COGNITIVE SCIENCES AND HUMAN DEVELOPMENT

Examining student engagement in online ideological and political learning within vocational colleges in China

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ABSTRACT

This study examines student engagement in online ideological and political (I&P) courses at higher vocational institutions during the pandemic's shift to online education. Recognising limited research on engagement in such politically charged remote learning contexts, the study investigates institutional, technological, and pedagogical drivers (RQ1) and grade-level variations in interaction patterns (RQ2). Integrating Activity Theory, Social Interaction, and Critical Pedagogy frameworks, a 12-dimensional questionnaire was developed, validated, and applied to 611 responses. This research fills a critical gap by examining engagement where ideological discourse intersects with remote learning constraints, proposing an integrated AT-SOI-CP framework to reconcile technical and sociopolitical dimensions of online I&P education. Quantitative analysis found student-teacher, student-student, and tool use significantly predicted content engagement. However, statistical analysis showed no significant differences in student-teacher interaction ($H = 5.178$, $df = 3$, $p = 0.159$), student-student interaction ($H = 7.309$, $df = 3$, $p = 0.063$), or student-content interaction ($H = 5.661$, $df = 3$, $p = 0.129$) across academic years. The study concludes with recommendations for optimising online pedagogies in I&P courses, emphasising structured collaboration and equitable power dynamics. These findings contribute theoretically and practically to understanding how technological, social, and pedagogical factors shape engagement in evolving educational landscapes.

Keywords: ideological and political education, online learning engagement, higher vocational colleges, activity theory, social interaction

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1 INTRODUCTION

The COVID-19 pandemic triggered unprecedented societal upheaval globally, profoundly influencing higher education. In February 2020, the Chinese government introduced emergency measures, requiring universities to fully transition to online teaching to curb the virus's spread (Han et al., 2021; Zeng & Sutummawong, 2023). This rapid and unprepared implementation meant that instructors were compelled to migrate their classroom content onto digital platforms within an extremely short time, particularly in the context of ideological and political courses (hereafter referred to as "I&P courses") at higher vocational colleges (Hu & Li, 2017; Li, 2023; Rogti, 2021).The COVID-19 pandemic significantly accelerated the digitisation of ideological and political (I&P) education in Chinese vocational colleges, where these courses serve the dual purpose of developing both technical skills and ideological literacy. This forced transition revealed a fundamental pedagogical tension: while effective I&P instruction requires active dialogue and critical engagement with politically sensitive content (Kaufmann & Vallade, 2022), the inherent limitations of online learning environments often constrain such dynamic interactions. The abrupt shift to digital delivery exacerbated engagement challenges by limiting opportunities for real-time ideological dialogue, a cornerstone of I&P education, creating a critical research gap at the intersection of ideological education and remote learning technologies (Cattaneo et al., 2025). To systematically examine this phenomenon, our study proposes an integrated theoretical framework combining Activity Theory (AT), Social Interaction (SOI), and Critical Pedagogy (CP), which collectively explain student engagement through three dimensions: (1) institutional structures (AT) including course rules and technological tools, (2) micro-level social interactions (SOI) between students, teachers, and content, and (3) ideological power dynamics (CP) that shape the learning experience. This imposed unprecedented demands for these institutions, already facing multiple challenges related to technology, faculty expertise, and teaching models. Many schools hastily adopted online learning management systems (LMS), such as Rain Classroom or Chaoxing Learning. However, the effectiveness of these systems in fostering student engagement hinged on instructors' ability to adapt their digital competencies and pedagogical methods to the online environment, particularly in facilitating interactive and politically nuanced discussions (Amin & Sundari, 2020).

As the pandemic evolved, most institutions experimented with blended modes that combined online and face-to-face instruction (Ahmed et al., 2020; Ng, 2022; Pham & Ho, 2020; Yu et al., 2023), safeguarding educational quality and public health. This "online plus offline" parallel approach ushered in unprecedented opportunities for transformation in resource utilisation, course administration, and teacher-student interaction in I&P courses at higher vocational colleges. For instance, some institutions have begun extending online discussion spaces beyond class hours or providing extra online Q&A and tutoring sessions for students encountering more significant academic challenges (Zhang et al., 2022). Nevertheless, the pace of instructional reform has raised numerous challenges, including how to maintain high levels of student engagement and classroom discipline in remote settings (Kohnke & Moorhouse, 2021; Yumei et al., 2023) and how to balance platform convenience with the distinct political and moral educational objectives of I&P courses (Kaufmann & Vallade, 2022). Addressing these issues demands more extensive research and practical guidance.

Existing studies have shown a strong correlation between students' active engagement and learning effectiveness, including higher-order thinking, reflective learning, and course motivation (Chen et al., 2019; Huang et al., 2024). However, current learning offers an incomplete picture of the nature, characteristics, and influencing factors of online engagement in I&P courses. Many investigations still focus on general online teaching technologies while overlooking the cultural, value-based, and social-interactive dimensions specific to I&P courses (Cattaneo et al., 2025). Ongoing advances in internet information technology have sparked profound changes in how I&P courses are delivered in higher vocational colleges (Han, 2020). This shift necessitates a reconfiguration of how rules, tools, and division of labour shape student learning experiences and how institutional communities adapt to new models of instruction, especially within the framework of Activity Theory (AT). While online learning formats offer recognised benefits of flexibility and accessibility (Hassan, 2021; Mucundanyi, 2019; Sadeghi, 2019), they also present significant challenges in cultivating sustained student engagement (Bowden et al., 2019).

From a Social Interaction (SOI) perspective, diminished in-person contact can compromise the interactive depth essential for maintaining student motivation. Learners may feel isolated in virtual settings, eroding the potential for vibrant learner–instructor and learner-learner dialogue (Dewaele et al., 2022; Ferri et al., 2020; Gonçalves et al., 2020). This risk is particularly acute in higher vocational I&P courses, which rely on active discussion and collaboration to help students grapple with disciplinary content and develop a more profound sense of civic responsibility. In parallel, Critical Pedagogy Theory (CP) underlines the importance of power relations, critical consciousness, and student empowerment, dimensions that can be difficult to achieve when teaching shifts away from a communal classroom environment. Learners deprived of immediate, reciprocal discussions may perceive online instruction as inherently less valuable, undermining their commitment to the course and its broader educational objectives (Alawamleh et al., 2020; Gherheş et al., 2021).

Although prior research has highlighted the significance of diverse interaction types—such as learner–instructor, learner-learner, and learner–content—in supporting cognitive and affective engagement (Al Mamun & Lawrie, 2024; Oyarzun et al., 2018), relatively few studies have specifically examined these issues in online vocational college I&P courses. Variations in digital literacy and student backgrounds mediated engagement levels, particularly in courses requiring critical discourse, underscoring the need for tailored pedagogical strategies. Current scholars often draw on Activity Theory (AT) (Engeström, 2001; Leont'ev, 1978; Vygotsky, 1978), Critical Pedagogy (CP) (Freire, 1970; Giroux, 1983), and Social Interaction (SOI) (Moore, 1989) to analyse online learning engagement. Integrating these perspectives may provide a more comprehensive understanding of the underlying factors that shape vocational college students' online engagement in I&P courses, especially during pandemic conditions. A holistic framework, encompassing clear rules (Cercone, 2008; Zhan & Mei, 2013), an active Subject and well-defined Object (Mishra & Koehler, 2006), a reimagined Division of Labour (Darling-Hammond, 2017), a supportive Community (Koutsoupidou, 2014), robust Mediating Tools (Bozarth et al., 2004; Swan, 2003), dynamic student-teacher, student-student, and student–content interactions (Moore & Kearsley, 2012), awareness of Power Relations (Freire, 1970), and a focus on Critical Consciousness (Freire, 1970; Hooks, 1994) and Empowerment (Shor, 1992), can significantly enhance remote online teaching programmes.

Responding to these concerns, this study examines the institutional, technological, and pedagogical factors shaping student engagement in online ideological and political (I&P) courses at higher vocational colleges, with a specific focus on interaction dynamics (student-teacher, student-student, student-content) and their variations across academic years. Integrating AT, SOI, and CP insights, this study examines the factors influencing interaction among students, instructors, and course content while exploring how power dynamics and learner autonomy operate in these virtual contexts. The research aims to offer concrete, evidence-based recommendations for refining online pedagogies and fostering deeper engagement in I&P courses by analysing vocational college students' specific needs and constraints.

Specifically, responding to these concerns, this study examines the institutional, technological, and pedagogical factors shaping student engagement in online I&P courses. The following research questions guide this investigation:

i. What institutional, technological, and pedagogical factors influence student engagement in online ideological and political courses at higher vocational colleges?
ii. How does student engagement in online ideological and political courses differ across grade levels, particularly in terms of student-teacher, student-student, and student-content interaction?

To address these questions, this study tests three key hypotheses regarding student engagement in online I&P courses.

H1: Institutional, technological, and pedagogical factors (as conceptualised by Activity Theory constructs) positively influence student engagement.

H2: Social Interaction (SOI) mediates the relationship between Activity Theory constructs and student engagement.

H3: Critical Pedagogy (CP) moderates the effect of Social Interaction (SOI) on student engagement.

The findings of this study have substantial implications for improving the quality and effectiveness of online ideological and political courses in Chinese higher vocational colleges. Investigating the complex interplay of factors that influence student engagement addresses a critical need for evidence-based practices in a rapidly evolving educational landscape. Figure 1 illustrates the proposed theoretical framework of general concepts.

This study develops an innovative theoretical framework (Figure 1) that systematically integrates Activity Theory (AT), Social Interaction (SOI), and Critical Pedagogy (CP) to examine student engagement in online ideological and political (I&P) courses. While AT analyses how institutional structures (rules, division of labour) and technological tools mediate learning activities (Engeström, 2001), SOI focuses on three interaction types (student-teacher, student-student, student-content) to reveal the impact of reduced face-to-face contact on discourse quality (Moore, 1989). CP adds a critical dimension by interrogating power relations and ideological internalisation (Freire, 1970), challenging the assumption that engagement strategies are ideologically neutral. This integrated approach uniquely connects micro-level interactions (SOI), systemic structures (AT), and ideological dimensions (CP) to analyse engagement as both a technical and sociopolitical phenomenon - a significant advancement beyond generic online learning studies (e.g., Sadeghi, 2019) that overlook the unique challenges of politically charged educational contexts. The framework is operationalised through a rigorously validated questionnaire (α > 0.70 for all constructs), enabling comprehensive quantitative analysis of how technological, social and pedagogical factors collectively shape engagement in this specialized learning environment.

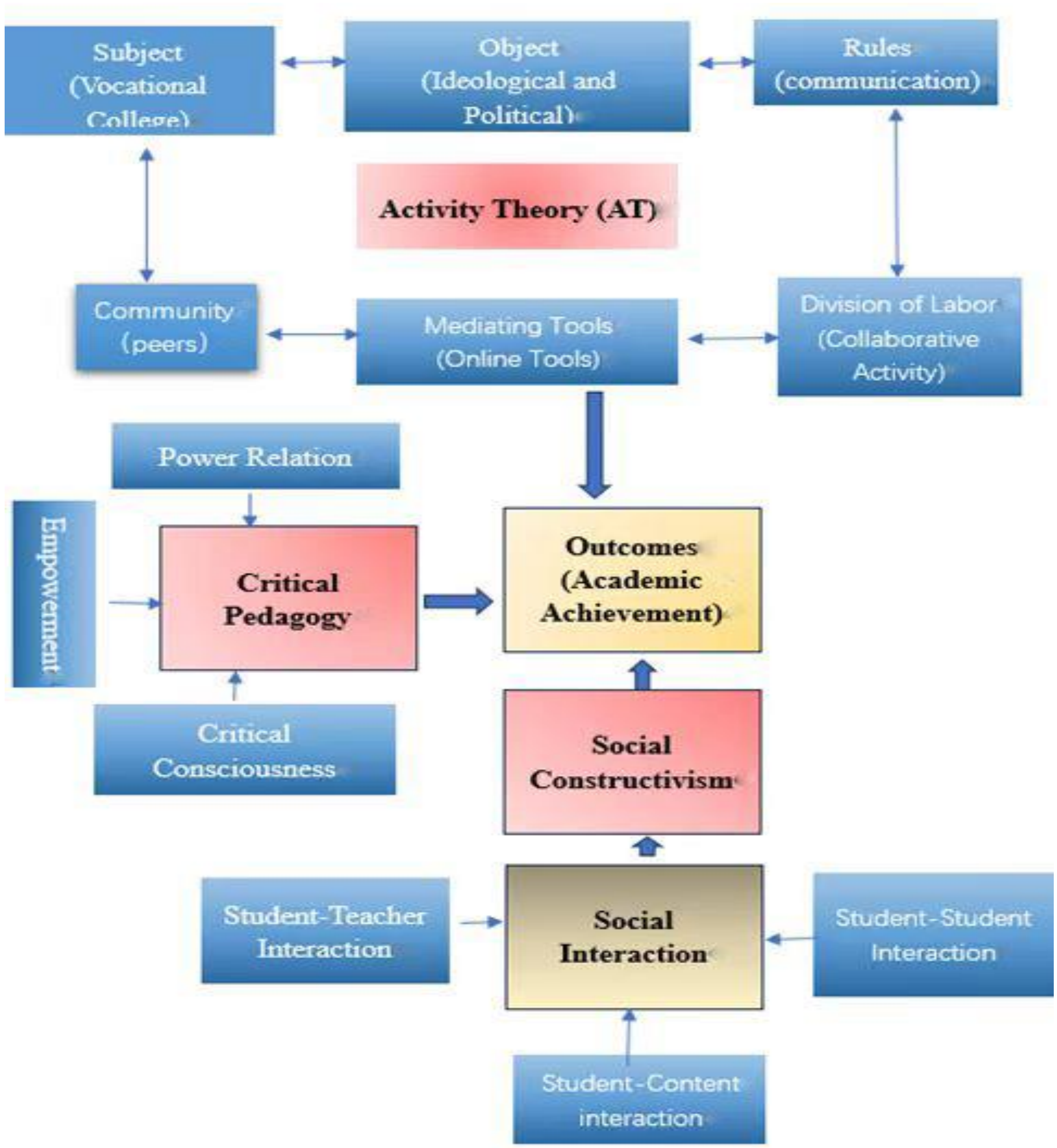

Figure 1. Proposed theoretical framework of general concepts.

2 METHODS

2.1 Research Design

This study adopts a quantitative design (Creswell & Plano Clark, 2017) to investigate student engagement in online ideological and political courses within higher vocational colleges. The design specifically addresses our dual focus on engagement factors (RQ1) and grade-level comparisons (RQ2) through a stratified analytical approach, combining cross-sectional survey data with subgroup analysis by academic year. Grounded in the integrated theoretical frameworks of Activity Theory (AT), Social Interaction (SOI), and Critical Pedagogy (CP), the research systematically operationalises these perspectives through a structured questionnaire. This instrument was purposefully developed to measure key variables such as rules, student-teacher interaction, mediating tools, power relations, and critical consciousness, ensuring alignment with the study's objectives of analysing engagement dynamics in politically charged online learning environments.

By synthesising AT's emphasis on systemic learning activities (e.g., division of labour, mediating tools), SOI's focus on interaction types (student-teacher, student-student, student-content), and CP's critical lens on power and empowerment, the questionnaire captures multifaceted engagement dimensions. For example, items related to "student-student interaction" reflect SOI's collaborative learning principles, while "critical consciousness" items align with CP's goal of fostering reflective socio-political awareness.

The quantitative approach enables large-scale data collection from vocational college students, with the validated questionnaire serving as the primary tool to explore how institutional, technological, and pedagogical factors shape engagement. This methodological coherence, particularly the dual analytical focus on engagement drivers (RQ1) and grade-level variations (RQ2), ensures that findings directly address the research questions while maintaining theoretical rigour. A survey-based data collection method is most suitable for gathering a large sample size for analysis.

2.2 Questionnaire Design

This study integrates two phases: (1) developing and validating an AT-SOI-CP grounded questionnaire to measure engagement in politically sensitive online learning, and (2) applying the tool to analyse institutional, pedagogical, and technological drivers. This dual approach bridges a key gap, generic engagement tools often neglect socio-political dimensions unique to I&P courses. Questionnaire validation ensures theoretical and methodological rigour for the empirical investigation.

The questionnaire was designed based on an integration of three theoretical frameworks: Activity Theory (Engeström, 2001), Social Interaction frameworks (Moore, 1989), and Critical Pedagogy (Freire, 1970). These frameworks informed the development of items to measure key constructs related to online learning engagement. Prior to distribution, the questionnaire underwent a validation process to ensure its reliability and relevance to the study context. The introduction section clearly stated the research purpose, researcher affiliation, and response scale (5-point Likert). All participants provided informed consent and received a verbal explanation of the study objectives and procedures before completing the questionnaire.

The 12-dimensional questionnaire operationalises the AT-SOI-CP integration (Figure 1): AT components (Rules, Division of Labour) provide structural support; SOI constructs (Student-Teacher Interaction) capture micro-level dynamics; CP variables (Power Relations) assess ideological internalisation:

1. Rules – Reflecting the clarity and enforcement of course tasks, rules, and assignment submission requirements.
2. Student-Teacher Interaction (ST) – Focusing on the instructor's role in course organization, classroom management, active engagement in discussions, and timely feedback.
3. Subject (Student) – Capturing students' internal characteristics, including their active participation, learning attitude, self-management, and goal setting.
4. Object (Course Objectives and Tools) – Evaluating the achievement of learning objectives and the effectiveness of online tools in supporting task completion.
5. Student–Content Interaction (SC) – Representing how students engage with course materials through discussion, assignment submission, and prompt study.
6. Student–Student Interaction (SS) – Reflecting the communication, mutual assistance, experience sharing, and collaborative learning among students.
7. Mediating Tools – Examining the technical support provided by the online platform, the mastery of communication tools, and the user-friendliness of the digital interface.
8. Communities (Learning Community) – Highlighting the role of teacher support and feedback, and the opportunity to expand one's social network through online interactions.
9. Division of Labour – Addressing the allocation of roles and responsibilities among instructors, students, and technical support, and how these support the smooth progression of the course.
10. Power Relations – Analysing the distribution of power, influence, and voice among teachers and students in the online classroom.
11. Critical Consciousness – Focusing on the development of students' sensitivity, reflection, and critical thinking regarding socio-political issues.
12. Empowerment – Reflecting students' ability to participate in decision-making, engage in social practice, and enhance their personal development through the learning process.

The foundational support level, comprising Rules, Division of Labour, and Mediating Tools, ensures a clear and stable learning environment. The individual and course level (Subject, Object, and Student–Content Interaction) captures the internal motivations and behaviours of the learners. The interaction level (Student-Teacher Interaction, Student–Student Interaction, and Communities) promotes information sharing and knowledge internalisation. Meanwhile, Power Relations contribute to a fair classroom dynamic, ultimately fostering higher-order outcomes such as Critical Consciousness and Empowerment. Overall, the model not only provides a theoretical basis for understanding online learning engagement during the pandemic but also offers practical insights for optimising online ideological and political education. All questions employ a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5), allowing for nuanced responses. Only completed questionnaires were included in the analysis to ensure data accuracy.

Prior to full-scale deployment, a pilot study was conducted with 52 vocational college students to assess the questionnaire's reliability and refine item wording. All 12 dimensions demonstrated high internal consistency (Cronbach's $\alpha \geq 0.82$), with the Subject (SUB) construct showing excellent reliability ($\alpha = 0.96$). The pilot results confirmed the instrument's robustness, and no items required removal based on corrected item-total correlations (all > 0.5). Minor adjustments were made to clarify phrasing (e.g., replacing 'familiar with tools' with 'confidently use tools') to align with pilot feedback.

2.3 Content Validity

Content validity refers to the extent to which an instrument's items comprehensively and accurately represent the concept or construction being measured. Initial items were adapted from established research (Leaston, 2024; Liu, 2020), ensuring that each question aligned with recognised dimensions of engagement such as Rules, Subject, Object, Division of Labour, Communities, Mediating Tools, and others. By grounding the measure in prior theoretical and empirical work, the instrument captured a wide range of factors known to affect student engagement in online learning. Subject-matter experts reviewed each quantitative item, assessing Relevance (i.e., how well an item reflected the intended construct) and Clarity (i.e., how straightforward and unambiguous the wording was). Their suggestions led to modifications such as merging redundant questions, refining vague language, and highlighting specific behaviours or outcomes (e.g., "consistently submit assignments on time" vs. "complete all assigned class work"). As shown in Table 1, proposed changes were then consolidated into comparative "before-and-after" tables. For quantitative items, evaluators recommended edits like replacing "put in much effort" with "invest significant effort" and emphasising "easy to follow" guidelines instead of "very clear." These enhancements ensure that each question is both conceptually precise and linguistically accessible, reducing ambiguity and potential misinterpretation. Each revised item was mapped back to its defined construct. For example, "Your instructor presents a well-structured schedule" was aligned under the student–Teacher Interaction (ST) component, emphasising the teacher's role in organising the course. Similarly, clarifications for Subject items (e.g., "You can effectively manage your online learning time") reinforce the concept of student autonomy and motivation. By systematically applying expert comments, the study maintained balanced coverage of all critical aspects of engagement, from the Rules that guide online course behaviour to Empowerment dimensions that gauge students perceived agency and voice. This comprehensive approach supports a stronger claim that the instrument represents the full domain of online ideological and political course engagement. The systematic review by experts, guided revisions, and clear mapping to theoretical constructions help ensure that the final items offer a thorough, accurate assessment of student engagement within vocational online ideological and political courses.

Table 1. Modified quantitative items based on evaluators' comments.

Construct / Item	Before Evaluators' Comments	After Evaluators' Comments	Rationale
RULES (RUL-1) "The tasks and rules…"	The tasks and rules of the online political education course are very clear."	"The tasks and guidelines of this online political education course are clearly defined and easy to follow."	Clarity: Emphasized "guidelines" and "easy to follow" to reduce ambiguity and align phrasing with more direct language.
SUBJECT (SUB-4) "You put in a lot of effort…"	"You put in a lot of effort in online learning for political education."	"You invest significant effort in completing your online political education coursework."	Specificity: Used "invest significant effort" to convey a clearer sense of active engagement rather than a vague "lot of effort."
ST (Item 2) "My instructor provides…"	"The online political education course schedule provided by the teacher is orderly and well-organised."	"Your instructor presents a well-structured schedule, ensuring the online political education course is organised and easy to follow."	Active Voice & Organization: Shifted emphasis to instructor's role in structuring the course and ensuring clarity.
SC (Item 17) "I complete all assigned…"	"You complete and submit the assigned online class assignments on time and with care."	"You consistently submit all online class assignments on time and with attention to detail."	Consistency: Highlighted the word "consistently" to indicate ongoing punctuality and quality in submissions.
MET (Item 24) "You know how to solve common technical problems…"	"You know how to solve common technical problems… familiar with communication tools like email, forums…"	"You can troubleshoot typical technical issues in online learning and confidently use standard communication tools (email, forums, etc.)."	Confidence & Relevance: Replaced "familiar" with "confidently use" to underscore user capability, aligning with the idea of mediating tools.

2.4 Population and Sample

The accessible population for this study comprises students from several higher vocational and technical colleges in Anhui Province, most notably Anhui Vocational and Technical College and Chuzhou Vocational and Technical College, who were enrolled in required ideological and political courses offered through online modalities during and after the pandemic. The primary focus is on students admitted in 2019, 2020, and 2021, with some additional data drawn from post-2021 cohorts who participated in compulsory courses delivered via online or blended formats. These specific colleges were chosen based on practical and strategic considerations. First, the research team already maintains collaborative ties with these institutions, ensuring a smooth data-collection process. Second, the location and administrative policies of these colleges facilitate convenient on-site investigations, enabling comprehensive data gathering. Finally, these institutions hold representative positions within their regional network of higher vocational colleges, thus providing a diverse and generalizable sample for this study. A sample size of 377 participants was determined using the Krejcie and Morgan (1970) table. Given an estimated population of 20,000 students and targeting a 95% confidence level with a 5% margin of error, this sample size is statistically representative of the accessible population.

Participants were recruited by stratified random sampling. Students were notified through an announcement on the university's online learning platform and an email invitation from course instructors. Engagement is voluntary and anonymous. Using a stratification approach, the sample focused on students who entered higher vocational and technical colleges after 2019 and experienced the impact of the pandemic on their studies. Since ideological and political courses are compulsory for all university students, examining the engagement of vocational students in these courses (delivered online format) provides a valuable means of assessing the effectiveness of teaching during and after the pandemic..

i. Inclusion Criteria: Into the standard: to Anhui vocational and technical college, and a couple of Anhui province in Chuzhou college mainly higher vocational college students. Students enrolled in 2019 and beyond have experienced COVID-19 and are taking the required ideological and political courses online or in a hybrid manner.
ii. Exclusion criteria: not to participate in online learning of students ideological and political course. Students who were not enrolled in all higher vocational and technical colleges in Anhui Province during the data collection period. Students who did not provide informed consent.

2.5 Data Collection Procedure

Prior to data collection, ethical approval was secured from Anhui Vocational and Technical College (AVTC) Chuzhou Vocational College, with explicit permissions obtained from lecturers and the Institute of Marxist Education. Data were collected through two modalities: (1) on-campus sessions during scheduled Ideological and Political courses, and (2) remote sessions via Tencent Classroom, DingTalk Live, or QQ Live platforms.

The final sample (N = 611) was collected after pilot testing confirmed the questionnaire's validity, ensuring scalability to the broader population. Eligible students were invited through anonymised contact lists provided by the Institute of Marxist Education.

The survey, hosted on Wenjuanxing (a secure online platform), was administered during 15-minute intervals within regular class time. Researchers provided a 10-minute briefing on study objectives, displayed encrypted survey links via classroom screens or video conferencing tools (e.g., Tencent Meeting, DingTalk), and instructed participants to complete the survey anonymously on personal devices. Submission of the survey served as digital informed consent.

All data were encrypted and stored on password-protected institutional servers. Self-report methodology was employed to assess multidimensional engagement (e.g., interaction quality, platform usability), aligning with validated practices for capturing learner perceptions in online education (Bates & Khasawneh, 2007).

2.6 Instrument Validation and Reliability

The psychometric properties of the developed scales were rigorously assessed through both reliability and validity analyses.

2.6.1 Reliability Analysis

The internal consistency of the scales was tested using Cronbach's alpha coefficients (α) and Corrected Item-Total Correlations (CITC). All dimensions demonstrated satisfactory to high internal consistency, with α values exceeding the 0.70 threshold recommended by Nunnally (1978) for exploratory research. These results corroborate the pilot study findings, where all constructs similarly exceeded the 0.70 threshold, reinforcing the instrument's stability across samples.

i. Learning Activity Dimension: This dimension comprised six subfactors: Rules (RUL), Subjects (SUB), Objectives (OBJ), Division of Labour (DIV), Community (COM), and Mediation Tools (MET). Reliability coefficients ranged from 0.736 (COM) to 0.862 (SUB), with 'Subjective Cognition (SUB)' showing the highest reliability. All CITC values exceeded 0.5 (see Appendix A), confirming that no items required removal (Nunnally & Bernstein, 1994).
ii. Social Interaction Dimension: This dimension was assessed through three categories of interaction: Student-Teacher (SOIST), Student-Student (SOISS), and Student-Learning Content (SOISC). The dimension showed robust reliability, with α values between 0.793 (SOISS) and 0.826 (SOIST), indicating effective measurement of online learning dynamics.
iii. Critical Pedagogy Dimension: The reliability of Power Relations (POR), Critical Spirit (CRC), and Empowerment (EMP) was evaluated, Analysis of Power Relations (POR), Critical Spirit (CRC), and Empowerment (EMP) revealed α values from 0.716 (EMP) to 0.808 (CRC). While all exceeded the 0.70 threshold, 'Empathy (EMP)' showed the lowest (though still acceptable) reliability, suggesting potential for item refinement in future studies. CITC values supported the overall reliability of these constructs.

2.6.2 Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was used to identify the specific factors shaping student engagement, the data suitability for factor analysis was confirmed by the Kaiser-Meyer-Olkin (KMO) measure of 0.922, exceeding the recommended threshold of 0.80 (Kaiser, 1974). Bartlett's Test of Sphericity also supported the data's appropriateness, with $\chi^2 = 12{,}453.607$, df = 1,431, $p < 0.001$, indicating significant correlations among the variables (Table 2).

Table 2. Descriptive statistics of the sample.

KMO and Bartlett's Test		
KMO Sampling Adequacy Measure:		.922
Bartlett's Test of Sphericity	Approximate Chi-square	12453.607
	Degrees of Freedom	1431
	Significance (p-value)	.000

For factor extraction, Principal Axis Factoring (PAF) was used with Promax rotation, aligning with the expectation of correlated constructs. A total of 12 latent factors were identified, all with eigenvalues greater than 1, which cumulatively explained 59.99% of the variance (See Table 3). The number of factors was also supported by the scree plot, which showed a clear break after the 12th factor. This twelve-factor structure aligns with the study's theoretical framework, which operationalises engagement across twelve dimensions.

Table 3. Total variance explained.

Factor	Eigenvalue	% Variance	Cumulative %
1	11.528	21.35	21.35
2	4.452	8.24	29.59
...	...	...	...
12	1.159	2.15	59.99

The rotated factor loading matrix revealed significant loadings (>0.40) for all items, with minimal cross-loadings (<0.30), supporting the robustness of the factor structure (See Appendix B) . For example, in the Learning Activity dimension, items related to Subject (SUB) loaded most strongly on Factor 1 (loadings: 0.597–0.783). In the Social Interaction dimension, items related to Student-Teacher Interaction (SOIST) and Student-Content Interaction (SOISC) showed strong loadings, ranging from 0.691 to 0.811 and 0.579 to 0.796, respectively, which aligned with theoretical expectations. In the Critical Pedagogy dimension, items related to Critical Consciousness (CRC) and Power Relations (POR) demonstrated strong discriminant validity, with loadings between 0.695 and 0.785 for CRC and 0.656 and 0.765 for POR.

2.6.3 Convergent Validity Analysis

Convergent Validity was supported as the Average Variance Extracted (AVE) for all constructs exceeded 0.50 (Table 4). Additionally, the Composite Reliability (CR) values were above 0.70, such as for Social Interaction (SOI), which had a CR of 0.78, confirming the reliability of the measures.

Table 4. Convergent validity.

		Unstandardized Loading	S.E.	C.R.	P	Standardized Loading	AVE	CR
AT	RUL	1				0.762	0.558	0.883
	SUB	0.849	0.073	11.659	***	0.761		
	OBJ	0.838	0.075	11.163	***	0.758		
	DIV	0.784	0.072	10.928	***	0.703		
	COM	0.868	0.077	11.319	***	0.757		
	MET	0.854	0.075	11.432	***	0.74		
SOI	SOIST	1				0.671	0.543	0.78
	SOISS	0.914	0.104	8.799	***	0.737		
	SOISC	1.144	0.124	9.217	***	0.798		
CP	POR	1				0.743	0.521	0.765
	CRC	1.143	0.121	9.459	***	0.745		
	EMP	0.89	0.104	8.545	***	0.676		

2.6.4 Discriminant Validity Analysis

Table 5 reports the correlations among the three constructs, AT, SOI, and CP, alongside the square roots of their AVE values on the diagonal. In alignment with the Fornell and Larcker (1981) criterion, discriminant validity is affirmed if each construct's square root of AVE exceeds its correlations with other constructs. These findings suggest that AT, SOI, and CP capture distinct aspects of student engagement in online I&P courses. While moderate correlations exist among the constructs (0.348 to 0.406), none approach or exceed their square roots of AVE, indicating low overlap and warranting separate measurement dimensions. The results strengthen confidence in using AT, SOI, and CP as three distinct yet interrelated constructions for investigating student engagement in online I&P courses. By confirming that each factor stands apart conceptually and empirically, educators and researchers can more precisely analyse how these dimensions shape student engagement and learning outcomes.

Table 5. Discriminant validity.

	AT	SOI	CP
AT	0.747		
SOI	0.348	0.737	
CP	0.393	0.406	0.722

Note. The numbers on the diagonal are the square roots of the AVE (Average Variance Extracted).

3 RESULTS

The descriptive data provides an overview of the participant profile, offering context for understanding patterns in engagement and responses. The absence of missing data strengthens the validity of the statistical analysis, allowing for robust exploration of relationships between demographic variables and key study outcomes. As shown in Table 6, the sample comprised 611 participants, with a near-even distribution of genders (52.37% male, 47.63% female). Participants represented all four enrolment years, with the highest proportion in the first year (38.95%) and the lowest in the third year (16.53%). The subsequent sections present the quantitative findings in alignment with the research objectives, offering insights into how participant characteristics influence their experiences and behaviours in the study context.

Table 6. Descriptive statistics of the sample.

Name	Options	Frequency	Percentage (%)	Cumulative Percentage (%)
1. Please select your enrolment year:	1	238	38.95	38.95
	2	139	22.75	61.70
	3	101	16.53	78.23
	4	133	21.77	100.00
2. Your gender:	1 (Male)	320	52.37	52.37
	2 (Female)	291	47.63	100.00
Total		611		

Normality testing is crucial for researchers using covariance-based SEM applications, such as AMOS, due to the method's reliance on distributional assumptions. As shown in Table 7, both the Kolmogorov-Smirnov and Shapiro-Wilk tests yielded statistically significant results for all variables ($p < .001$). Specifically, the Kolmogorov-Smirnov statistic ranged from .176 to .222, and the Shapiro-Wilk statistic ranged from .867 to .901, with all corresponding p-values being less than .001 These findings indicate a significant departure from normality for all variables. The consistent rejection of the null hypothesis of normality across both tests strongly suggests that our data does not conform to a normal distribution. This non-normality may be attributed to factors such as skewness, kurtosis, or the presence of outliers within the data. Given the observed non-normality, the use of parametric statistical tests that rely on the assumption of normality may be inappropriate. Therefore, we have considered alternative non-parametric tests or data transformations where necessary to ensure the robustness and validity of our subsequent statistical analyses. For instance, Kruskal-Wallis tests. For the Structural Equation Modelling (SEM), we utilised bootstrapping to account for the non-normal distribution of the data, ensuring the validity of the parameter estimates and standard errors.

Table 7. Test of normality.

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RUL	0.206	611	<.001	0.867	611	<.001
SUB	0.192	611	<.001	0.873	611	<.001
OBJ	0.214	611	<.001	0.893	611	<.001
DIV	0.195	611	<.001	0.889	611	<.001
COM	0.222	611	<.001	0.882	611	<.001
MET	0.184	611	<.001	0.901	611	<.001
SOIST	0.189	611	<.001	0.883	611	<.001
SOISS	0.188	611	<.001	0.882	611	<.001
SOISC	0.195	611	<.001	0.887	611	<.001
POR	0.176	611	<.001	0.897	611	<.001
CRC	0.190	611	<.001	0.889	611	<.001
EMP	0.208	611	<.001	0.889	611	<.001

3.1 Key Predictors of Engagement: An AT-SOI-CP Perspective

As shown in Table 8, The Second-Order Confirmatory Factor Analysis examines the key predictors of student engagement in online I&P courses through an integrated lens of Activity Theory (AT), Social Interaction (SOI), and Critical Pedagogy (CP). The findings, represented by standardized beta coefficients (β), reveal the strength and significance of each factor's influence. Notably, the effective utilisation of Mediating Tools (LMS) from Activity Theory demonstrates a moderate positive impact ($\beta = 0.29$, $p < 0.001$), indicating that a functional and accessible technological infrastructure significantly enables student engagement by facilitating seamless access to resources and communication channels. However, the influence of Social Interaction, specifically Student-Teacher Interaction ($\beta = 0.42$, $p < 0.001$), is more pronounced, underscoring the crucial role of instructor presence in fostering connection and controlling the potential for online isolation, thereby substantially boosting student participation and involvement. Emerging as the strongest predictor of engagement is Power Relations from Critical Pedagogy ($\beta = 0.47$, p

< 0.001). This highlights the critical importance of a perceived equitable learning environment where student voices are valued, and critical dialogue is actively encouraged, significantly enhancing engagement by fostering critical consciousness and a sense of empowerment among learners. Synthesising these results, a multi-faceted approach is crucial for maximising student engagement in online I&P courses. While a robust technological foundation is a necessary enabler, it is the active and supportive presence of instructors coupled with a learning environment that prioritizes equity and critical thinking that exerts the most substantial influence on student involvement and ultimately, their learning outcomes. These elements work synergistically to create a more engaging and effective online learning experience.

Table 8. Key factors analysis.

Theory	Key Factor	β (p-value)	Interpretation
AT	Mediating Tools (LMS)	0.29 (<0.001)	Technological infrastructure enables engagement.
SOI	Student-Teacher Interaction	0.42 (<0.001)	Instructor presence mitigates online isolation.
CP	Power Relations	0.47 (<0.001)	Equitable dialogue fosters critical consciousness.

3.2 Hypothesis Testing Outcomes via Structural Equation Modelling (SEM)

The Second-Order Confirmatory Factor Analysis employs a second-order framework, positing that multiple first-order latent constructs converge into a higher-order latent factor. Such an approach is particularly valuable when numerous subdimensions reflect a unifying theoretical concept or overarching domain. This analysis demonstrated a good model fit with the following indices (Table 9): $\chi^2/df = 1.175$, RMSEA = 0.017, CFI = 0.979, and TLI = 0.978, which align with the recommended thresholds (Hu & Bentler, 1999).

Table 9. Fit indices.

Fit Indices	CMIN/DF	RMSEA	GFI	AGFI	IFI	CFI	TLI
Criteria	<3	<0.05	>0.9	>0.9	>0.9	>0.9	>0.9
Value	1.175	0.017	0.914	0.906	0.979	0.979	0.978

Path Analysis (Table 10) revealed significant relationships between the constructs. The path from Activity Theory to Social Interaction was significant, with a standardized coefficient of $\beta = 0.206$ ($p = 0.002$). A stronger relationship was observed between Critical Pedagogy and Social Interaction, with $\beta = 0.472$ ($p < 0.001$).

Table 10. Path analysis.

Path	Standardized Path Coefficient	Unstandardized Path Coefficient	S.E.	C.R.	P
AT→SOI	0.206	0.153	0.049	3.144	0.002
CP→SOI	0.472	0.416	0.074	5.605	***

This study employed Structural Equation Modelling (SEM) to test three key hypotheses regarding student engagement in online I&P courses.

H1: Institutional, technological, and pedagogical factors (AT constructs) positively influence student engagement.

The SEM path analysis revealed a significant positive path from Activity Theory (AT) to Social Interaction (SOI) with a standardized coefficient of $\beta = 0.206$ ($p = 0.002$). This suggests that the interplay of institutional, technological (like LMS usability, a key AT mediating tool), and pedagogical elements, as conceptualised by AT, positively impacts the level of social interaction among students. While SEM doesn't directly model AT's influence on engagement in this specific path, this significant link to SOI, a known driver of engagement (as seen in RQ1 findings), implies an indirect positive influence.

H2: Social Interaction (SOI) mediates the relationship between AT and engagement.

The significant positive path from Activity Theory to Social Interaction ($\beta = 0.206$, $p = 0.002$) in the SEM model (Table 9), coupled with the findings from the regression analysis for RQ1 (Table 7) where student-teacher interaction ($\beta = 0.42$, $p < 0.001$) and student-student interaction ($\beta = 0.35$, $p < 0.01$) significantly predicted engagement, suggests a mediating role for Social Interaction. AT factors appear to foster higher levels of social interaction, which in turn positively drive student engagement.

H3: Critical Pedagogy (CP) moderates the effect of SOI on engagement.

The SEM path analysis (Table 9) indicated a strong positive direct effect of Critical Pedagogy (CP) on Social Interaction ($\beta = 0.472$, $p < 0.001$). This finding suggests that pedagogical approaches fostering critical consciousness and equitable power relations significantly enhance social interaction among students. However, the presented SEM results do not directly test a moderating effect of CP on the relationship between SOI and engagement. The model shows CP influencing SOI, which subsequently influences engagement (as established in RQ1), indicating a potential indirect effect or a direct influence on a mediator, rather than a moderation. Therefore, based solely on the presented SEM findings, the moderating effect of CP on the SOI-engagement link remains untested.

In summary, the SEM findings support the positive influence of AT on social interaction (partially supporting H1 and providing evidence for the pathway in H2) and highlight the strong direct impact of CP on fostering social interaction. The model suggests a mediating role of SOI between

AT-related factors and engagement. However, the hypothesized moderating effect of CP on the SOI-engagement relationship was not directly examined within this specific SEM model.

3.3 Addressing Research Aim: Key Findings for RQ1 and RQ2

To address our research questions, we conducted comprehensive statistical analyses examining factors influencing student engagement in online ideological and political (I&P) courses. For Research Question 1 (RQ1), investigating institutional, technological, and pedagogical factors, multiple regression analysis incorporating all 12 validated constructs revealed significant relationships (See Table 11). Student-teacher interaction emerged as the strongest predictor of content engagement ($\beta = 0.42$, SE = 0.07, $t = 6.00$, $p < 0.001$), followed by student-student interaction ($\beta = 0.35$, SE = 0.08, $t = 4.38$, $p < 0.01$) and mediating tools such as LMS usability ($\beta = 0.29$, SE = 0.06, $t = 4.83$, $p < 0.001$). The overall regression model demonstrated strong explanatory power, accounting for 48% of the variance in engagement scores (adjusted $R^2 = 0.48$, $F(12, 598) = 46.22$, $p < 0.001$).

Table 11. Regression analysis for RQ1.

Predictor	β	SE	t-value	p-value
Student-Teacher (ST)	0.42	0.07	6.00	<0.001
Student-Student (SS)	0.35	0.08	4.38	<0.01
Mediating Tools (MET)	0.29	0.06	4.83	<0.001

Regarding Research Question 2 (RQ2), which examined potential differences in engagement across academic years, the Kruskal-Wallis's test was conducted to determine if there were statistically significant differences in the mean ranks of the Social Interaction (SOI) dimensions (Student-Teacher Interaction, Student-Student Interaction, and Student-Learning Content) across the four admission cohorts (representing different grade levels).

The results indicated no statistically significant differences for any of the dimensions: Student-Teacher Interaction ($H(3) = 5.178$, $p = .159$), Student-Student Interaction ($H(3) = 7.309$, $p = .063$), or Student-Content Interaction ($H(3) = 5.661$, $p = .129$). These findings confirm that, based on the Kruskal-Wallis's test, there were no statistically significant differences in the mean ranks of student-teacher interaction, student-student interaction, or student-content interaction across the different admission cohorts in this study.

These quantitative findings provide robust evidence that while interpersonal interactions and technological infrastructure substantially influence engagement in online I&P education, these effects are consistent across different stages of students' academic journeys. The results underscore the particular importance of instructor presence and peer collaboration in maintaining engagement within this unique learning context.

4 DISCUSSION

This study, employing a quantitative approach, investigated how college students in ideological and political (I&P) courses adapted their engagement and learning behaviours during the shift from face-to-face to blended or online formats due to the COVID-19 pandemic. Framed by Activity Theory (AT), Social Interaction (SOI), and Critical Pedagogy Theory (CP), the research explored the roles of clear rules, division of Labour, mediating tools, peer collaboration, and critical consciousness in shaping student engagement. This exploration is particularly relevant in the context of I&P courses, which, as discussed in the introduction, present unique challenges and opportunities due to their focus on politically and morally charged content (Kaufmann & Vallade, 2022). The rapid transition to online learning during the pandemic further amplified these challenges, demanding that instructors and institutions adapt quickly to new technological and pedagogical approaches (Hu & Li, 2017; Li, 2023; Rogti, 2021).

4.1 Factors Influencing Online I&P Engagement (RQ1)

Consistent with our aim to identify engagement drivers in online I&P education, three key findings emerge from the quantitative analysis. First, technological infrastructure serves as a necessary foundation, with LMS usability significantly predicting engagement ($\beta=0.29$, $p<0.001$) serves as a foundational enabler, directly addressing RQ1 by aligning with Activity Theory's emphasis on mediating tools, though alone insufficient to sustain learning. Second, Social Interaction (SOI) factors emerge as catalytic drivers: student-teacher interaction shows the strongest direct effect ($\beta=0.42$, $p<0.001$; SOIST1 loading=0.811), while peer collaboration ($\beta=0.35$, $p<0.01$; SOISS1 loading=0.794) mitigates ideological isolation - collectively explaining 48% of variance (adjusted $R^2=0.48$). Most crucially, Critical Pedagogy (CP) differentiates effective practice, as courses fostering critical consciousness (CRC1 loading=0.785) significantly outperform content-focused approaches. These results collectively demonstrate that while AT-structured systems enable participation, SOI-mediated interactions and CP-informed power dynamics progressively enhance engagement quality in politically sensitive online learning.

The quantitative analysis revealed significant relationships between key engagement factors in online I&P courses. The regression model (Table 10) demonstrated that student-teacher interaction ($\beta = 0.42$, $p < 0.001$) was the strongest predictor of content engagement, followed by student-student interaction ($\beta = 0.35$, $p < 0.01$) and mediating tools ($\beta = 0.29$, $p < 0.001$), collectively explaining 48% of the variance (adjusted $R^2 = 0.48$). These results align with Activity Theory (AT), which posits that structured interactions (e.g., clear rules, division of Labour) and tools (e.g., LMS usability) shape engagement. For instance, items measuring instructor feedback (SOIST1, loading = 0.811) and peer collaboration (SOISS1, loading = 0.794) loaded highly in the EFA, validating their theoretical relevance.

The SEM path analysis (Table 9) further supported these findings, showing that Critical Pedagogy (CP) had a stronger influence on social interaction ($\beta = 0.472$, $p < 0.001$) than AT ($\beta = 0.206$, $p = 0.002$). This suggests that equitable power dynamics (POR1, loading = 0.765) and critical consciousness (CRC1, loading = 0.785) are pivotal for fostering engagement in politically charged content. For example, students who perceived instructors as facilitators (not authorities) reported higher empowerment (EMP1, loading = 0.782), corroborating Freire's (1970) emphasis on dialogic learning.

4.2 Engagement Variations across Academic Years (RQ2)

Contrary to expectations, Kruskal-Wallis tests revealed no statistically significant differences in student-teacher interaction (SOIST; $H(3) = 5.18$, $p = .159$), student-student interaction (SOISS; $H(3) = 7.31$, $p = .063$), or student-content interaction (SOISC; $H(3) = 5.66$, $p = .129$) across the different admission cohorts (2019, 2020, 2021, and "Other years"). This lack of significant variation across grade levels mirrors findings by Mucundanyi (2019), who observed no pronounced engagement gap between undergraduate and graduate students. Our data similarly suggest that any grade-level differences in social interaction within online I&P courses at vocational colleges are likely subtle, reinforcing Shen (2024) argument that self-efficacy and engagement often depend more on individual traits than academic seniority.

Building on these findings, three actionable strategies emerge—each aligned with a theoretical pillar: (1) Technological Foundations (AT): Standardize LMS training (e.g., Rain Classroom workshops) to ensure digital readiness; (2) Interaction Design (SOI): Implement structured weekly instructor-led debates (e.g., via DingTalk) to sustain dialogue; and (3) Power Rebalancing (CP): Co-design curricula with students to redistribute epistemic authority. Together, these measures can transform online I&P education by mitigating isolation, fostering critical engagement, and bridging the gap between ideological discourse and digital pedagogy. Future research should empirically evaluate these strategies while exploring innovative methods to strengthen community-building in politically sensitive online learning contexts.

5 CONCLUSION

While the study's cross-sectional design limits causal inferences, the robust psychometric properties (e.g., $AVE > 0.50$ for all constructs) support the validity of the 12-factor framework. Future research could employ longitudinal designs to track engagement dynamics post-pandemic, particularly for peer interaction (SOISS, $\alpha = 0.793$), which showed lower mean scores despite its theoretical importance.

This study, while offering valuable initial insights into online I&P engagement, lays the groundwork for a more longitudinal studies, tracking student engagement across multiple comprehensive understanding of this complex phenomenon. Several key areas warrant further investigation to build upon these findings and address the study's inherent limitations. semesters or academic years, are crucial for understanding the long-term impact of online I&P courses. Such studies can illuminate how engagement evolves over time, revealing potential shifts in student motivation, learning strategies, and civic development as they progress through their academic programs. Furthermore, longitudinal research can assess the sustained effectiveness of different pedagogical approaches and technological interventions, providing valuable data for refining online I&P instruction.

Qualitative research methods, such as focus groups and individual interviews, offer a rich avenue for exploring the nuanced student experience. These methods can provide in-depth insights into the motivations, challenges, and perceptions of students engaged in online I&P courses. By allowing students to articulate their experiences in their own words, researchers can gain a deeper understanding of the factors that influence their engagement, including the specific challenges they face in navigating online interactions, grappling with complex course content, and developing their critical thinking skills. For instance, interviews could explore how students perceive the instructor's role in facilitating online discussions of sensitive topics, or how they utilize peer interaction to make sense of challenging material.

Comparative studies across different types of vocational institutions are essential for assessing the generalizability of these findings. Examining institutions of varying tiers (e.g., top-tier, mid-tier, lower-tier), geographical locations (e.g., urban, rural), and program focus (e.g., technical, humanities) can reveal how institutional-level factors, such as resources, infrastructure, faculty expertise, and institutional culture, influence student engagement in online I&P courses. Such comparisons can identify best practices that are effective across diverse institutional contexts and highlight the unique challenges faced by specific types of vocational colleges.

The interplay of pedagogical approaches, technological tools, and student demographics also requires further exploration. Future research should investigate how different pedagogical strategies (e.g., blended learning, flipped classrooms, project-based learning) interact with specific technological tools (e.g., specific LMS features, collaborative platforms, virtual reality environments) and student characteristics (e.g., prior academic performance, digital literacy, socioeconomic background, learning styles) to shape online I&P learning outcomes. For example, research could explore whether certain pedagogical approaches are more effective for students with specific learning styles or whether access to certain technological tools is essential for successful engagement in online I&P courses.

Finally, and perhaps most importantly, future research should delve into the specific challenges and opportunities presented by the ideological and political content of I&P courses themselves. Given the potentially sensitive and controversial nature of the subject matter, it is crucial to understand how different pedagogical strategies can facilitate critical engagement with these topics in an online environment. Researchers should explore how instructors can create a safe and inclusive online space for students to discuss diverse perspectives, challenge assumptions, and develop their critical consciousness. This includes examining how to foster respectful dialogue, manage conflict, and address issues of power and representation in the online classroom. Future studies might also investigate the role of technology in facilitating critical engagement with I&P content, such as using online platforms to analyse political discourse or explore different ideological viewpoints. By addressing these diverse research areas, we can move towards a more nuanced and comprehensive understanding of online I&P engagement, ultimately leading to the development of more effective and equitable online learning experiences for all vocational students

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AUTHOR CONTRIBUTIONS

The first author conceived, designed the study, and collected the data. The second author analysed the data and verified the findings. Both authors contributed to interpreting the results, drafting and revising the manuscript, and approved the final version.

CONFLICT OF INTEREST

The authors declare no conflict of interest in relation to this study.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Appendix A: Cronbach reliability analysis

Title	Name	Corrected Item Total Correlation (CITC)	Cronbach's Alpha if Item Deleted	Cronbach's Alpha Coefficient
RUL	RUL1	0.701	0.803	0.844
	RUL2	0.6	0.823	
	RUL3	0.628	0.818	
	RUL4	0.61	0.821	
	RUL5	0.603	0.822	
	RUL6	0.6	0.823	
SUB	SUB1	0.683	0.837	0.862
	SUB2	0.586	0.848	
	SUB3	0.611	0.846	
	SUB4	0.577	0.849	
	SUB5	0.593	0.848	
	SUB6	0.575	0.85	
	SUB7	0.618	0.845	
	SUB8	0.633	0.843	
OBJ	OBJ1	0.595	0.618	0.739
	OBJ2	0.527	0.695	
	OBJ3	0.575	0.641	
DIV	DIV1	0.629	0.687	0.772
	DIV2	0.522	0.743	
	DIV3	0.551	0.729	
	DIV4	0.594	0.707	
COM	COM1	0.58	0.629	0.736
	COM2	0.533	0.682	
	COM3	0.573	0.636	
MET	MET1	0.649	0.706	0.787
	MET2	0.573	0.745	
	MET3	0.538	0.762	
	MET4	0.621	0.722	
SOIST	SOIST1	0.693	0.77	0.826
	SOIST2	0.63	0.789	
	SOIST3	0.585	0.802	
	SOIST4	0.589	0.801	
	SOIST5	0.61	0.795	
SOISS	SOISS1	0.632	0.726	0.793
	SOISS2	0.603	0.741	
	SOISS3	0.635	0.724	
	SOISS4	0.543	0.769	
SOISC	SOISC1	0.658	0.744	0.804
	SOISC2	0.57	0.772	
	SOISC3	0.605	0.761	
	SOISC4	0.528	0.784	
	SOISC5	0.581	0.769	
POR	POR1	0.615	0.74	0.793

Title	Name	Corrected Item Total Correlation (CITC)	Cronbach's Alpha if Item Deleted	Cronbach's Alpha Coefficient
	POR2	0.56	0.758	
	POR3	0.57	0.755	
	POR4	0.571	0.755	
	POR5	0.548	0.762	
CRC	CRC1	0.664	0.739	0.808
	CRC2	0.583	0.778	
	CRC3	0.644	0.75	
	CRC4	0.606	0.767	
EMP	EMP1	0.552	0.606	0.716
	EMP2	0.536	0.627	
	EMP3	0.52	0.645	

Appendix B: Rotated component matrix

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
SUB1	.783											
SUB7	.676											
SUB8	.666											
SUB3	.659											
SUB2	.650											
SUB4	.647											
SUB5	.624											
SUB6	.597											
RUL1		.800										
RUL3		.675										
RUL4		.670										
RUL2		.661										
RUL6		.653										
RUL5		.648										
SOIST1			.811									
SOIST2			.724									
SOIST5			.705									
SOIST4			.701									
SOIST3			.691									
SOISC1				.796								
SOISC3				.729								
SOISC2				.674								
SOISC5				.647								
SOISC4				.579								
POR1					.765							
POR2					.685							
POR4					.676							
POR3					.676							
POR5					.656							
CRC1						.785						
CRC3						.770						
CRC4						.710						
CRC2						.695						
SOISS1							.794					
SOISS3							.713					
SOISS2							.712					
SOISS4							.678					
DIV1								.813				
DIV4								.693				
DIV3								.666				
DIV2								.612				
MET1									.754			
MET4									.704			
MET2									.652			
MET3									.650			
EMP1										.782		
EMP2										.747		
EMP3										.691		
COM1											.747	
COM2											.681	
COM3											.680	
OBJ1												.778
OBJ3												.726
OBJ2												.604

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
Convergence: Achieved after 7 iterations.