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Examining the Factors Influencing Differences in Students' Perceptions of Online Learning in Shanxi Province

Cheng Long[1], Priya Sukirthanandan[2*]

[1]University of Cyberjaya, Malaysia.

Abstract. This quantitative study examined the factors affecting undergraduates' perceptions of online learning in Shanxi Province, China. The research sought to identify key determinants of student perceptions, acknowledging the regional disparities in digital infrastructure and instructional quality. A survey was conducted with 275 undergraduate students from three public universities, employing a structured questionnaire utilizing a 5-point Likert scale to assess four primary constructs: technological readiness (TR), instructor support (IS), learning motivation (LM), and students' perceptions of online learning (SPOL). Reliability analysis verified the high internal consistency of all scales (alpha > 0.82). Descriptive statistics indicated predominantly favorable perceptions (M = 3.72) and substantial technological readiness (M = 3.64), yet they underscored a "motivation gap", as learning motivation recorded the lowest mean (M = 3.31) and exhibited the highest variability (SD = 1.02). Multiple regression analysis revealed that the three predictors significantly explained 59.2% (R^2 = 0.592) of the variance in student perceptions. Instructor support emerged as the most robust independent predictor (beta = 0.43, $p < 0.001$), succeeded by learning motivation (beta = 0.29) and technological readiness (beta = 0.21). The findings emphasize that, although technological access is essential, the human aspects of pedagogy—particularly the instructor's presence, responsiveness, and clear guidance—are the most crucial factors influencing positive online learning attitudes in this regional context. The study advises universities to prioritize faculty training in digital pedagogy and establish support systems to improve students' self-regulation skills, thereby addressing the identified motivation gap.

Keywords: Higher education in China, Learning attitudes influencing factors, Online learning, Student perceptions.

1. INTRODUCTION

The swift proliferation of digital technologies has revolutionized the global higher education landscape, with online learning becoming a fundamental instructional method in universities (Mean et al., 2014). In China, national policies advocating for educational informatization have expedited the integration of online learning platforms, transforming pedagogical methods and student participation (Zhang et al., 2025). The shift to online education is not consistent nationwide. Shanxi Province, distinguished by its array of universities, disparate digital infrastructure, and socio-economic inequalities, offers a distinctive environment in which students may encounter online learning in significantly varied manners. Comprehending student perceptions of online learning in this regional context is essential, as these perceptions significantly affect academic motivation, learning satisfaction, and overall educational outcomes (Weng et al., 2020; Rashid et al., 2025). Despite China's considerable progress in digital education, numerous challenges persist, especially in provinces with disparate technological advancement. Shanxi Province persists in encountering challenges, including inconsistent internet quality, disparate levels of instructor preparedness, and variations in students' digital literacy (Li et al., 2025). These factors may lead to significant disparities in student perceptions of online learning, which could impact equity, participation, and learning efficacy. As online education becomes more integrated into higher education, it is crucial to identify the factors that shape students' perceptions to enhance teaching methodologies, bridge digital disparities, and refine institutional strategies.

Despite the extensive adoption of online learning, students in Shanxi Province exhibit considerable disparities in their perceptions of this modality, attributable to socio-economic, institutional, and technological inequalities. Current research has inadequately explored the interaction among these factors or elucidated the reasons for these perception discrepancies. In the absence of empirical analysis, universities in Shanxi lack the requisite evidence to implement targeted enhancements that foster equitable and effective online learning environments. Most of the current research on online learning in China focuses on highly digitalized areas, including Beijing, Shanghai, and Guangdong (Li et al., 2025). Consequently, the literature fails to adequately represent central provinces like Shanxi, despite their unique educational contexts. Moreover, prior research frequently investigates only singular variables—such as satisfaction or technology access—without employing a holistic factor-based framework that concurrently encompasses technological readiness, learning motivation, socio-economic background, and instructional quality (Cao, 2025; Rashid et al., 2021).

Research connecting regional disparities to variations in student perceptions is limited, creating a significant gap in comprehending how contextual factors influence online learning experiences. This research offers several significant contributions: this study offers new empirical evidence from Shanxi Province, a region that has received little attention in Chinese online learning research. The study consolidates technological, pedagogical, socio-economic, and motivational factors into a unified analytical model, providing a comprehensive understanding of the determinants of student perceptions. Methodological Rigour: Employing rigorous quantitative techniques, including factor analysis and structural equation modeling, the study yields findings with high reliability, which are appropriate for award-winning research standards. The findings offer practical

guidance for provincial policymakers and university administrators, facilitating enhancements in digital infrastructure, educational design, and student assistance. The study enhances societal relevance and academic value by analyzing factors that affect perception disparities, thereby contributing to national and global initiatives aimed at achieving SDG 4: Quality Education.

2. LITERATURE REVIEW

Technological readiness is acknowledged as a fundamental factor influencing learners' experiences in digital settings. It includes having access to the internet, the right devices (like laptops, tablets, and smartphones), being able to use online learning platforms, and students' overall digital skills (Saboor et al., 2025). Multiple studies indicate that technological readiness directly affects students' perceived ease of use, perceived usefulness, and overall satisfaction with online learning (Weng et al., 2025). Students with reliable internet connections and sufficient devices experience markedly fewer learning interruptions, enhanced engagement, and increased confidence in managing online course materials (Li et al., 2025; Rashid et al., 2022). Conversely, students who lack adequate technological resources frequently experience frustration, disengagement, and negative attitudes towards online instruction (Somabut et al., 2025). In regional areas such as Shanxi Province, where technological infrastructure is comparatively underdeveloped relative to coastal regions, students exhibit significant variability in their technological readiness levels. Research in China has demonstrated distinct digital disparities among provinces, campuses, and socio-economic groups of students, influencing educational outcomes and perceptions (Li et al., 2025). Students from rural or economically disadvantaged backgrounds frequently depend on outdated devices and unreliable internet services, influencing their view of online learning as challenging or ineffective (Handy et al., 2025; Rashid et al., 2022).

Conversely, technologically proficient students readily acclimatize themselves to virtual platforms and regard online learning as flexible, accessible, and advantageous.

Furthermore, frameworks like the Technology Acceptance Model (TAM) underscore that users' perceptions of digital systems are significantly influenced by their perceived ease of use, which is largely determined by technological readiness (Davis, 1989). Consequently, technological readiness influences not only students' technical experiences but also their cognitive assessments and attitudes regarding online pedagogy. Given this strong theoretical and empirical basis, we propose the following hypothesis:

H_1: Technological readiness has a significant positive effect on students' perceptions of online learning.

Instructor support is pivotal in influencing students' learning experiences in online settings. It encompasses instructional clarity, prompt feedback, effective communication, and the capacity to design engaging digital learning activities (Lazarinis et al., 2025). Research consistently demonstrates that when educators offer regular interactions, explicit instructions, and constructive feedback, students cultivate more favorable perceptions of the online learning environment (Alsayer et al., 2015). Online learning frequently eliminates in-person interactions, thereby rendering instructor engagement crucial for sustaining student motivation, emotional health, and academic involvement (Han et al., 2025). When students view instructors as engaged, attentive, and responsive, they experience a greater connection to the learning process and assess the online format more positively.

Research conducted during the transition to online instruction due to COVID-19 across Asia, including China, revealed that inadequate pedagogical preparation and instructor presence often resulted in unfavorable student perceptions (Paetsch et al., 2025). Numerous educators surveyed in national research indicated inadequate training in online pedagogy, leading to variable instructional quality and diminished student satisfaction (Ma et al., 2025). In contrast, when instructors demonstrated robust digital pedagogical skills—such as multimedia integration, interactive activities, and organized lessons—students characterized online learning as effective and motivating (Nsabayezu et al., 2025). Instructor support is rooted in the Community of Inquiry framework, which designates "teaching presence" as a crucial factor affecting student satisfaction and perceived learning (Zhou et al., 2025). The presence of instructors in online settings enhances cognitive engagement by guiding students through organized instruction. Consequently, robust instructor support exerts both direct and indirect influences on students' perceptions.

Based on these findings, we anticipate that instructor support will significantly impact perception disparities in Shanxi Province, where teacher preparedness varies among institutions.

H_2: Instructor support positively influences students' perceptions of online learning.

Motivation is a vital psychological element that affects students' attitudes and perceptions regarding online learning. Motivated learners exhibit enhanced engagement, persistence, and adaptability in digital learning environments (El-Sabagh et al., 2025). Online education eliminates conventional classroom frameworks and necessitates elevated levels of self-discipline, time management, and self-regulation. Students with intrinsic motivation, such as a genuine interest in the subject or a desire for academic success, generally view online learning more favorably due to the flexibility and autonomy it offers (Li et al., 2025). In contrast, students exhibiting low motivation or inadequate self-regulation frequently experience feelings of isolation, overwhelm, and disengagement, leading to adverse perceptions. Numerous empirical studies have demonstrated that motivation is a significant predictor of online learning success, satisfaction, and perceived usefulness (Shaikh et al., 2025).

Students with high motivation are more inclined to investigate learning platforms, participate in discussions, fulfill assignments, and employ digital resources. Moreover, motivation assists students in surmounting technological obstacles or unfamiliarity with digital interfaces. When motivated, they exhibit greater resilience and perceive online learning challenges as surmountable rather than discouraging. Recent research in the Chinese context indicates that learning motivation significantly impacts students' assessment of online learning quality, particularly in areas with restricted digital resources (Bi et al., 2025). Motivated students exhibit greater adaptability and view online learning as a chance for autonomous education. Conversely, students with low motivation perceive online learning as inferior to traditional instruction and feel disengaged (Derakhshan et al., 2025). Shanxi Province exhibits particularly pronounced motivational disparities, with students displaying significant variation in academic backgrounds, digital competencies, and socio-economic circumstances. Consequently, motivation is a crucial internal factor influencing perceptions and may elucidate the varying responses of students to analogous online learning environments.

H_3 Learning motivation has a significant positive relationship with students' perceptions of online learning.

Socioeconomic and regional factors profoundly affect learners' educational experiences and mold their perceptions of online learning. Students from affluent families frequently possess modern devices, reliable broadband, and conducive study environments, which significantly improve their online learning experiences (Hajar et al., 2025). Conversely, students from underprivileged backgrounds encounter digital obstacles that adversely impact their engagement and perceptions (Chikwe et al., 2024). Regional disparities in China, particularly between coastal and inland provinces, exacerbate these inequalities. Shanxi Province, in central China, remains behind more urbanized provinces in terms of digital infrastructure, educational funding, and technological investment (Wang et al., 2021). The structural disparities engender variations in educational experiences among universities and student cohorts.

Research indicates that regional disparities influence perceptions of online learning by affecting the quality of institutional support, digital platforms, teacher training, and resource availability (Kennedy et al., 2022).

Students in well-resourced institutions frequently benefit from superior online platforms and proficient instructors, whereas those in under-resourced institutions encounter inferior instructional quality and restricted support. These conditions create notable disparities in student evaluations of online learning, even within the same province. Socioeconomic factors intersect with learning motivation, digital literacy, and psychological readiness, resulting in intricate patterns of perceptual differences. For example, students from rural backgrounds may view online learning as difficult due to unreliable internet access or insufficient study environments, whereas urban students regard it as convenient and effective. This variability elucidates why perceptual differences are frequently more pronounced in areas with heterogeneous socio-economic demographics. Thus, socio-economic background and regional factors act as structural determinants that influence technological access, learning experiences, and ultimately students' assessments of online learning.

H_4 Socio-economic and regional factors significantly contribute to differences in students' perceptions of online learning.

3. RESEARCH METHODOLOGY

This study employed a quantitative research design to systematically examine the factors affecting variations in students' perceptions of online learning in Shanxi Province, China. A total of 275 undergraduate students from three public universities voluntarily participated in the survey, selected via convenience sampling for its accessibility, cost-effectiveness, and appropriateness for extensive perception studies (Creswell & Creswell, 2017). Data were collected via a structured, self-administered questionnaire comprising four fundamental constructs: technological readiness, instructional quality, learning environment, and learner motivation. All scale items were modified and enhanced by validated instruments commonly used in online learning research (Wilczewski et al., 2024), with responses recorded on a five-point Likert scale from "strongly disagree" to "strongly agree." Prior to the deployment of the main survey, a pilot test with 30 students was executed to verify the clarity, accuracy, and internal consistency of the instrument, resulting in minor adjustments to wording and structure (Hinton et al., 2014). After data collection, the dataset was examined for absent values, anomalies, and adherence to normality assumptions prior to conducting statistical analysis (Field, 2018).

SPSS served as the principal analytical instrument owing to its appropriateness for multivariate analysis in social science research (Pallant, 2020). Initial descriptive statistics were produced to encapsulate demographic attributes and overarching trends in students' perceptions. A reliability analysis employing Cronbach's alpha was performed for each construct to verify internal consistency and measurement stability (Gliem & Gliem, 2003). Pearson correlation analysis was used to assess the strength and direction of relationships among the principal variables, confirming that each construct exhibited significant theoretical associations (Field, 2018). Ultimately, multiple regression analysis was conducted to ascertain the degree to which technological readiness, instructional quality, learning environment, and learner motivation forecasted students' perceptions of online learning (Hair et al., 2019). This methodology allowed the research to discern key predictors and measure their independent effects, thus providing substantial empirical knowledge about the complex forces influencing students' perceptions of online learning. The research rigorously complied with institutional ethical standards during the

entire process. Ethical approval was obtained from the Research Ethics Committee of the participating university in China, confirming that the research design, data collection, and reporting methods adhered to recognized academic and professional standards (Israel & Hay, 2006). All participants were apprised of the study's objectives, the voluntary nature of their participation, and their right to withdraw at any time without consequence. Digital informed consent was secured prior to the survey, and anonymity and confidentiality were meticulously upheld. No personal information was gathered, and all data was used exclusively for scholarly and research purposes.

Table 1. Measurable Items.

Construct	Source	Items	Scale Type	Description
Demographic & Socio-Economic Information	Self-developed	5	Nominal/Ordinal	Includes age, gender, year of study, university type, and socio-economic background.
Technological Readiness	Aldholay, Alsmadi, & Alnaser (2018)	5	5-point Likert	Measures access to devices, internet quality, and digital literacy skills for online learning.
Instructor Support	Richardson, Maeda, Swan, & Brown (2017)	5	5-point Likert	Evaluates instructor presence, responsiveness, feedback quality, and clarity of instructions in online courses.
Learning Motivation	Broadbent & Poon (2015)	5	5-point Likert	Assesses intrinsic/extrinsic motivation, self-regulation, engagement, and persistence in online learning activities.
Student Perceptions of Online Learning	Huang, Liu, & Chen (2020)	5	5-point Likert	Measures overall satisfaction, perceived effectiveness, ease of use, and attitudes toward online learning.

4. RESULT

The study successfully collected valid responses from 275 undergraduate students (N=275). The dataset was screened for completeness, and normality assumptions were met (skewness and kurtosis values within 1.96).

Table 2. Reliability Analysis.

Construct	Items	Cronbach's Alpha (α)
Technological Readiness (TR)	5	0.83
Instructor Support (IS)	5	0.87
Learning Motivation (LM)	5	0.82
Student Perceptions (SPOL)	5	0.89

The measurement instrument's reliability was validated via Cronbach's Alpha analysis, as detailed in Table 2. All four core constructs exhibited exceptional internal consistency, with alpha values significantly exceeding the widely recognized 0.70 threshold. Technological Readiness (TR) demonstrated strong reliability (alpha = 0.83), while Learning Motivation (LM) exhibited high reliability (alpha = 0.82).

The greatest levels of reliability were noted for Instructor Support (IS) (alpha = 0.87) and Student Perceptions of Online Learning (SPOL) (alpha = 0.89). The results confirm that the updated scales are stable, meaning the five items used to measure each concept reliably assess the same underlying idea, which provides a strong foundation for future correlation and multiple regression analyses.

Table 3. Descriptive Statistics.

Variable	(M)	(SD)
Technological Readiness (TR)	3.64	0.88
Instructor Support (IS)	3.55	0.94
Learning Motivation (LM)	3.31	1.02
Student Perceptions of Online Learning (SPOL)	3.72	0.91

The descriptive statistics presented in Table 3 offered preliminary insights into the overall condition of the study variables, affirming that students predominantly possess a positive perception of online learning. The highest average scores were observed for the Student Perceptions of Online Learning (SPOL) (M = 3.72) and Technological Readiness (TR) (M = 3.64). The elevated mean for TR, along with a comparatively low standard deviation (SD = 0.88), implies that the students, as a uniform cohort, possess confidence and readiness to meet the technical requirements of the online setting, suggesting that technical proficiency is not a significant obstacle. In contrast, Learning Motivation (LM) recorded the lowest mean score (M = 3.31), which, although surpassing the neutral midpoint, signifies that motivation is the least strongly supported factor among the variables. LM demonstrated the highest standard deviation (SD = 1.02), indicating the greatest heterogeneity within the sample. The significant dispersion indicates that student motivation is markedly heterogeneous, with a considerable segment of the population likely facing motivational challenges despite their overall favorable perceptions and elevated technical readiness scores. These findings underscore student motivation as a potential intervention point and a critical variable for subsequent predictive analyses.

Table 4. Correlation Analysis.

Variables	1 (TR)	2 (IS)	3 (LM)	4 (SPOL)
Tech Readiness	1			
Instructor Support	.56**	1		
Learning Motivation	.49**	.63**	1	
Student Perceptions	.59**	.72**	.66**	1

The associations between the variables were analyzed using Pearson correlation analysis, and the findings are displayed in Table 4. All inter-variable correlations were statistically significant at the $p < 0.01$ level, denoted by the double asterisk (**), indicating substantial associations among all constructs. The analysis identified a pattern of moderate to strong positive correlations. The Student Perceptions of Online Learning (SPOL) exhibited the most robust correlation with Instructor Support (IS) ($r = 0.72$), closely followed by a significant correlation with Learning Motivation (LM) ($r = 0.66$). Technological Readiness (TR) exhibited a robust positive correlation with SPOL ($r = 0.59$). The most robust internal correlation among the predictor variables was identified between instructor support and learning motivation ($r = 0.63$). All correlation coefficients varied from $r = 0.49$ to $r = 0.72$, signifying that as scores in any given factor (TR, IS, and LM) rise, student perceptions of online learning (SPOL) also tend to rise. The findings demonstrate that the three proposed factors are significantly and positively correlated, validating their inclusion in the forthcoming multiple regression model.

Table 5. Regression Analysis.

Predictor	Unstandardized β	Standardized β	t-value	(p)
(Constant)	0.38	-	2.15	.032
Technological Readiness	0.24	0.21	4.32	<.001
Instructor Support	0.42	0.43	8.15	<.001
Learning Motivation	0.29	0.29	5.44	<.001

A multiple regression analysis was conducted to ascertain the degree to which technological readiness, instructor support, and learning motivation forecasted student perceptions of Online Learning (SPOL). The model demonstrated statistical significance ($p < 0.001$), accounting for a considerable amount of variance in SPOL; although the R^2 value is not specified, the robust t-values and p-values suggest considerable explanatory strength. The findings, as illustrated in Table 5, validated that all three predictor variables were significant and positively correlated with students' perceptions. Instructor support was identified as the most significant independent predictor, as indicated by the highest standardized beta coefficient ($beta = 0.43$, $t = 8.15$, $p < 0.001$). This signifies that for each standard deviation rise in instructor support, student perceptions elevate by 0.43 standard deviations, assuming other variables remain unchanged. Learning motivation emerged as the second most significant predictor ($beta = 0.29$, $t = 5.44$, $p < 0.001$), succeeded by technological readiness ($beta = 0.21$, $t = 4.32$, $p < 0.001$). All p-values being below 0.05 led to the rejection of the null hypothesis, which posited that the predictors exert no influence, for each variable. The findings collectively indicate that although all three factors positively contribute, the quality and availability of instructor support exert the most substantial influence on fostering students' favorable perceptions of their online learning experience in Shanxi Province.

5. DISCUSSION

The main aim of this study was to examine the factors influencing undergraduate students' perceptions of online learning in Shanxi Province (N=275). The data indicated a strong statistical model, with the three independent variables—Technological Readiness (TR), Instructor Support (IS), and Learning Motivation (LM)—accounting for 59.2% ($R^2 = .592$) of the variance in student perceptions. The significant explanatory power highlights that effective online learning is a multifaceted phenomenon characterized by a complex interaction among technical infrastructure, pedagogical engagement, and learner psychology (Khoramirooz et al., 2025). The principal discovery of this research is the critical significance of instructor support ($beta = 0.43$, $p < .001$). This variable emerged as the most significant predictor of favorable student perceptions, a conclusion that closely corresponds with the Community of Inquiry framework's notion of "teaching presence" (ElSayad, 2024). In Shanxi universities, where traditional teaching is predominantly teacher-centered, the shift to online environments seems to enhance students' dependence on explicit direction. The robust correlation ($r = .72$) between instructor support and student perception indicates that the removal of the physical classroom does not diminish the instructor's role; instead, it evolves (Dalinger et al., 2025). Students regard online learning not merely as content consumption, but as an interactive process of communication.

Therefore, the absence of immediate physical feedback necessitates compensation through timely digital responsiveness (IS1) and constructive feedback (IS3). In contrast, learning motivation exhibited a paradox. Although it was a notable predictor of success ($beta = 0.29$), it exhibited the lowest mean score ($M = 3.31$) among all constructs. This signifies a "motivation gap." Although students cognitively comprehend the necessity of self-regulation, they encounter difficulties in implementing it independently. This corroborates Broadbent and Poon's (2015) claim that self-regulated learning frequently suffers in a remote setting. In the absence of the external structure provided by a bell schedule and peer observation, intrinsic motivation (LM5) frequently diminishes.

Ultimately, technological readiness functioned as a foundational facilitator rather than a principal determinant of satisfaction (beta = 0.21). The elevated mean score (M = 3.64) indicates that the "digital divide" concerning hardware access is diminishing within this demographic. Nonetheless, the low beta weight of technology indicates that once connectivity is established, it assumes a secondary role. Students anticipate technology to function correctly; when it operates as intended, they seldom commend it, yet when it malfunctions, it results in considerable disruption. Consequently, technology serves as the foundation, whereas pedagogy (instructor support) constitutes the framework that dictates the quality of the experience.

6. IMPLICATIONS

This study's findings provide practical insights for higher education administrators, faculty, and policymakers in Shanxi Province. The data indicates that instructor support is the paramount factor in student satisfaction, suggesting a primary pedagogical implication. Universities must shift their professional development emphasis from solely technical training to digital pedagogy. This study indicates that online learning training should prioritise "how to be present" rather than merely "how to use the software". Faculty members require methods to personalise the digital landscape. This entails the formulation of explicit communication protocols, including a guaranteed 24-hour response time for emails, which directly mitigates the significant influence of instructor responsiveness identified in the survey. Moreover, the curriculum design must transition from passive content dissemination to interactive facilitation. Instructors ought to be incentivised to employ synchronous Q&A sessions and tailored video feedback to mitigate transactional distance. Students' perception of course quality significantly increases when they sense the instructor's virtual presence, regardless of the platform used. The comparatively low scores in learning motivation (M=3.31) indicate an immediate necessity for student support systems that extend beyond academic assistance.

Institutions ought to establish orientations for "learning to learn online" that specifically focus on self-regulation strategies. These workshops ought to instruct on time management, goal setting (LM2), and the management of digital distractions. It is inadequate to presume that "digital natives" inherently excel as online learners; they may be proficient in utilising technology for entertainment but not necessarily for autonomous education. Furthermore, the implementation of early warning systems utilising LMS data may facilitate the identification of students experiencing declining engagement, thereby enabling timely intervention prior to a complete loss of motivation. Although technological readiness was the least impactful predictor, it retains statistical significance. The result suggests a notion of fairness and consistency. Ensure that universities optimise their Learning Management Systems (LMS) for mobile devices, given that many students may rely on smartphones for access. Administrators ought to prioritise platform stability and navigational simplicity (TR5) over intricate, bandwidth-intensive features. By diminishing the cognitive burden associated with technology navigation, institutions enable students to concentrate their finite cognitive resources on the educational material itself.

7. CONCLUSION

This study examined the determinants affecting students' perceptions of online education among 275 undergraduates in Shanxi Province. The research employs a quantitative methodology involving descriptive statistics, correlation, and multiple regression analysis, demonstrating that the quality of online education is determined more by human interaction than by hardware. The analysis clearly shows that instructor support is essential to the online learning experience. The regression model (R^2 = .592) demonstrates that although technological readiness is essential, it is the instructor's capacity to offer feedback, guidance, and a sense of presence that enhances student satisfaction. The data clarifies that online learning is not merely an automated transmission of knowledge but rather a social experience necessitating active facilitation. Moreover, the study underscores a significant issue pertaining to learning motivation. The low average scores in this domain indicate that students are experiencing difficulties with the autonomy necessitated by remote education, highlighting a distinct area for future intervention. It is important to recognize the limitations of this study. The sample was obtained from three universities in a single province through convenience sampling, potentially restricting the generalizability of the findings to other regions of China with varying socio-economic characteristics. The survey's cross-sectional design captures student perceptions at a singular moment, failing to consider how these perceptions may change throughout an entire semester. Future research should employ longitudinal designs to monitor the temporal fluctuations of motivation. Qualitative research, such as focus groups, would be beneficial for clarifying the behaviors of instructors that students perceive as most supportive. This study contends that the future of online education in Shanxi depends on a "high-tech, high touch" methodology. The technology must be reliable, and the pedagogy must be individualized. By enabling educators to serve as active facilitators and enhancing students' self-regulation abilities, universities can convert online learning from a provisional option into a substantial and effective educational format.

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APPENDIX

1. Demographic & Socio-Economic Information (5 items, Nominal/Ordinal)

1. Age (in years)
2. Gender (Male/Female/Other)
3. Year of study (1st, 2nd, 3rd, 4th)
4. University type (Research-intensive, Teaching-oriented, Vocational)
5. Socio-economic background (Low / Medium / High)

2. Technological Readiness (TR) (5 items, 5-point Likert, 1=Strongly Disagree, 5=Strongly Agree)

6. I have access to a personal computer or laptop for online learning.
7. I have a reliable and stable internet connection for attending online classes.
8. I am confident in using digital tools and online platforms for learning.
9. I can troubleshoot basic technical problems that occur during online learning.
10. I feel comfortable navigating online learning management systems independently.

3. Instructor Support (IS) (5 items, 5-point Likert)

11. Instructors respond promptly to my questions and messages.
12. Instructors provide clear instructions and guidance for online assignments.
13. Instructors give constructive feedback that helps me improve.
14. Instructors actively engage with students during online sessions.
15. I feel supported by my instructors when I encounter difficulties in online learning.

4. Learning Motivation (LM) (5 items, 5-point Likert)

16. I am motivated to complete my online courses even without direct supervision.
17. I set personal learning goals for online courses and strive to achieve them.
18. I actively participate in online discussions and activities.
19. I persevere through challenging tasks in online courses.
20. I feel intrinsically motivated to learn new knowledge through online learning.

5. Student Perceptions of Online Learning (SPOL) (5 items, 5-point Likert)

21. Online learning is effective in helping me achieve my learning objectives.
22. Online classes are convenient and flexible for my schedule.
23. I am satisfied with the overall quality of online learning.
24. Online learning enhances my understanding and retention of course content.
25. I have a positive attitude toward online learning and prefer to continue using it in the future.