

# Obstacles and Promotion Mechanisms to the Development of Digital Resilience among College Students

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**Abstract:** Digital resilience is a critical competency enabling college students to address challenges and adapt positively in digital environments, shaped by the interplay of multiple factors. This study systematically examines the barriers and facilitators influencing the development of digital resilience among university students. The findings reveal that at the individual level, obstacles include insufficient digital literacy, psychological vulnerability, and inadequate metacognitive skills; at the environmental level, they involve inadequate technological support, weak social support networks, and flawed curriculum design; and at the structural level, issues such as the digital divide and biased evaluation systems. Facilitating mechanisms encompass four pathways: accumulation of psychological capital, activation of social support, strategic coping strategies, and institutional safeguards. Based on an analysis of these interactions, this paper proposes practical recommendations at three levels—universities, educators, and students—to inform the development of student support systems during higher education's digital transformation.

**Keywords:** Digital Resilience, College Students, Higher Education.

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## 1. Introduction

### 1.1. Research Background

Since the 21st century, the rapid development of digital technology has profoundly transformed the ecosystem of higher education. Online learning platforms, digital resource repositories, and intelligent teaching systems have become integral components of university education. According to the "57th Statistical Report on China's Internet Development" released by the China Internet Network Information Center, as of December 2025, China had 1.125 billion internet users, among whom young people aged 10 to 29 accounted for 26.7%[2]. For contemporary college students, digital learning has become an essential choice for their daily life, academic studies, and social interactions. However, the complexity and uncertainty of the digital environment have also posed unprecedented challenges to students. Issues such as frequent technical failures, cognitive overload due to information overload, social pressure online, and digital anxiety have become increasingly prominent[6][11]. During online learning, learners often face challenges such as difficulties in resolving technical issues and insufficient digital literacy, and varying effectiveness in addressing these challenges can lead to varying degrees of digital anxiety. Against this backdrop, how to cultivate college students' adaptability and resilience in digital environments has become a critical issue urgently requiring resolution in the field of higher education[5][10].

The concept of digital resilience was developed in response to this practical need. Digital resilience refers to an individual's ability to maintain mental well-being, adapt effectively, and grow positively when facing challenges such as technological changes, information overload, and online stress in a digital environment[11]. For college students, digital resilience is not only crucial for academic success but also significantly impacts their mental health and career development[9]. Students with strong digital resilience can remain calm and seek solutions during technical failures,

effectively filter and integrate information amid overload, and maintain a healthy self-perception under digital social pressures[1][8].

### 1.2. Research Significance

A thorough understanding of the obstacles and fostering mechanisms behind the development of digital resilience among college students holds significant theoretical and practical importance. Theoretically, digital resilience represents an advancement in resilience research within the digital age. While traditional resilience studies focus on general coping strategies with adversity, digital resilience specifically addresses challenges unique to digital contexts[4][11]. Identifying these barriers and drivers enables the construction of more explanatory and contextually adaptive theoretical models of digital resilience, thereby enriching interdisciplinary research in positive psychology and educational technology[3][7]. Practically, universities still exhibit a tendency to prioritize technical skills over psychological well-being in digital literacy education, often neglecting the cultivation of students' digital psychological resilience[5]. Clarifying these influencing factors can provide targeted guidance for curriculum design, support system development, faculty training, and student self-improvement initiatives, ultimately shifting higher education's digital transformation from technology-focused training to competency-driven development[12].

### 1.3. Definition of Core Concepts

#### (1) Resilience

The concept of resilience can be understood from three perspectives: traits, processes, and outcomes. As a trait, resilience refers to the personal characteristics that enable individuals to recover from adversity; as a process, it emphasizes the dynamic interaction between individuals and their environment; as an outcome, it focuses on the positive state individuals achieve after overcoming adversity[4][10].

This study adopts a process-oriented perspective, defining resilience as a developable capability.

## (2) Digital Resilience

Digital resilience, as an emerging concept, has garnered significant attention in academic circles. It refers to an individual's capacity to maintain mental health, adapt effectively, and achieve positive growth when confronting challenges such as technological changes, information overload, and digital stress in a digital environment[9][11]. Key components include technical problem-solving skills, information management abilities, emotional regulation in digital contexts, utilization of social support, and the ability to learn from and grow through digital setbacks[8]. For college students, digital resilience not only impacts academic success but also profoundly influences their mental well-being and future development[9].

Barriers to digital resilience refer to individual, environmental, or structural factors that impede the development of college students' digital resilience[5][12]. These factors may directly undermine adaptive capacity or indirectly hinder resilience through their impact on intermediate variables. The mechanisms underlying digital resilience enhancement encompass not only static resources or traits but also emphasize dynamic processes involving resource activation and strategic application[1].

## 2. Obstacles to the Development of Digital Resilience among College Students

The development of digital resilience among college students is not a linear or automatic process, but is hindered by multiple factors. These obstacles can be categorized into three dimensions: individual, environmental, and structural, with the factors across these dimensions being interrelated and mutually reinforcing.

### 2.1. Obstacles at the Individual Level

#### 2.1.1. Structural Deficiencies in Digital Literacy

Digital literacy forms the foundational capacity for digital resilience. Current university students exhibit significant structural deficiencies in this area, primarily manifested as stronger proficiency in tool usage than in information processing, and greater competence in information consumption than in creative production. Research indicates that while students demonstrate adequate skills in basic office software operations and social media usage, they generally lack advanced digital competencies such as information discernment, data management, collaborative digital work, and privacy protection. These structural shortcomings directly hinder the development of digital resilience. When students lack information discernment skills, information overload quickly escalates into cognitive strain and anxiety; when deficient in data management capabilities, technical failures may lead to irreversible loss of learning outcomes, exacerbating frustration. More critically, inadequate digital literacy limits students' diversity of coping strategies—greater limitations in these skills result in fewer viable approaches and narrower room for resilience development.

#### 2.1.2. Psychological Vulnerability

Psychological vulnerability constitutes a significant individual barrier to the development of digital resilience. Its primary manifestations include:

(1) Low digital self-efficacy. Self-efficacy refers to an

individual's belief in their ability to accomplish specific tasks. In digital contexts, students with low self-efficacy tend to give up rather than persevere when encountering technical glitches, and avoid exploring new platforms instead of investigating them. (2) Fixed mindset. Students with a fixed mindset view abilities as innate and immutable, interpreting technical difficulties as evidence of personal inadequacy rather than opportunities for learning and growth. This mindset leads to avoidance behaviors when facing challenges and premature abandonment after setbacks. (3) Technical anxiety. Technical anxiety involves concerns and fears about potential negative consequences of technology use. Students with high technical anxiety experience excessive physiological responses—such as accelerated heart rate and sweating—alongside psychological burdens like fear of errors or embarrassment, which impair cognitive resources required for problem-solving. (4) Digital perfectionism. Some students exhibit perfectionist tendencies in digital environments, demanding flawless performance in all technical operations and impeccable presentation of digital content. Such unrealistic standards magnify the impact of minor technical issues, turning routine frustrations into significant setbacks.

#### 2.1.3. Deficiency in Metacognitive Abilities

Metacognitive ability refers to an individual's capacity to monitor and regulate their own cognitive processes. In the development of digital resilience, metacognitive ability manifests as: recognizing one's emotional state (e.g., "I am feeling anxious right now"); identifying effective coping strategies (e.g., "This approach worked last time"); evaluating strategy efficacy and making adjustments (e.g., "This method doesn't work—try another"). Students lacking metacognitive ability often fall into emotional overwhelm, being overwhelmed by anxiety and frustration to the point of impaired rational thinking; they may exhibit fixed coping patterns by repeatedly using ineffective strategies without modification; or demonstrate insufficient reflection by failing to integrate and refine experiences following setbacks. All these factors significantly hinder the development of digital resilience.

### 2.2. Environmental Barriers

#### 2.2.1. Challenges in the Accessibility and Quality of Technical Support Services

The lack or inadequacy of technical support constitutes a significant environmental barrier to building digital resilience. This issue manifests in three aspects: (1) Accessibility challenges. Many universities offer technical support services with limited availability and limited channels, failing to meet students' urgent technical assistance needs. Students encountering technical issues during nighttime, weekends, or holidays often find no recourse. (2) Quality disparities. Even when support is available, its effectiveness varies significantly. Some support staff lack familiarity with educational contexts, providing solutions that are theoretically sound but ineffective in practice; others respond slowly, only addressing issues after students have resolved them independently or incurred substantial losses. (3) Communication barriers. The knowledge gap between support personnel and students frequently leads to poor communication. Technical terms used by support staff are often incomprehensible to students, while inaccurate problem descriptions make it difficult for technicians to identify issues accurately. These barriers exacerbate student frustration and reinforce the perception that technology is mysterious and

beyond control.

### **2.2.2. Weakness of the Social Support System**

Social support plays a protective role in fostering digital resilience, yet such support is not inherently available. Current social support systems for college students in digital contexts face the following challenges: (1) The informality and unreliability of peer support. While peers are the primary source of technical assistance for students, its effectiveness heavily depends on proximity – the availability of qualified individuals nearby significantly diminishes support efficacy. Moreover, information provided by peers may contain inaccuracies that complicate problem-solving. (2) The dual challenges of teacher support: On one hand, some educators lack sufficient digital literacy to provide effective technical guidance; on the other hand, even competent teachers may struggle to respond promptly due to time constraints or large class sizes. More fundamentally, many teachers treat technical issues as "students' personal matters" rather than integral components of instructional support. (3) Temporal and spatial limitations of family support. For most students, families live geographically distant from schools, making immediate technical assistance difficult. Parents primarily offer emotional support and resource assistance, such as purchasing better devices rather than providing specific technical guidance.

### **2.2.3. Deficiencies in Course and Teaching Design**

Curriculum and instructional design can hinder the development of digital resilience in multiple dimensions: (1) Presupposed ideal user scenarios in implicit curricula. Current curriculum designs often assume students can effortlessly use all technological tools without encountering technical issues. This assumption attributes technical failures to individual student limitations rather than recognizing them as common phenomena in normal learning processes. (2) Insufficient error tolerance. Under time-constrained and task-heavy academic pressures, students lack opportunities to experiment, make mistakes, and learn from errors. A single technical failure may lead to failed assignment submissions or grade penalties—a high-risk environment that reinforces risk-averse behaviors and suppresses exploration and experimentation. (3) Absence of dedicated courses for cultivating digital resilience. Although digital literacy has gained increasing recognition, most universities have not incorporated digital resilience training into formal curricula. Students consequently lack systematic guidance and practice opportunities to develop these essential competencies.

## **2.3. Structural Barriers**

### **2.3.1. The Persistent Impact of the Digital Divide**

The digital divide has not vanished with technological advancement but continues to exert its influence in more subtle ways. For the development of digital resilience among college students, this gap manifests in two key aspects: (1) Differences in device and network conditions. Students from diverse socioeconomic backgrounds exhibit significant disparities in device performance and network stability. Those using outdated devices or experiencing network slowdowns face more frequent technical issues – yet these very students who require resilience most often lack the necessary supportive conditions for its development; (2) Variations in digital habits. Bourdieu's concept of "habitus" provides insight into the underlying impacts of the digital divide. Students from families with abundant digital resources grow up immersed in a technology-rich environment, developing

familiarity, mastery, and a positive attitude toward technology; in contrast, those from digitally disadvantaged households may develop feelings of alienation, distrust, and anxiety toward technology. These differences in digital habits constitute a crucial structural foundation for resilience formation.

### **2.3.2. Bias in the Evaluation System**

The current evaluation system hinders the development of digital resilience across multiple dimensions: (1) Result-oriented assessment focus. The existing framework overemphasizes learning outcomes (such as homework scores and exam results) while neglecting adaptive processes, adjustments, and personal growth during learning. Under this approach, students encountering technical issues primarily concern themselves with "whether it affects their grades" rather than "how to resolve the problem and learn from it." (2) Lack of recognition for resilient behaviors. Resilient behaviors—including proactively seeking help, exploring multiple solutions, and recovering from failures—are scarcely acknowledged within the current evaluation system. Students are rewarded solely for achieving normal assignment completion after resolving issues, rather than for recognizing the resilience process itself. This evaluation bias undermines students' intrinsic motivation to develop resilience. (3) Absence of error tolerance mechanisms. Most courses lack proper mechanisms to accommodate technical failures. A single technical issue may prevent assignment submission or exam participation, with no available remedial channels provided.

## **3. Mechanisms that Promote the Development of Digital Resilience among College Students**

In contrast to these obstacles, the development of digital resilience among college students is supported by multiple facilitative mechanisms. These mechanisms can be summarized into four pathways: accumulation of psychological capital, activation of social support, strategic coping strategies, and institutional safeguards.

### **3.1. Mechanism of Psychological Capital Accumulation**

Psychological capital constitutes the core element of an individual's positive psychological state, encompassing four dimensions: self-efficacy, hope, optimism, and resilience. During the development of digital resilience, the accumulation of psychological capital plays a fundamental role.

(1) Cultivating Digital Self-Efficacy. The development of digital self-efficacy primarily stems from hands-on experience, vicarious learning, verbal persuasion, and emotional engagement. Universities can foster students' digital self-efficacy by designing progressively challenging digital tasks, providing success stories, and establishing an encouraging feedback culture. (2) Developing Growth Mindset. In the context of digital resilience, a growth mindset involves viewing technical difficulties as learning opportunities rather than proof of incompetence, and interpreting seeking help as a strategic approach rather than a sign of inadequacy. This mindset requires reinforcement of process over outcome, recognition of effort and strategy rather than innate ability, and reinterpreting mistakes as learning opportunities. (3) Transitioning from Fixed to

Growth Thinking. Such cognitive shift demands sustained cognitive restructuring training. When students say "I just can't learn this software," guide them to respond "I'm still practicing; I need more practice." When they complain "Another problem-what bad luck!" encourage them to view it as "This challenge provides me with a chance to acquire new skills." This linguistic and cognitive transformation serves as a crucial pathway for building psychological capital.

### **3.2. Social Support Activation Mechanism**

The role of social support in enhancing digital resilience depends not only on its presence but also on its activation. In other words, possessing support resources without knowing how to utilize them or lacking the willingness to do so cannot translate into genuine resilience. The activation mechanism of social support comprises three key components:

First, the willingness to seek support. Seeking support is the first step in activating social support, but this behavior itself requires a certain psychological foundation. Shyness in seeking help, uncertainty about whom to turn to, or low expectations regarding the outcome can all inhibit the willingness to seek assistance. Therefore, the primary task in promoting social support activation is to lower the psychological barriers to seeking help and normalize and destigmatize this behavior. Second, the accessibility of support networks. Even with willingness, activation cannot occur if support networks are inaccessible. Accessibility encompasses temporal, spatial, cognitive, and emotional dimensions. Establishing multi-level, multi-channel support networks—including peer support, teacher support, technical assistance, and family support—is crucial for enhancing accessibility. Third, the reciprocity of support exchange. The optimal state of social support involves mutual benefit rather than one-sided giving and receiving. In reciprocal relationships, everyone serves as both recipient and provider of support, fostering an equitable and sustainable support ecosystem. Forms such as peer support groups and learning communities effectively promote this reciprocity in support exchange.

### **3.3. Strategic Response Mechanism**

The strategies adopted in addressing digital challenges directly determine the direction and pace of resilience development. Strategic response mechanisms encompass two dimensions: cognitive strategies and behavioral strategies. First, training in cognitive restructuring is essential—this involves altering how stress events are interpreted and evaluated. Students with higher resilience tend to view technical failures as learning opportunities rather than proof of incompetence, temporary difficulties rather than catastrophic incidents, and controllable issues rather than insurmountable obstacles. Cognitive restructuring can be practiced through techniques like worst-case scenario analysis and perspective shifting. Concurrently, emotional regulation strategies should be implemented. Digital challenges inevitably trigger emotional responses; the key lies in effectively managing these emotions. Effective emotional regulation strategies include emotion labeling, attention diversion, self-soothing, and social-emotional support. Emotional regulation aims not to eliminate emotions but to prevent them from interfering with cognitive resources required for problem-solving. Second, timely adjustments to problem-focused strategies are crucial. Problem-focused strategies target the issue itself through actions such as

information gathering, tool utilization, seeking support, and step-by-step resolution. Compared to emotional focus strategies, problem-focused approaches demonstrate significantly stronger benefits for fostering resilience development.

### **3.4. Institutional Guarantee Mechanisms**

The effective functioning of individual psychological capital, social support, and coping strategies requires support from the institutional environment. Institutional safeguards encompass the following aspects: the design of error-tolerance mechanisms, which serve as key institutional frameworks for fostering digital resilience; these specifically include mechanisms for delayed submission of assignments during technical failures, make-up examination arrangements, academic grade appeals, and incorporating evaluation criteria that assess process-oriented adaptive behaviors; the institutionalization of digital resilience development by integrating it into formal curricula and student support systems; and ensuring equitable resource allocation through measures such as equipment lending programs, network subsidies, and targeted support for economically disadvantaged students to mitigate structural barriers to digital resilience development.

## **4. Practical Recommendations for Promoting Digital Resilience Among College Students**

### **4.1. At the University Level, a Systematic Support System Should Be Established.**

(1) Incorporate digital resilience into training objectives. Clearly integrate digital resilience into talent development programs, making it an integral component of students' core competencies rather than an optional supplement. (2) Establish a three-tier support system: self-service support (knowledge bases, tutorials), mutual assistance (student volunteers, technical communities), and specialized assistance (rapid response from professionals) to ensure students receive timely and effective help. (3) Develop dedicated courses. Offer courses or workshops on digital resilience covering tool usage, information management, emotional regulation, problem-solving strategies, with emphasis on experiential and practical learning. (4) Implement error tolerance and incentive mechanisms. Establish technical fault tolerance measures such as extended submission deadlines and retake opportunities, while recognizing resilient behaviors—including proactive seeking of help, active problem-solving, and assisting others—with credit recognition or honors.

### **4.2. At the Teacher Level, Educators Should Play a Pivotal Guiding Role.**

Enhance digital resilience. Teachers should lead by example, demonstrating composure and a positive attitude when encountering technical issues, and conveying the belief that "technical problems are normal and can always be resolved." Design resilience-building activities by incorporating relevant elements into lessons—such as setting appropriate technical challenges, organizing discussions on technical setbacks, and requiring students to document problem-solving processes in their learning journals—to foster an error-tolerant environment.

### 4.3. At the Student Level, it is Essential to Cultivate Self-directed Growth Capabilities.

Accumulate successful experiences. Begin with small, manageable technical challenges to gradually build a portfolio of successful accomplishments, and strengthen self-efficacy by maintaining a success journal. Establish a support network. Proactively connect with peers who possess strong technical skills, join or create learning communities, and grow together through mutual assistance. Practice cognitive restructuring. When facing technical setbacks, consciously shift your perspective: assess the worst-case scenarios, comfort yourself as you would a friend, identify valuable lessons to learn, and gradually internalize these approaches as positive thinking habits.

## 5. Conclusion and Prospects

First, the development of digital resilience among college students faces multiple obstacles. At the individual level, these include structural deficiencies in digital literacy, psychological vulnerabilities (low self-efficacy, fixed mindset, technological anxiety, digital perfectionism), and inadequate metacognitive skills; at the environmental level, challenges encompass accessibility and quality issues of technical support services, weak social support systems, and flaws in curriculum and instructional design; at the structural level, persistent effects of the digital divide and biases in evaluation systems. These obstacles are interconnected and mutually reinforcing, creating systemic barriers to resilient development.

Second, the development of digital resilience among college students is supported by four key mechanisms. The psychological capital accumulation mechanism focuses on fostering digital self-efficacy and a growth mindset; the social support activation mechanism emphasizes the crucial transition from mere presence to active engagement with support; the strategic coping mechanism involves employing approaches such as cognitive restructuring, problem-focused thinking, and emotional regulation; and the institutional safeguard mechanism includes error-tolerant frameworks, institutionalized resilience cultivation programs, and equitable resource allocation.

Third, hindering factors and promoting mechanisms jointly shape the trajectory of resilience development through dynamic interaction. The integrated "resource-cognition-behavior" model demonstrates that the transformation from resources to resilience requires mediation through cognitive evaluation and behavioral practice; there are specific conditions governing the transition between obstacles and facilitators, and the design of promoting mechanisms should

focus on effectiveness rather than mere presence; resilience development exhibits distinct phases—contact phase, accumulation phase, consolidation phase, and migration phase—with each requiring tailored support strategies.

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