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Research on the Enhancement Mechanism of Business English Teachers' Digital Literacy from the Perspective of Self-Determination Theory: An Empirical Investigation Based in Hunan Province,China

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Abstract: Against the backdrop of educational digital transformation, the Business English discipline must trigger its teaching digital transformation to achieve the goal of cultivating applied talents and meet the talent development demands of industrial transformation and globalization . This study, guided by the Self-Determination Theory, surveyed Business English teachers in Hunan Province to investigate their overall level of three needs covered in the theory. The author employed a questionnaire survey, utilizing a self-developed scale based on the Teacher Digital Literacy Standards designed by Chinese Education Ministry, to sample 125 Business English teachers in the very province. All 125 distributed questionnaires were returned valid. Data were analyzed using SPSS software. The findings reveal that: (1) Teacher have no motivation to persist in continuous digital teaching practice and proactive creative power despite their own high-level recognition of digital transformation; (2) Teachers show their competence deficiency in higher-level application including the analysis and transformation of students' feedback and exploration of teaching resources with enterprises; and (3) Teachers show their dilemma in the high individual endeavor but low community interactivity, reflecting the loss of satisfaction of relatedness need. From the perspective of SDT, this study suggests that Business English teachers' intrinsic motivation could be enhanced with the realization of basic psychological needs, which are realized with the combination of external regulation, introjected regulation, identified regulation and integrated regulation for which teachers themselves, administrators and enterprises are responsible together. This study provides valuable implementations to accelerate the development of Business English teachers self-determination level, which are valuable reference for the formulation of training policies.

Keywords: SDT; Business English Teachers; Survey; Digital Literacy; Enhancement

Introduction

Amidst the deep integration of globalization and digital technologies, the digital transformation of education has emerged as a core engine for reshaping talent development paradigms (UNESCO, 2021)[1]. Industry advancement increasingly demands composite competencies integrating linguistic proficiency and digital skills (Zhang, 2022)[2]. As an applied interdisciplinary field, Business English pedagogy directly impacts the quality of talent supply for export-oriented economies. However, Business English instructors currently face a critical theory-practice misalignment, manifesting as a pronounced paradox of "high awareness, low implementation" . This contradiction exposes fundamental limitations in existing transformation approaches, including institutional overreliance on supplies of hardware investment, skill training as well as and policy mandates to drive teacher transformation, while neglecting the activation of educators' intrinsic motivational systems (Teo, 2020)[3]. Consequently, Self-Determination Theory (SDT)[4] provides a novel perspective to address this impasse by elucidating how to energize teachers' motivational systems and sustain behavioral engagement. However, the truth is that rare study has been conducted to investigate the instructors of Business English in Hunna Province, China. Grounded in this framework, this study investigates Business English instructors at provincial universities in Hunan, China. Employing a survey instrument structured around the five dimensions of China's Teacher Digital Literacy Standards (Ministry of Education, 2022)[5], the author operations digital awareness as autonomy needs, digital teaching competence as competence needs and professional development as relatedness needs. With the ultimate aim of proposing evidence-based solutions for pedagogical transformation, the research, with the aid of SPSS software to make descriptive statistics, tends to examine correlations among these three SDT-aligned constructs and assess their aggregate levels and deficiencies .

I Literature Review

1.1 Connotation of Teachers' Digital Literacy

Overall, the conceptual evolution of teachers' digital literacy has progressed through two distinct phases: from a skill-based paradigm to a motivation-driven approach.Digital literacy for educators was initially conceptualized by Gilster (1997), who defined it as an individual's capacity to comprehend, utilize, evaluate, and create digital information. This encompasses technical, cognitive, social, and ethical dimensions, emphasizing "the ability to understand and use information from multiple sources" [6]. Subsequently, this conceptual framework has been substantively expanded by Western scholars and international organizations. Giovannella (2011) discusses speculative approaches in HCI, emphasizing the need to anticipate future interactions through interdisciplinary reflection (e.g., philosophy, sociology, and

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design theory). He also argues that HCI design must align with philosophical frameworks (e.g., phenomenology, complexity theory) and evolve its methodologies to address emergent socio-technical challenges[7]. Cartelli (2022) analyzes how digital literacy initiatives in developing countries deeply depend on cultural issues (e.g., local values, traditions), social content (e.g., community structures, power dynamics) and domain-specific knowledge (e.g., subject expertise in education/health/agriculture)[8].

1.2 Core Framework of Self-Determination Theory

Self-Determination Theory (SDT), proposed by American psychologists Deci and Ryan in the 1980s, posits that human behavior is driven by three innate psychological needs—autonomy, competence, and relatedness—with the degree of their satisfaction determining motivational quality and behavioral sustainability (2000) [4]. This theory conceptualizes motivation as a continuum spanning a motivation to intrinsic motivation, with the critical distinction lying in the level of behavioral autonomy and the internalization of extrinsic motivation. External environments influence motivation by supporting or thwarting these basic needs. Specially speaking, autonomy-supportive contexts enhance innovative willingness and controlling environments (e.g., administratively mandated tool usage) induce alienation.

1.3 SDT Mapping on the Study of Teachers' Digital Literacy

Pettersson (2021) emphasizes that teachers' digital literacy must transcend the "skills checklist" paradigm and evolve toward dynamic contextual competence – wherein competence manifests as educators' capacity to flexibly integrate technology, subject-specific pedagogy (TPACK), and ethical judgment within instructional settings[9]. This conceptual shift converges with the competence need in Self-Determination Theory (SDT). Langelotz et al. (2022), through a sociomaterial lens, conducted a longitudinal observational study of 12 Swedish teachers, proposing that teacher agency is not an individual attribute but rather a triadic product of human-technology-institution interactions. They contend that the ultimate goal of teachers' digital literacy is to achieve professional agency in technological contexts, enabling educators to reconfigure technical frameworks (e.g., transforming standardized LMS into personalized learning spaces) rather than passively adapt[10]. This theoretically complements SDT's psychological perspective.Wang & Guo (2022) empirically demonstrated that satisfaction of the relatedness need serves as the key mediating variable in teachers' sustained use of digital technologies, accounting for 68% of the effect size[11]. This study provides the first empirical validation of relatedness as a foundational mechanism in digital literacy development.Wu & Zhou (2023) constructed a three-stratum motivational model for Chinese teachers' digital literacy development. Their framework proposes targeted interventions across three levels:Survival stratum to implement external regulation (e.g., compliance mechanisms), developmental stratum to foster introjected regulation (e.g., career advancement incentives) and transcendent stratum to cultivate identified regulation (e.g., alignment with educational values)[12]. This tri-level design precisely maps onto the three basic psychological needs in Self-Determination Theory.

However, the fulfillment of the three psychological needs in teachers' digital literacy development remains suboptimal, constrained by contextual factors such as local culture and administrative coercion. Tapingkae et al. (2023) identify that Southeast Asian teachers' digital literacy is shaped by collectivist cultural norms, including prioritizing technology use to maintain classroom harmony (e.g., avoiding professional loss of face from technical failures), and relying on hierarchical mentoring rather than autonomous exploration for professional development, which reflects comparatively weaker autonomy needs fulfillment among Southeast Asian teachers, limiting the developmental thrust toward self-determination[13].In parallel, the Ministry of Education Strategic Research Base for Educational Informatization (Central China) (2023) compares provincial digital literacy standards in Zhejiang (2021), Shanghai (2022), and Guangdong (2023), revealing critical gaps. Only the Shanghai standards explicitly incorporate "autonomy rights" indicators (e.g., permitting competency self-demonstration via teaching portfolios), while Zhejiang's competency-centric standards induce widespread competence anxiety (compliance rate: merely 41%)[14]. Consequently, the researchers advocate integrating "need satisfaction metrics" into China's national digital literacy framework. Empirically corroborating this, Chen & Li (2023) demonstrate through a survey of 1,872 K-12 teachers that autonomy support (e.g., self-selecting training content) indirectly enhances digital literacy through competence need fulfillment ($\beta = 0.42$, $p < .001$)[15]. Administratively mandated training erodes intrinsic motivation, resulting in "zombie-like usage" of digital tools (e.g., deploying platforms solely for attendance tracking). Critically, Scherer (2019) empirically validated a significant correlation between sustained teacher technology usage and perceived competence ($\beta = 0.68$, $p < .001$) [16]. Complementarily, Teo (2020) demonstrated that administratively mandated tool implementation ,which undermines autonomy, triggered passive non-compliance in 50% of teachers [3]. In the Chinese context, Hu (2021) designed a "Digital Learning Consortium for Teachers" grounded in SDT principles, resulting in a 45% increase in tool adoption rates [17]. This outcome substantiates the catalytic value of relatedness need fulfillment in digital literacy development.

1.4 The Challenge Business English Meets in the Course of Digital Teaching Transformation

As an applied interdisciplinary field, Business English demands digital literacy that integrates linguistic operability (e.g., cross-border livestreaming) with commercial simulation fidelity (e.g., VR negotiation systems) (Li, 2022) [18]. Currently, empirical studies reveal three core dilemmas for Business English instructors. Contextual resource deficits goes first, including scarcity of authentic, timely training resources such as foreign trade correspondence templates, cross-cultural negotiation scenarios, and operable cross-border e-commerce accounts compatible with campus networks (Chen, 2021)[19]. Competence conversion gap follows,while more than 60% of instructors possess basic digital tool proficiency in our survey of 125 Hunan Province Business English teachers, most cannot autonomously design digital business case studies. Motivational disincentives also can not be ignored. Digital teaching achievements remain excluded from academic promotion evaluations (Wang, 2023) [20].These pain points directly reflect systematic gaps in satisfying SDT's three basic psychological needs within specialized professional contexts.

II Research Design

2.1 Research Sample and Data Collection

The study surveyed Business English instructors from higher education institutions (including public and private universities) and vocational colleges across 14 prefecture-level divisions in Hunan Province.This comprehensive geographical coverage ensured representative sampling and reinforced the authenticity and validity of the survey data. Data collection was conducted throughout July 2024, lasting one month, yielding 125 valid responses.

2.2 Research Instrument

The study was guided by the dual frameworks of the *Teaching Guidelines for Undergraduate Foreign Language and Literature Majors in Regular Higher Education Institutions* (Ministry of Education of China, 2021) [21] and the *Teacher Digital Literacy Standards* (Ministry of Education of China, 2022) [5]. It incorporated current realities such as the use of digital technologies in teaching, ideological and political education in curricula, application of specialized practical platforms, and the integration of short videos in project-based learning.

A 4-point Likert scale was designed (1 = Highly Aligned, 2 = Moderately Aligned, 3 = Not Aligned, 4 = Highly Not Aligned).The scale consisted of two sections: one being basic demographic variables including gender, educational background, professional title, and geographic region, the other one being Business English teacher digital literacy, including 29 items across five dimensions—Digital Awareness, Knowledge and Technology, Digital Teaching Competence, Ethical Cognition and Professional Development.

2.3 Validity and Reliability Testing

Exploratory Factor Analysis (EFA) was employed to assess construct validity. Each of the 29 items loaded onto 7 factors, with communalities ranging from 0.474 to 0.895 (most exceeding 0.7), indicating strong associations between items and latent constructs with minimal measurement error. The Kaiser-Meyer-Olkin (KMO) measure was 0.900 (df = 253), confirming sufficient correlation among variables for EFA.

Internal consistency reliability was evaluated using Cronbach's α, with a threshold of 0.7. The overall α coefficient was 0.864, exceeding the benchmark and confirming high reliability across all validated items. Thus, the questionnaire demonstrated robust psychometric properties for measuring the target constructs.

2.4 Research Content

a) Demographic survey of Business English teachers in Hunan Province, investigation of basic demographic characteristics (e.g., gender, educational background, professional title, geographic distribution) across sampled institutions; and

b) Current status of digital literacy dimensions aligned with SDT Needs: Digital awareness (Autonomy Need), Digital Teaching Competence (Competence Need), and Professional Development (Relatedness Need).

III Result Data

3.1 Sampling Results of Demographic Characteristics

Table 1 Descriptive Statistics

options		frequency	percentage
Gender	Female	108	86.4
	male	17	13.6
age	≤30	9	7.2
	31-40	35	28
	41-50	62	49.6
	51-59	19	15.2
Education background	Bachelor's degree	33	26.4
	Master's degree	82	65.6
	Doctor's degree	10	8
Professional title	Assistant lecturer	14	11.2
	Lecturer	52	41.6
	Assistant professor	48	38.4
	Professor	11	8.8
geographic distribution	county	13	10.4
	Prefecture-level/Autonomous city	93	74.4
	Provincial city	19	15.2
	Total	125	100

The study collected a total of 125 valid questionnaires. The sample was predominantly female, with females comprising 86.4% (n = 108) and males 13.6% (n = 17). Regarding age distribution, participants aged 30 and below accounted for 7.2% (n = 9), those between 31 and 40 years old represented 28.0% (n = 35), and the largest cohort was individuals aged 41 to 50, constituting 49.6% (n = 62). Participants aged 51 to 59 made up 15.2% (n = 19), indicating a concentration of the sample in middle age.

In terms of educational background, holders of a Master's degree formed the largest group at 65.6% (n = 82), followed by Bachelor's degree holders at 26.4% (n = 33), and Doctoral degree holders comprised 8.0% (n = 10). This suggests a generally high level of educational attainment within the sample. The distribution of professional titles showed that Lecturers were the most numerous at 41.6% (n = 52), followed by Associate Professors at 38.4% (n = 48), while Assistant Lecturers and Full Professors accounted for 11.2% (n = 14) and 8.8% (n = 11) respectively, revealing a trend towards mid-level and senior professional ranks.

Regarding the administrative level of participants' locations, the majority hailed from prefecture-level cities, representing 74.4% (n = 93). Those from provincial capitals constituted 15.2% (n = 19), and participants from county-level cities or counties accounted for 10.4% (n= 13). This indicates a sample with some diversity in regional distribution, though it was primarily composed of individuals from prefecture-level cities.

3.2 Current Status of Digital Literacy Dimensions Aligned with SDT Needs

3.2.1 Current Status of Digital Awareness Aligned with the Need for Autonomy

Table 2 Mean Statistical Analysis on the Current Status of Digital Awareness

	N	Min	Max	Mean	SD
Items	125	1	4	1.62	0.477
1. I am aware of the pivotal role that digital technology plays in the development of a digital society, particularly its significant importance in the digital transformation of education.	125	1	4	1.54	0.602
2. I have realized that digital technology resources have put forth new demands on the teaching theories, instructional models, and pedagogical methods of Business English. Furthermore, an ethical need has arisen for both teachers and students in the use of these technologies.	125	1	4	1.53	0.562
3. I proactively seek to understand the functionalities and roles of digital technological resources and possess the willingness to employ them in Business English instruction to enhance pedagogical efficacy.	125	1	4	1.72	0.604
4. I am committed to integrating digital technologies with Business English pedagogy, thereby fully addressing the instructional needs of an applied discipline.	125	1	4	1.57	0.558
5. I am capable of overcoming the difficulties and challenges inherent in utilizing digital technological resources and innovating pedagogical methods within educational digitalization practices. I maintain an unwavering conviction and persistently engage in the exploration of digital education and teaching practices.	125	1	4	1.72	0.562

Overall, the total mean score for "Current Status of Digital Awareness" was 1.62 (SD = 0.477), indicating a positive performance in digital awareness across the sample. Teachers generally recognized the importance of digital technology in education and demonstrated a willingness to actively participate in the transformation towards digital teaching. A detailed analysis of individual items reveals:

Item 2 yielded the lowest mean score (M = 1.53, SD = 0.562), indicating a high sensitivity and deep cognitive understanding among teachers of the educational changes driven by digital technology. Item 1 (M = 1.54, SD = 0.602), reflected a solid foundational awareness of digital issues among teachers. Item 4 had a mean score of 1.57 (SD = 0.558), suggesting strong willingness for pedagogical integration and an active response to shifting instructional demands. Item 3 and Item 5, focusing on teaching motivation and capability to handle challenges respectively, shared the same score (M = 1.72), the highest among the five items. This suggests that while teachers possess a certain degree of application willingness and practical belief, there remains room for development in terms of proactive use and sustained exploration.

3.2.2 Current Status of Digital Application Aligned with the Need for Competence

Table 3 Mean Statistical Analysis on the Current Status of Digital Application

	N	Min	Max	Mean	SD
Items	125	1	4	1.96	0.479
1. I am capable of employing appropriate digital assessment tools—such as homework grading platforms, cloud-based intelligent testing systems, online collaborative teaching platforms, and Business English simulation software—to analyze students' learning aptitude, effectiveness, and styles.	125	1	4	1.98	0.575
2. I am able to proactively utilize digital technological means, such as AI and ChatGPT, to create digital teaching resources that align with course objectives, thereby enriching pedagogical methods.	125	1	4	2.1	0.67
3. I am capable of integrating digital teaching technologies and resources into instructional activities based on learning objectives to achieve course goals, utilizing platforms such as Rain Classroom and Zhihuishu (Wisdom Tree).	125	1	4	1.94	0.586

4. I am capable of leveraging digital technological resources—such as teaching platforms, educational software, and micro-lectures—to overcome spatiotemporal constraints through the adoption of a blended online and offline learning model. This ensures comprehensive monitoring of student learning throughout all phases: pre-class, in-class, and post-class.	125	1	4	1.92	0.562
5. I am capable of leveraging digital resources to systematically organize intelligent teaching activities. By utilizing smart classrooms, instructional platforms, educational software, and attendance mini-programs, I effectively engage students in collaborative group discussions, peer evaluations, knowledge mapping, and thematic exercises.	125	1	4	1.9	0.56
6. I am able to use digital tools—such as WeChat mini-programs and QQ online documents—to gather student feedback in real time, refine my instructional practices, optimize pedagogical sequences, and regulate the flow of the lesson.	125	1	4	1.7	0.663
7. I can leverage the big-data analytics embedded in platforms or software to identify students' learning variations and deliver targeted guidance.	125	1	4	2.02	0.595
8. I am able to integrate students' multimodal learning data from both online and offline contexts—including learning logs, discussion interactions, clickstreams, body movements, head poses, and facial expressions—to conduct comprehensive, multimodal academic assessments.	125	1	4	2.02	0.653
9.I can employ visualization tools such as charts and heat maps to depict the distribution of student achievement and learning performance, thereby enabling timely adjustments to educational management strategies.	125	1	4	2.05	0.62
10. I can guide students to select and use digital resources appropriately and correctly to support their learning, thereby enhancing their digital literacy (DQ)—for example, by collecting literature, searching for case studies, and producing short videos.	125	1	4	1.9	0.545
11. I am able to leverage digital resources to diversify the delivery of ideological and political education within Business English courses, thereby enhancing the effectiveness of value-oriented instruction.	125	1	4	1.9	0.551
12. I can integrate mental-health education activities into course instruction by leveraging digital resources such as AI, including problem diagnosis, group counseling, psychological training, scenario design, role-playing, and game-based therapy.	125	1	4	2.02	0.647
13. I can employ digital resources to establish school–enterprise partnerships, bringing social educational assets into the classroom to achieve collaborative education among families, schools, and enterprises, thereby broadening the pathways for holistic student development.	125	1	4	2.07	0.624

On the whole, the overall mean for "Current State of Digital Application" is 1.96 (SD = 0.479), a value close to the low end of 1.9, indicating that teachers generally possess a solid awareness and behavioral foundation for integrating digital technologies into their teaching practice.

Specifically, the lowest-scoring item is Item 6 (M = 1.70, SD = 0.663), revealing that teachers are already strong at leveraging digital tools for immediate instructional adjustment. Other comparatively low-scoring items include Item 5 (M = 1.90), Item 10 (M = 1.90), and Item 11 (M = 1.90). These figures suggest teachers are relatively adept at integrating digital technologies into instructional design and curriculum-based moral education.

Higher scores concentrate on items such as "developing multimodal data," "conducting data-visualization analyses," and "school-enterprise collaborative education." For example, Item 13 records the highest mean (M = 2.07), and Item 2 also scores comparatively high (M = 2.10). This may imply that teachers still face certain technical thresholds and operational barriers when engaging in high-level digital integration and cross-boundary collaboration.

With respect to standard deviations, most items fall within the 0.5–0.6 range; only a few—Item 2 (SD = 0.670) and Item 6 (SD = 0.663)—are slightly higher. This suggests substantial inter-teacher variability in these digital-teaching practices, likely constrained by factors such as age, prior training, and institutional support.

3.2.3 Current Status of Professional Development Aligned with the Need for Relatedness

Table 4 Mean Statistical Analysis on the Current Status of Professional Development

	N	Min	Max	Mean	SD
Items	125	1	4	1.84	0.528

1. I proactively participate in professional-development activities supported by digital resources, such as virtual teaching-and-research offices and live-streamed forums.	125	1	4	1.85	0.623
2. I can leverage digital resources to analyze my own instructional practices, thereby supporting reflective teaching and continuous improvement.	125	1	4	1.86	0.592
3.I am capable of leveraging digital technological resources to continuously innovate teaching models, refine instructional activities, and transform student learning approaches, thereby effectively meeting the demands of applied disciplines..	125	1	4	1.82	0.545
4. I actively participate in faculty-development programs focused on digital teaching and promptly translate what I learn into both my instructional practice and my research.	125	1	4	1.82	0.597

Based on the mean statistical results of the "current status of professional development," teachers demonstrate a generally positive attitude toward professional development in the context of digital technology empowerment (M = 1.84, SD = 0.528). This indicates that most teachers proactively engage in learning and practices related to digital teaching to some extent.

Across various dimensions, teachers show the highest level of agreement with the following items （3，M = 1.82, SD = 0.545) and (4,M = 1.82, SD = 0.597). These results reflect teachers' strong awareness of teaching reform and motivation for professional development.

However, slightly higher mean scores were observed for the following items (2, M = 1.86, SD = 0.592) and (1,M = 1.85, SD = 0.623). This suggests that there is still room for growth in some teachers' application of technology for reflective practices and their initiative in online engagement.

4. Discussion and Implication

4.1 Digital Literacy Dimensions Aligned with SDT Needs

According to Self-Determination Theory (SDT), the need for autonomy refers to an individual's requirement to feel that their behavior is self-initiated and congruent with their internal values, rather than being externally controlled [4]. In Table 2, Item 4 (willingness to integrate) scored well (1.57), but Item 3 (motivation for proactive use) scored poorly (1.72). This indicates that teachers are willing to passively comply with digital teaching reforms but lack the drive for spontaneous innovation—a typical manifestation of unmet autonomy needs. This is likely because the current push for digitalization relies on administrative mandates or assessment pressures, making teachers feel controlled and thus undermining their intrinsic motivation. The high score for Item 5 (capability to handle challenges, M=1.72) reveals teacher anxiety regarding issues like technical failures and student disparities. If digital teaching training is forced training on fixed tools, preventing teachers from autonomously choosing their learning paths, it easily fosters a sense of frustration, further reducing their willingness to try. Teachers understand the importance of digital technology (Items 1, 2), yet this cognition fails to translate into sustained practice (Item 3). This cognition-behavior gap often stems from a lack of value integration; if teachers perceive digital tools as an "external burden" rather than an "extension of self," it becomes difficult to incorporate them into their teaching identity.

Fulfilling teachers' need for autonomy requires a three-pronged institutional strategy. First, administrators must enhance the autonomy in learning pathways to strengthen the sense of volition for proactive use (Item 3), thereby promoting the willingness to integrate digital technology with pedagogy (Item 4) and transforming this willingness into proactive behaviors. This can be achieved by providing open-ended toolkits, allowing teachers to autonomously select technological tools based on Business English course types (e.g., theoretical vs. practical courses), rather than mandating uniform platforms. Furthermore, institutions should advocate for teacher-led research in digital teaching reform and curriculum development, supporting educators in proposing personalized projects (e.g., co-developing practical resources for business scenario simulations with enterprises) backed by institutional technical and resource support. Second, it is also necessary to expand the options for self-directed learning content to indirectly boost teachers' confidence in addressing challenges (Item 5). Moving away from a standardized training approach, digital skills should be modularized into "Core Modules (mandatory) + Advanced Modules (elective)" (e.g., basic screen recording tools as mandatory; AI oral assessment or cross-border e-commerce data tools as elective), empowering teachers to select training content aligned with their individual contexts. Third, institutions should flexibly structure learning formats. Establishing peer-facilitated workshops, where technically adept teachers initiate thematic discussions, can reduce the unidirectional knowledge delivery from external training providers and simultaneously address the need for relatedness.

In summary, by addressing educators' profound needs for "instructional agency," "personalized pathways," and "value recognition," the cultivation of digital literacy will transition from a compliance-based model ("being told to use") to a self-determined one ("choosing to use"), thereby unleashing the endogenous momentum for sustainable transformation.

4.2 Digital Application Aligned with the Need for Competence

Self-Determination Theory (SDT) posits that a genuine sense of competence is attained only when individuals successfully overcome challenges that are personally meaningful (Ryan & Deci, 2020)[4]. When the perceived difficulty of a task markedly exceeds one’s current skill level, the anticipated “sense of mastery” is replaced by heightened feelings of incompetence. In the present data, teachers demonstrate high perceived competence in lower-order digital operations (Item 6); conversely, their scores for higher-order innovative practices (Items 2 and 13) are significantly higher on the scale—i.e., closer to “does not describe me”—indicating that the complexity of these tasks surpasses their “competence

comfort zone." Consequently, avoidance behaviours emerge, exemplified by reduced experimentation with AI-generated instructional resources.

Moreover, the capacity to collect data via digital tools (Item 6) constitutes only the initial phase of data-informed teaching. Without the subsequent ability to translate data into actionable pedagogical decisions (Items 7–8), teachers fail to experience instructional improvement attributable to their own growing competence, thereby thwarting their fundamental need for competence. The pronounced competence reported for Item 6 (real-time feedback tools) starkly contrasts with the relative weakness in Items 7–8 (data analysis and interpretation), suggesting that teachers have not yet received coherent, closed-loop training in data-driven instructional cycles.

Finally, complex tasks demand an integrated "competence bundle." Item 13 registers the lowest perceived competence (M = 2.07), as it necessitates the orchestration of technological proficiency, industrial resource coordination, and curriculum design. Current support structures, however, tend to be fragmented—for instance, training may focus exclusively on technical skills—thereby preventing teachers from developing a holistic sense of control over the entire collaborative process.

To satisfy teachers' need for competence, administrators must start from each teacher's Zone of Proximal Development (ZPD) and deliberately design challenges that are perceived as both valuable and attainable, thereby enhancing self-efficacy and perceived control. First, either through institutional guidance or individual reflection, teachers should decompose demanding requirements into manageable sub-goals so as to minimize frustration and strengthen efficacy in AI resource development (Item 2) and school–enterprise collaboration (Item 13). Institutions can invite industry experts to host online micro-workshops that reduce the communication, coordination, and alignment barriers between teachers and enterprises, facilitating access to meaningful off-campus educational resources. For instance, the school may broker partnerships in which companies supply authentic datasets for in-class case analyses, or co-develop practice-oriented courses such as international business negotiation labs.

Second, teachers should be empowered to leverage students' real-time feedback and convert seemingly fragmented data into concrete instructional artifacts. Specifically, teachers can transform the collected data (Item 6) into visualizations of student engagement and knowledge-heat maps, evaluate the effectiveness of teacher–student interactions in the classroom, and then apply these insights to subsequent instruction (Items 7–8). Such a closed feedback loop allows teachers to clearly observe how their growing competence directly contributes to instructional optimization. To achieve this, schools need to expand training in low-code analytic tools to lower the technical threshold. Finally, schools must avoid one-size-fits-all training. Uniform programs risk intensifying frustration among teachers for whom the challenge exceeds their ZPD, or leaving others under-stimulated when the challenge falls below their ZPD. This underscores the necessity of tiered professional development that aligns with teachers' current digital competence levels and offers greater autonomy of choice. In sum, by accurately identifying competence gaps and anchoring interventions within each teacher's ZPD, schools can support teachers' evolution from tool users to designers of digitally enhanced education, thereby realizing a competence-driven digital transformation.

4.3 Professional Development Aligned with the Need for Relatedness

According to Self-Determination Theory (SDT), relatedness refers to an individual's need to feel connected to others through the establishment and maintenance of safe, stable, and meaningful relationships, experiencing care, acceptance, value, and respect.Furthermore, individuals need to perceive themselves as part of a group or feel a sense of connection with others [4]. Rather than the quantity of relationships, individuals place greater emphasis on their quality and depth; the key lies in feeling genuinely cared for, respected, and supported.

Overall, the study participants exhibited a pattern characterized by "high individual effort but low community interaction," reflecting a deficiency in support for relatedness. Teachers lack a sense of safety that comes from "being witnessed" and "receiving feedback." Weaker performance in technology-facilitated reflection (M = 1.86) and online collaboration (M = 1.85) indicates that developmental activities are predominantly concentrated at the individual level. Isolated reflection can easily lead to self-doubt and overlooks the inherently social nature of reflective practice. Consequently, it becomes difficult to transform individual practices into collective wisdom.

While teachers are willing to participate in training (M = 1.82), they tend to avoid virtual teaching workshops (M = 1.85). This suggests that current online activities might prioritize passive "listening" over genuine two-way dialogue, failing to establish deep psychological connections within virtual teaching and research groups or forums. Thus, superficial interactions cannot satisfy the profound need for relatedness derived from "being accepted by a professional community."

Addressing teachers' need for relatedness is fundamentally about helping them break free from the dilemma of isolated development, opening doors to external connections, and forming a "professional learning community." First, it is essential to prevent virtual teaching workshops, forums, or training sessions from becoming mere one-way information channels. Instead, small communities should be cultivated based on factors such as the courses teachers instruct (e.g., international business, cross-border e-commerce) or their research interests. This approach can accelerate teachers' disciplinary identity formation and reduce the social cost of engagement. Second, reflective practices should be transformed into collaborative group projects among teachers. This shift helps mitigate the anxiety stemming from self-doubt, thereby increasing the sustainability of such practices.

Conclusion

The study yielded three key findings.Firstly, despite teachers' strong willingness to pursue digital teaching transformation collaboratively, they exhibit low motivation to sustain proactive and creative digital practices. This reflects low autonomy satisfaction and a failure in external regulation. Secondly, teachers are reluctant to use feedback or seek enterprise

cooperation for improving instructional design, indicating a high need for competence in higher-level applications. Last, teachers' high individual effort coupled with low community interaction suggests a lack of relatedness, hindering intrinsic motivation.

These findings underscore a neglect of humanistic considerations in supporting teachers' digital transformation and professional growth. To sustain teachers' long-term motivation for digital literacy development, it is essential to integrate external, introjected, identified, and integrated forms of regulation. Teachers, administrators, and enterprises must collaborate to align self-motivation and goal achievement through humane training policies and active business involvement. Generic training approaches risk overlooking teachers' and data to address teachers' need for relatedness.

The study has several limitations. The research was conducted only in one province in China without the width of regions and population, and it is unclear whether similar facts would be observed in other regions of China. Moreover, our sample was composed of respondents whose majority are females. Future studies should replicate the survey among more representative samples in other provinces. Despite these limitations, this study provides crucial evidence that teachers' three needs of self-determination are all at low level and it is urgent to adjust.

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