conceptualize information fluency as the intersection of information literacy, computer literacy, and critical thinking, illustrating the multidimensional nature of fluency in accessing and utilizing information.

Bundy (2004) further elaborates on the relationship between information literacy and lifelong learning, positing information literacy as the foundation for independent and lifelong learning endeavors. Heine et al. (2006) contribute to this discourse by defining Digital Information Fluency (DIF) as the ability to effectively, efficiently, and ethically find, evaluate, and use digital information. This involves understanding the nuances between digital and print information and developing the necessary skills and dispositions for digital environments.

Lorenzo and Dziuban (2006) extend the discussion by highlighting the characteristics of individuals fluent in information technology (FIT persons), emphasizing their ability to creatively express themselves, reformulate knowledge, and adapt to change through lifelong learning. Zhang (2010) reinforces this perspective by defining information fluency as having the ability for critical thinking while participating in utilizing information and technology, regardless of the platform or medium. Moreover, the 21st Century Information Fluency Project (21CIF) (2024) echoes this sentiment, defining Digital Information Fluency (DIF) as the ability to effectively use digital information while understanding its differences from print information.

Lombard (2016) contributes to the discourse by emphasizing the importance of collaboration and commitment in information fluency, distinct from information literacy. Additionally, Al Ameen (2019) offers a concise definition of Digital Information Fluency (DIF) as the efficient and effective ethical use of digital information. Finally, the NSW Department of Education (2021) reiterates the significance of information fluency in critically engaging with and utilizing information and technology across various platforms. Collectively, these perspectives underscore the multifaceted nature of digital fluency and emphasize the integration of critical thinking, collaboration, and ethical considerations in contemporary educational settings (NSW Department of Education, 2023). Finally, Table 1 shows the results of the synthesis of digital information management (DIM), digital literacy (DL), and digital data communication (DDC) skills needed for high school students according to the literature.

Research Objectives (RO)/Questions

RO1: To synthesize DIF from relevant documents such as books, textbooks, and related research.
- What are the key components and indicators of DIF skills derived from these sources?
- How do these synthesized skills align with current understandings of DIF?

RO2: To investigate the level of DIF skills among students.
- What is the current level of DIF skills among students?
- Are there variations in DIF skills among different student demographics (e.g., age, gender, socioeconomic status)?
- How do students perceive their own DIF skills?

RO3: To analyze DIF skills among students.
- What are the strengths and weaknesses of students' DIF?
- How do these skills compare to established frameworks or standards of digital fluency?
- What factors contribute to variations in DIF skills among students?

Methods

Studying High School Student (DIF) Skills

The data sources for this aspect of the research include books, textbooks, and related research materials, followed by the analysis and synthesis of content using a document synthesis form. The data analysis method employed is content analysis.

Table 1. Results of the Synthesis of DIF Skill Components

Digital Information Fluency (DIF) skill components	**Lin (2000)**	**Zhang (2010)**	**Rettig & Hagen (2003)**	**Bundy (2004)**	**Lorenzo & Dziuban (2006)**	**21CIF (2024)**	**Heine et al. (2006)**	**Lombard (2016)**	**Al Ameen (2019)**	**NSW Department of Education (2023)**
Digital Information Management (DIM)										
Assessment	✓			✓		✓	✓	✓		
Critical thinking		✓	✓							✓
Identification (defining information needs)								✓	✓	
Asking questions										
Analysis										
Knowledge reformulation					✓					
Digital Literacy (DL)										
Searching	✓			✓		✓	✓	✓	✓	
Information literacy		✓	✓							
Computer literacy		✓	✓							
Teamwork/collaboration						✓		✓		
Acquire/awareness										
Information access									✓	
Ethics and legal use of information									✓	
Digital Data Communication										
Information/data use	✓			✓		✓	✓	✓		✓
Digital technology use								✓		✓
Applications										
Creative expression					✓					
Synthesizing new information					✓					

Population and Sample Size

This section begins with a description of the population and sample size. The population under study comprises technology teachers at the high school level during the academic year 2023, across schools under the supervision of the Office of the Basic Education Commission (OBEC) Secondary Educational Service Area Offices (SEAOs). According to the Individual Student Data Collection System (2023), the population consisted of 2,360 individuals. The sample size chosen was 400 individuals, according to Costello and Osborne's (2019) recommendation that the ratio of the sample group to the number of parameters or observable variables should not be less than 10-20 times per 1 observed variable. Since there are 11 observable variables in this research, the sample size was set at more than 30 times the observed variables. The sampling method employed used multi-stage random sampling, consisting of three stages:

1. Stratified random sampling by randomly selecting OBEC SEAOs from four geographic regions to ensure a representative sample.
2. Simple random sampling from the selected SEAOs, with not less than 50% of the number of SEAOs offering instruction at the regional level included in the sample.
3. Simple random sampling of technology subject teachers from the 33 selected schools, classified by region.

Table 2 provides a breakdown of the sampling by region, SEAOs, and teachers, detailing the targeted and actual sample sizes for each category. The regions include Northern, Central, Eastern, Northeast, and Southern, with corresponding populations and sample groups for SEAOs and teachers, demonstrating the distribution of the sample across different geographic areas.

Table 2. Sampling Breakdown by Regions, SEAOs, and Teachers

Survey Region	**Population**		**Sample Groups**			
			Number Targeted		**Actual Sample**	
	SEAOs	**Teachers**	**SEAOs**	**Teachers**	**Teachers**	**%**
Northern	15	456	8	77	65	84
Central / Eastern	21	637	11	108	98	91
Northeast	17	933	9	158	136	86
Southern	9	334	5	57	55	96
Totals	**62**	**2,360**	**33**	**400**	**354**	**89**

Research Tools

The instrument utilized in this research to measure the variables was a questionnaire assessing the appropriateness of DIF skills components and indicators for high school students. Comprising three components and 11 indicators, the questionnaire underwent evaluation by seven experts. The index of item-objective congruency (IOC) ranged from 0.57 to 1.00, indicating satisfactory agreement among the experts. Additionally, the questionnaire demonstrated discriminatory power values between 0.21 and 0.80, with a reliability value of 0.87, affirming its internal consistency and reliability.

Data Collection

Data were collected from technology teachers at the high school level within the secondary education area under the Office of the Basic Education Commission during the academic year 2023, across 33 areas. The researcher distributed a Google Form questionnaire to technology teachers via the network between August and September 2023. A total of 354 responses were received, accounting for 89% of the targeted sample. Detailed information is presented in Table 3.

Data Analysis

Descriptive statistics, including means, standard deviations (SD), and percentages, were employed for general data analysis using SPSS for Windows Version 21. A five-level Likert scale was used to assess each expert's agreement for each item, with scale levels, numerical values, and interpretation for each level as follows: 5 = strongest agreement (4.50-5.00), 4 = strong agreement (3.50-4.49), 3 = moderate agreement (2.50-3.49), 2 = somewhat agree (1.50-2.49), and 1 = minimal agreement (1.00-1.49). Expert opinions on content and structural validity were assessed through the IOC, yielding values ranging from 0.66 to 1.00, indicating significant agreement.To analyze the components of digital fluency skills in news for high school students, a second-order confirmatory factor analysis (2nd-order CFA) was conducted using the LISREL 9.10 program. The accuracy of the factor model was interpreted based on specific criteria detailed in Figure 2, ensuring robustness and validity in the analysis process.

Results

Table 3 presents a comprehensive overview of the demographic characteristics of the respondents who participated in the questionnaire. The majority of the sample respondents were female, accounting for 62.99% of the total. Regarding age distribution, 40.40% of the respondents were under 30 years old, while 42.09% fell within the 30-40 age bracket. Those aged 41 years and above constituted 17.51% of the sample. In terms of teaching experience, the distribution was as follows: 32.20% had less than 5 years of experience, 28.25% had 5-10 years of experience, and the largest proportion, 39.55%, had been teaching for 11-15 years. Regarding the highest level of education attained, 68.93% of the respondents held a bachelor's degree, while 31.07% had a postgraduate degree.

Table 3. Questionnaire's General Information Items (*n*=354)

General information		Teachers	%
Gender	- man	131	37.01
	- female	223	62.99
Age	- Under 30 years old	143	40.40
	- 30-40 years	149	42.09
	- 41 years and above	62	17.51
Teaching experience	- less than 5 years	114	32.20
	- 5 - 10 years	100	28.25
	- 11 - 15 years	140	39.55
Highest level of education	- Bachelor's degree	244	68.93
	- Postgraduate degree	110	31.07

The data presented in Tables 4 and5 sheds light on the digital fluency skills of high school students regarding news consumption and their interrelationships, providing valuable insights into the efficacy of current educational practices and the potential for further enhancement.From Table 4, it is evident that technology teachers perceive high school students to possess high levels of DIF skills, with all indicators scoring at the highest levels of agreement. Notably, digital information management emerged as the component with the highest mean value, indicating that students excel in tasks such as specifying required information, evaluating data, and adjusting data formats. Similarly, digital data communication and literacy components also scored highly, emphasizing students' proficiency in selecting software, using digital technology to collaborate online, and applying data ethically. These findings underscore the effectiveness of current educational strategies in equipping students with essential digital literacy skills, crucial for navigating the information-rich digital landscape.

Table 4. **O**pinion Levels of Teachers' DIF Skills Importance

Element/Indicator	**Mean**	**SD**	Opinion level
Digital Information Management (DIM)	**4.82**	**0.34**	strongest agreement
Specify required information (A1)	4.88	0.37	strongest agreement
Evaluate data (A2)	4.81	0.45	strongest agreement
Adjust data format (A3)	4.77	0.48	strongest agreement
Digital Literacy (DL)	**4.77**	**0.36**	strongest agreement
Digital software selection and use (B1)	4.62	0.58	strongest agreement
Software data management (B2)	4.80	0.49	strongest agreement
Digital online technology collaboration with others (B3)	4.74	0.52	strongest agreement
Ethical data use (B4)	4.92	0.35	strongest agreement
Digital Data Communication (DDC)	**4.79**	**0.36**	strongest agreement
Synthesize new data (C1)	4.84	0.46	strongest agreement
Create digital information (C2)	4.84	0.45	strongest agreement
Apply data (C3)	4.79	0.51	strongest agreement
Disseminating information using digital technology (C4)	4.70	0.53	strongest agreement
Average	**4.79**	**0.31**	strongest agreement

Correlation Coefficients Analysis

Moving to Table 5, the correlation coefficient (r) analysis reveals significant positive relationships among the 11 observed variables, with 55 pairs of indicators displaying statistically significant correlations at the .01 level. This indicates that the various components of DIF skills are interconnected and mutually reinforcing. Moreover, r values are often interpreted with r values indicating a weak (0.10–0.29), moderate (0.30–0.49) or strong (0.50–1) interrelationship (Ruenphongphun et al., 2021). The r values ranging from 0.21 to 0.61 signify the strength of these relationships, suggesting a coherent and integrated framework of digital literacy acquisition among high school students. Furthermore, the Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) value of 0.90 and Bartlett's Test of Sphericity value of 1396.11 indicate a high level of suitability and statistical significance of the data, respectively, affirming the robustness of the correlation analysis.

Table 5. Correlation Coefficients of Observed Variables

Item	A1	A1	A3	B1	B2	B3	B4	C1	C2	C3	C4
A1	1.00	-	-	-	-	-	-	-	-	-	-
A2	.41**	1.00	-	-	-	-	-	-	-	-	-
A3	.33**	.44**	1.00	-	-	-	-	-	-	-	-
B1	.21**	.35**	.34**	1.00	-	-	-	-	-	-	-
B2	.36**	.45**	.36**	.48**	1.00	-	-	-	-	-	-
B3	.40**	.30**	.31**	.32**	.32**	1.00	-	-	-	-	-
B4	.49**	.40**	.43**	.33**	.51**	.56**	1.00	-	-	-	-
C1	.44**	.52**	.38**	.32**	.47**	.39**	.54**	1.00	-	-	-
C2	.35**	.42**	.35**	.38**	.41**	.34**	.50**	.61**	1.00	-	-
C3	.32**	.42**	.40**	.31**	.42**	.30**	.44**	.46**	.47**	1.00	-
C4	.26**	.35**	.33**	.43**	.37**	.47**	.40**	.30**	.32**	.32**	1.00

Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0.90; Bartlett's Test of Sphericity =1396.11 df=55 Sig. < 0.01; **Sig.<.01

Overall, the data underscores the importance of fostering digital fluency skills among high school students, particularly in the context of information consumption in the digital era. These skills not only enable students to effectively manage and communicate digital information but also promote critical thinking, collaboration, and ethical use of data (B4). By understanding the interconnectedness of these skills and their high levels of proficiency among students, educators can tailor instructional strategies to further enhance students' digital literacy capabilities, empowering them to navigate the complexities of the digital world with confidence, safety, and discernment (Kornpitack & Sawmong, 2022; Pimdee & Leekitchwatana, 2019). The data in Figure 2 presents the results of the second confirmatory factor analysis conducted by the researchers to assess the consistency of the core components of digital information fluency skills among high school students.

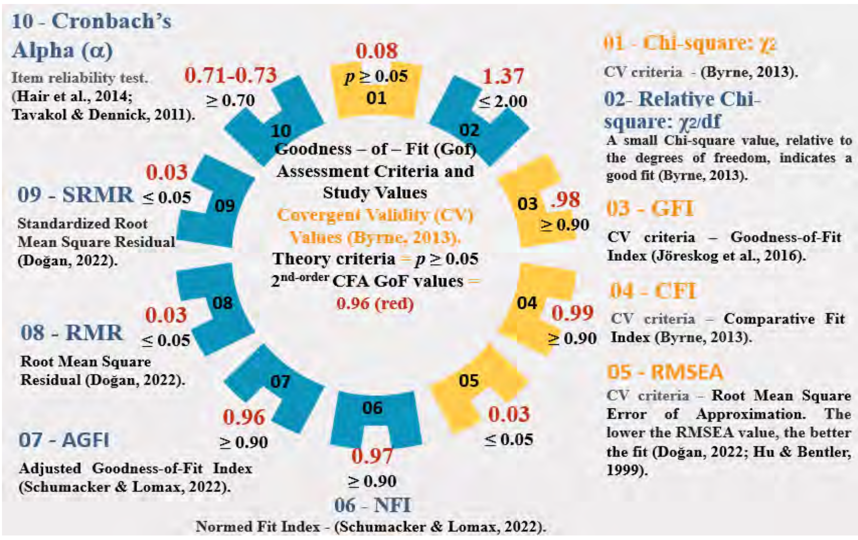

Figure 2. Goodness-of-Fit Analysis Wheel

(Byrne, 2013; Doğan, 2022; Hair et al., 2014; Hu & Bentler, 1999; Jöreskog et al., 2016; Schumacker & Lomax, 2022; Tavakol & Dennick, 2011).

The analysis focused on 11 observed variables related to digital fluency skills in news consumption. Figure 2 highlights various criteria used to evaluate the conformity index of the confirmatory component model. Each criterion is accompanied by its respective threshold value and the actual value obtained from the analysis. Here's a breakdown of the key findings:

1. The *p*-value of the chi-square test ($\chi 2$): A p-value greater than or equal to 0.05 indicates that the model fits the data well. In this case, the obtained p-value of 0.08 validates the model's fit to the data (Byrne, 2013).
2. The ratio of chi-square to degrees of freedom ($\chi 2/df$): A ratio less than 2 indicates a good fit between the model and the data. With a value of 1.37, the obtained ratio validates the model's fit (Byrne, 2013).
3. The CFI, GFI, AGFI, and NFI: These indices measure how well the model fits the data, with values equal to or greater than 0.90 indicating a good fit. In this analysis, all these indices surpassed the threshold values, with CFI, GFI, AGFI, and NFI values of 0.99, 0.98, 0.96, and 0.97, respectively (Byrne, 2013; Jöreskog et al., 2016; Schumacker & Lomax, 2022).
4. The RMSEA, SRMR, and RMR: These indices measure the discrepancy between the observed data and the model, with values less than or equal to 0.05 signifying a good fit. In this analysis, all these indices met the threshold values, with RMSEA, SRMR, and RMR values of 0.03 each (Doğan, 2022; Hu & Bentler, 1999).

Overall, the results indicate that the confirmatory component model of high school students' digital fluency skills in news consumption demonstrated a strong fit to the empirical data, as it met all established criteria for model validity (Byrne, 2013; Doğan, 2022; Hair et al., 2014; Hu & Bentler, 1999; Jöreskog et al., 2016; Schumacker & Lomax, 2022; Tavakol & Dennick, 2011). Figure 3 shows that the results of the 2nd-order CFA for Thai student DIF skills (Ruenphongphun et al., 2021).

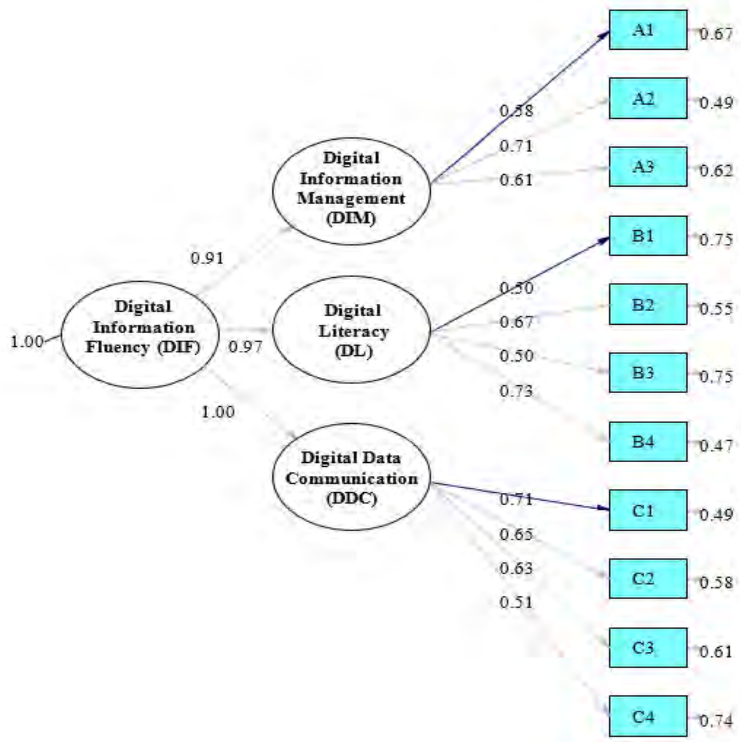

Figure 3. Results of 2nd-Order CFA of DIF's Principal Components

Note. Chi-Square=45.08, df=33, *p*-value=0.08, RMSEA=0.03

Table 6 provides detailed information on the confidence values, including element weight, reliability of observable variables, and component score coefficients, for each component of digital information fluency skills among high school students. Element Weight (α): This column indicates the reliability or internal consistency of each component, measured by Cronbach's alpha (α). Higher values of α suggest greater reliability, indicating that the observed variables within each component are highly correlated and measure the same underlying construct. In this analysis, all components exhibit acceptable α values, ranging from 0.71 to 0.73, indicating good internal consistency.

Table 6. Analysis of Confidence Values and Reliability Measures

Element/Indicator	(α)	β(SE)	(t)	(R^2)
Digital Information Management (DIM)	**0.71**	**0.91(0.09)**	**9.85****	**0.83**
Specify required information (A1)		0.58	-	0.33
Evaluate data (A2)		0.71	9.29**	0.51
Adjust data format (A3)		0.61	8.51**	0.38
Digital Literacy (DL)	**0.72**	**0.97(0.11)**	**8.90****	**0.95**
Digital software selection and use (B1)		0.50	-	0.25
Software data management (B2)		0.67	9.17**	0.45
Digital online technology collaboration with others (B3)		0.50	7.34**	0.25
Ethical data use (B4)		0.73	8.45**	0.53
Digital Data Communication (DDC)	**0.73**	**1.00(0.07)**	**14.53****	**1.00**
Synthesize new data (C1)		0.71	-	0.51
Create digital information (C2)		0.65	13.20**	0.42
Apply data (C3)		0.63	10.78**	0.39
Disseminating information using digital technology (C4)		0.51	8.83**	0.26

Note. β = standardized regression coefficient, SE = standard error, 't' = t-value, coefficient of determination = R^2

Reliability of Observable Variables (β(SE)and t): This section assesses the reliability of individual observable variables within each component. The parameter ' β ' represents the unstandardized regression coefficient, while 'SE' denotes the standard error, and 't' signifies the t-value. A higher t-value indicates greater reliability and statistical significance of the variable. Notably, for most variables, the t-values are statistically significant at the $p < .01$ level, indicating robust reliability. Component coefficient of determination (R^2): The component R^2 measures the proportion of variance in the component explained by the observed variables. Higher R^2 values indicate a stronger relationship between the observed variables and the component s (Chicco et al., 2021). In this analysis, all components exhibit substantial R^2 values, ranging from 0.83 to 1.00, suggesting that the observed variables contribute significantly to the overall component.

The importance of this analysis lies in its ability to provide insights into the reliability and validity of the digital information fluency skills model among high school students. By assessing the internal consistency of components and the reliability of individual observable variables, researchers can ascertain the robustness of the measurement model. Moreover, the component score coefficients offer valuable information on the extent to which observed variables contribute to the underlying constructs, thereby enhancing our understanding of the structure and dynamics of digital information fluency skills.

Overall, this detailed analysis enables researchers and educators to make informed decisions regarding the development and implementation of interventions aimed at enhancing students' digital information fluency skills. It provides a comprehensive assessment of the model's psychometric properties, laying the foundation for effective curriculum design, instructional strategies, and assessment practices tailored to students' needs and abilities.

Conclusion

In summary, the components of digital information fluency skills among high school students were comprehensively analyzed. These skills consist of three main components with a total of 11 indicators. Among these components, the highest-weighted component was digital data communication (DDC), with a weight of 1.05. This indicates the crucial role of effective communication of digital information in today's information-rich environment. Following closely is digital literacy (DL), with a weight of 0.97, emphasizing the importance of understanding digital tools and technologies for information consumption and creation. Additionally, digital data management (DDM), with a weight of 0.91, underscores the significance of efficiently organizing and managing digital information.

These findings align with previous research by Lorenzo and Dziuban (2006), who emphasized the importance of information fluency in navigating today's information environment. Similarly, Al Ameen (2019) highlighted the need for advanced digital skills in a communication-driven world, supporting the significance of digital information communication. Moreover, Lombard (2016) emphasized collaboration in achieving information fluency, indicating the importance of effective communication in digital environments.Furthermore, the reliability of the component model was confirmed, with construct validity falling within acceptable ranges. This suggests that the components identified in this study can serve as a foundation for further research and educational interventions.

Recommendations

Based on these findings, it is recommended that the Basic Education Commission prioritize the integration of digital information fluency skills into the curriculum. This should include planning and providing resources for enhancing students' skills in digital information communication, literacy, and management. Educational institutions should also develop learning management plans and digital learning resources to facilitate the acquisition of these skills. Additionally, teachers should incorporate activities that promote digital information fluency skills into their subject-specific lessons, enabling students to apply these skills across disciplines.

By prioritizing the development of digital information fluency skills, students will be better equipped to navigate the ever-changing information landscape and apply their knowledge effectively in various contexts. This will ultimately contribute to the cultivation of a digitally literate and competent workforce, essential for driving quality digital societal development in the future.

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