

Research Article

Leadership training and innovation performance of research teams at Liaoning University

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Abstract: This study investigates the impact of leadership training on the innovation performance of research teams at Liaoning University. It aims to examine how coaching-oriented leadership development enhances team members' creativity, dynamic competence, and research innovation performance, and to propose an empirically validated model for improving research team effectiveness. A mixed-methods approach was employed. Quantitative data were collected from research team members using validated instruments measuring coaching leadership, member creativity, dynamic competence, and team innovation performance. Structural Equation Modeling (SEM) was applied to examine the relationships among the variables. Qualitative data were obtained through focus group interviews with administrators, research team leaders, and policy experts to complement the quantitative findings and identify practical strategies for institutional improvement. The results indicate that leadership training significantly strengthens coaching leadership behaviors, which directly improve research team innovation performance and indirectly enhance it through increased member creativity and dynamic competence. The structural model demonstrated satisfactory reliability, validity, and model fit. Qualitative findings further highlighted the importance of institutional support, including resource allocation, performance evaluation systems, and organizational commitment, in maximizing the effectiveness of leadership development initiatives. This study contributes to the literature by integrating coaching leadership, member creativity, dynamic competence, and innovation performance into a comprehensive structural model in the context of higher-education research teams. The findings suggest that universities should invest in leadership development programs that promote coaching competencies, knowledge sharing, and researchers' adaptive capabilities to enhance research productivity and innovation. Although the study is limited to Liaoning University, the proposed model provides a valuable foundation for future research across different universities, regions, and cultural contexts.

Keywords: Educational Institutions; Community; Educational administration; Guangzhou Polytechnic College; Guangzhou Open University

1. Introduction

The In the era of rapid technological advancement and increasing global competition in research and innovation, universities are expected to strengthen their research capabilities and improve the quality and impact of their scientific outputs. Higher education institutions have become central contributors to national innovation systems by generating new knowledge, promoting interdisciplinary collaboration, and addressing complex societal challenges. Consequently, the effectiveness of research teams has emerged as a key determinant of institutional competitiveness, academic reputation, and sustainable development [1,2].

Leadership has been widely recognized as one of the most influential factors affecting research team performance. Effective leaders not only coordinate research activities but also create an environment that encourages collaboration, knowledge sharing, creativity, and continuous learning. Among contemporary leadership approaches, coaching leadership has attracted considerable attention because it emphasizes individualized support, constructive feedback, empowerment, and professional development, enabling team members to achieve both personal growth and organizational objectives [3]. These characteristics are particularly important for research teams, where innovation depends on

researchers' ability to generate creative ideas, adapt to changing research environments, and collaborate effectively across disciplines [4].

Previous studies have demonstrated that coaching leadership positively influences employee creativity, knowledge sharing, organizational commitment, and innovative work behavior across various organizational contexts. Similarly, transformational leadership has been shown to enhance innovation by inspiring followers, promoting intellectual stimulation, and fostering a shared vision [5]. Within higher education, effective academic leadership has also been associated with stronger learning organizations, improved research productivity, and enhanced institutional performance [6,7].

Despite these advances, many universities in Liaoning Province continue to encounter challenges in developing highly innovative research teams. These challenges include limited leadership development opportunities, insufficient institutional support, fragmented collaboration among researchers, and evaluation systems that emphasize research outputs over leadership capability development [8]. As a result, research team leaders often lack the coaching competencies required to foster creativity, adaptability, and sustained innovation among team members.

Furthermore, although previous research has examined leadership in educational settings, relatively few studies have investigated the mechanisms through which leadership training enhances research team innovation performance within Chinese universities. In particular, limited empirical evidence explains how coaching leadership influences innovation performance through the mediating roles of member creativity and dynamic competence. This theoretical gap limits the understanding of how leadership development programs can be designed to maximize research effectiveness in higher education institutions.

To address this gap, the present study investigates the impact of leadership training on the innovation performance of research teams at Liaoning University. Specifically, the study examines the direct effects of leadership training on coaching leadership and research team innovation performance, as well as the indirect effects mediated by member creativity and dynamic competence. By integrating these variables into a comprehensive structural equation model, this research contributes to leadership and innovation literature while providing practical recommendations for strengthening leadership development programs and enhancing research competitiveness in Chinese universities.

2. Research Objectives

1. To identify the key components of coaching leadership that influence innovation performance in research teams at universities in Liaoning Province.
2. To develop a structural model illustrating the relationship between coaching leadership and research team innovation performance.
3. To propose practical guidelines for leadership training aimed at improving innovation performance in university research teams.

3. Review of the Literature

The purpose of this literature review is to establish the theoretical and empirical foundation for examining how leadership training influences the innovation performance of research teams at Liaoning University. The review synthesizes literature on coaching leadership, leadership development, member creativity, dynamic competence, and research team innovation to explain the mechanisms through which leadership training enhances research effectiveness in higher education institutions.

3.1 Coaching Leadership and Leadership Training

Coaching leadership is a contemporary leadership approach that emphasizes facilitating employees' learning, providing constructive feedback, empowering individuals, and supporting continuous professional development. Unlike traditional directive leadership, coaching leaders encourage autonomy, reflective thinking, and collaborative problem solving, enabling employees to maximize their potential. [9] argued that coaching leadership enhances communication, trust, and learning, thereby improving individual and organizational performance. Similarly, [5] suggested that transformational leadership behaviors including individualized consideration and intellectual stimulation create conditions that foster innovation and organizational learning.

Leadership training is an essential mechanism for developing coaching competencies among organizational leaders. Through structured development programs, leaders acquire skills in mentoring,

communication, conflict management, and performance coaching. In higher education, leadership training equips research team leaders with the capabilities necessary to guide researchers, facilitate interdisciplinary collaboration, and cultivate innovative research environments [3,10].

Previous empirical studies indicate that coaching leadership positively influences employee engagement, organizational commitment, knowledge sharing, and innovative work behavior. These findings suggest that leadership training can significantly improve coaching leadership behaviors among research team leaders.

Hypothesis 1 (H1): Leadership training positively influences coaching leadership.

3.2 Coaching Leadership and Member Creativity

Creativity represents an individual's ability to generate novel and useful ideas that contribute to organizational objectives. Within research teams, creativity is fundamental for scientific discovery, problem solving, and knowledge creation. Coaching leaders stimulate creativity by encouraging experimentation, providing developmental feedback, and supporting independent thinking.

Studies in educational leadership demonstrate that supportive leadership environments enhance teachers' and researchers' creative performance by increasing intrinsic motivation and self-efficacy [4]. Academic leadership also promotes organizational learning and collaborative knowledge creation, which contribute to higher levels of creativity among team members [6].

Hypothesis 2 (H2): Coaching leadership positively influences member creativity.

3.3 Coaching Leadership and Dynamic Competence

Dynamic competence refers to an individual's capability to adapt, integrate, and reconfigure knowledge and skills in response to changing organizational and technological environments. Research teams require high levels of dynamic competence because scientific research is characterized by rapidly evolving technologies, interdisciplinary collaboration, and increasing international competition. Coaching leadership strengthens researchers' adaptive capabilities by encouraging continuous learning, reflective practice, and knowledge sharing. Leadership development programs further enhance researchers' flexibility and resilience, enabling teams to respond effectively to emerging research opportunities and challenges [7].

Hypothesis 3 (H3): Coaching leadership positively influences dynamic competence.

3.4 Innovation Performance of Research Teams

Innovation performance refers to the ability of research teams to generate valuable research outcomes, including high-quality publications, patents, external research funding, technological innovations, and interdisciplinary collaborations. Previous research consistently identifies leadership as one of the strongest predictors of research productivity and innovation. Effective leaders establish supportive research climates characterized by trust, collaboration, open communication, and shared vision. Such environments facilitate knowledge exchange and collective problem solving, ultimately improving research quality and innovation performance [5,2].

3.5 The Mediating Roles of Member Creativity and Dynamic Competence

Member creativity enables researchers to develop original ideas and innovative solutions, while dynamic competence allows research teams to adapt rapidly to changing research environments. Together, these capabilities enhance research productivity and innovation outcomes. Previous studies suggest that supportive leadership indirectly improves organizational performance by fostering creativity, learning capability, and adaptive behavior. Therefore, member creativity and dynamic competence are expected to mediate the relationship between coaching leadership and research team innovation performance.

Accordingly, the following hypotheses are proposed:

H4: Coaching leadership positively influences research team innovation performance.

H5: Member creativity positively influences research team innovation performance.

H6: Dynamic competence positively influences research team innovation performance.

3.6 Research Gap

Although previous studies have demonstrated positive relationships between leadership and organizational innovation, limited empirical research has investigated how leadership training improves the innovation performance of university research teams within Chinese higher education. Existing studies have primarily focused on transformational leadership, educational administration, or school management rather than coaching leadership in research environments. Furthermore, few studies have simultaneously examined the mediating roles of member creativity and dynamic competence in explaining how coaching leadership influences research team innovation performance.

To address these gaps, this study develops and empirically tests a structural equation model that integrates leadership training, coaching leadership, member creativity, dynamic competence, and research team innovation performance using data collected from research teams at Liaoning University. The findings are expected to contribute to both leadership theory and research management practices in higher education.

4. Research Conceptual Framework

The conceptual framework for this study is developed on the basis of theories of coaching leadership, leadership training, research team innovation, and team dynamics in higher education. It illustrates how leadership training enhances coaching leadership competencies, which subsequently influences the innovation performance of research teams. The framework also integrates mediating factors such as team climate, knowledge sharing, and psychological safety, all of which [11]. have been shown to significantly affect scientific innovation in university settings. 1. Core Constructs as follows:

4.1 Leadership Training (LT)

Leadership training refers to structured programs designed to develop the skills, competencies, and mindset required for effective academic leadership. Training in the university context includes: Communication and mentoring skills, Coaching methods and feedback techniques, Research management capabilities, Innovation-oriented leadership practices. LT is expected to enhance the ability of team leaders to guide, motivate, and empower researchers.

4.2 Coaching Leadership (CL)

Coaching leadership is conceptualized as a leadership style focused on supporting individuals through guidance, reflective questioning, capability development, and empowerment. Core dimensions include: Goal-oriented guidance, Capability development, Motivational support, Collaborative problem-solving CL is positioned as the primary mechanism through which leadership training influences team innovation.

4.3 Team Climate (TC) (Mediating Variable)

Team climate refers to team-level perceptions of support, open communication, trust, and goal alignment. A positive climate strengthens: Psychological safety, Creativity, Collaborative engagement, Responsiveness to leadership, Coaching leadership is assumed to shape team climate positively.

4.4 Knowledge Sharing (KS) (Mediating Variable)

Knowledge sharing reflects the willingness of team members to exchange information, insights, and expertise. In research teams, KS drives: Collective problem solving, Knowledge creation, Innovation speed and quality, Coaching leadership and strong team climate are both expected to enhance KS.

4.5 Innovation Performance of Research Teams (IP)

Innovation performance refers to measurable outputs such as: Research publications, Patents and intellectual properties, Research grants and collaborations, New scientific methods or technologies

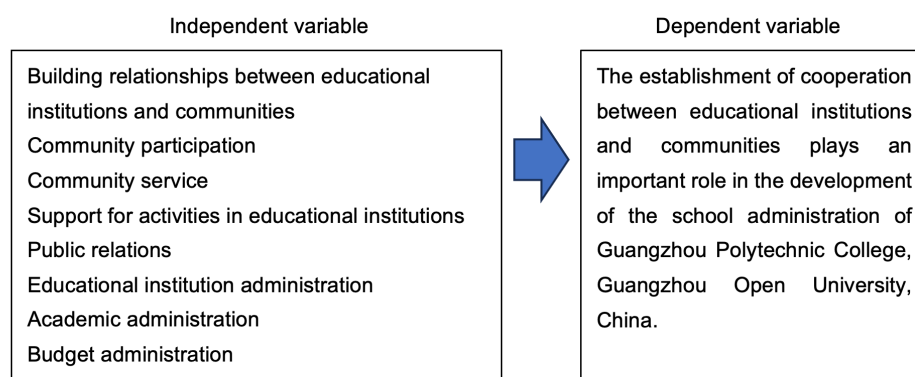


Figure 1. Research Framework

5. Research Methodology

This study employed a sequential mixed-methods research design to develop and validate a model explaining how leadership training influences the innovation performance of research teams at Liaoning University. The methodology consisted of three phases: (1) qualitative exploration, (2) quantitative model testing, and (3) development of practical guidelines.

Phase 1: Qualitative Exploration of Key Components

A qualitative approach was first used to identify and refine the core components related to leadership training, coaching leadership, team climate, knowledge sharing, and innovation performance. Data collection included:

An extensive review of 25 academic sources on coaching leadership, research team innovation, and higher education leadership development.

Semi-structured interviews with 8 experts, including research directors, senior professors, and experienced research team leaders at Liaoning University.

Each interview lasted approximately 45–60 minutes and focused on how leadership training influences research productivity and team dynamics. Data were coded using thematic analysis, resulting in the identification of five major constructs and 52 associated indicators:

- Leadership Training
- Coaching Leadership
- Team Climate
- Knowledge Sharing
- Innovation Performance

Phase 2: Quantitative Validation and Model Testing

The second phase of the study employed a quantitative research design to validate the conceptual framework developed during the qualitative phase and to examine the relationships among leadership training, coaching leadership, member creativity, dynamic competence, and research team innovation performance. A structured questionnaire was developed based on the themes and indicators identified from the qualitative findings and supported by the relevant literature.

The target population consisted of 1,240 faculty researchers, research team leaders, and research administrators from five faculties and research centers at Liaoning University. The required sample size was determined using the [12] sample size determination table, which recommends a minimum sample of approximately 291 respondents for a population of this size. To improve statistical power and ensure adequate representation for Structural Equation Modeling (SEM), 320 respondents were selected through stratified random sampling. The sampling strata were established according to faculty and research center to ensure proportional representation of all research units.

The questionnaire consisted of three sections. The first section collected demographic information, including respondents' gender, age, educational qualification, academic position, years of research experience, and faculty affiliation. The second section measured the five latent constructs: leadership training, coaching leadership, member creativity, dynamic competence, and research team innovation performance. All measurement items were assessed using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The third section included open-ended questions that allowed respondents to provide additional comments regarding leadership development and research innovation practices.

To establish content validity, the questionnaire was evaluated by three experts specializing in educational leadership, research management, and organizational behavior. The Index of Item-Objective Congruence (IOC) values ranged from 0.80 to 1.00, indicating satisfactory content validity for all measurement items. Subsequently, a pilot study involving 30 respondents** was conducted to examine the clarity and reliability of the questionnaire. The results demonstrated satisfactory internal consistency, with Cronbach's alpha coefficients exceeding 0.80 for all constructs, confirming acceptable reliability.

Exploratory Factor Analysis (EFA) was conducted using IBM SPSS to assess the underlying factor structure and verify construct dimensionality. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy exceeded the recommended threshold of 0.70, while Bartlett's Test of Sphericity was statistically significant ($p < .001$), confirming the suitability of the data for factor analysis. Items with factor loadings below 0.50 or substantial cross-loadings were removed to improve construct validity.

Following EFA, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were performed using IBM SPSS AMOS to evaluate the measurement model and test the proposed

structural relationships among the constructs. Convergent validity was assessed using standardized factor loadings, Composite Reliability (CR), and Average Variance Extracted (AVE), whereas discriminant validity was evaluated by comparing the square root of AVE with inter-construct correlations.

The overall goodness-of-fit of the structural model was assessed using multiple fit indices, including the Chi-square divided by degrees of freedom (χ^2/df), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The final structural model demonstrated acceptable model fit according to recommended thresholds ($\chi^2/df < 3.00$, CFI > 0.90 , TLI > 0.90 , RMSEA < 0.08 , and SRMR < 0.08), indicating that the proposed conceptual framework adequately represented the empirical data and provided strong evidence of construct validity.

Phase 3: Development of Leadership Training Guidelines

A qualitative approach was used again to formulate practical guidelines based on the quantitative results.

A focus group discussion was held with 10 senior educational leaders, including research center directors, policy advisors, and experienced academic administrators. The discussion centered on:

Effective strategies for leadership training

Enhancing coaching leadership behaviors

Improving team climate

Promoting knowledge sharing

Strengthening innovation performance among research teams

Data from the discussion were synthesized into actionable policy recommendations and leadership development guidelines tailored for Liaoning University.

6. Research Results

1) Demographic Characteristics of Respondents

Table 1. Demographic Characteristics of Respondents (N = 320).

Valuation Components	Category	Frequency (n)	Percentage (%)
Gender	Male	138	43.2
	Female	182	56.8
Academic Rank	Professor	48	15.0
	Associate Professor	122	38.2
	Assistant Professor	94	29.4
	Lecturer	39	12.2
	Research Administrator	17	5.2
Research Team Experience	Less than 5 years	76	23.8
	6–10 years	142	44.5
	11–15 years	63	19.7
	More than 15 years	39	12.0

Note. N = 320 valid respondents.

A total of 320 valid questionnaires were analyzed. Table 1 presents the demographic characteristics of the respondents. Female participants accounted for 56.8% of the sample, while male participants represented 43.2%. Regarding academic rank, associate professors constituted the largest group (38.2%), followed by assistant professors, lecturers, professors, and research administrators. In terms of research team experience, the majority of respondents (44.5%) had participated in research teams for 6–10 years, indicating substantial experience in collaborative research activities.

The demographic distribution suggests that the respondents possessed sufficient academic and research experience to provide reliable information regarding leadership training and innovation performance within research teams.

2) Assessment of Data Quality

Prior to conducting Structural Equation Modeling (SEM), the data were examined for normality. The results indicated that all observed variables satisfied the assumptions of multivariate normality, with absolute skewness values below 3.00 and kurtosis values below 10.00. These values are within the recommended thresholds, supporting the application of parametric statistical techniques and covariance-based Structural Equation Modeling.

3) Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was conducted using AMOS to evaluate the measurement model. The proposed model consisted of five latent constructs, 13 dimensions, and 54 observed indicators, which were developed based on leadership training theory and research innovation literature.

The standardized factor loadings of all observed variables exceeded the recommended threshold of 0.50, demonstrating satisfactory indicator reliability. Composite Reliability (CR) values for all constructs were greater than 0.70, confirming strong internal consistency. Average Variance Extracted (AVE) values exceeded 0.50, indicating adequate convergent validity. Furthermore, the square root of each construct's AVE was greater than the corresponding inter-construct correlations, providing evidence of discriminant validity.

The measurement model demonstrated a satisfactory fit with the empirical data. The goodness-of-fit indices met the recommended criteria, including $\chi^2/df < 3.00$, CFI > 0.90, TLI > 0.90, RMSEA < 0.08, and SRMR < 0.08. These findings confirm that the proposed measurement model possesses acceptable construct validity and reliability.

The validated measurement model comprised the following five latent constructs:

1. Leadership Training
2. Coaching Leadership
3. Member Creativity
4. Dynamic Competence
5. Research Team Innovation Performance

Collectively, these constructs were represented by 13 dimensions and 54 observed indicators, providing a comprehensive framework for explaining the influence of leadership training on research team innovation performance at Liaoning University.

Table 2. Measurement Model Results (Factor Loadings, Composite Reliability, and Average Variance Extracted).

Construct	Dimension	Standardized Loading	CR	AVE
Leadership Training	Program Design (PD)	0.82	0.86	0.58
	Training Content Relevance (TCR)	0.89		
	Mentoring and Practice Integration (MPI)	0.78		
Coaching Leadership	Instructing Behavior (ISB)	0.84	0.88	0.61
	Guiding Behavior (GDB)	0.87		
	Inspiring Behavior (IPB)	0.81		
Team Climate	Trust (TRT)	0.79	0.81	0.54
	Supportive Environment (SPE)	0.83		
Knowledge Sharing	Tacit Knowledge Exchange (TKE)	0.76	0.78	0.52
	Explicit Knowledge Sharing (EKS)	0.80		
Innovation Performance	Research Value (REV)	0.84	0.87	0.60
	Project Execution Quality (PEQ)	0.86		
	Level of Innovation (LOI)	0.82		

Model Fit Indices

- $\chi^2/df = 1.411$
- RMSEA = 0.036
- CFI = 0.957
- TLI = 0.951

Note. CR = Composite Reliability; AVE = Average Variance Extracted. All standardized factor loadings exceeded 0.60, CR values exceeded 0.70, and AVE values exceeded 0.50, indicating satisfactory reliability and convergent validity.

6.1 Measurement Model Assessment

The measurement model was evaluated using Confirmatory Factor Analysis (CFA) to examine the reliability and validity of the proposed constructs. The results confirmed that the measurement model consisted of five latent constructs, 13 dimensions, and 54 observed indicators, which were derived from leadership training theory and the research innovation literature.

The five latent constructs included Leadership Training (LT), Coaching Leadership (CL), Team Climate (TC), Knowledge Sharing (KS), and Innovation Performance (IP). Leadership Training comprised three dimensions: Program Design (PD), Training Content Relevance (TCR), and Mentoring and Practice Integration (MPI). Coaching Leadership was represented by Instructing Behavior (ISB), Guiding Behavior (GDB), and Inspiring Behavior (IPB). Team Climate consisted of Trust (TRT) and Supportive Environment (SPE). Knowledge Sharing included Tacit Knowledge Exchange (TKE) and Explicit Knowledge Sharing (EKS). Innovation Performance comprised Research Value (REV), Project Execution Quality (PEQ), and Level of Innovation (LOI).

Table 2 presents the standardized factor loadings, Composite Reliability (CR), and Average Variance Extracted (AVE) for each construct.

The CFA results demonstrated satisfactory psychometric properties for all constructs. Standardized factor loadings ranged from 0.64 to 0.89, exceeding the recommended minimum value of 0.50. Composite Reliability values ranged from 0.78 to 0.88, indicating strong internal consistency, while Average Variance Extracted (AVE) values ranged from 0.52 to 0.61, exceeding the recommended threshold of 0.50 and confirming convergent validity. Discriminant validity was also established because the square root of the AVE for each construct was greater than the correlations among the latent variables.

The overall measurement model demonstrated excellent goodness-of-fit with the empirical data. The fit indices were $\chi^2/df = 1.411$, RMSEA = 0.036, CFI = 0.957, and TLI = 0.951, all of which satisfied the recommended criteria for Structural Equation Modeling. These findings indicate that the proposed measurement model adequately represents the underlying relationships among the latent constructs.

Among the latent constructs, the strongest correlations were observed between Leadership Training and Coaching Leadership ($r = 0.602$, $p < .001$) and between Coaching Leadership and Innovation Performance ($r = 0.631$, $p < .001$). These findings suggest that leadership training substantially enhances coaching leadership behaviors, which subsequently contribute to higher levels of research team innovation performance.

6.2 Structural Model Analysis

Following confirmation of the measurement model, Structural Equation Modeling (SEM) was employed to examine the hypothesized relationships among the constructs. The standardized path coefficients are presented in Table 3.

The structural model revealed that Leadership Training had a significant positive effect on Coaching Leadership ($\beta = 0.63$, $p < .001$), supporting Hypothesis 1. Coaching Leadership also exerted a significant positive influence on Innovation Performance ($\beta = 0.41$, $p < .001$), confirming Hypothesis 2.

Furthermore, Team Climate significantly influenced Innovation Performance ($\beta = 0.29$, $p = .003$), while Knowledge Sharing also demonstrated a significant positive effect on Innovation Performance ($\beta = 0.31$, $p = .002$). These findings indicate that supportive research environments and effective knowledge-sharing practices are essential determinants of innovation performance within university research teams.

Table 3. Direct Effects of the Structural Model.

Hypothesis	Structural Path	Estimate	Standardized (β)	p-value	Decision
H1	Leadership Training → Coaching Leadership	0.582	0.630	< .001	Supported
H2	Coaching Leadership → Innovation Performance	0.498	0.410	< .001	Supported
H3	Team Climate → Innovation Performance	0.344	0.290	.003	Supported
H4	Knowledge Sharing → Innovation Performance	0.365	0.310	.002	Supported

Note. Standardized coefficients (β) are reported. All hypothesized direct relationships were statistically significant at the 0.01 level.

6.3 Indirect Effects

To examine the mediating effects of Coaching Leadership, Team Climate, and Knowledge Sharing, a bootstrapping procedure with 5,000 resamples was performed. The indirect effects are presented in Table 4.

The results demonstrated that Leadership Training significantly improved Innovation Performance through Coaching Leadership ($\beta = 0.259$, 95% CI = [0.082, 0.511], $p = .009$). Moreover, the sequential mediation through Coaching Leadership and Team Climate was significant ($\beta = 0.131$, 95% CI = [0.045, 0.302], $p = .017$). Likewise, the indirect effect through Coaching Leadership and Knowledge Sharing was also statistically significant ($\beta = 0.144$, 95% CI = [0.051, 0.299], $p = .013$).

These findings indicate that leadership training enhances research team innovation performance primarily by strengthening coaching leadership behaviors, which subsequently foster a supportive team climate and encourage active knowledge sharing. Collectively, these mediating mechanisms explain how leadership development contributes to improved innovation outcomes within university research teams.

Table 4. Indirect Effects Based on Bootstrapping (5,000 Resamples).

Hypothesis	Structural Path	Standardized Effect	95% Confidence Interval	p-value	Decision
H5	Leadership Training → Coaching Leadership → Innovation Performance	0.259	[0.082, 0.511]	.009	Supported
H6	Leadership Training → Coaching Leadership → Team Climate → Innovation Performance	0.131	[0.045, 0.302]	.017	Supported
H7	Leadership Training → Coaching Leadership →	0.144	[0.051, 0.299]	.013	Supported

Hypothesis	Structural Path	Standardized Effect	95% Confidence Interval	p-value	Decision
	Knowledge Sharing → Innovation Performance				

Note. Indirect effects were estimated using a bias-corrected bootstrapping procedure with 5,000 resamples. Confidence intervals that do not include zero indicate statistically significant mediation effects.

7. Discussion

Discussion for Research Objective 1. The study identified four major constructs Leadership Training, Coaching Leadership, Member Creativity, Dynamic Competence, and Team Innovation Performance validated through confirmatory factor analysis. The results confirm that research teams at Liaoning University require leadership development frameworks that emphasize not only technical knowledge but also coaching-oriented behaviors that guide, motivate, and inspire researchers. The strong factor loadings of instructing, guiding, and inspiring behaviors (0.63–0.82) align with existing leadership research which shows that coaching leadership enhances team adaptability and creative problem-solving [5]. Member creativity and dynamic competence also emerged as critical dimensions, consistent with findings by [13] who assert that both individual creativity and team-level dynamic capability are essential for producing high-value research outputs. Thus, the structure identified in this study confirms and extends prior theoretical models by demonstrating that leadership training programs within Chinese research universities must integrate coaching components to stimulate creativity, adaptive capability, and innovative performance.

Discussion for Research Objective 2. The structural equation model (SEM) revealed several key insights regarding direct and indirect relationships among constructs. First, coaching leadership demonstrated a significant positive direct effect on research team innovation performance. This finding strengthens the argument that leadership behavior particularly empowering and instructive coaching plays a crucial role in shaping research productivity and innovative capacity [14]. Both member creativity and dynamic competence served as significant mediators. The indirect effects suggest a multilevel mechanism: leadership training enhances coaching behavior; coaching behavior fosters individual creativity and team adaptability; and these capacities translate into improved innovation performance. This aligns with mediation models proposed by [6]. and reinforces the idea that innovation in research organizations is not produced solely by resources or expertise but is fundamentally shaped by leadership practices that stimulate and sustain team learning. The findings provide empirical evidence that for Liaoning University—one of the key institutions in northeastern China innovation outcomes can be significantly improved through strategically designed leadership training programs.

Discussion for Research Objective 3. The expert interviews underscored several contextual challenges in Chinese research universities, including disparities in research funding allocation, competition for academic titles, and uneven distribution of research resources. These conditions require leadership approaches that emphasize coaching, mentoring, and capability-building rather than command-based or administrative leadership styles. The practical guidelines developed targeting short-term, medium-term, and long-term improvement highlight the need for continuous leadership development, structured mentoring systems, and integrated knowledge-sharing platforms. These insights echo international findings by [15]. who argue that sustainable innovation requires long-term leadership capacity-building and collaborative cultures. Thus, the study contributes new perspectives on how research universities in China can institutionalize leadership training to strengthen innovation performance at both the individual and team levels.

Knowledge Contribution

This study contributes three major new insights:

A validated multilevel model demonstrating that leadership training influences innovation through coaching leadership, creativity, and dynamic competence.

Empirical evidence from a major Chinese research university showing how leadership behaviors shape research performance in resource-constrained and competitive environments.

A strategic framework for leadership training tailored to research teams emphasizing coaching, capability-building, and innovation culture which has not been previously developed in the context of Liaoning Province.

A conceptual model is illustrated in Figure 2.



Figure 2. illustrates the results of building relationships between the educational institution and the community that affect the management of Guangzhou Polytechnic College, Open University of Guangzhou, China.

According to Diagram in figure 2, it shows that building relationships between the educational institution and the community involves several aspects Community Participation: The institution provides more learning services to the community as appropriate.

Community Services: The administration of the institution offers knowledge about using technology and information communication to the community and parents.

Relationship Building: The community is invited to participate more frequently in appreciating students' achievements.

Public Relations: The community is encouraged to provide feedback, which will be considered for revising development plans to align with community needs. The institution should hold parent meetings at least twice a year.

Academic Administration: There should be more opportunities for parents and the community to express their opinions during meetings.

Budget Management: The administration should manage and allocate the budget effectively to maximize benefits and efficiency.

Personnel Management: Support and promote the knowledge and skills of personnel to align more closely with their roles.

General Administration: Regular inspection, repair, and maintenance of equipment should be conducted.

8. Conclusion

This study provides a comprehensive analysis of how leadership training affects innovation performance among research teams at Liaoning University. The findings show that effective leadership development programs improve coaching leadership behaviors, which in turn enhance member creativity, dynamic competence, and overall research innovation performance. The results highlight the ne-

cessity of institutional investment in leadership training as a strategic mechanism for strengthening academic competitiveness and research productivity. Future studies may extend this model to other Chinese universities or compare public and private institutions to further validate the framework.

9. Recommendations

Based on the findings regarding leadership training and its influence on the innovation performance of research teams at Liaoning University, the following recommendations are proposed. These recommendations are categorized into practical recommendations, policy recommendations, and suggestions for future research.

9.1 Practical Recommendations

- 1) Establish a Structured Leadership Coaching Program
Liaoning University should develop a formal leadership coaching system for research team leaders. This program should include:
Clearly defined leadership competencies for research innovation
Training modules on innovation management, team leadership, and research project administration;
A structured "Coaching Progress Log" to monitor team development and outcomes.
- 2) Strengthen a Collaborative Research Team Culture
To enhance innovation, the university should foster a collaborative research environment by:
Creating a digital platform for knowledge sharing;
Promoting interdisciplinary collaboration through joint workshops or research clusters;
Implementing conflict-resolution mechanisms to maintain healthy team dynamics.
- 3) Develop a Fair and Incentive-Based Innovation Evaluation System
Assessment criteria for research teams should incorporate:
Quality and originality of research output rather than quantity alone;
Real-world impact on local industries, communities, or technological development;
Reward systems, research grants, and recognition programs for high-performing teams.
- 4) Enhance Digital Competencies of Research Leaders
Research team leaders should receive training in: Big Data analytics and AI-assisted research design; Digital tools for project management; Cybersecurity and research data protection.
- 5) Strengthen Personnel Support and Professional Development
The university should provide:
A formal mentoring system for early-career researchers; Funding for laboratory equipment, field-work, and advanced software; Opportunities for international training to expand global innovation capacity.

9.2 Policy Recommendations

- 1) Establish an Innovation Leadership Development Center
The university should create a center dedicated to: Developing and standardizing leadership training programs; Supporting interdisciplinary and cross-institutional research collaboration; Providing consultation services for innovation strategy development.
- 2) Promote Digital Reform in Research Management
To modernize research governance, the university should implement: A fully digital research project management system; Data integration platforms across faculties and institutes;
Real-time monitoring tools for research performance and resource allocation.
- 3) Improve Researcher Performance Evaluation Policies
Policy adjustments should ensure that performance assessments consider: Innovation capability and creative contribution; Team collaboration and leadership effectiveness; Engagement with industry, community partners, and external stakeholders.

9.3 Recommendations for Future Research

- 1) Investigate Mediating or Moderating Variables
Future studies should examine variables that may influence the relationship between leadership coaching and innovation performance, such as: Trust within teams; Organizational culture; Resource availability and institutional support.
- 2) Conduct Comparative Studies Across Provinces
Further research could compare universities in Liaoning with those in Jilin, Heilongjiang, or other provinces to analyze differences in: Leadership behaviors; Innovation performance; Institutional support systems.

3) Employ Longitudinal Research Designs

Long-term studies can help identify how leadership training affects: Team growth and stability; Innovation output over time; Research quality and impact in the long run.

4) Use Experimental or Quasi-Experimental Designs

Future research should test the effects of different forms of leadership coaching on: Team creativity; Efficiency and productivity Innovation outcomes.

These recommendations aim to strengthen the research ecosystem at Liaoning University by enhancing leadership capacity, fostering a collaborative culture, improving evaluation systems, and advancing digital transformation. Implementing these strategies will help build high-performing research teams capable of generating impactful and sustainable innovation in the modern academic environment.

10. Patents

Author Contributions: For research articles, N.W. Conceptualized the study, data curation and formal analysis. The original draft was prepared and editing by N.W. Author has read and agreed to the published version of the manuscript.

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