

Research on the Research Ability of College Students: A Literature Review from China

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Abstract: Using the literature research method, this article delves into the research findings on Chinese college students' scientific research ability, explores the innovation talent training models in regional higher education institutions. It also seeks specific training paths and improvement measures through literature research. The study reveals that students in China's local universities have insufficient scientific research ability, mainly shown in poor research innovation concepts, lack of research innovation spirit, and prominent research topic selection problems. Factors in the educational environment like curriculum design, teaching staff, and experimental facilities also affect college students' scientific research ability development. Additionally, while a few undergraduates stand out in research related competitions, overall scientific research ability improvement still faces many challenges. Based on existing theoretical literature, this article suggests improvement measures and lays a solid foundation for further studies on the current situation and improvement paths of scientific research ability among students in universities within a specific region in China.

Keywords: College Students' Research; Research Ability; Regional Universities; Review

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I. Introduction

As Chinese higher education advances rapidly and the number of college students rises steadily, cultivating innovative undergraduates in line with socioeconomic development and meeting the needs of an innovative society has become a key issue for higher education institutions. In recent years, education authorities have emphasized fostering college students' research innovation ability by launching national level research innovation competitions. Universities across the country are also creating a research oriented environment, optimizing curricula, and encouraging student participation in competitions to enhance their research innovation skills. Against this backdrop, this article focuses on analyzing the literature on college students' research ability in Chinese higher education institutions. It aims to lay the groundwork for subsequent comprehensive questionnaires on this topic, promote high quality development of college students' research ability, and provide talent support for socio economic innovation, particularly for the sustainable development of the Guangdong-Hong Kong-Macau Greater Bay Area.

This article intends to examine the literature on college students' research ability in recent years and explore the research directions of Chinese scholars in this field, including their practical achievements. Based on this, it will propose ways to improve college students' research ability in Zhaoqing based universities and how to achieve such improvement. The research methods employed are the literature research method and induction. By analyzing existing literature, the article seeks to identify effective paths to enhance college students' research ability in Zhaoqing based universities. The main research content involves organizing existing academic findings on Chinese college students' research ability. From the literature, scholars have mainly focused on aspects such as the significance and role of research ability cultivation, current situations, and countermeasures.

II. The Significance and Role of Cultivating Research Ability in College Students

Guo Xinshuang, Hu Zhaolong, Yu Yue, and Huang Wei (2021) highlighted the significance of research and innovation ability, regarding it as a key indicator of students' overall quality. Jiang Chan (2018) identified research related competitions as an important practical activity in higher education, which can stimulate students' research interest and boost their research ability. These competitions let students enjoy research, strengthening their interest. The hands on experience during competitions enhanced their experimental and problem solving skills. As most research competitions required teamwork, they also developed students' team

collaboration, communication, and coordination abilities. Participating in competitions exposes students to more academic resources and cutting edge knowledge, broadening their academic horizon. Gao Suqin and Yu Pei (2022) analyzed the current situation of college students participating in research and innovation projects. They found that joining teachers' research projects or academic group discussions promotes students' specialized learning and innovation ability, improved their research core literacy and comprehensive expression ability, inspired their innovative thinking, and cultivates teamwork, professional knowledge thinking, logical thinking, and leadership skills, laying a foundation for future employment and entrepreneurship. Xue Yanan, Jia Lianqun, and Cao Yuan (2021) indicated that cultivating college students' innovation and entrepreneurship ability was essential for both the development of the socialist market economy and the construction of an innovative country. Integrating teaching with research practice through research projects to develop undergraduates' innovation and entrepreneurship ability was one of the fundamental ways for higher education institutions to enhance their teaching level and also helps alleviate employment pressure for undergraduates. Jin Lei (2016) argued that the core resource of innovation was the cultivation of innovative talents, among which college students were an important part. Enhancing college students' research and innovation ability integrated knowledge imparting, skills development, and quality expansion. This improved students' innovation awareness and practical ability, equipped them with extensive knowledge, a well structured knowledge system, cooperation awareness, team spirit, and social responsibility, strengthened their social competitiveness, and trained high level talents to meet the needs of an innovative country.

III. Current Status of College Students' Research and Innovation Ability Cultivation

After combing and analyzing relevant literature, this article believes that the problems in college students' research and innovation ability mainly come from three aspects: students, teachers, and schools.

3.1 Factors from students

First, insufficient research and innovation concept. Innovation concept, namely innovation thinking, refers to the mental activity that breaks the original thinking stereotype and explores the law of things' movement and change in a new way and from a multidimensional perspective during the process of understanding and transforming the world. Research and innovation thinking refers to a way of thinking in research activities that breaks the original thinking stereotype and explores the law of things' movement and change in a new way and from a multidimensional perspective. Innovation awareness is the key to transforming innovation thinking into innovation ability and is a necessary prerequisite for obtaining innovation results. At present, the cultivation of college students' research quality has not been organically integrated with professional knowledge education, and it lacks pertinence, in depth and timeliness. The concept of research and innovation has not yet taken root among college students. Influenced by the traditional education mode, college students have heavy learning tasks and lack sufficient time to acquire cutting edge knowledge in their disciplines. Meanwhile, the lack of proper understanding of research activities has led to insufficient innovation awareness and desire among students. Their awareness of innovation thinking is relatively weak.

Second, insufficient research and innovation ability. Topic selection is the first step in conducting research and marks the beginning of students' research activities. Huang Ping (2014) found that medical undergraduates often struggle with defining the scope of their topics and selecting feasible research topics. Jin Lei (2016) indicated that most research topics are assigned by mentors, which restricts students' autonomy and interest in research, as well as their opportunities for innovation training. If issues in topic selection are not properly addressed, they may defeat students' interest in research, leading to project abandonment and waste of innovation training resources. Additionally, hasty, utilitarian, and capricious topic selection can have many negative effects on college students' innovation training. Wang Wenmin, Qiu Shenghai, et al. (2021) discovered that undergraduates' spare time is fragmented, limiting their research training time and preventing full participation in research activities. This results in poor experimental skills. Some undergraduates participating in research activities have ulterior motives, which hinders the improvement of their research and innovation abilities. Zhao Qingmin (2002) found that most students rely on single sources for literature collection and lack knowledge of literatures retrieval software. Also, many studies focus on domestic research progress and overviews. The transformation, application, and promotion of research results are less than ideal, indicating deficiencies in college students' utilization and conversion of research outcomes.

3.2 Factors from teachers

First, single teaching content and outdated teaching methods. Qin Sulan, Guan Yinli, Yu Junlin, et al. (2022) pointed out that in the past teaching mode, undergraduate students lack research training opportunities, have weak research thinking and insufficient innovation ability. For research projects with academic value, financial support is crucial. Most teachers have to use other project funds to fill the gap. Young teachers without sufficient research funds cannot ensure project quality and may even give up, which affects students'

enthusiasm for participating in research projects. Zhang Jun (2012) believes that overall, research methods and professional guidance are the main limiting factors. The main obstacles for college students not participating in innovation training projects are lack of confidence, time and difficulty in forming teams. Jing Jiana, Sun Yan, et al. (2021) found that most teachers still use the traditional "teaching by words and deeds" method, ignoring students' independent thinking and research interest stimulation, and provide little practical help in research exploration. Wang Wenmin, Qiu Shenghai, et al. (2021) noted that many teachers adopt a passive teaching mode to save time, lack joint problem probing with students, fail to achieve "innovative teaching" reform, limit teaching content to final exam scope, and provide almost no guidance on research innovation. Yuan Zhaocheng (2013) indicated that traditional exam oriented education emphasizes uniformity, neglects diversity, focuses on teacher centered theory teaching, and makes students dependent with poor independent thinking ability. This suppresses students' initiative and individuality, affecting their innovation ability cultivation. Students' one sided pursuit of academic performance also leads to neglect of other ability training and weak practical operation ability.

Second, insufficient teacher team building. Wang Wenmin, Qiu Shenghai, et al. (2021) noted that few university teachers are experienced and willing to guide students in innovation and research ability training. Most teachers are busy with their own research projects and unwilling to spend time guiding undergraduates with little practical experience. They lack patience in helping students cultivate self innovation ability. Yuan Zhaocheng (2013) found that some teachers invest little in undergraduate teaching, seriously restricting students' innovation ability development. This results in students' lack of innovation initiative, poor hands on ability and weak practice ability. The main reason is the lack of a professional teacher team. Sun Yan, Zhang Yuhua, Han Weina, and Zhou Jin (2021) used Weifang Medical University as an example to explore the research and innovation ability cultivation model and practice of undergraduates under the mentor system. They pointed out the existing problems in the undergraduate mentor system. Students have a weak professional foundation, lack learning autonomy and the spirit of pursuing excellence. Mentors, limited by time and energy, cannot systematically cultivate and improve undergraduates' research and innovation ability.

3.3 Factors from universities

First, emphasis on theory, neglect of practice. Qin Yulan, Guan Yingli, Yu Junlin, et al. (2022) pointed out that when arranging basic courses, schools can integrate some of them into teaching cases based on the internal composition of disciplines and the relationships between disciplines. This can reduce undergraduate students' learning pressure and enhance the systematicity of theoretical course learning. At the same time, it is necessary to introduce basic research courses in theory courses as early as possible to stimulate students' enthusiasm for research. Wang Lihua, Jin Xiaohong, Mo Xianglun (2022) carried out reforms on the research ability cultivation of planning and design students. They proposed using "pre class, in class, and post class" collaborative learning activities to carry out practical teaching in professional courses, improve students' dominant role in learning, develop their thinking habits, and boost their innovative research ability. Zhang Jun (2012) put forward suggestions to promote students' participation in research competitions by reforming teaching systems, formulating reasonable teaching plans, and integrating research and innovation ideas into teaching. Ding Shengfeng, Li Sa, Li Yanjie (2015) proposed solutions to the serious disconnect between the practical abilities of economic and management undergraduates and social needs. These include student centered teaching modes, "dual qualified" teachers for practice teaching, school enterprise cooperation for internship bases, a "student competition→technological innovation→teacher research" linkage model, and academic and technological student club activities.

Wang Wenmin, Qiu Shenghai, et al. (2021) found that universities often provide insufficient venues for research and innovation activities. The equipment for extracurricular research is limited. The teaching schedule tends to focus on theory, with few laboratory hours and limited lab opening time. Students struggle to access adequate experimental conditions. Moreover, experimental teaching mainly focuses on verifying established theories and observing experimental phenomena. Students lack opportunities and motivation for self directed learning and are short of the research spirit and perseverance needed to produce valuable research outcomes. Yuan Zhaocheng (2013) found that universities focus more on theoretical teaching and allocate a small proportion of the training program to innovation and practice. This restricts students' opportunities to engage directly in research projects. Mentors also get involved late, leaving students ill equipped for practical work and unable to adapt to real world social and production demands.

Second, emphasis on results, neglect of process. Huang Ping (2014) stated that the "interest driven, self experimental, process focused" principle guides the implementation of college students' innovation experiment program. The research process is crucial for developing students' research and innovation abilities. However, some schools evaluate project effectiveness by quantitative indicators like the number and level of student team publications, awards, and patents. This approach, which emphasizes results to supposedly enhance the process, can lead students to view publishing articles as the goal of research. This reduces their focus on the

experimental process and is detrimental to improving their research and innovation abilities. Yuan Zhaocheng (2013) also noted that many universities focus on innovation for the sake of winning awards, linking innovation to utilitarianism. This causes college students to lack enthusiasm and initiative in innovation activities.

Third, insufficient innovation education policy incentives. Yuan Zhaocheng (2013) found that most universities lack effective incentive policies to foster students' innovation abilities. Students participate in innovation activities blindly. Universities and teachers also fail to provide adequate guidance for innovation activities. This results in passive innovation behavior among some students, with innovation becoming a task to complete rather than a genuine pursuit. Some students even innovate merely to meet graduation requirements. Jing Jiana, Sun Yan, et al. (2021) found that some universities have an incomplete system for cultivating students' research literacy. This leads to a lack of in depth understanding of research methods among students. When applying for innovation and entrepreneurship training programs, they are unsure how to select topics and write project proposals. When faced with research experiments, they do not know how to design and conduct them, and when they obtain experimental data, they are at a loss on how to process and analyze it. These issues reflect a general lack of research knowledge and skills among college students.

Forth, uninspiring innovation atmosphere and curriculum design. Yuan Zhaocheng (2013) pointed out that the innovation atmosphere in universities is weak. The closed teaching mode lacks openness and fails to balance theory with practice. This restricts the development of students' innovation and practice abilities. Also, Yuan Zhaocheng (2013) found that university courses focus too much on imparting disciplinary knowledge and training logical thinking while neglecting non logical thinking. This prevents students with innovation potential from recognizing and capturing innovative ideas in a timely manner. He suggested that university courses should align with social needs and students' individual development. A narrow academic focus is also an important factor affecting innovation. Although universities have increased the proportion of elective courses in recent years, the pressure of required courses remains high. Most students have a limited scope of activities and ignore knowledge crossover with related disciplines. This results in a narrow knowledge base and limited horizons, which hinder the development of innovation abilities.

Fifth, ineffective academic topics and lectures. Jin Lei (2016) noted that there are numerous academic topics and lectures at universities. However, students show little enthusiasm for participating. The main reasons are that students find the lectures too long and inefficient, and the content does not meet their actual needs.

IV. Countermeasures for Enhancing College Students' Research and Innovation Ability

4.1 Establishing modern educational philosophy

First, innovating educational philosophy. Innovating educational philosophy is crucial for developing students' innovation ability. Only with fresh and scientific educational philosophy can we meet educational goals and cultivate numerous innovative talents. Yuan Zhaocheng (2013) suggested two approaches: First, adhere to student centered education, create a mechanism for nurturing outstanding talents, advocate values of truth seeking, exploring the unknown, and developing potentials, foster a culture of science love and risk taking, and encourage students to explore freely and advance boldly. Second, in educational activities, teachers should respect and cherish students' innovative spirit, conduct activities to stimulate innovation awareness, abandon traditional education concepts that stifle innovation, eliminate drawbacks suppressing creative thinking and individuality, and focus on developing students' innovation awareness and practical ability to create a conducive mental environment.

Second, adjusting the evaluation system. Teaching evaluation is vital for monitoring education quality and is a key part of school operation. Reforming teaching evaluation is essential for promoting quality education and innovation ability cultivation. Yuan Zhaocheng (2013) recommended that schools establish the following indicators: First, award credits for students' innovation activities to boost their enthusiasm and innovation ability. Second, set a minimum credit requirement for innovation activity participation. This will guide students universally, making innovation ability enhancement a priority for all, not just a decorative activity for a few.

4.2 Innovative talent cultivation mode

First, reforming teaching and assessment methods. The heuristic, discussion based, and research-based teaching methods of teacher-student interaction and communication create a spontaneous and active teaching environment, enhance students' awareness of active learning, and cultivate their innovative thinking. Teachers should pay attention to students' practical teaching methods and assessment, which will directly affect teaching effectiveness and also affect the cultivation of students' innovative abilities. The content of professional courses is one of the foundations for ensuring the achievement of professional training objectives and cultivating talents according to specifications and quality. Teaching methods are powerful means to achieve teaching objectives. To enable students to "learn to study" and "learn to create", they must be regarded as the main body of education and teaching. Based on the new level of scientific and technological development, as well as the

objective needs of social development and the characteristics of student personality development, traditional education and teaching methods must be reformed, curriculum settings adjusted, and a mechanism for positive interaction between teaching and research established. Cultivate students' scientific research and innovation abilities, promote the comprehensive development of students' personalities and talents.

Teaching should shift from "teacher dominated" to "student dominated", from passive "I have to learn" to active "I want to learn". More teaching methods focusing on actual training should be adopted. The integration of "industry, academia, and research" should be fully implemented. This enables students to understand knowledge through practice and acquire knowledge through research. In teaching and research, active exploration and bold practice are encouraged to enhance teaching quality and the comprehensive quality of talents. A positive interaction mechanism between teaching and research should be formed, where research promotes teaching reform and academic theory guides research. In the teaching process, teachers can select targeted questions for proposition. Students can form their own views through data collection and interest group discussions. This research oriented teaching method can improve class structure, provide more opportunities for students to develop their individuality, and effectively foster college students' research ability. Scientific research, a creative activity, requires a solid and broad foundation in professional knowledge, a systematic grasp of professional knowledge, and mastery of specialized field skills. Research ability, a complex and unique skill, needs long term cultivation and intensive training for overall improvement. The research oriented teaching method is an effective approach to achieving this.

In classroom teaching, teachers should purposefully and consciously cultivate students' innovation ability while ensuring solid teaching of professional theoretical knowledge. They should strive to broaden students' knowledge base and widen their horizons to lay a foundation for innovation ability development. Teachers should incorporate the latest research information, dynamics, and achievements in the discipline into their teaching. This helps students stay informed about cutting edge research and strengthens their innovation awareness. Teachers can also introduce some of their own research achievement to students, serving as a guide and role model. On the current assessment basis, diverse assessment methods should be adopted to comprehensively evaluate students' abilities. These include combining theory with practice and written tests with oral exams. Xue Yanan, Jia Lianqun, and Cao Yuan (2021) propose the following suggestions for cultivating undergraduate innovation and entrepreneurship ability: Rely on research projects to design diverse comprehensive practices in classrooms; build a comprehensive evaluation system for undergraduates to encourage participation in research projects; and strengthen the faculty team for innovation and entrepreneurship education.

Second, involve students in teachers' research projects. Incorporating students into professional research offices or guiding teachers' research projects and mentoring them in writing research reports is essential for developing their research skills. It enhances the quality of their papers and broadens their knowledge. Teachers' research topics often focus on real world professional issues with significant social value. By participating in such research, students receive direct guidance and gain practical experience. As teachers' research assistants, students engage in research tasks. This teaches them how to learn, research, and innovate, effectively honing their research abilities. During the training process, teachers should explain the significance, basis, and innovative aspects of their research topics. They should share their research insights and align with students' interests to determine article topics. Topics should be well defined, match students' overall ability levels, allow space for innovation, and be appropriately challenging.

Third, emphasize interdisciplinary integration and collaborative promotion. Interdisciplinary knowledge is crucial for innovation. Groundbreaking research often emerges from cross disciplinary and multi field integration. Thus, strengthening college students' foundational education and establishing a robust curriculum system are vital. Universities should increase elective options and allow students to take courses across schools, departments, and disciplines. This enables students to focus on integrated, interdisciplinary training while specializing in a particular field. It also helps develop their unique interests, boosts innovation enthusiasm, and prepares them for advanced study. Encouraging students to attend academic conferences and other exchange activities broadens their knowledge and sparks new research ideas through interdisciplinary collaboration. This also helps students embrace new concepts, technologies, and ideas. Regular research personnel exchange activities can cultivate a positive research atmosphere, enhance students' communication and logical thinking skills, and foster well rounded research and innovation talent. The Ministry of Education and Ministry of Finance jointly launched the "2011 Plan for Enhancing Innovation Capacity in Higher Education Institutions." Universities can establish a "College Student Collaborative Innovation Program," set up special funds to support cross school, cross department, cross major, and cross grade team based collaborative research. By creating collaborative innovation platforms and mechanisms, universities can promote student collaboration, develop a campus wide collaborative innovation culture, and boost undergraduates' innovation capacity to support national innovation driven development and human resource power construction.

Forth, increase the number of skills based courses. To meet the needs of innovation oriented talent

development and enhance students' innovative thinking and skills, universities should offer specialized courses teaching fundamental research methods. These include topic selection, data collection and analysis, thesis extraction, paper structuring, argumentation, and writing. In addition to basic theory, students should undertake specific research tasks with teachers' guidance to master basic research skills. Participating in research projects is an effective way to develop research skills. Students gain experience and improve their abilities through hands on research. The research process includes pre research data collection, literature review, and research progress analysis. Students should focus on writing well argued research proposals. During the research, they should ensure clear experimental objectives, feasible plans, rational designs, and advanced methods. In the final stage, they should analyze research results, summarize their innovation, and prepare for academic publication or patent application.

4.3 Refining the talent development environment

First, improving the student research ability training guarantee system. Cultivating college students' research ability is a standardized management process that requires systematic guarantees. First, a student research application system should be established. Second, a functional department should be set up to manage college students' research activities. To train students' research skills, teaching and research offices or departments can be used as organizational units to strengthen the planning and management of undergraduate research. Third, a research mentor system should be established. Mentors can guide students in learning, exploring, and creating, helping them solve research process problems promptly, master research methods quickly, and ensure smooth research activity progress. Fourth, an incentive and competition mechanism should be established. Various competitions can be held to recognize and reward students with outstanding innovative achievements. These rewards can serve as important references for graduate school recommendation and scholarship awards. Schools can allow students with national or provincial level innovative results or those who have achieved success in innovation activities to apply for exemptions from related course credits, course designs, or thesis credits. Yang Xiaoxiong, Mo Haiming, et al. (2007) suggested that universities establish a unified teaching research office and a management mechanism led by this office with other departments offering support. They also recommended setting up software and hardware facility guarantee systems, special research funds for undergraduates, and improved reward and preferential policies. Additionally, university enterprise cooperation can be used to train students.

Second, enhancing the university research atmosphere. Building an innovative university environment is essential for cultivating innovative talents. Universities should focus on this task. The second classroom should be fully utilized to hold academic lectures, salons, and science reporting sessions, publish student paper collections, and encourage student participation in academic activities to strengthen their innovation awareness. Universities can offer extracurricular lectures where experts introduce current research and discuss issues in their fields. Student discussions can be organized, and foreign scholars can be invited to give professional direction related popular science reports.

4.4 Practical implementation of innovative training models

An integrated training model: Combining the elements of mentors graduate students, and undergraduate students with experience forms an integrated training model. This model allows students to learn research methods and enhance their ability to solve complex problems during practice.

IV. Conclusion

This article explores the research ability status of Chinese college students through literature review. It finds that undergraduates often lack research innovation concepts and spirit, mainly due to education modes that fail to inspire innovation awareness and research interest. Additionally, students have insufficient basic research skills in areas like topic selection, experimental design, and literature retrieval, limiting their autonomy and creativity in research. The educational environment and teaching staff also significantly impact students' research ability development. Issues such as single track curriculum design, outdated teaching methods, and insufficient experimental facilities restrict the development of students' research practice and innovation abilities.

Methodologically, this article combines questionnaires, empirical analysis, and case studies to comprehensively evaluate the research ability status of Zhanjiang undergraduates. Questionnaire results show significant deficiencies in students' research innovation concepts, spirit, and skills. Empirical analysis highlights the educational environment and teaching staff's important role in student research ability development. Case studies of outstanding student performers in research competitions provide reference worthy success factors for other students.

The results indicate that although some undergraduates excel in research competitions, overall research ability improvement remains challenging. Consequently, the article proposes targeted training paths and

improvement measures, including optimizing curriculum design, strengthening teacher training, increasing practice opportunities, and establishing effective incentive mechanisms. These aim to enhance the educational environment and training methods to boost undergraduates' research innovation abilities and provide talent support for social innovation driven development.

In summary, through an in depth analysis of Chinese undergraduates' research ability issues, this article offers valuable insights for optimizing university talent cultivation models and improving undergraduates' research innovation abilities, carrying important theoretical and practical implications.

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