

Research on the Influencing Factors of Research and Innovation Ability of Top Students in Colleges and Universities

-- Take The Winners of the "Challenge Cup" National Competition of Jiangsu University as An Example

She Han, Jiayi Sun^a, Yang Zhu

Jiangsu University, Jiangsu, China

^asunjiayisuda@163.com

Abstract: To cultivate the university students' ability of scientific research and innovation is one of the important tasks of higher education in our country. Based on the grounded theory, this study deeply explores the influencing factors of the scientific research innovation ability of outstanding college students who have made great achievements in scientific research, so as to improve and optimize the training method of scientific research ability of college students. It is found that the scientific research innovation ability of students with excellent achievements in scientific research is mainly affected by environmental characteristics, ability structure and quality structure. Environmental characteristics mainly refer to the resources, opportunities and information obtained by students in scientific research practice. Ability structure emphasizes students' judgment, reasoning power and practical power when solving scientific research innovation problems, and quality structure includes personality and quality factors. It is the "source power" of students' scientific research and innovation. It is suggested that educational authorities and colleges and universities implement a multi-subject collaborative training mechanism, pay attention to cultivating college students' ability of planning, self-learning and practice, set up more easy and targeted psychological counseling centers, and encourage college students to be innovative, dare to be the first, and be good at doing well while cultivating young people who truly have "four self-confidence".

Keywords: Research and innovation abilities, Grounded theory, University students, Environmental characteristics, Ability structure, Quality structure.

1. Introduction

As a talent training base, colleges and universities not only need to train college students with ideals, morality and culture, but also need ambitious young people who can continuously supply fresh blood for the national innovation work. Nowadays, with the rapid updating and iteration of science and technology, the requirements for the national innovation ability are also increasing day by day, and the national innovation ability depends on high-quality scientific research talents. Therefore, colleges and universities should actively cultivate the scientific research ability of college students, strengthen the rigorous and realistic scientific research style of college students, establish correct scientific research values, and encourage the scientific research spirit of daring to be the first, so as to cultivate more top scientific research talents. Add strength to national development.[1]

2. Review of Literature

At present, the research on the influencing factors of students' scientific research and innovation ability is mainly based on quantitative research and speculative research of traditional inductive analysis. In terms of quantitative research, Chen (2013) [2] conducted statistical analysis on the data by means of questionnaires through analyzing the competency characteristics of graduate students' scientific research ability. It is found that the required abilities include achievement desire, self-monitoring ability, logical thinking ability, finding and solving problems, data collection and

processing ability, scientific innovation ability, practical operation ability, language expression and interpersonal communication ability. Tao(2020) [3] used quantitative research to explore the influencing factors of college students' scientific research and innovation ability, and concluded that autonomous learning, tutor guidance and school scientific research support can actively promote the improvement of college students' scientific research and innovation ability. Wang HC(2022)[4] found that the innovation and entrepreneurship ability of college students in China was generally at a medium level by compiling the scale of innovation and entrepreneurship ability of college students and conducting large-scale data statistics, and there was no significant relationship between school level and grade on innovation and entrepreneurship ability. In terms of the speculative research of traditional induction analysis, Lu Dongxiang (2021) [5] proposed the cultivation path of college students' innovation and entrepreneurship ability through in-depth analysis of the obstacles to the cultivation of college students' innovation and entrepreneurship ability in application-oriented undergraduate colleges. It is suggested that colleges and universities should cultivate college students' scientific research, innovation and entrepreneurship ability by forming the standard of innovation and entrepreneurship ability system, improving the curriculum system of innovation and entrepreneurship education, and optimizing the teaching staff of innovation and entrepreneurship. By clarifying the concept, meaning and basic characteristics of top-ranked innovative talents, Zhang (2021) [6] explored the problems existing in the development

of the training policy of top-ranked innovative talents in colleges and universities in China, and put forward relevant countermeasures and suggestions, holding that it is necessary to strengthen the scientific research training of college students, expand their international vision, and cultivate their critical thinking ability.

From the existing research, the research on the influencing factors of college students' scientific research ability is mainly divided into two aspects: external factors and individual factors. In terms of the research on the influencing factors of college students' scientific research ability, Zhang (2019) [7] believed that the innovative quality of top-ranked innovative talents in colleges and universities includes innovative personality, innovative consciousness, innovative thinking, innovative behavior, innovative support perception and innovative self-efficacy. Yang (2007) [8] believed that the influence on the innovation ability of top talents included reasonable knowledge structure, strong innovation and practical ability, and good non-intellectual factors. Lin (2020) [9] believed that outstanding talents who graduated from all disciplines should have similar core competencies and qualities, including lifelong learning ability, courage to challenge difficulties, academic confidence and self-identity, ability to integrate and apply multidisciplinary knowledge, innovation and entrepreneurship, dynamic adaptability, teamwork ability, organization and management ability, etc.

In terms of scientific research and innovation ability, there are some similarities and differences in the definition and connotation of it among scholars. In terms of studying students' scientific research and innovation ability, Liu and Ma (2017) defined scientific research and innovation ability as students' ability to generate and practice novel ideas or solve new problems in the process of scientific research [10]. Scientific research and innovation ability is the sum of students' ability to acquire knowledge, scientific research and innovation achievements, scientific research practice ability and scientific research and innovation characteristics [11]. In this study, students' scientific research innovation ability is defined as their ability to creatively enter and solve problems in scientific research.

Considering that the existing research ignores the boost of

external environmental factors to innovation ability, and that the scientific research ability of college students is mostly affected by individual factors, which is difficult to be completely quantified, this research plan introduces qualitative research to solve the problems of low authority and credibility caused by the lack of data support.

The "Challenge Cup" National College Students Extracurricular Academic Science and Technology Works Competition, as an important platform to cultivate top innovative talents in colleges and universities, takes the cultivation of innovative talents and the promotion of social and economic development as the core goal, and attaches importance to the scientific research ability of the participating students. For example, based on the empirical investigation of the winners of the National Challenge Cup from 11 universities in Shanghai, Zhang (2020) [12] explored and obtained the evaluation index system of the innovation literacy of the winners of the National Challenge Cup. Fang (2020) [13] believed that the "Challenge Cup" played an important role in improving students' innovation and scientific research ability.

Therefore, based on the grounded theory and through qualitative research methods, this paper aims to conduct in-depth interviews with 11 core research members of the "Challenge Cup" winning team, analyze the influencing factors of the scientific research ability of the top university scientific research students, and construct the influencing factor model of their scientific research ability.

3. Research Design and Process

3.1. Research object selection and data collection

This study selects college students who have outstanding achievements in scientific research activities, outstanding scientific research achievements, and high scientific research ability. Finally, 11 college students from a university were selected as the research objects. The respondents were numbered from L1 to L9, and the basic information is shown in Table 1.

Table 1. Basic information of college students

Number	Gender	Award status	Major
L1	Female	First prize of the 17th Challenge Cup	Medical laboratory technology
L2	Male	Special prize of the 17th Challenge Cup	Engineering in agriculture
L3	Male	Second prize of the 17th Challenge Cup	Engineering in agriculture
L4	Male	First prize of the 17th Challenge Cup	Food Engineering
L5	Female	Second prize of the 17th Challenge Cup	Pharmaceutical sciences
L6	Female	Second prize of the 17th Challenge Cup	Environmental engineering
L7	Male	Special Prize of the 16th Challenge Cup	Power engineering
L8	Male	Second prize of the 16th Challenge Cup	Chemical engineering
L9	Female	First prize of the 16th Challenge Cup	Medical laboratory technology
L10	Female	First prize of the 16th Challenge Cup	Food Engineering
L11	Female	Second prize of the 16th Challenge Cup	Clinical medicine

Scientific research ability includes a lot of subjective consciousness and personal quality and ability such as students' personal quality and ability, and the quality

characteristics of tutors, which are difficult to quantify. Therefore, this study adopts semi-structured interview outline, as shown in the following table:

Table 2. Outline of semi-structured interviews

Serial number	Content
1	Understand the basic information and scientific research ability of the interviewees, and explain the purpose and confidentiality of the interview.
2	What was the time and opportunity for your first contact with scientific research? What factors do you think you lacked most to support your scientific research at that time?
3	What effective help do you think teachers provide to improve your research ability in scientific research? What help do you want your teacher to provide you most?
4	What help do you think the university has provided for you in cultivating scientific research and innovation talents? Among these kinds of help, which ones do you think are most effective in improving your scientific research ability, and which ones do you hope the school will provide you with the most help for your scientific research?
5	Could you tell me some of your most impressive research experiences?
6	What difficulties have you encountered in the process of scientific research?
7	What personal abilities or qualities do you think enable you to do scientific research well?
8	What platform or help do you think the country has provided for the improvement of your scientific research ability?

Table 3. Analysis results of participants' open login (part)

Subcategory	Initial concept	Original statement
B1 Scientific research platform	A1 National Competition	Participating in the Challenge Cup is very helpful for scientific research
	A2 National scientific research project	In fact, the innovation and entrepreneurship training program for college students we participated in was also very helpful
B2 Research Grants	A3 Research Fund	Some funds that mentors will apply for on national and provincial platforms
	A4 Aid for Studying abroad	I can apply for the overseas study fund of the National Foundation of China, and go abroad for a visiting study at public expense
	A5 Competitive disciplines	As an advantage subject, our university gives us a research and development cost
B3 Incentive mechanism	A6 Reward incentive	Our university will support us to research. In addition to the funding, the platform, I think there is also a reward mechanism
B4 Opportunities for scientific research practice	A7 Scientific research project approval	The university will organize application for scientific research projects every year
	A8 School-enterprise cooperation	Our college has industry-university-research cooperation with many enterprises
	A9 Academic conference exchange	Our university always encourages us to participate in international conferences
B5 School research resources	A10 Financial support	The university's scientific research projects, and then there are innovative research projects, which can bring certain financial support
	A11 Facility support	Our university has better facilities for scientific research
	A12 Key Laboratory	The university has set up a state key laboratory
.....		
B29 Feelings of anxiety	A64 Lost	I am often lost, and quite lost
	A65 The pressure of continuous failure	You are sure to be under pressure. You will lose patience if you fail again and again
	A66 Not confident	When I first entered the competition, I was a little unsure
B30 Sense of cooperation	A67 Awareness of mutual assistance	In this process, everyone is mutually beneficial
	A68 Team work	The fire is high when everyone gathers wood
B31 Challenge	A69 Pursue challenges	If you feel too stable, in fact, you do not have that kind of joy after participating
	A70 seeks to innovate	A simple experiment may not be innovative, it is the continuous failure may be challenging
B32 Initiative	A71 Report proactively	Usually you have to report to your teacher
	A72 Active communication	I am the type who takes the initiative to communicate with teachers
B33 Communication and coordination	A73 Disagreement handling	When two different solutions emerge, we will first discuss the science and feasibility of the solution
	A74 Communicate with each other	We will communicate and compromise in many ways
	A75 Expression	I think my achievement is Powerpoint speech and expression
B34 Independence	A76 Own efforts	When I encounter difficulties, my first approach is to solve them through my own efforts
	A77 Self-discovery of problems	The problems we found from the very beginning were self-posed problems
	A78 Do it by oneself	Do it in a personal way, so that you can exercise your scientific hands-on skills
B35 Interest	A79 Enthusiasm	I think enthusiasm is more important in the beginning
	A80 Fun	You'll find it fun to do research
	A81 Charm	This is also a charm of scientific research
B36 Self-efficacy	A82 Confidence	I believe this problem can be solved with more time
	A83 Patience	I am a more patient person. If I fail, I will try again
	A84 Belief	Always have the belief that you can do it eventually

This interview is mainly conducted in the form of two-to-one interview, that is, there are two interviewers, one of whom is the principal and the other is the assistant, and the interviewee is one. After obtaining the consent of the interviewees and informing them of the relevant research content and purpose, the interview was conducted, the interview content was recorded, the recorded data were transcribed and sorted out, and the interview data of more than 70,000 words were finally obtained. The data were checked and confirmed by two interviewers to ensure that the meanings of the interviewees remained the same.

3.2. Data sorting and analysis

The three-level coding technology in grounded theory is adopted for data collation, namely open coding, axial coding and selective coding.

(1) Open coding

Open coding belongs to first-level coding, which analyzes the original text word by word, labels and conceptualizes the original data, tries to suspend the opinions of the researchers, and tries to select the original words of the respondents to improve credibility. [14] In this study, the original interview data were screened, compared and summarized, with a total of more than 80,000 words. The initial concept is further categorized into 36 sub-categories, including scientific research platform, scientific research resource support, achievement transformation and application.

(2) Axial coding

Axial coding is to further summarize and summarize the subcategories after conceptualization and categorization of the initial data, and further explore the internal connections and logical relations among the subcategories.

Table 4. Results of axial coding analysis

Dimensions	Category of principal	Subcategory
Characteristics of environment	C1 National support C2 University's Support C3 Tutor's support C4 Partners' support	B3 Incentive mechanism, B4 Scientific research practice opportunity, B5 School scientific research resources, B6 Tutor's encouragement, B7 tutor's guidance frequency of communication, B8 Control of research direction, B9 Support of research resources, B10 Scientific research help, B11 Psychological counseling help
Structure of capabilities	C5 Scientific research and practice ability C6 Logical thinking ability C7 Time management ability C7 Self-learning ability	B12 Achievement transformation and application, B13 Research design and implementation, B14 Data collection and processing capacity, B15 Induction, B16 Flexibility, B17 Reflection, B18 Judgment, B19 Plan, B20 Execute, B21 Optimize, B22 Independent study, B23 Independent research
Structure of quality	C8 Quality factor C9 Emotional factors C10 Momentum factors C11 Personality factors	B24 Perseverance, B25 Pursuit of excellence, B26 Self-discipline, B27 Emotional stability, B28 Emotional adaptability, B29 Anxiety, B30 Sense of cooperation, B31 Challenge, B32 Initiative, B33 Communication and coordination, B34 Independence, B35 Interest, B36 Self-efficacy

(3) Selective coding

Selective coding mainly excavates the dimensions of core categories. In this paper, the logical relationships and

relational connotations among the conceptual categories formed by axial coding are sorted out, as shown in Table 5.

Table 5. Typical relationship structure of main categories

Typical relationship structure	Structure of relationship	The connotation of relationship structure
State support→University's support→tutor's support	Mediating relationship	The national scientific research platform and scientific research funding will affect the school's policy adjustment of incentive mechanism, scientific research practice opportunities and scientific research resources, and tutors will adjust the direction of students' scientific research, the tendency of scientific research resources and the content of encouraging students according to the policy
Emotional factors→logical thinking ability→time management ability	Mediating relationship	Emotional stability, emotional adaptability, and anxiety can affect rationality, that is, generalization, flexibility, reflection, and judgment, which can affect students' ability to plan, execute, and optimize their time to solve problems
Momentum factor→scientific research practice ability	Cause and effect relationship	The sense of cooperation, initiative and challenge can promote students' ability to collect and process data, carry out more active research design and implementation, and promote the transformation and application of results
Quality factor→scientific research practice ability	Cause and effect relationship	Perseverance, pursuit of excellence and self-discipline directly affect students' ability of scientific research practice, and affect the progress and continuity of students' achievements transformation and application, research design and implementation, data collection and processing

(4) Saturation analysis

In order to ensure the accuracy of the grounded theory research results, this study further conducts saturation test. Through open login, axial coding and selective coding of the two reserved interview records, no new concepts, categories or relationships were found. Therefore, it is believed that the concepts and categories of coding results in this study have reached saturation.

4. Research Findings

Through the coding and analysis of the interview records above, it can be seen that the scientific research and innovation ability of the top scientific research students in colleges and universities is affected and acted on by many different factors, and different individuals have different focuses while the overall situation is similar. That is, the factors affecting the scientific research and innovation ability have different weights for different outstanding students, but they are all affected by external factors and internal individual factors on the whole, which affect the scientific research and innovation ability of top scientific research students in colleges and universities in different ways. In the following section, the influence of external environmental characteristics, internal quality structure and ability structure on the scientific research and innovation ability of top-notch scientific research talents in colleges and universities is explored in the form of "story line."

(1) Environmental characteristics: "outside-in" intervention influence

As for the external factors, the support of the state, the help of the university where the students are from, the support of the teachers and their peers are the external driving force for the development of the scientific research and innovation ability of the top students, and the external factors that they will inevitably contact in scientific research, which affect the formation of their scientific research and innovation ability from the outside and the inside.

Through coding and analysis, it can be found that excellent college students generally hold a highly positive attitude towards the support of the state, the support of the school, the support of the tutor and the support of their peers. Participating in national competitions is for students to "broaden their horizons and expand their thinking" (L9). In addition, students can "apply for government-funded study abroad" (L5) and "subsidise us to study abroad for a PhD free of charge" (L7), which can provide students with further opportunities to expand their scientific research and further study. On the whole, the large-scale scientific research platform and scientific research funding provided by the state provide direct help for students' scientific research practice, expand students' scientific research cognition internally, facilitate the accumulation of scientific research innovation, expand students' scientific research boundary externally, and enable students to further study on a larger platform.

The support of the university is also a major driving force for the growth of outstanding students' scientific research and innovation ability, especially for science and technology majors. The interviewees mentioned that the university provided "relatively good research equipment and research platform" (L11) and "established state key laboratory" (L2) for students' scientific research activities, which met students' demand for scientific research hardware resources. In addition, it can also provide students with many opportunities

and platforms for scientific research. Every year, the school will "organize scientific research projects and large-scale innovation projects, and also provide certain financial support" (L5). It can be seen that on the one hand, the support of the university breaks the "hard condition" constraints of students' scientific research activities; on the other hand, by setting up characteristic scientific research activities, it creates scientific research opportunities and atmosphere for students, which provides sufficient nutrition for the growth of students' scientific research ability.

In addition, the support of supervisors affects the scientific research progress of top students. It is necessary for the supervisor to control the direction of research, and the supervisor can "give me a general direction" (L10). The resources provided by tutors also become "nutrients" for the development of students' scientific research ability. Tutors will use their own resources to help students' growth, "they will take me to attend some academic conferences" (L4), and they will also ask experts outside the university to comment on our works "(L3), which are all supported by tutors' resources. At the same time, the tutor encourages students to do something related to scientific research (L9), which is also of great significance to the growth of students' ability. Tutors have the most effective influence on students' scientific research, the control of students' scientific research direction is the cornerstone of students' effective scientific research innovation, and the support of tutors' scientific research resources is the propellant of students' scientific research activities.

The support of peers provides the most direct help for the progress of top students' scientific research. In terms of scientific research and academic problems, senior students can "help us solve small problems very well and quickly" (L7). Secondly, when they have bad emotions, they can "joke with senior brothers and sisters to relieve their mood" (L5), so as to relieve their emotions (L9). It can be seen that the same students can "fight side by side" in both scientific research and life, and most directly help students solve scientific research problems and emotional problems.

To sum up, by providing high-level scientific research platforms, the state stimulates students' scientific research potential in the form of high-level competitions and scientific research innovation projects, and consolidates students' scientific research ability with high-quality scientific research resources. With the characteristics of "nearby", the school provides students with direct supply of scientific research resources and scientific research platform. Tutors and peers provide direct help in thinking and practice as "guides", and cultivate and shape students' scientific research ability as "pioneers". These factors will affect students' scientific research ability from the outside and interfere with students' internal ability development in the form of external objective existence. These factors are some of the common characteristics of the top scientific research talents investigated.

(2) Capability structure: "inside-out" promoting influence

For the ability structure, the scientific research practice ability, logical thinking ability, time management ability and self-learning ability have a "from the inside out" promoting impact on the scientific research and innovation ability of the top scientific research students in colleges and universities. These abilities improve the efficiency of students' scientific research and lay a foundation for the effective improvement

of students' scientific research ability.

Through coding and analysis, it can be found that the ability structure has an impact on the efficiency of the progress of excellent students' scientific research activities, and then affects their ability to do scientific research. The practical ability of scientific research can help students solve problems and make progress. Respondents said that they "designed the whole process of the experiment by themselves" (L5), and "conducted sufficient research and analysis" (L7) before each experiment, so as to exercise their scientific research and practice ability. The ability of logical thinking determines the way students think and solve problems. One interviewee said that he was "good at summarizing some ideas from other people's articles", so as to gain experience and inspiration of thinking (L1). Many interviewees mentioned that by being flexible and looking for new breakthroughs in scientific research, "this road cannot go, so we will change direction" (L2). It can be seen that flexibility can make students break through the conventional thinking and have the flexibility of scientific research thinking. Some students mentioned that they would reflect when they made a mistake, check whether the problem was caused by "the same mistake" (L9), and look for "wrong feedback" (L4). Most of the students indicated that they had rational judgment on the opinions of the outside world, and they could not trust 100% of the published literature. They had to trust their own experimental data (L10), and would not directly trust the opinions of others, but would verify my ideas with my logic (L4). Time management ability becomes an important pillar of their scientific research. They complete work according to the planned time point (L2), arrange things according to the priority (L7), and execute efficiently according to the plan. Most students "focus on scientific research" (L10), and ensure their investment in scientific research through "trade-offs" (L4) and "trade-offs" (L8). Therefore, the allocation of research time is related to the investment in scientific research, thus affecting the effect of scientific research. It is found in the interview that students generally encounter aspects they do not understand in scientific research. Most interviewees have self-learning consciousness from 0 to 1, and can consciously "take the initiative to learn" (L3), which reflects their self-learning consciousness. With self-study and research consciousness to form the ability of self-study, so as to solve the unknown problems in scientific research.

It can be seen that students' ability structure is related to students' ability to solve scientific research problems with their hands and brains, whether students can think independently, find opportunities and start to implement them, plays a decisive role in scientific research and innovation ability, and plays a promotion effect on students' scientific research process, which is also the common characteristic of the top scientific research talents investigated.

(3) Quality structure: the impact of scientific research continuity and stability

As for the quality structure, quality reflects the individual behavior characteristics, motivation and willingness, and is reflected in their actual performance, which provides a guarantee for the formation of top students' scientific research and innovation ability. The study found that quality factors, emotional factors, personality factors and motivation factors are the factors that affect the continuous and stable growth of the scientific research ability of the top scientific research students.

The formation of quality and ability is closely related. The road of scientific research is long and bumpy. How to lead outstanding students to move forward steadily depends on whether students can maintain perseverance and stable mentality in the process of scientific research. Motivation factors can promote students to move forward, "let me continue to push forward" with inner motivation (L10), "actively communicate with teachers" (L5), "actively contact" relevant institutions for help (L9) and other ways to obtain information and resources, so as to promote scientific research projects. Choose challenges to seek "meaning of research" (L4, L7), "increase motivation" (L8), and "complete research faster and discover new ideas" (L10) through teamwork. It can be seen that students can be committed to scientific research by improving initiative, increasing challenge, and increasing motivation for scientific research through cooperation. The personality characteristics of most students are also of great significance to their scientific research. Students generally have the independence to "first solve problems by themselves" (L8, L9), attach importance to the role of "mutual communication and coordination" (L2), think that scientific research is "quite interesting" (L11), and have the self-efficacy of "believing in themselves" (L4). Can use personality factors to contribute to their own scientific research. It is found in the interview that the quality of students also affects their ability to do scientific research. The quality of perseverance, pursuit of excellence and self-discipline is manifested as the focus of scientific research and internalized as the ability of scientific research. People are emotional animals, and emotional factors always affect our attitude and efficiency in doing things. In the process of scientific research, students will frequently encounter "continuous failure of scientific research" (L11) and "lack of confidence" (L10). Students generally express "pressure and anxiety" (L5), but they all have the way of "self-regulation" emotions (L11). With the "frequent encounter" of scientific research problems (L9), he gradually managed to maintain emotional stability in the face of pressure, while also acknowledging that "pressure is good". It can be seen that the regulation and stability of emotions can help students get rid of emotional troubles in the process of scientific research, and the anxiety caused by pressure can also become one of the driving forces for their scientific research.

Based on the above research findings, this study constructs the influencing factors model of the scientific research and innovation ability of the top students in colleges and universities (Figure 1), and describes the action mechanism of different influencing factors on the scientific research and innovation ability of outstanding students through the story line. As an external factor, environmental characteristics have an impact on the development of students' scientific research and innovation ability. For scientific research ability, environmental characteristics can be either an incentive factor or a constraint factor, and the impact of environmental characteristics on students' scientific research and innovation ability is inevitable. The factors of quality structure have individual characteristics and will become the motivation and support force of scientific research under the action of environmental characteristics; Ability structure is the core of this model, which directly or indirectly constitutes the main part of students' scientific research ability. The growth of students' ability needs the support of environmental resources, including the supply of information, opportunities, funds and hardware for scientific research activities, so as to form the

practical power of scientific research. Therefore, the ability structure is the "prototype" of students' scientific research ability, through which students can have the internal spiritual

power and external action power of scientific research innovation.

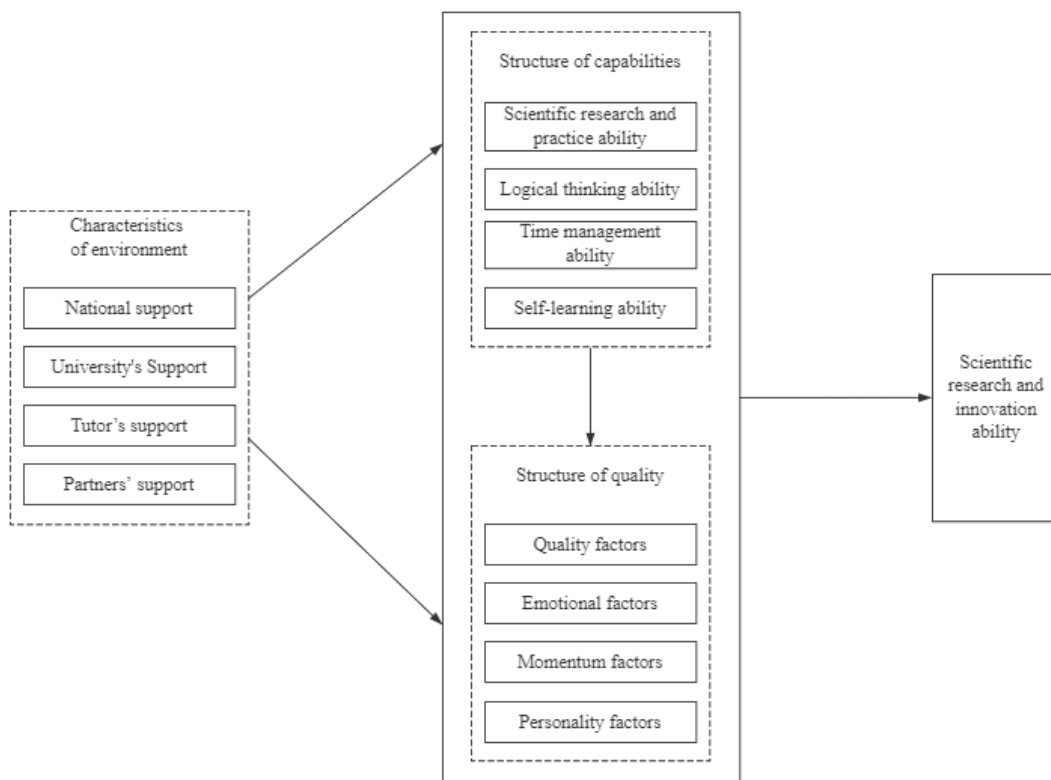


Figure 1. Model of influencing factors of top students' scientific research ability in colleges and universities

5. Discussion and Suggestions

Through the sorting of the original interview data and the observation of the interviewees' preparation for the Challenge Cup, this paper deeply analyzes the influencing factors of the scientific research and innovation ability of the top university students. We find that external environment, internal quality, personal ability and other influencing factors will play a crucial role in the performance of top university students in scientific research tasks and competitions. Environmental factors influence students' scientific research ability from the outside to the inside, mainly playing the role of direction guidance and resource support, and internalizing external information and resources into personal ability. The ability structure affects the scientific research ability of students from the inside out. The quality structure is reflected in the continuity and stability of students' scientific research, and the improvement of their scientific research ability is achieved by considerable accumulation and research. The growth of students' scientific research and innovation ability needs external support and self-adjustment, so as to obtain the most effective promotion and become the top talents in scientific research. Therefore, this paper puts forward the following suggestions:

Firstly, a multi-subject training mechanism should be established to help improve the scientific research and innovation ability of college students. It is found in the research that in the environment of outstanding students, the country, the school, the tutor and the same students play different roles to meet the different needs of these top scientific research students in the development of scientific

research and innovation ability. Therefore, educational authorities, colleges and universities, supervisors and peers should fully understand and understand the needs of college students in scientific research, and give the most appropriate help according to the characteristics of their roles. Specifically, educational authorities should actively build a good scientific research platform to provide students with opportunities for academic exchanges and competition, so that students can promote the continuous growth of their scientific research and innovation ability by means of expanding academic cognition and competition. As the initiator and guide of students' scientific research, tutors should lead students to grasp the right direction and correct method by "teaching people to fish", so that students can explore and master scientific research skills under the premise of "doing the right thing". Peers have the advantage of direct contact. As elders, they should be able to help "those who have heard the truth" solve the details of their scientific research, optimize the scientific research process, and improve the efficiency of their scientific research and innovation ability growth.

Second, cultivate college students' planning consciousness, encourage students to take the initiative to practice, learn by themselves, and plan ahead. In this study, it is found that facing unknown things, students need to solve them independently. Therefore, the school should pay attention to the cultivation of students' ability to solve problems independently. First of all, the ability of dialectical thinking should be cultivated. Students should be able to analyze problems in the face of problems, so as to take the lead in thinking, systematically disassemble problems, distinguish

the primary and secondary, and make rational decisions. The second is to train students' ability to act, take action according to plan, open source learning and reasonable selection of coping methods, improve the proficiency of core skills.

Third, provide effective psychological relief help, pay attention to the mental health of college students. After in-depth interviews, it is found that most of the interviewed top scientific research talents have different degrees of anxiety, and some even affect their health. Therefore, the school should set up a targeted psychological counseling center, pay attention to the psychological status of scientific research personnel, protect the personal privacy of students, so that students can "have a solution to the difficulties, the heart has a safe place", and in this process, the tutor should always care about and care for students' life and mental health, so as to achieve the coexistence of strict love, according to their aptitude. At the same time, students themselves should also cultivate good psychological quality, "trouble is bodhi", do valuable learning, let their knowledge and heart in the process of learning to be tempered, in order to effectively deal with all kinds of difficulties encountered in the process of scientific research, and then realize the steady improvement of scientific research and innovation ability.

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