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From Self-Efficacy to Civic Literacy: Modeling the Motivational and Information Pathways among Chinese University Students

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ABSTRACT

This study aims to establish the reliability and construct validity of four instruments, test a theory-driven structural model in which self-efficacy predicts learning motivation and information literacy, learning motivation predicts information literacy, and learning motivation and information literacy predict civic literacy, estimate total direct and indirect effects among the constructs and evaluate overall model fit, and examine differences by gender academic year and discipline. Undergraduate students from a university in Xi'an, China, provided 323 valid responses collected via stratified sampling. Pearson correlations were positive among all variables, with the strongest association between self-efficacy and learning motivation (r = .474). Instrument quality was adequate, with all α > .82, KMO = .902, a significant Bartlett's test, four PCA factors explaining 63.626% of variance, and strong loadings (~.70–.82) without salient cross-loadings, indicating good structural and discriminant validity. The SEM showed excellent fit, χ²/df = 1.296, RMSEA = .030, GFI = .943, NFI = .930, TLI = .983, CFI = .983. Path tests supported the theorized chain, with self-efficacy predicting learning motivation β = .565, learning motivation predicting information literacy β = .352, and information literacy emerging as the strongest proximal predictor of civic literacy β = .398. Group differences indicated higher self-efficacy for women t = −3.787, p < .001, significant academic-year effects on information literacy and civic literacy F = 3.666, p = .013; F = 2.783, p = .041, significant discipline effects on self-efficacy and information literacy F = 3.929, p = .004; F = 3.640, p = .006, and nonsignificant effects for home location and daily internet-use duration. Findings inform course and program designs that scaffold motivation into high-quality information practices to strengthen civic readiness.

Introduction

In the digital era, the rapid expansion of information technology has profoundly reshaped university students' learning contexts, civic responsibilities, and developmental trajectories. As digital platforms increasingly become central to academic and social life, competencies such as information literacy and civic participation are no longer optional but foundational for informed and responsible engagement. Information literacy not only concerns the retrieval, evaluation, and ethical use of information; it also directly supports the quality of judgment and level of participation in both digital and offline public spheres (Head et al., 2020; Mihailidis & Thevenin, 2013). Correspondingly, digital citizenship has emerged as a comprehensive framework emphasizing the coordinated development of information evaluation, online participation, social responsibility, and technological ethics. Within this framework, civic literacy reflects students' readiness for public engagement across digital and real-world arenas, whereas information literacy denotes the capacity to locate, evaluate, and use information effectively; together they constitute key dimensions of contemporary higher-education goals (Kahne & Bowyer, 2017; Mihailidis & Thevenin, 2013; Head et al., 2020).

At the psychological level, self-efficacy—defined as individuals' beliefs in their capability to organize and execute actions to handle future situations—functions as a pivotal construct influencing students' motivation, learning behavior, and ability to cope with challenges (Bandura, 1997; Bandura, 1986). A substantial body of research shows that self-efficacy is a critical antecedent for acquiring and applying cognitive–technical competencies such as information literacy; it also enhances academic performance and sustained engagement by shaping goal setting, effort, and persistence (Schunk & Pajares, 2009; Honicke & Broadbent, 2016). Meanwhile, learning motivation serves as a driving force in both academic and civic learning: higher motivation promotes engagement and reflection in complex information tasks, the deployment of metacognitive strategies, and self-regulated learning behaviors, thereby fostering the continued development of information literacy and public participation. From motivational theory, the growth of intrinsic motivation and autonomy facilitates the internalization of civic values and responsibilities into stable behavioral tendencies (Pintrich, 2000; Ryan & Deci, 2000).

It should be noted that, although research on self-efficacy, learning motivation, information literacy, and civic literacy has expanded, the literature remains fragmented in articulating their integrated structural relationships and is predominantly situated in Western contexts, with relatively limited empirical evidence from Chinese higher education. In addition, how demographic variables—such as gender, academic year, disciplinary background, family region, and digital behaviors—shape these core competencies requires systematic testing in localized settings. Situated in increasingly urbanized and technology-rich environments, Chinese university students encounter both opportunities and challenges in cultivating digital and civic competencies, underscoring the practical necessity and theoretical value of examining developmental mechanisms from cognitive–motivational–civic perspectives.

Against this backdrop, the present study targets undergraduates at a university in Xi'an, China, with the aim of examining the structural associations among self-efficacy, information literacy, learning motivation, and civic literacy, while also analyzing group differences across demographic characteristics. The research design integrates reliability and validity assessments, exploratory factor analysis, and correlation and regression (or structural equation modeling) to provide a fuller account of the internal linkage mechanisms spanning cognitive,

motivational, and civic dimensions within contemporary higher education. The findings are expected to inform curriculum design and student-development strategies that support academic achievement while cultivating responsible digital citizens and active participants in public life.

Literature Review and Theoretical Framework

Self-Efficacy and Information Literacy

Self-efficacy refers to an individual's belief in their capability to organize and execute actions required to achieve specific performance outcomes (Bandura, 1997). Within educational contexts, self-efficacy has been widely recognized as a critical psychological factor influencing students' learning behaviors, persistence, and cognitive engagement. Students with high self-efficacy tend to demonstrate greater confidence when performing academic tasks and are more likely to engage with complex learning challenges. In the context of digital learning environments, self-efficacy has been shown to significantly influence students' information literacy development. Information literacy involves the ability to identify information needs, locate relevant sources, critically evaluate content, and use information ethically and effectively (Julien et al., 2020). These competencies require not only technical skills but also confidence in one's ability to navigate digital systems and evaluate information credibility. Previous studies have consistently found a positive relationship between self-efficacy and information literacy. For example, Tuncer (2013) reported that students with higher levels of computer and information self-efficacy were more confident in conducting information searches and evaluating digital resources. Similarly, Kurbanoglu et al. (2006) found that self-efficacy beliefs significantly predicted students' performance in information literacy tasks, as individuals with stronger confidence were more willing to experiment with new information technologies and overcome technological difficulties. Based on these theoretical and empirical findings, self-efficacy can be considered a critical antecedent that enhances students' information literacy capabilities.

Self-Efficacy and Learning Motivation

Self-efficacy also plays a crucial role in shaping students' learning motivation. According to social cognitive theory (Bandura, 1986), individuals' beliefs about their capabilities strongly influence their goal setting, effort investment, and persistence when facing challenges. Students who believe they can succeed in learning tasks tend to demonstrate higher motivation and stronger academic engagement. Learning motivation refers to the internal and external factors that initiate, direct, and sustain learning behaviors. It encompasses both intrinsic motivations, driven by personal interest and curiosity, and extrinsic motivation, influenced by external rewards or academic outcomes. Research has consistently shown a strong relationship between self-efficacy and learning motivation. Schunk and Pajares (2009) argue that self-efficacy influences learners' willingness to invest effort and maintain persistence in challenging tasks. Furthermore, a meta-analysis conducted by Honicke and Broadbent (2016) confirmed that academic self-efficacy is strongly associated with students' motivational beliefs across various educational contexts. Students with higher self-efficacy are more likely to set ambitious goals, adopt adaptive learning strategies, and remain resilient in the face of

academic obstacles. Therefore, self-efficacy can be considered a key psychological driver that energizes and sustains students' learning motivation.

Learning Motivation and Information Literacy

Learning motivation is widely recognized as a significant factor influencing students' cognitive engagement and knowledge acquisition. According to self-determination theory (Deci & Ryan, 1985), motivated learners are more likely to engage deeply in learning activities and demonstrate persistence when encountering challenges. In the context of information literacy, motivation plays a vital role in encouraging students to actively seek, analyze, and evaluate information. Information literacy tasks often involve complex cognitive processes such as problem identification, information searching, critical evaluation of sources, and synthesis of knowledge. These processes require sustained effort and curiosity.

Research suggests that students with higher motivation are more likely to explore diverse information sources and engage in deeper levels of information processing (Andretta, 2005). Choi and Lim (2016) found that intrinsic motivation significantly predicts students' information-seeking behaviors and their performance in information literacy assessments. Moreover, motivated learners tend to apply metacognitive strategies and self-regulated learning approaches, both of which are essential for effective information literacy development (Pintrich, 2000). Consequently, learning motivation serves as a cognitive-affective mechanism that facilitates the development of students' information literacy skills.

Information Literacy and Civic Literacy

In the digital era, civic literacy has become an essential competency for individuals participating in democratic societies. Civic literacy refers to individuals' knowledge, skills, and dispositions required to understand social issues, evaluate public information, and engage in civic and political activities. Information literacy plays a fundamental role in the development of civic literacy. Individuals who possess strong information literacy skills are better equipped to access reliable information, critically evaluate media content, and identify misinformation or biased narratives. These abilities are crucial for making informed civic decisions and participating responsibly in public discourse. Kahne and Bowyer (2017) argue that digital information competencies are essential for supporting democratic participation in contemporary societies. Similarly, head et al. (2020) emphasize that students must develop the ability to critically evaluate online information in order to navigate the increasingly complex digital information landscape. Empirical evidence also supports the relationship between information literacy and civic engagement. Mihailidis and Thevenin (2013) found that young adults with strong information literacy skills were more likely to participate in civic activities such as online discussions, advocacy campaigns, and community initiatives. Additionally, digital citizenship frameworks increasingly recognize information literacy as a core competency required for responsible civic participation (Rheingold, 2012).

Therefore, strengthening information literacy can directly contribute to the development of civic literacy in modern digital societies.

Learning Motivation and Civic Literacy

Learning motivation also plays a significant role in shaping students' civic literacy and civic engagement. Motivated learners are more likely to demonstrate interest in social issues, public affairs, and community participation. According to self-determination theory (Ryan & Deci, 2000), individuals with high intrinsic motivation are more likely to internalize social values and civic responsibilities as part of their personal identity. Educational environments that promote autonomy, competence, and relevance can foster students' motivation to engage with civic learning. Research on civic education supports this perspective. Torney-Purta et al. (2001) found that students who demonstrated higher academic motivation were more actively engaged in civic learning activities and discussions of public issues. Similarly, Levine (2007) suggests that motivated students are more inclined to participate in democratic processes and community initiatives. Recent empirical studies also indicate that students with higher levels of academic motivation are more likely to engage in civic behaviors such as volunteering, expressing political opinions, and participating in collaborative problem-solving activities (Lau et al., 2019). Therefore, learning motivation contributes not only to academic success but also to the development of civic awareness and participatory competencies.

Theoretical Framework

Based on the theoretical and empirical literature discussed above, this study proposes a conceptual model examining the relationships among self-efficacy, learning motivation, information literacy, and civic literacy among university students. The model hypothesizes that:
1. Self-efficacy positively influences both information literacy and learning motivation.
2. Learning motivation positively influences information literacy and civic literacy.
3. Information literacy positively influences civic literacy.
Additionally, learning motivation is proposed to act as a mediating variable linking self-efficacy to both information literacy and civic literacy outcomes.

Objectives

1. To examine the factor structure, internal consistency, and construct validity of the Self-Efficacy, Information Literacy, Learning Motivation, and Civic Literacy scales using exploratory factor analysis (EFA) and reliability testing, ensuring that each instrument is psychometrically sound and appropriate for subsequent analysis.
2. To analyze the influence of demographic characteristics—including gender, academic year, field of study, home location, and daily internet usage—on university students' Self-Efficacy, Information Literacy, Learning Motivation, and Civic Literacy, identifying significant differences among subgroups.
3. To investigate the interrelationships among Self-Efficacy, Information Literacy, Learning Motivation, and Civic Literacy through correlation and structural equation modeling (SEM), with a particular focus on the mediating and predictive roles of Learning Motivation in shaping digital citizenship competencies and cognitive perceptions.

Methodology

Population and Sample

The population of this study comprised undergraduate students enrolled at a university in Xi'an, China. A total of 323 valid responses were obtained using stratified random sampling to ensure demographic representativeness across gender, academic year, field of study, home location, and internet usage duration. The sample size was designed to meet the statistical requirements for exploratory factor analysis, as well as structural equation modeling, while also considering practical feasibility. Stratified random sampling was adopted to accurately reflect the characteristics of the target student population and enhance the generalizability of the findings.

Table 1 Descriptive Result of the Sample

Variable	Items	n	%	Variable	Items	n	%
Gender	Male	150	46.4	Home Location	Arts	96	29.7
	Female	173	53.6		Medical	32	9.9
Academic Year	Year 1	44	13.6		Urban	154	47.7
	Year 2	165	51.1		Rural	169	52.3
	Year 3	102	31.6	Average Internet Use per Day (hour)	<1	17	5.3
	Year 4	12	3.7		1-3	44	13.6
Field of Study	science	34	10.5		3-5	143	44.3
	Humanities	57	17.6		>5	119	36.8
	social	104	32.2				

The demographic characteristics of the study sample are as follows: The gender distribution was relatively balanced, with 150 male respondents (46.4%) and 173 female respondents (53.6%). Regarding academic year, second-year students accounted for the largest proportion (165 students, 51.1%), followed by third-year students (102 students, 31.6%). First-year and fourth-year students accounted for 44 (13.6%) and 12 (3.7%) students, respectively. In terms of field of study, the majority were from the social sciences (104 students, 32.2%), followed by arts (96 students, 29.7%), humanities (57 students, 17.6%), science and engineering (34 students, 10.5%), and medicine (32 students, 9.9%). For place of origin, slightly more students came from rural areas (169 students, 52.3%) compared to urban areas (154 students, 47.7%). As for daily internet use, most students reported using the internet for 3–5

hours per day (143 students, 44.3%), followed by more than 5 hours (119 students, 36.8%), 1–3 hours (44 students, 13.6%), and less than 1 hour (17 students, 5.3%).

Research Instrument

Self-efficacy was measured with reference to the General Self-Efficacy Scale (GSE) developed by Schwarzer and Jerusalem (Schwarzer & Jerusalem, 1995). While preserving the core construct, we adapted a concise set of items from the original scale to reflect typical university learning and problem-solving contexts, covering key facets such as perceived control, coping with difficulties, and persistence. The translation followed a forward–back-translation procedure, and a small pilot test was conducted prior to formal administration. In this study, the scale used a five-point response format, and the mean score represented the level of self-efficacy. Internal consistency was good (α = .854), aligning with the reliability range typically reported for university samples (≈ .76–.90), supporting the stability and applicability of the measure.

Information literacy was assessed with reference to the Information Literacy Self-Efficacy Scale (ILSES) developed by Kurbanoglu, Akkoyunlu, and Umay (Kurbanoglu et al., 2006). Centered on core processes of defining information needs, search strategies, source evaluation, and ethical use of information, we selected and localized a concise set of items that covers the critical skills chain while reducing respondent burden and maintaining construct representativeness and structural integrity. Items were rated on a five-point scale; higher mean scores indicate stronger self-efficacy in information retrieval, evaluation, and application. In the current sample, internal consistency was excellent (α = .857). Item loadings were concentrated on the intended factor with no salient cross-loadings, indicating good convergent and discriminant validity.

Learning motivation was measured with reference to the motivation section of the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich and colleagues (Pintrich et al., 2000). We emphasized dimensions with the strongest explanatory power in university settings—intrinsic goal orientation, task value, and beliefs about learning control—and assembled a semantically equivalent, concise set of items. Responses used a five-point format; higher mean scores reflect stronger learning motivation. Internal consistency in this study was good (α = .836), consistent with the reliability range commonly reported for MSLQ subscales in higher-education samples (.70–.90), indicating acceptable stability in the local context.

Civic literacy was measured with reference to the Civic Attitudes and Skills Questionnaire (CASQ) proposed by Moely and colleagues (Moely et al., 2002). We extracted representative items spanning civic responsibility, attention to political and social issues, evidence-based expression of positions and viewpoints, and interpersonal/problem-solving skills, forming a concise version suited to classroom and campus participation contexts while controlling overall questionnaire length. Items were scored on a five-point scale; higher mean scores indicate higher levels of civic literacy. In this sample, internal consistency was good (α = .825). Together with the structural relations among information literacy, self-efficacy, and learning motivation observed in the structural equation model, these results further support the scale's structural validity. For research contexts that emphasize participation and ethics in online public spaces, the Digital Citizenship Scale developed by Choi et al. (2017) can be added in subsequent

studies as a complementary measure of the digital citizenship dimension, enabling examination of the proximal mechanism from information literacy to (digital) civic literacy.

Research Statistics

In data preparation, reverse-scored items were recoded, scales were standardized, and missing data were handled at the scale level by mean imputation when <20% of items were missing; otherwise, cases were excluded for that scale. Descriptive statistics (frequencies, percentages, means, SDs) profiled the sample. Measurement quality was assessed via Cronbach's alpha, KMO, and Bartlett's test. Exploratory factor analysis used principal component analysis with Varimax rotation; factor retention followed eigenvalues >1, scree plot, and cumulative variance, with item loadings (≥.70 preferred) and communalities evaluated.

Associations among self-efficacy, learning motivation, information literacy, and civic literacy were examined with Pearson correlations (two-tailed). Group differences used independent-samples t tests for two-group factors (with Levene's test and Cohen's d) and one-way ANOVA for three-or-more groups; when omnibus F was significant, Fisher's LSD post hoc tests and η^2/partial η^2 were reported. Structural relations were tested with SEM in AMOS 27.0 using maximum likelihood, reporting fit indices (χ^2/df, RMSEA, GFI, NFI, TLI, CFI, PNFI, PGFI) and path statistics

All preprocessing, descriptive and inferential analyses (reliability, KMO/Bartlett, EFA, Pearson correlations, independent-samples t tests with Levene's test and Cohen's d, and one-way ANOVAs) were conducted in SPSS Statistics, while structural equation modeling and the reporting of fit indices and path statistics (standardized β, CR, p) were performed in AMOS.

Results

To ensure the scientific rigor and psychometric soundness of the measurement instruments employed in this study, both reliability and validity analyses were conducted. Reliability analysis aimed to evaluate the internal consistency of the scales, while validity analysis was performed to assess the structural appropriateness of the latent constructs. The procedures included Cronbach's alpha estimation, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy, Bartlett's test of sphericity, and exploratory factor analysis (EFA). These steps were undertaken to verify that the measurement tools are both statistically reliable and theoretically valid for examining the hypothesized relationships among variables in the context of university students.

Table 2 Rotated Component Matrix

	Component	**Communalities**	**Total Variance Explained**	**Cronbach's α**
SE1	0.768	0.667		
SE2	0.728	0.587		
SE3	0.754	0.612	34.774	0.854
SE4	0.791	0.705		
SE5	0.756	0.628		
IL1	0.751	0.627	12.001	0.857

	Component	Communalities	Total Variance Explained	Cronbach's α
IL2	0.76	0.657		
IL3	0.726	0.612		
IL4	0.742	0.636		
IL5	0.792	0.666		
LM1	0.823	0.712		
LM2	0.735	0.665	9.002	0.836
LM3	0.751	0.677		
LM4	0.738	0.644		
CL1	0.726	0.616		
CL2	0.756	0.63		
CL3	0.742	0.572	7.848	0.825
CL4	0.700	0.593		
CL5	0.742	0.581		
Extraction Method: Principal Component Analysis				

All four scales demonstrated high internal consistency (α > .82), indicating stable and coherent item performance. Information Literacy showed the highest reliability (α = .857), followed by Self-Efficacy (α = .854) and Learning Motivation (α = .836); Civic Literacy was slightly lower yet still above the commonly accepted adequacy threshold (α = .825). These values suggest limited measurement error and good interpretability of both total and subscale scores. Regarding validity, the KMO statistic was .902—within the "excellent" range—and Bartlett's test was significant, confirming that the correlation matrix was suitable for factor analysis. Principal Component Analysis extracted four factors in line with the theoretical model, explaining 63.626% of the total variance; after Varimax rotation, factor contributions became balanced (≈14%–17%), implying a multidimensional structure with roughly comparable weights. Item loadings on their intended factors were strong (≈.70–.82) with no salient cross-loadings, evidencing good discriminant validity; communalities all exceeded .57, indicating that a substantial portion of item variance was accounted for by the corresponding latent factors. Collectively, these results support the instruments' structural and discriminant validity, providing a solid measurement foundation for subsequent analyses of inter-construct relationships and SEM testing.

To investigate the potential influence of demographic variables on students' psychological and behavioral attributes, this study conducted independent sample t-tests and one-way ANOVAs using gender, home location, academic year, field of study, and daily internet use as grouping variables. The outcome variables examined were self-efficacy (SE), information literacy (IL), learning motivation (LM), and civic literacy (CL).

Table 3 Result of Difference Analysis

		SE	IL	LM	CL
1	Male	t=3.787***	t=1.253	t=1.133	t=0.812
	Female	p=0.000	p=0.211	p=0.258	p=0.417
2	Year 1	F=2.188	F=3.666*	F=1.831	F=2.783*
	Year 2	p=0.089	p=0.013	p=0.141	p=0.041

		SE	IL	LM	CL
	Year 3				
	Year 4				
3	Science	F=3.929** p=0.004	F=3.640** p=0.006	F=1.666 p=0.158	F=1.479 p=0.208
	Humanities				
	Social				
	Arts				
	Medical				
4	Urban	t=0.490 p=0.624	t=0.434 p=0.665	t=0.441 p=0.660	t=1.107 p=0.269
	Rural				
5	<1	F=0.104 p=0.958	F=1.352 p=0.258	F=1.024 p=0.382	F=0.977 p=0.404
	1-3				
	3-5				
	>5				

Note: ***$p<0.001$, **$p<0.01$, *$p<0.05$; 1=Gender, 2=Academic Year, 3=Field of Study, 4=Home Location, 5= Average Internet User per Day.

Statistically significant group differences were observed primarily in Self-Efficacy (SE) and Information Literacy (IL). For SE, a significant gender difference was found, with female students scoring higher (M = 3.994, SD = 0.728) than male students (M = 3.611, SD = 1.078), t = -3.787, p < 0.001. In terms of academic year, SE differences approached significance (F = 2.188, p = 0.089), and LSD post hoc analysis revealed that third-year (M = 3.927) and second-year students (M = 3.816) scored significantly higher than fourth-year students (M = 3.250). Regarding field of study, SE also varied significantly (F = 3.929, p = 0.004), with medical students achieving the highest scores (M = 4.081), followed by science and engineering (M = 3.994), and arts students the lowest (M = 3.521). For IL, significant differences were observed across academic years (F = 3.666, p = 0.013), where first-year students scored the highest (M = 3.955) and fourth-year students the lowest (M = 3.117). Field of study also had a significant impact on IL (F = 3.640, p = 0.006), with medical students again performing best (M = 4.213), followed by science and engineering (M = 3.947), and humanities students scoring the lowest (M = 3.470). Other variables such as Learning Motivation and Civic Literacy showed fewer or no significant differences across the demographic groups. Additionally, home location and internet usage time did not yield any statistically significant effects on the measured variables.

To examine the relationships among the key variables in this study—Self-Efficacy (SE), Information Literacy (IL), Learning Motivation (LM), and Civic Literacy (CL)—a Pearson correlation analysis was conducted. The results are presented in Table 4.

Table 4 Result of Correlation Analysis

VAR	SE	IL	LM	CL
SE	1	0.390**	0.474**	0.287**
IL	0.390**	1	0.418**	0.447**
LM	0.474**	0.418**	1	0.382**
CL	0.287**	0.447**	0.382**	1

Note: **p<0.01; SE=Self-Efficacy, IL=Information Literacy, LM=Learning Motivation, and CL=Civic Literacy

The results of the Pearson correlation analysis indicated that all research variables were significantly and positively correlated (p < 0.01). Specifically, the correlation coefficient between Self-Efficacy (SE) and Information Literacy (IL) was 0.390, between SE and Learning Motivation (LM) was 0.474, and between SE and Civic Literacy (CL) was 0.287, all of which reflect moderate correlation levels (Cohen, 1988). Among them, the strongest association was found between SE and LM (r = 0.474), while the weakest was between SE and CL (r = 0.287). All correlation coefficients were below the threshold of 0.60, indicating that the variables are statistically related while maintaining adequate discriminant validity (Henseler et al., 2015). Structural Equation Modeling (SEM) is a statistical method used to analyze relationships among variables based on the covariance matrix. In this study, the model and its goodness-of-fit were tested using AMOS 27.0 software. The model diagram is shown in the figure.
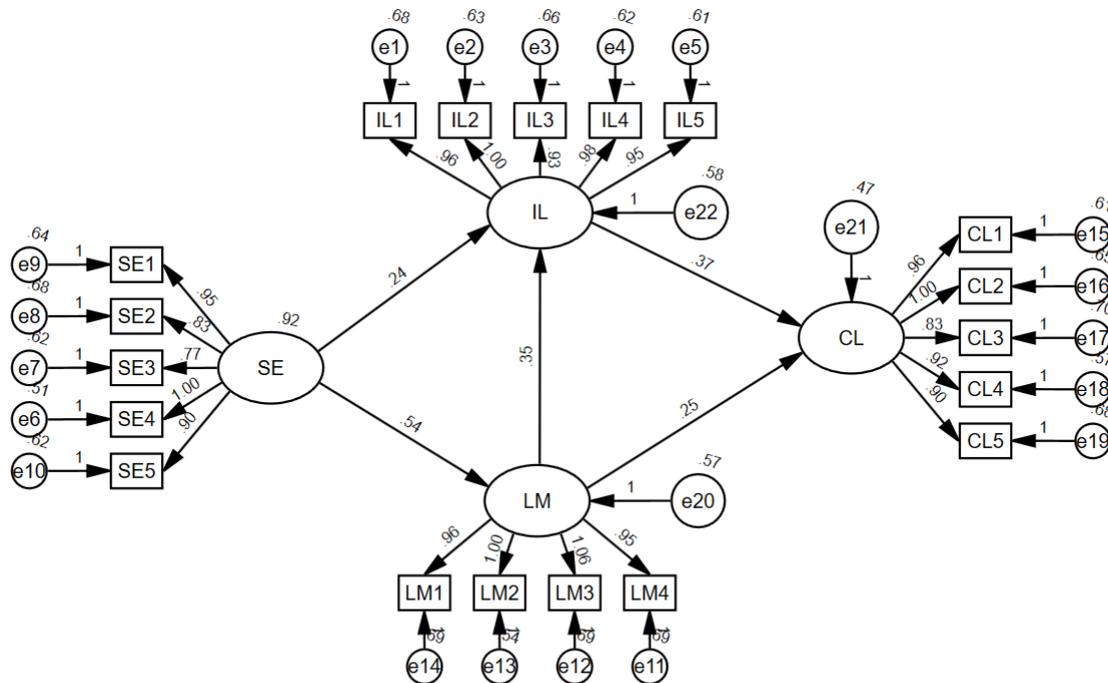

Figure 1 Structural Equation Modeling

The structural model was analyzed using the Maximum Likelihood Estimation (MLE) method, as shown in the table. The model yielded a χ^2/df value of 1.296, which is below the

recommended threshold of 3. The RMSEA value was 0.030, and the GFI, NFI, TLI, and CFI values all exceeded 0.90. Additionally, PNFI and PGFI values were above 0.70. These results indicate that the model demonstrates an ideal level of goodness-of-fit.

Table 5 Model Fit Indices

Fit Indices	x^2/df	RMSEA	GFI	NFI	TLI	CFI	PNFI	PGFI
	1.296	0.030	0.943	0.930	0.983	0.983	0.799	0.730

The results of the Structural Equation Modeling (SEM) path analysis indicated that all hypothesized paths reached statistical significance (p < 0.05). Specifically, Self-Efficacy (SE) had the strongest direct positive effect on Learning Motivation (LM), with a standardized coefficient of β = 0.565 (CR = 8.408, p < 0.001). SE also had a significant but relatively weaker direct effect on Information Literacy (IL), with β = 0.258 (CR = 3.402, p < 0.001). Among the predictors of Civic Literacy (CL), IL demonstrated the strongest direct predictive effect (β = 0.398, CR = 5.290, p < 0.001), while LM also significantly influenced CL, though with a smaller effect size (β = 0.274, CR = 3.776, p < 0.001). Notably, LM exerted a significant positive effect on IL (β = 0.352, CR = 4.476, p < 0.001). These results suggest the existence of clear direct effects among the core variables, with LM playing a central predictive role within the model.

Discussion

The present findings reveal a coherent cognitive–motivational pathway linking self-efficacy, learning motivation, information literacy, and civic literacy among university students, while also identifying patterned demographic differences that carry implications for curriculum design and digital citizenship education.

Psychometric Validity of the Measurement Instruments

The psychometric properties of the instruments were robust. Reliability analysis demonstrated strong internal consistency, with Cronbach's alpha values ranging from approximately 0.83 to 0.86 across the four constructs. Sampling adequacy was excellent, as indicated by the Kaiser–Meyer–Olkin (KMO) value of 0.902 and a significant Bartlett's Test of Sphericity (p < .001). Exploratory factor analysis extracted four clearly defined factors with high factor loadings (greater than 0.70) and acceptable communalities (greater than 0.572), supporting the distinctiveness of the constructs and confirming that the instruments were suitable for subsequent structural modeling. These results align with current methodological recommendations emphasizing the need for clear evidence of construct validity before testing structural relationships (Cheung et al., 2024). Relationships Among Self-Efficacy, Learning Motivation, Information Literacy, and Civic Literacy

Correlation analysis revealed positive relationships among all variables. The strongest correlation occurred between self-efficacy and learning motivation (r = 0.474), followed by self-efficacy and information literacy (r = 0.390), and self-efficacy and civic literacy (r = 0.287).

This pattern suggests that efficacy beliefs primarily operate through motivational processes, which subsequently support the development of higher-order literacies rather than influencing them directly. The structural equation model further clarified these relationships. Self-efficacy demonstrated the strongest direct effect on learning motivation (β = 0.565, $p < .001$), a finding consistent with social–cognitive theory, which posits that efficacy beliefs influence goal setting, effort, and persistence in learning tasks (Bandura, 1997; Schunk & Pajares, 2009). Learning motivation, in turn, significantly predicted information literacy (β = 0.352, $p < .001$), indicating that motivated students are more likely to engage in demanding information practices such as extensive searching, critical evaluation of sources, and metacognitive monitoring. Information literacy emerged as the strongest proximal predictor of civic literacy (β = 0.398, $p < .001$), while learning motivation also exerted a smaller but significant direct influence on civic literacy (β = 0.274, $p < .001$). These findings support a sequential pathway in which self-efficacy enhances motivation, motivation facilitates the development of information literacy, and information literacy ultimately strengthens civic literacy. Importantly, the stronger predictive power of information literacy compared with learning motivation highlights that civic competence depends not only on motivational readiness but also on the ability to critically evaluate and apply information in civic contexts.

Demographic Differences Among Student Groups

The analysis of demographic characteristics revealed several noteworthy patterns. Female students reported significantly higher levels of self-efficacy than male students (female mean = 3.994; male mean = 3.611; t = −3.787, $p < .001$), while gender differences in information literacy, learning motivation, and civic literacy were not statistically significant. Although previous studies often report lower female self-efficacy in science, technology, engineering, and mathematics contexts, the domain-general measure used in this study and the substantial representation of students from social sciences and arts may explain the higher female scores. This finding highlights the importance of contextual and disciplinary factors when interpreting gender differences in self-efficacy. Differences across academic years also emerged. First-year students demonstrated the highest levels of information literacy, and both first- and third-year students scored higher in civic literacy than fourth-year students. In contrast, self-efficacy differences were marginal, and learning motivation differences were not statistically significant. The lower scores among senior students may reflect increased academic workload, internships, and career preparation activities that shift attention away from deliberate information practices and civic engagement. Integrating information-literacy and civic-engagement components into senior-year capstone courses may help mitigate this decline. Disciplinary differences were also evident. Students in medical and science fields reported significantly higher levels of self-efficacy and information literacy than students in arts and humanities disciplines, although civic literacy did not differ significantly across fields of study. This pattern may reflect the stronger emphasis on research methods, evidence evaluation, and scientific inquiry in certain curricula. These results reinforce calls to embed explicit information-literacy learning outcomes and authentic research tasks within arts and humanities programs as well (Fosnacht, 2017).

Interpretation of Non-Significant Findings

Two non-significant findings offer additional insight. First, home location (urban versus rural) did not significantly influence any of the four constructs. This may indicate a reduction in the digital access gap among university students, at least in terms of perceived competencies and civic readiness. However, the absence of measures related to socioeconomic status, prior educational opportunities, or internet infrastructure limits firm conclusions, suggesting the need for more nuanced indicators of digital inequality in future research. Second, the duration of daily internet use showed no significant relationship with self-efficacy, information literacy, learning motivation, or civic literacy. This finding supports the perspective that the quantity of digital exposure does not necessarily translate into competence. Instead, the quality and purpose of online engagement appear more important for developing information and civic literacy. Future studies incorporating behavioral or activity-based measures may better capture the experiential factors that shape these competencies (Caballero-Julia et al., 2024).

Methodological Considerations

Several methodological strengths enhance confidence in the findings. The reliability and validity of the instruments were strong, and the structural equation model demonstrated excellent fit indices. The ratio of chi-square to degrees of freedom was 1.296, the root mean square error of approximation was 0.030, and the Goodness-of-Fit Index, Normed Fit Index, Tucker–Lewis Index, and Comparative Fit Index all exceeded 0.93. Additionally, the Parsimony Normed Fit Index and Parsimony Goodness-of-Fit Index were above 0.73, supporting the adequacy of the proposed model. Nevertheless, several limitations should be acknowledged. The exploratory factor analysis relied on principal component analysis, which extracts maximum variance rather than latent common variance. Future research could replicate the analysis using common factor extraction methods and confirmatory factor analysis with indicators such as standardized loadings, average variance extracted, and composite reliability. Furthermore, discriminant validity was inferred from moderate correlations rather than formally tested. Because the study employed a cross-sectional design and self-report measures, causal interpretations should be made cautiously, and potential common-method bias should be assessed. Finally, the sample was drawn from a single institution in Xi'an, which limits generalizability. Multi-institutional and longitudinal studies would help verify whether the observed pathway from self-efficacy to learning motivation to information literacy to civic literacy remains consistent across contexts and over time.

Educational and Curricular Implications

The findings suggest several practical strategies for higher education. First, instructional designs that foster mastery experiences, calibrated challenges, and formative feedback may strengthen students' self-efficacy and thereby enhance learning motivation (Bembenutty et al., 2024). Second, to translate motivation into information literacy, courses should incorporate authentic, ill-structured information problems that require iterative searching, critical evaluation of sources, and metacognitive reflection.

Because information literacy is the strongest predictor of civic literacy, civic education initiatives should integrate explicit training in evidence evaluation, argument analysis, and decision-making under conditions of informational uncertainty. These approaches are particularly important for senior students and for disciplines where information literacy is not explicitly embedded in the curriculum. Finally, the absence of significant effects of internet-use duration suggests that educational programs should prioritize purposeful digital engagement rather than simply increasing online activity, aligning co-curricular initiatives with structured information-analysis tasks and civic learning opportunities (Valkenburg et al., 2022).

Conclusion

The present study advances an integrated explanatory framework in which self-efficacy functions as a foundational psychological driver that stimulates learning motivation, learning motivation in turn scaffolds the development of information literacy, and information literacy ultimately anchors civic readiness in contemporary digital environments. The structural relationships observed in this study suggest that these constructs operate not as isolated competencies but as mutually reinforcing dimensions within a broader learning ecosystem. From a theoretical perspective, the findings contribute to the growing body of literature that emphasizes the role of motivational and cognitive factors in shaping students' capacity to critically access, evaluate, and utilize information for socially responsible participation. The results also reinforce the importance of linking psychological constructs with digital competencies in order to better understand how learners navigate complex information landscapes and translate knowledge into civic engagement.

From a practical standpoint, the model offers actionable insights for educators, curriculum designers, and policymakers seeking to cultivate digitally competent and civically responsible learners. Educational interventions that strengthen students' academic self-efficacy may indirectly enhance information literacy by fostering stronger learning motivation. Similarly, instructional strategies that integrate inquiry-based learning, critical evaluation of digital information, and reflective engagement with social issues may further reinforce the pathway from information literacy to civic readiness. These implications highlight the need for holistic educational designs that simultaneously address motivational, cognitive, and civic dimensions of learning.

Nevertheless, several limitations should be acknowledged. The cross-sectional nature of the data constrains causal inference and limits the ability to capture dynamic changes in learners' psychological and informational competencies over time. Future research would benefit from longitudinal or experimental designs that can more rigorously test causal pathways and temporal sequencing among the constructs examined. Additionally, strengthening measurement strategies—such as testing measurement invariance across demographic groups, cultural contexts, or educational levels—would enhance the generalizability and robustness of the proposed framework.

Further investigation should also incorporate multimodal data sources, including behavioral log data from digital learning platforms, to distinguish between the quantity and quality of learners' digital engagement. Such data could provide deeper insight into how learners actually interact with information resources and how these interactions translate into meaningful civic competencies. By integrating psychometric measures with behavioral

analytics, future studies can move beyond self-reported perceptions toward a more comprehensive understanding of learning processes in digitally mediated environments.

Collectively, these extensions would help advance the field beyond correlational plausibility toward stronger causal precision and more durable instructional design. In doing so, they would contribute to the development of evidence-based educational practices capable of fostering learners who are not only confident and motivated but also information literate and civically prepared to participate in an increasingly complex digital society.

Recommendations

Contributions to the Body of Knowledge

This study advances an integrated account of how self-efficacy, learning motivation, information literacy, and civic literacy interrelate in a Chinese higher-education context. Psychometric evidence establishes a solid foundation for modeling. Substantively, the structural pathway—from self-efficacy to learning motivation, from learning motivation to information literacy, and from information literacy to civic literacy—clarifies that civic readiness is most proximally driven by information processes rather than motivation alone. The findings also add nuance to group differences: higher self-efficacy among women, stronger information literacy and civic literacy among non-seniors, and discipline-sensitive patterns favoring medical and science/engineering programs. Null effects for home location and daily internet-use duration contribute to debates on digital inequality and screen time by suggesting that perceived competencies and civic readiness hinge more on the quality of engagement than on access or hours online.

Practical Recommendations for Educators and Institutions

Course and assessment design should first cultivate self-efficacy through mastery experiences, calibrated challenge, and frequent formative feedback, then convert heightened motivation into information literacy via authentic, ill-structured information problems that require iterative searching, source triangulation, and metacognitive reflection. Because information literacy is the strongest proximal predictor of civic literacy, capstones and general education should include evidence-centered civic tasks and perspective-taking protocols grounded in credible sources. Targeted supports are warranted for final-year students and for disciplines where information-literacy outcomes are less explicit. Institutions should formalize partnerships among faculty, libraries, and learning centers to co-design rubrics, mini-lessons, and feedback tools that make information evaluation and civic reasoning visible, practicable, and assessable.

Policy Recommendations for the Public Sector

Education authorities can accelerate impact by setting clear, developmentally sequenced standards that articulate information-literacy and civic-reasoning outcomes across the undergraduate years, with alignment to teacher professional development and program accreditation. Funding streams should prioritize cross-campus "civic labs" and university–community partnerships that engage students in evidence-based problem solving using open

government data. Equity efforts need to move beyond a simple urban−rural lens toward actionable indicators of device quality, bandwidth reliability, and prior training, coupled with targeted grants to close these gaps. Finally, data-governance guidelines should enable learning analytics that track the quality of digital engagement, while enforcing privacy-by-design, de-identification, and transparent student consent.

Directions for Future Research

Future work should strengthen causal inference and generalizability through longitudinal and experimental designs that test whether boosting self-efficacy reliably raises learning motivation, which in turn improves information literacy and civic literacy over time. Multi-site studies across regions and institution types can examine measurement invariance and contextual moderators. Measurement should be extended with confirmatory factor analysis, average variance extracted, composite reliability, and heterotrait−monotrait checks, along with objective performance tasks for information literacy and civic reasoning. Fine-grained behavioral data—distinguishing task-focused searching from passive scrolling and creation from consumption—will help specify which digital practices translate motivation into durable literacies. Comparative and cross-cultural replications can test the robustness of the pathway and identify policy- and curriculum-relevant levers in diverse educational systems.

References

Andretta, S. (2005). *Information literacy: A practitioner's guide.* Chandos Publishing.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* W. H. Freeman.

Bembenutty, H., Kitsantas, A., DiBenedetto, M. K., Wigfield, A., Greene, J. A., Usher, E. L., ... & Chen, P. P. (2024). Harnessing motivation, self-efficacy, and self-regulation: Dale H. Schunk's enduring influence. *Educational Psychology Review*, 36(4), 139-145.

Caballero-Julia, D., Martín-Lucas, J., & Andrade-Silva, L. E. (2024). Unpacking the relationship between screen use and educational outcomes in childhood: A systematic literature review. *Computers & Education*, 215, 105049.

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia pacific journal of management*, 41(2), 745-783.

Choi, J., Lee, M., Lee, J. K., Kang, D., & Choi, J. Y. (2017). Correlates associated with participation in physical activity among adults: a systematic review of reviews and update. *BMC public health*, 17(1), 1-13.

Choi, S. B., & Lim, M. S. (2016). Effects of social and technology overload on psychological well-being in young South Korean adults: The mediatory role of social network service addiction. *Computers in Human Behavior*, 61, 245-254.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* Plenum.

Fosnacht, K. (2020). Information Literacy's Influence on Undergraduates' Learning and Development: Results from a Large Multi-institutional Study. *College & Research Libraries*, 81(2), 272.

Head, A. J., Fister, B., & MacMillan, M. (2020). *Information Literacy in the Age of Algorithms: Student Experiences with News and Information, and the Need for Change.* Project Information Literacy.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135.

Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review*, 17, 63–84.

Julien, H., Latham, D., Gross, M., Moses, L., & Warren, F. (2020). Information Literacy Practices and Perceptions of Community College Librarians in Florida and New York. *Communications in Information Literacy*, 14 (2), 287–324

Kahne, J., & Bowyer, B. (2017). Educating for democracy in a partisan age: Confronting the challenges of motivated reasoning and misinformation. *American Educational Research Journal*, 54(1), 3–34.

Kurbanoglu, S. S., Akkoyunlu, B., & Umay, A. (2006). Developing the information literacy self-efficacy scale. *Journal of Documentation*, 62(6), 730–743.

Lau, Y., Fang, L., Cheng, L. J., & Kwong, H. K. D. (2019). Volunteer motivation, social problem solving, self-efficacy, and mental health: a structural equation model approach. *Educational Psychology*, 39(1), 112-132.

Levine, P. (2007). *The future of democracy: Developing the next generation of American citizens.* Tufts University Press.

Mihailidis, P., & Thevenin, B. (2013). Media literacy as a core competency for engaged citizenship in participatory democracy. *American Behavioral Scientist*, 57(11), 1611–1622.

Moely, B. E., Mercer, S. H., Ilustre, V., Miron, D., & McFarland, M. (2002). Psychometric properties and correlates of the Civic Attitudes and Skills Questionnaire (CASQ): A measure of students' attitudes related to service-learning. *Michigan Journal of Community Service Learning*, 8(2), 15-26.

Pintrich, P. R. (2000). *The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 451–502).* Academic Press.

Rheingold, H. (2012). *Net smart: How to thrive online.* MIT Press.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78.

Schunk, D. H., & Pajares, F. (2009). *Self-Efficacy Theory. In K. R. Wenzel, & A. Wigfield (Eds.), Handbook of Motivation at School (pp. 35-53).* Taylor & Francis Group.

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. *Causal and control beliefs*, 35(37), 35-38.

Torney-Purta, J., Lehmann, R., Oswald, H., & Schulz, W. (2001). *Citizenship and education in twenty-eight countries: Civic knowledge and engagement at age fourteen.* International Association for the Evaluation of Educational Achievement.

Tuncer, M. (2013). An analysis on the effect of computer self-efficacy over scientific research self-efficacy and information literacy self-efficacy. *Educational Research and Reviews*, 8(1), 33–40.