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From Learned Helplessness to Collective Efficacy: A Three-Year Action Research Study of Peer-Supported Intervention in an Independent College

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Abstract

Students in independent colleges (privately funded undergraduate institutions affiliated with public universities) in China face a dual structural disadvantage: weak academic foundations in foundational engineering courses and inadequate informational support for postgraduate admission decision-making. While existing research has examined admission mechanisms primarily in elite universities, micro-level intervention studies targeting independent college engineering students remain scarce. This study reports a three-year action research project involving 141 vehicle engineering students (2019 cohort) at an independent college in Jiangsu Province, with a matched cohort of 130 students (2017 cohort) serving as the comparison group. A peer-supported "Dual-Axis Transmission" model—comprising an academic exemplar serving as the "axis center," course-specific peer tutors as the "axis spokes," and a counselor coordinator as the "network hub"—was implemented alongside a structured "School-Selection Database" designed to support evidence-based postgraduate decision-making. Results showed a 59.1% reduction in total course failures (chi-square [χ^2] = 48.44, *p* <.001, Cramér's V =.423) and a 90.6% reduction in *College Physics* failures specifically (64 vs. 6 students; χ^2 = 71.42, *p* <.001, Cramér's V =.513). The overall postgraduate admission rate increased from 11.5% to 32.0% (χ^2 = 16.29, *p* <.001, Cramér's V =.245). Qualitative evidence from 87 individual counseling records revealed shifts from learned helplessness toward proactive academic engagement, with three distinct mechanisms identified: goal anchoring, meaning reconstruction, and strengths-based institutional matching. The findings suggest that structured peer transmission networks, combined with data-driven decision support, can transform individual admission anxiety into collective efficacy, offering a replicable pathway for student development support in applied universities.

Keywords

Learned Helplessness, Collective Efficacy, Peer Transmission, Action Research, Independent College, Postgraduate Admission

1. Introduction

In the context of China's rapid higher education massification [15] and the intensifying competition for postgraduate admission, students in independent colleges occupy a structurally disadvantaged position: their aspirations for upward mobility are strong,

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yet the institutional support available to them is markedly insufficient. The massification of Chinese higher education has been accompanied by persistent structural stratification, with independent college students facing particular challenges in graduate employment and social mobility [11]. This tension is particularly acute for engineering students, who simultaneously seek to escape the stigma of the independent college label through graduate school admission and are constrained by high failure rates in foundational courses such as advanced mathematics and college physics. Caught between the extensive academic capital of students at elite "Double First-Class" universities (a Chinese government initiative to develop world-class universities and disciplines) and the policy advantages available to vocational college students, independent college engineering students experience a dual exclusion: excluded from elite academic resources on one side, and from vocational policy support on the other. The collision between high expectations and weak academic foundations frequently manifests as chronic academic avoidance behavior.

Existing research on postgraduate admission in China has focused predominantly on elite universities, paying limited attention to the micro-level intervention mechanisms needed by the large population of independent college students. While some studies have addressed academic support for underperforming students, most remain at the level of macro policy commentary, lacking systematic empirical evidence from frontline practice. The limited literature on peer tutoring in higher education further tends to describe spontaneous mutual assistance rather than theorize how such practices can be deliberately structured into sustainable support systems. In practice, however, peer interaction constitutes the most frequent and trusted form of informal educational influence among engineering students. This makes the peer network a natural infrastructure for precision support—if its internal transmission mechanisms can be scientifically activated and organizationally sustained.

This study reports a three-year action research project conducted with 141 vehicle engineering students (2019 cohort) at Jingjiang College of Jiangsu University, an independent college in Jiangsu Province. The intervention was triggered by a baseline crisis: 79 course failures were recorded at the end of the students' first year, signaling the early onset of learned helplessness and academic disengagement. In response, the researchers designed and implemented a structured "Dual-Axis Transmission" peer mentoring mechanism integrated with a data-driven "School-Selection Database." Two research questions (RQs) guided the inquiry:

RQ1: What intervention mechanisms can effectively activate endogenous academic motivation among engineering students in resource-constrained independent colleges?

RQ2: How do peer transmission networks and information support systems jointly reshape students' postgraduate application decision-making from imitative conformity toward evidence-based choice?

Conventional peer tutoring in higher education typically operates through dyadic, one-to-one pairings, which, while effective for targeted remediation, often creates a linear and fragile support structure dependent on a single tutor-tutee relationship. In contrast, the present model reconceptualizes peer support as a distributed network embedded in students' residential and curricular ecologies. The dormitory context, as a site of sustained informal interaction, reduces the psychological cost of help-seeking and enables peer modeling to occur naturally outside formal instructional settings. By leveraging dormitory-based learning communities and course-aligned modular tutoring, the "Dual-Axis Transmission" model transforms isolated tutoring acts into a multi-node, resilient transmission web. This represents a shift from linear remediation to networked capacity-building—the central conceptual contribution of this study.

2. Theoretical Framework and Analytical Model

Students' academic development and career decision-making are not isolated individual behaviors but are embedded in specific social support networks and information environments. To analyze the transformation of independent college engineering students from academic underperformance to postgraduate admission success, this study adopts a chain governance perspective structured around three stages: academic foundation building, planning support, and safety-net provision. Three theoretical perspectives—social support theory, social cognitive theory, and academic retention theory—are integrated to construct the intervention logic combining the "Dual-Axis Transmission" peer mentoring model with the "School-Selection Database" information support system. These three theoretical anchors are functionally interdependent, collectively underpinning an "identification-provision-evaluation" framework for precision student support.

It is important to acknowledge that the 2019 cohort entered with slightly higher admission scores and a different provincial composition due to institutional adjustments in independent enrollment since 2018. However, the nearly identical first-year failure rates (79 vs 82) suggest that these demographic advantages did not spontaneously translate into better academic performance. The lessons learned from the 2017 cohort's struggles were, in fact, the primary impetus for developing the intervention. The model was designed precisely to activate the latent potential of these students, converting baseline willingness into sustained academic engagement.

Through an in-depth case analysis, this study aims to reveal the mechanisms underlying postgraduate application decision-making among independent college students and to provide empirical reference for student support practices in Chinese higher education.

2.1. Peer Support as a Mechanism for Academic Pressure Alleviation: Reconstructing the Social Support Network

Social support theory has established that instrumental support from peer groups functions as an important buffer against academic stress [3-5]. Engineering students in independent colleges must manage not only high-difficulty foundational courses such as College Physics and Engineering Mechanics, but also limited access to reliable academic and career information. Under these conditions, counselor-centered support alone cannot achieve scale. Vygotsky's [16] concept of the zone of proximal development suggests that learners can exceed their current ability boundaries when assisted by peers with slightly higher competence. Building on this logic, the present study constructed the "Dual-Axis Transmission" model: the top-ranked student serves as the "axis center" to set the academic benchmark, while course-specific high achievers serve as the "axis spokes" to deliver modular, targeted instructional support. This model translates abstract academic demands into concrete peer demonstration, consistent with the social support principle that instrumental assistance reduces help-seeking barriers (see Figure 1).

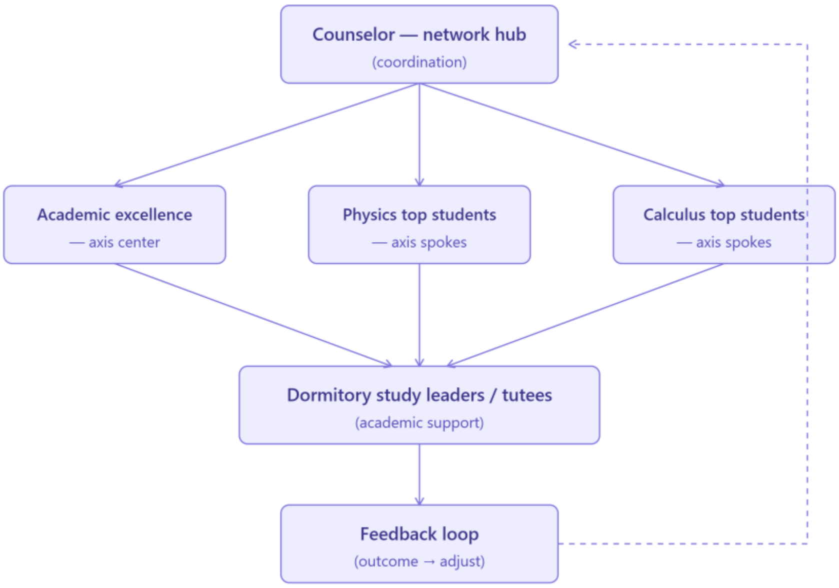

Figure 1. *Conceptual model of the "Dual-Axis Transmission" peer mentoring network. The counselor serves as the network hub, coordinating the axis center (top-ranked student) and axis spokes (course-specific high achievers). These roles jointly support dormitory-based tutoring teams, with a feedback loop informing ongoing coordination.*

Within this model, the counselor functions as the "network hub," coordinating need identification, resource matching, and relational management. The top-ranked student, as the axis center, establishes the value benchmark of the support network through academic exemplarity and behavioral modeling. Course-specific high achievers form the "radiating axis spokes," providing modularized support according to their respective subject strengths, thereby constructing a distributed support network. This model breaks through the linear limitation of traditional one-to-one tutoring by building a distributed, mesh-like transmission pathway embedded in students' dormitory and course ecologies, effectively reducing the psychological barriers faced by academically struggling students.

2.2. Information Support and Rationalization of Postgraduate Application Decisions: From Zero-Sum to Collective Intelligence

From an information economics perspective, the quality of postgraduate application decisions depends fundamentally on the completeness of information available to the applicant. Independent college students frequently lack familial cultural capital and reliable information channels, leading to what this study terms a zero-sum application pattern: a concentration of applications to the parent university (the public university with which the independent college is affiliated) that depresses admission rates and creates mutual crowding-out among peers. Marginson [10] has emphasized that student choice and voice are central concerns in contemporary global higher education, implying that institutional intervention must actively respond to individualized career development needs. Jaeger and Bertot's [7] work on technology infrastructure for educational decision-making provides further theoretical grounding for addressing information asymmetry through structured support systems.

On this basis, a structured "School-Selection Database" was developed over a six-month period. Data were collected through a systematic review of publicly available admission brochures, disaggregation of admission records from the preceding three years, and interviews with previous applicants. The resulting database includes institutional tier, geographical distribution, disciplinary rating, enrollment ratio, preliminary examination cutoff, and evidence of applicant-origin discrimination. Unlike static archival resources, this database is supported by a dynamic updating mechanism that underpins individualized, person-specific matching. The intervention thereby facilitates a shift in postgraduate application behavior from imitative conformity toward evidence-based rational choice.

2.3. Psychological Capital Reconstruction: From Learned Helplessness to Endogenous Activation

Bandura's [2] self-efficacy theory posits that an individual's expectation of success directly shapes subsequent behavioral choices, and that competence verified through practice constitutes the psychological foundation for resisting academic adversity. In engineering education, repeated failure in high-difficulty courses creates conditions conducive to learned helplessness [13], in which students progressively disengage from academic striving. The present study found that "micro-success experiences" generated through peer transmission can effectively interrupt this negative psychological pattern. The sense of academic self-control acquired in supported learning contexts can transfer across domains, influencing career planning and postgraduate aspirations. The cognitive shift from "I can't" to "I can"constitutes the core psychological mechanism through which postgraduate motivation becomes endogenously activated.

Tinto's [14] academic retention theory further posits that academic integration is a key condition for sustained engagement. When students successfully master foundational "gatekeeper" courses such as physics through peer-supported learning, their academic self-concept is reconstructed, simultaneously strengthening their institutional commitment and their motivation for further study.

2.4. Synthesis: A Three-Stage Chain Governance Framework

Integrating the three mechanisms discussed above—peer transmission, information intervention, and psychological capital reconstruction—this study proposes a "support-intervention-activation" pathway operationalized through a three-stage chain governance framework (see Figure 2):

Stage 1 (Academic Foundation, Year 2): Consolidate academic fundamentals, with priority given to core courses with historically high failure rates.

Stage 2 (Planning Support, Year 3): Deploy the School-Selection Database to implement precision matching, eliminating information blind spots in application decision-making.

Stage 3 (Safety Net, Year 4): Provide value clarification and fallback security, ensuring zero delayed graduation and high-quality employment outcomes.

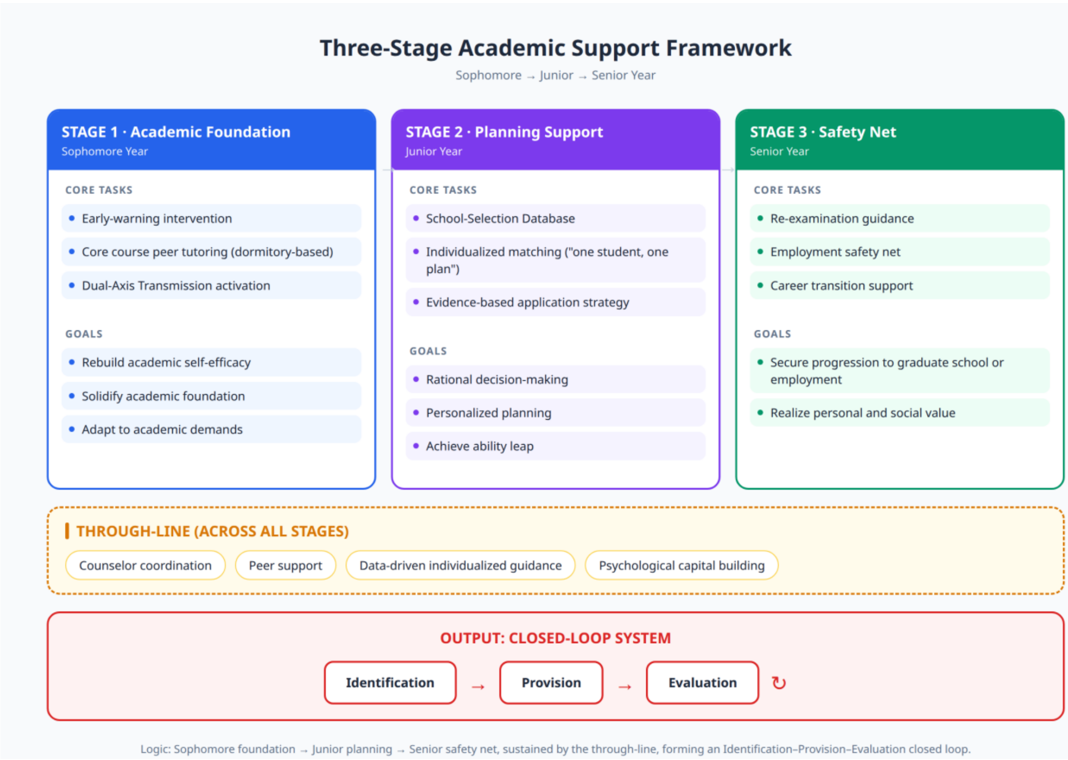

Figure 2. *Three-stage chain governance framework. Academic foundation (Year 2), planning support (Year 3), and safety-net provision (Year 4).*

The three stages are temporally sequential and functionally coupled, collectively forming a closed-loop system of need identification, resource supply, and outcome evaluation.

3. Research Design: Hybrid Approach and Action Intervention

Because the intervention addressed both individual-level psychological change (self-efficacy reconstruction) and group-level structural change (social support network reconfiguration), no single method could adequately capture the full intervention process. This study therefore adopted a mixed-methods design, combining a quasi-experimental comparison with action research to evaluate the "identification-provision-evaluation" framework in the context of an independent college. The design aimed to balance causal inference with rich process description.

3.1. Quasi-Experimental Design and Sample Selection

The intervention was triggered by a crisis observed at the point of cohort transition. When the first author assumed counseling responsibility for the 2019 cohort at the beginning of their sophomore year, the class exhibited an anomalous pattern of "high investment, low output": despite generally strong learning engagement and a palpable competitive atmosphere, first-year course failures had reached 79—concentrated in foundational courses such as Advanced Mathematics and College Physics. This discrepancy between effort and achievement signaled a failure of learning strategy rather than a lack of student potential. The first author who served as the counselor for the intervention cohort, occupied a practitioner-researcher role [1]. This insider position enabled both high-fidelity implementation of the intervention and sustained access to process-level observational data.

The counselor's initial response involved restructuring the class committee and replacing underperforming student cadres, establishing a governance structure centered on academic guidance. This measure initially generated confusion and some resistance among students, who perceived the changes as administratively imposed. However, as the peer-supported academic climate began to yield visible improvements, students' attitudes shifted from passive acceptance to active maintenance of the new learning culture. This transition—from resistance to co-ownership—was documented in early counseling records and is interpreted here as evidence of the cohort's high plasticity: the same competitive energy that had previously manifested as disorganized "involution" could be redirected into structured, collective academic progress when appropriate scaffolding was provided.

This contextual episode is significant for two reasons. First, it illustrates the problem identification phase of the action research cycle: the gap between effort and achievement was recognized as the core issue requiring intervention. Second, it demonstrates that the intervention did not begin with the "Dual-Axis Transmission" model fully formed; rather, the model emerged from an iterative process of diagnosing the cohort's specific dysfunction and adjusting support structures accordingly. The study followed the action research tradition [8], in which the researcher participates directly in the change process while systematically documenting its effects.

3.2. Operational Definition of Intervention Variables

To ensure that the intervention was observable, verifiable, and potentially replicable, the three core mechanisms were translated into specific, measurable indicators. Table 1 summarizes the operational definitions linking each theoretical construct to its practical implementation.

Table 1. *Operational Definitions of Intervention Variables.*

Stage	Mechanism	Implementation Strategy	Key Indicators
Academic Foundation (Year 2)	Dual-Axis Scaffolding (Peer Support)	Counselor as network hub; top-ranked student as axis center; course-specific high achievers as axis spokes; dormitory-based distributed tutoring network	1. Change in course failure counts 2. Student satisfaction
Planning & Guidance (Year 3)	"School-Selection Database" (information support)	Structured database of postgraduate programs suitable for vehicle engineering students	1. First-choice admission rate 2. Admission Adjustment Rate 3. High-quality employment rate
Safety Net (Year 4)	"Early Warning and Support" (safety-net provision)	Interview skills training, psychological resilience building, and employment fallback for unsuccessful applicants	1. Psychological resilience assessment 2. Interview pass rates 3. Employment rate

Detailed operational definitions of each mechanism:

1) *Peer transmission ("Dual-Axis Transmission")*. During the second semester of the sophomore year, the counselor selected the top-ranked student as the "axis center" and recruited course-specific high achievers as the "axis spokes". These students formed dormitory-based micro tutoring teams. The intervention included weekly fixed-time tutorials for high-difficulty courses, including Advanced Mathematics, Probability and Statistics, College Physics, Engineering Mechanics, Mechanical Principles and Design, Engineering Thermodynamics, and Numerical Analysis. In addition, one-to-one help pairs were established to provide targeted support for students requiring course retakes. Key indicators included changes in course failure counts and student satisfaction.
2) *Information support ("School-Selection Database")*. The counselor spent approximately six months systematically collecting information on all universities nationwide that admit independent college mechanical engineering applicants. The resulting database contained enrollment ratios, preliminary examination cutoffs, difficulty levels of specialized course examinations, and evidence of applicant-origin discrimination. The database was designed to be dynamically updated. Intervention activities included providing personalized university recommendations based on database queries, holding themed class meetings on "breaking the clustered application pattern", and training students in decision-making principles for identifying the optimal cost-performance match. Key indicators included first-choice admission rate, transfer admission rate, and high-quality employment rate.
3) *Operational definition of the security mechanism*. Safety-net provision ("Early Warning and Support"). During the senior year re-examination and admission adjustment phase, the counselor provided continuous tracking support, including interview skills coaching, psychological counseling, and timely dissemination of admission adjustment information. For students who did not pass the postgraduate entrance examination, employment alternatives were activated, including resume revision, interview preparation, and job recommendations. Key indicators included the comprehensive interview pass rate, employment completion rate, employment quality index, and dynamic assessment of students' psychological resilience.

3.3. Data Collection and Triangulation

This triangulation design [6] integrates quantitative archival data, qualitative process data, and cross-cohort tracking data. To enhance the reliability and validity of the findings, this study employed a triangulation design integrating three evidence streams (see Figure 3).

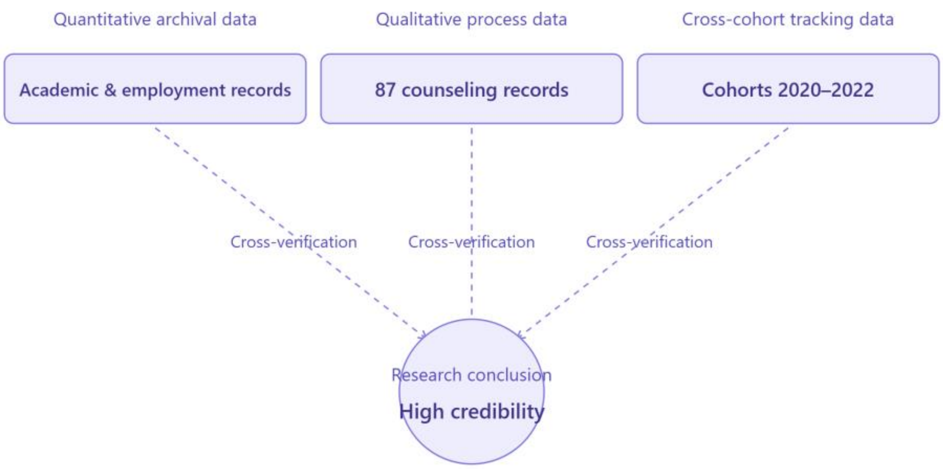

Figure 3. *Triangulation design: three evidence streams. Quantitative archival data, qualitative process data, and cross-cohort tracking data—converging through cross-verification to support research conclusions with high credibility.*

Stream 1: Quantitative archival data. Objective indicators—including course failure counts, postgraduate admission rates, and employment completion rates—were extracted from the university's academic affairs and career services databases.

Stream 2: Qualitative process data. Eighty-seven in-depth counseling records accumulated over the three-year intervention period were analyzed to trace students' psychological transitions and document the iterative adjustment of intervention strategies.

Stream 3: Cross-cohort tracking data. Admission outcomes for the 2020, 2021, and 2022 cohorts were tracked longitudinally to assess the model's robustness under varying student quality and external conditions.

The convergence of these three streams serves a dual function: it satisfies the process-oriented requirements of action research while mitigating the validity threats associated with reliance on any single data source [9].

3.4. Validity Considerations and Limitations

The first author's dual role as both practitioner and researcher facilitated access to privileged data while also introducing potential observer bias. Several safeguards were implemented: all student-identifying information was anonymized, participation in the intervention respected individual differences and voluntary engagement, and the study protocol received institutional approval. Interpretation of qualitative evidence was cross-checked against archival records to reduce reliance on the researcher's subjective impressions.

Two limitations should be acknowledged. First, some early-stage process documents were lost due to personnel changes and office equipment replacement; however, the core evidence base—academic records, employment dispatch data, and all 87 counseling transcripts—remained intact. Second, as with all non-equivalent group designs, between-cohort differences in macro-environmental conditions and campus cultural climate cannot be fully ruled out, despite the baseline comparability established on academic indicators. Future research could extend this line of inquiry through multi-institutional, multi-case longitudinal designs to examine the model's transferability across institutional contexts.

4. Results

4.1. Reduction in Course Failures

Figure 4 presents the comparison of course failure outcomes between the two cohorts. In the comparison group (2017 cohort), the total number of course failures in the sophomore year reached 88, with College Physics alone accounting for 64 failures—a pattern of systemic academic disengagement. In the intervention group (2019 cohort), despite a comparable baseline of 79 failures at the end of the first year, sophomore-year failures dropped to 36, a 59.1% reduction.

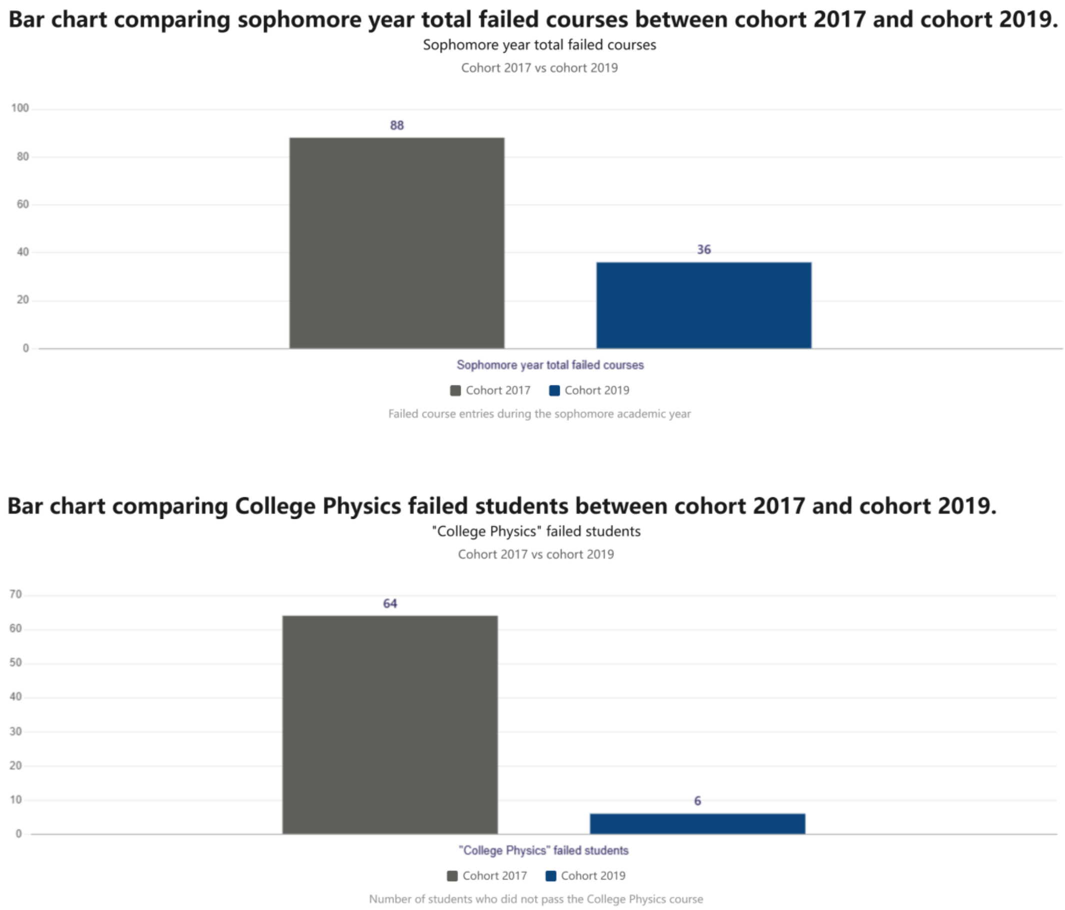

Figure 4. *Comparison of course failure outcomes. (top) Sophomore-year total failures; (bottom) College Physics failures.*

For College Physics, identified a priori as the highest-risk course, the number of failing students decreased from 64 (49.2%) to 6 (4.3%), a 90.6% reduction. A chi-square test confirmed that this difference was statistically significant, χ^2 (1, N = 271) = 71.42, *p* <.001, with a large effect size (Cramér's V =.513).

The overall course failure difference was also significant, χ^2 (1, N = 271) = 48.44, *p* <.001, Cramér's V =.423.

4.2. Rationalization of Postgraduate Application Decisions

Table 2. *Comparison of postgraduate application and admission outcomes by cohort.*

Indicator	2017 (Control)	2019 (Intervention)
Total students in cohort	130	141
Registered applicants	86	87
Applicants targeting parent university, *n* (%)	70 (81.4%)	10 (8.7%)
Admitted among parent-university applicants, *n* (%)	9 (12.9%)	5 (50.0%)
Above national line, *n*	18	60
National line pass rate (%)	20.90%	69.00%
Total admitted, *n*	15	45
First-choice admission, *n* (%)	10 (66.7%)	34 (75.6%)
Transfer admission, *n* (%)	5 (33.3%)	11 (24.4%)
Parent university admission, *n* (%)	9 (60.0%)	5 (11.1%)
Other regular university admission, *n* (%)	5 (33.3%)	33 (73.3%)
985/211 university admission, *n*	0	4
Overall admission rate (%)	11.50%	32.00%

Table Note: Overall admission rate = total admitted / total students in cohort. Parent-university admit rate = admitted among applicants targeting the parent university. The overall admission rate difference between cohorts was statistically significant, χ^2 (1, N = 271) = 16.29, *p* <.001, Cramér's V =.245.

Application behavior. In the comparison group, 86 students registered for the postgraduate entrance examination, of whom 70 (81.4%) applied to the parent university—a concentrated, path-dependent pattern that produced a zero-sum competition with an admission rate of only 12.9%. In the intervention group, the number of applicants to the parent university dropped to 10 (8.7%), representing a fundamental restructuring of application strategy.

Admission outcomes. The overall admission rate increased from 11.5% (15/130) to 32.0% (45/141), χ^2 (1, N = 271) = 16.29, *p* <.001, Cramér's V =.245. The intervention group also achieved the program's first admissions to Project 985/211 universities (China's national initiatives designating key universities; n = 4).

Decision quality. The first-choice admission rate in the intervention group reached 75.6%, compared with 66.7% in the comparison group. The transfer admission rate decreased from 33.3% to 24.4%, suggesting that more students were admitted to programs they had deliberately selected rather than being assigned through the adjustment process.

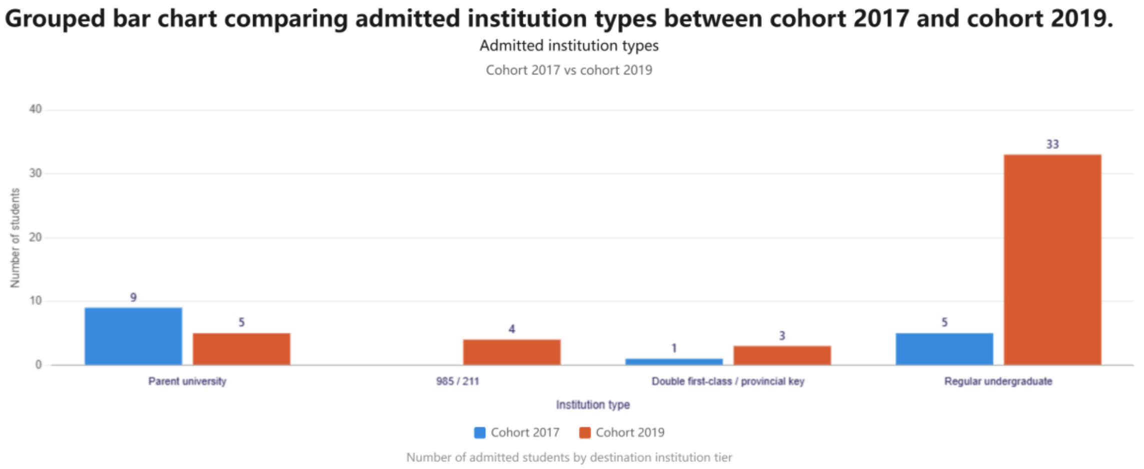

Figure 5. *Distribution of admitted institutions by cohort.*

Qualitative evidence from counseling interviews corroborated this shift. While comparison-group students frequently justified their choices with statements such as "Everyone else is applying there, so I applied too", intervention-group students increasingly articulated evidence-based reasoning, such as "For my score range, this school is the safest strategic choice". This pattern indicates that the "School-Selection Database" effectively reduced information asymmetry, enabling a transition from imitative conformity to evidence-based decision-making.

4.3. Cross-Cohort Robustness

To examine whether the intervention's effects were cohort-specific or potentially sustainable, we examined postgraduate admission rates for three subsequent cohorts (Table 3)

Table 3. *Cross-cohort postgraduate admission outcomes (2020-2022).*

Cohort	Total size	Applicants	National line pass rate	Admission rate
2017 (comparison)	130	86	20.90%	11.50%
2019 (intervention)	141	87	69.00%	32.00%
2020	129	80	37.50%	28.80%
2021	100	52	26.90%	23.10%
2022	147	55	61.80%	40.00%

Under the dual pressures of national examination reform and declining student quality at intake, admission rates for the 2020, 2021, and 2022 cohorts were 28.8%, 23.1%, and 40.0%, respectively. All remained substantially above the comparison cohort's 11.5% baseline. The 2021 cohort's decline to 23.1%—while still more than double the control baseline—reflects the compounded pressures of examination reform and further declines in incoming student quality. The 2022 cohort's rebound to 40.0%, exceeding the 2019 peak, suggests that the model functions as a resilient support system capable of maintaining a performance floor under deteriorating external conditions rather than producing cohort-specific gains only.

4.4. Final Academic and Employment Outcomes

Table 4 summarizes final academic and employment outcomes. The comparison cohort recorded one case of delayed graduation and a year-end employment completion rate of 84.2%. In the intervention cohort, delayed graduation was eliminated entirely (0 cases), and the employment completion rate reached 96.6%—a 12.4 percentage point improvement. The number of unemployed or awaiting-employment students decreased from 20 to 5, a 75% reduction.

Table 4. Final graduation and employment outcomes by cohort.

Indicator	2017 (Comparison)	2019 (Intervention)
Delayed graduation, *n*	1	0
Year-end employment completion rate (%)	84.20%	96.60%
Unemployed / awaiting employment, *n*	20	5

Table Note: Year-end employment completion rate = employed or admitted to postgraduate study by the end of the graduation year / total cohort size. The difference in employment completion rates represents a 12.4 percentage point improvement. The number of students unemployed or awaiting employment decreased by 75%.

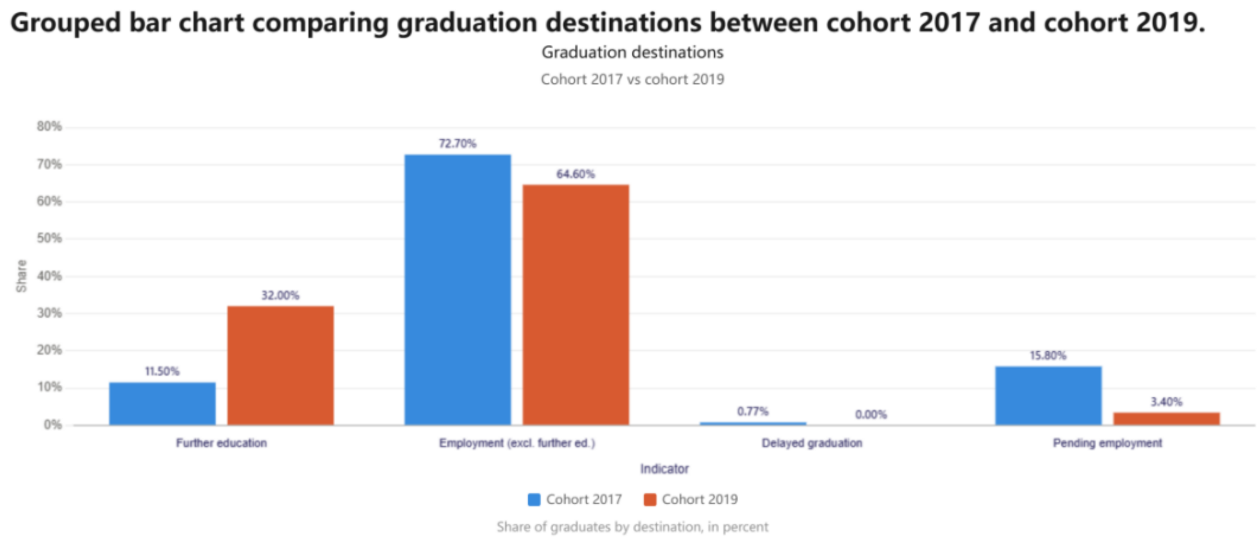

Figure 6. Employment completion rate comparison.

Critically, these employment gains were achieved simultaneously with the substantial increase in postgraduate admission, indicating that the intervention did not trade employment for further study. Rather, the chain-structured support model successfully created an "academic foundation → postgraduate preparation → quality employment" pathway, interrupting the "academic failure → employment difficulty" transmission chain that commonly affects independent college students.

4.5. Qualitative Evidence: Three Student Trajectories

4.5.1. From Chronic Failure to Goal Anchoring: The Case of Student H

Student H entered the program with a cumulative record of six failed courses across his first three years, including Advanced Mathematics, College Physics, and Engineering Mechanics. His counseling logs consistently reflected a resigned pattern of self-attribution: "I know I should try harder, but I just can't learn this stuff." This pattern is characteristic of learned helplessness—a generalized belief that effort does not change outcomes.

The turning point occurred during a graduate school information session in the second semester of his third year. Unlike most of his peers, Student H was observed paying unusual attention to the term "Double First-Class." A subsequent one-on-one conversation revealed an underlying aspiration that had long been suppressed by repeated academic failure. Rather than encouraging him toward an unrealistic target, the counselor used the "School-Selection Database" to anchor a goal that balanced symbolic value and attainable difficulty. Nanjing Forestry University was identified through three specific criteria: its newly established professional master's program in mechanical engineering (first-year enrollment, implying less saturated competition), a disciplinary evaluation rating of B-, and a preliminary examination cutoff approximately equal to the national baseline. This was a deliberate strategy of trading disciplinary prestige for institutional status—a Double First-Class university with a comparatively less competitive engineering program.

Following this goal anchoring, course-specific peer tutors ("axis spokes") provided modularized support in Mechanical Design, translating abstract formulas into step-by-step problem-solving routines. Student H's counseling logs showed a marked shift from avoidance to active engagement. He scored

327 on the preliminary examination, ranking 20th among 32 admitted candidates. He subsequently passed the interview and was formally admitted to Nanjing Forestry University.

His final counseling log recorded: “For the first time, I feel like I am no longer the child in my family who has achieved nothing”.

4.5.2. From Remedial Recipient to Professional Identity: The Case of Student N

Student N was among the first students identified through the “Dual-Axis Transmission” network’s early-warning system. He had failed three or more courses per semester across four consecutive semesters, with College Physics and Electrical and Electronic Technology requiring multiple retakes. His initial counseling session revealed a level of anxiety that was physically manifest: during his first peer tutoring session, his hands trembled as he sat at his dormitory desk. He told the counselor, “I’ve been bad at physics since middle school. At university, I don’t understand a word.”

The intervention’s first breakthrough came from a deliberate reframing strategy by the “axis spoke” tutor. Instead of beginning with formal equations, the tutor re-introduced Newton’s first law using the braking distance of a car—a context immediately familiar to automotive engineering students. Student N’s response marked a cognitive shift: “Physics isn’t a book of mystery. It actually makes sense.”

This reframing initiated a transformation from passive remediation to active professional identity formation. Rather than pursuing postgraduate study, Student N chose direct employment. The counselor activated the “safety-net” module, facilitating an internship in automotive calibration testing. His performance during the internship drew explicit praise from the enterprise supervisor, who noted that his proficiency in consulting technical manuals and executing calibration tasks independently exceeded expectations. He was subsequently hired as a calibration testing engineer at an automotive systems company, where he also serves as an assistant for campus recruitment.

Notably, Student N now mentors new employees within his company. The peer-support ethos of the “Dual-Axis” model has been internalized and extended beyond its original boundary—evidence of what the model terms distributed transmission beyond the campus context.

4.5.3. Strengths-Based Matching and the Role of Student Leadership: The Case of Student H2

Student H2 presented a profile distinct from the previous two cases: no record of course failure, above-average academic performance, and a strong record of student leadership. As class secretary, she had led her class to three consecutive “May Fourth Red Flag League Branch” (a national honor for outstanding student organizations) awards and was preparing for a provincial robotics competition. Yet her counseling log recorded a persistent ambiguity regarding postgraduate goals “I want to apply to a good university, but I don’t know what ‘good’ means for me.”

The intervention shifted from a remediation-oriented logic to a strengths-based matching logic. The “School-Selection Database” was queried with an additional criterion: the weight assigned to comprehensive quality interviews in the admission process. Northeast Forestry University was identified as the optimal match—a Ministry of Education-affiliated institution with a distinctive forestry machinery focus and, critically, a comprehensive quality interview accounting for 40% of the final admission score.

This matching created a structural opportunity for differentiated competition. Rather than competing against peers with stronger academic metrics in a purely exam-driven selection context, Student H2 competed in a domain where her accumulated non-academic capital—competition awards, leadership portfolio, and organizational service—was institutionally recognized and weighted. Her preparation was accordingly restructured: one-third of her time was allocated to compiling a “personal comprehensive quality dossier” rather than exclusively drilling examination questions.

The outcome confirmed the efficacy of this alignment. She entered the interview stage ranked third in the written examination, and her comprehensive interview performance was among the highest in the cohort, securing admission. Her case demonstrates that within the “Dual-Axis Transmission” framework, precision matching operates not as a strategy of lowering standards, but as a strategy of institutional fit optimization—locating the evaluation context in which a student’s existing strengths are most legible to decision-makers.

4.6. Summary of Findings

Taken together, the quantitative and qualitative results converge on a consistent finding: the “Dual-Axis Transmission” model, combined with the structured “School-Selection Database” produced significant improvements in both academic performance and postgraduate admission outcomes. The qualitative case studies suggest that these improvements were mediated by three mechanisms: goal anchoring, meaning reconstruction, and strengths-based matching.

5. Discussion

5.1. Summary of Key Findings

This three-year action research project examined the effects of a chain-structured intervention—integrating peer transmission, information support, and safety-net provision—on 141 engineering students at an independent college in China. The quantitative results demonstrated statistically significant improvements across all primary outcomes: sophomore-year course failures decreased by 59.1% (χ^2 = 48.44, *p* <.001), College Physics failures by 90.6% (χ^2 = 71.42, *p* <.001), and the postgraduate admission rate increased from 11.5% to

32.0% (χ^2 = 16.29, *p* <.001). The intervention cohort also achieved the program's first admissions to Project 985/211 universities and eliminated delayed graduation entirely. Cross-cohort data from 2020 to 2022 further indicated that the model's effects were not cohort-specific but maintained a protective floor under deteriorating input conditions.

5.2. Peer Transmission as the Key Mechanism for Breaking Academic Barriers

The most substantial intervention effect was observed in College Physics, where the failure rate dropped from 49.2% to 4.3%. This outcome is consistent with the buffering hypothesis in social support theory [4], which posits that instrumental peer support mitigates the negative impact of academic stressors. However, the present findings extend this framework in an important direction. Existing peer tutoring research has typically conceptualized support as a dyadic relationship—one tutor paired with one tutee. The "Dual-Axis Transmission" model demonstrates that peer support can function as a distributed network, in which the counselor (network hub), the top-ranked student (axis center), and course-specific high achievers provided scaffolding [17] that enabled struggling students to master concepts they had previously found impenetrable. This networked architecture helps explain why the intervention produced system-level effects—such as the transformation of class academic climate—rather than merely individual-level improvements.

The psychological mechanism underlying this transformation involves what we term micro-success experiences. When students who had repeatedly failed physics achieved mastery through peer-facilitated scaffolding within their zone of proximal development [16], their collective belief shifted from the perception that academic outcomes were uncontrollable to the conviction that they could be deliberately influenced. This cognitive shift constitutes the core of learned helplessness reversal [13] and provided the psychological foundation for subsequent intervention stages. In this sense, the "Dual-Axis" network functioned not merely as a knowledge delivery system but as a psychological capital generation mechanism.

5.3. Information Support and the Resolution of Collective Action Dilemmas

The comparison cohort's application pattern—81.4% of applicants targeting the parent university, with an admission rate of only 12.9%—represents a textbook example of a collective action problem: individually rational choices aggregating into collectively irrational outcomes. This phenomenon parallels Olson's [12] classic analysis in The Logic of Collective Action, in which the absence of coordination mechanisms leads rational individuals to produce suboptimal collective results.

The intervention's success in reducing parent-university applications to 8.7% while simultaneously raising the admission rate to 50.0% demonstrates that information transparency, rather than administrative coercion, can resolve such coordination failures. The "School-Selection Database" functioned as a coordination device by making the costs of concentrated application visible to all participants. Once students could see—through structured data rather than anecdotal experience—that their individual choices were mutually constraining, they were able to recognize that decentralized application was simultaneously individually and collectively advantageous.

This finding aligns with Marginson's [10] argument that student choice in global higher education must be supported by institutional mechanisms responsive to individualized career development needs. It also extends Jaeger and Bertot's [7] work on technology infrastructure for educational decision-making into the specific context of postgraduate application behavior. The key insight is that information infrastructure, when combined with value guidance, can transform individual admission anxiety into collective strategic capacity.

5.4. Resilience and Boundary Conditions of the Chain Guidance Model

The cross-cohort data (2020-2022) provide evidence that the model's effects are not limited to the original intervention cohort. Despite the compounded pressures of national examination reform and declining student quality at intake, admission rates remained substantially above the comparison baseline across all three subsequent cohorts. The 2022 cohort's rebound to 40.0%—exceeding the 2019 peak—suggests that the model operates as a resilient support system rather than a one-off intervention effect.

This resilience can be attributed to two features of the model's design. First, the early warning mechanism enables risk identification before academic failure becomes chronic, allowing for targeted course remediation and employment-oriented support to be activated proactively. Second, the institutionalized nature of the support structures—the database, the peer network, and the counseling protocols—means that the model does not depend on the continued presence of any single individual. This institutionalization is critical for sustainability in resource-constrained institutions where staff turnover is common.

However, the model's upper boundary is clearly constrained by student input quality and macro-policy changes. The 2021 cohort's decline to 23.1%—still more than double the comparison baseline—indicates that the model can maintain a floor but cannot fully neutralize the effects of external shocks. Future development of the model should focus on refining "precision profiling" techniques to better identify individual student needs and optimize resource allocation.

5.5. Contributions to the Literature

This study makes three contributions to the existing literature on peer support and student development in higher education. First, it provides one of the first systematic empirical evaluations of a structured peer-support intervention specifically designed for independent college engineering students—a population that has been largely neglected in previous research, which has focused predominantly on elite institutions. Second, it extends social support theory by demonstrating that peer support can be operationalized as a distributed network rather than a dyadic relationship, with distinct structural roles generating system-level effects. Third, it integrates information economics and collective action theory into the study of postgraduate application behavior, showing that structured information infrastructure can resolve coordination failures that individual counseling alone cannot address.

5.6. Implications for Practice

The findings carry three practical implications. First, intervention should be anchored in the identification of high-risk courses and implemented during the critical sophomore-year window, before academic failure becomes chronic. The College Physics result—from 64 failures to 6—demonstrates that targeted peer scaffolding in a single high-risk course can generate cascading effects across the entire academic climate.

Second, the“axis center”and“axis spokes”should not be treated as volunteers but as core components of the institutional support system. Their role in generating psychological capital—through peer modeling and micro-success experiences—is irreplaceable by counselor-centered approaches. Institutions should consider formal recognition and incentive structures that acknowledge the“radiation effect”of these student leaders, not merely their individual academic performance.

Third, the“School-Selection Database”demonstrates that information infrastructure is a legitimate and necessary component of student affairs work. The shift from“mobilization-style”guidance to data-driven individualized matching represents a fundamental transition in how institutions support student decision-making. This transition requires not only technological investment but also a conceptual shift from managing students in the aggregate to supporting them as individuals with distinct needs and strengths.

6. Conclusion

This study examined the effects of a three-year, chain-structured intervention designed to support engineering students at an independent college in China. The intervention integrated peer-mediated academic support (“Dual-Axis Transmission”), data-driven postgraduate application guidance (“School-Selection Database”), and systematic safety-net provision. Results from a quasi-experimental comparison between two cohorts (2017 and 2019) showed that the intervention was associated with a 59.1% reduction in sophomore-year course failures, a 90.6% reduction in College Physics failures, and an increase in the postgraduate admission rate from 11.5% to 32.0%. Cross-cohort tracking data from 2020 to 2022 further indicated that the model maintained a protective floor effect under deteriorating student input conditions.

The study makes two principal contributions. Theoretically, it demonstrates that peer support in higher education can be operationalized as a distributed network—comprising an axis center, axis spokes, and a network hub—rather than as a dyadic tutoring relationship. This networked architecture explains how peer-mediated support can generate system-level changes in class academic climate, not merely individual-level improvements. The study also shows that information transparency, operationalized through a structured school-selection database, can resolve collective action dilemmas in postgraduate application behavior—shifting the pattern from zero-sum competition toward coordinated, evidence-based choice.

Practically, the findings suggest that student development support in resource-constrained institutions should prioritize early intervention in high-risk foundational courses, the institutionalization of peer support structures, and the provision of information infrastructure for postgraduate decision-making. These three components, when integrated into a coherent chain, can interrupt the “academic failure → employment difficulty” transmission pathway that disproportionately affects independent college students.

The study has clear limitations. The quasi-experimental design, while strengthened by baseline comparability, cannot fully rule out between-cohort differences in unobserved variables. The single-institution, single-major sample limits generalizability. Future research should test the model’s transferability across institutional contexts and disciplinary fields, and should incorporate value-added assessment approaches to evaluate intervention effects relative to students’ initial capacity rather than absolute outcome thresholds.

Ultimately, the core value of the chain-guidance model lies not in reproducing the peak outcomes of any single cohort, but in its capacity to help each cohort achieve the best possible outcomes under its own baseline conditions. This process-oriented, evidence-based approach to student support represents a meaningful alternative to the reactive, mobilization-style management that has historically characterized student affairs work in independent colleges.

Several limitations of this study warrant acknowledgment. First, the intervention was implemented within a single academic program (Vehicle Engineering) at a single institution. While this design enabled deep contextualization and process fidelity, the generalizability of the model to other disciplinary fields—particularly humanities and social sciences—remains to be tested. Second, the study relied primarily on administrative data and counseling records. Future research could incorporate systematic in-depth interviews and longitudinal follow-up to further examine the micro-level psychological mechanisms underlying students’ transitions from learned helplessness to proactive engagement. Third, the specific strategies of the chain-guidance model require iterative adaptation in response to changing postgraduate admission policies and student demographic shifts. The model's effectiveness is contingent on its capacity to evolve with external conditions rather than remain static.

Future research should expand the sample across multiple institutions and disciplinary contexts, conduct multi-case comparative studies, and extend longitudinal tracking of graduates' career trajectories. Such work would enable a more comprehensive evaluation of the model's long-term effects beyond the immediate academic and admission outcomes examined here. Additionally, future studies should consider integrating value-added assessment frameworks to evaluate intervention effects relative to students' initial capacity, rather than relying solely on absolute outcome measures.

Abbreviations

χ^2	Chi-square Test Statistic
p	Probability Value
V	Cramér's V (Effect Size Measure)
RQ1/RQ2	Research Questions (RQs)
985/211	Project 985 and Project 211 Universities (China's National Initiatives Designating Key Universities)
N	Total Sample Size
n	Subsample Size

Author Contributions

Xiaohua Xu: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Conflicts of Interest

The author declares no conflicts of interest.

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Biography

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