Qualitative Analysis Method for Training of College Students' Entrepreneurial Resilience from the Perspective of Entrepreneurial Ecological Environment

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Abstract—Due to the constraints of the entrepreneurial ecological environment and the heterogeneity of the individual college students and their interpersonal relationships and situations, some specific problems like psychological potential development and stress buffering effect in the process of college students' entrepreneurial resilience cultivation have not been fundamentally resolved. Therefore, this paper explores the qualitative analysis method for cultivation of college students' entrepreneurial resilience from the perspective of entrepreneurial ecological environment. First, the relationship among the main roles in the entrepreneurial ecosystem was shown, the homogeneity-driven integration process of the strategies for college students' entrepreneurial resilience cultivation was expounded, and a knowledge interaction model for college students' entrepreneurial resilience cultivation was constructed. Then, a conceptual model of college students' entrepreneurial heterogeneity was constructed, and a dynamic evolution analysis was performed on the homogenization-oriented complementary adjustment of college students' entrepreneurial ecological environment. The experiment showed that the empirical results of the constructed model basically met the theoretical expectations. Finally, the experimental results under the completely heterogeneous, generally homogenized and completely homogeneous states were given and discussed, which verified the effectiveness of the homogenization-oriented complementation strategy.

Keywords—entrepreneurial ecological environment, entrepreneurship of college students, mental resilience training, qualitative analysis

1 Introduction

At present, the concept of mass entrepreneurship and innovation is taking root in people's heart. With the implementation of policies by governments at all levels and the active responses from all sectors of society, new industries, models and business forms have been effectively stimulating social and economic vitality, and more and more college students have joined the entrepreneurial team [1-7]. College students

have relatively rich knowledge reserves and also creativity which is lacked by other high-level intellectuals, but they also need to be psychologically ready for the great risks and challenges of entrepreneurship. Having entrepreneurial resilience will help college students actively cope with the inevitable setbacks and pressures they will face in the entrepreneurial process [8-15]. Due to the constraints of the entrepreneurial ecological environment and the heterogeneity of the individual college students and their interpersonal relationships and situations, some specific problems like psychological potential development and stress buffering effect in the process of college students' entrepreneurial resilience cultivation have not been fundamentally resolved [16-22]. Therefore, it is of certain practical value to carry out relevant research aiming at the heterogeneity problem, which is the key obstacle in the cultivation of the entrepreneurial resilience of college students.

Russell et al. [23] examines the relationship between the use of success factors by high-risk students and their academic performance and compared the final grades and dropout risks of students who were expected to have poor grades after the first midterm exam. The results showed that high-risk students who used the success factors were resilient. Based on the theories of emotion and social cognition, Liu [24] proposed a research model for college students' psychological capital in entrepreneurship to test whether the students' psychological capital in entrepreneurship plays an intermediary role in promoting entrepreneurial exploratory learning. The results show that it is of great significance to enrich the applied research on the psychological capital in entrepreneurship and innovate the teaching mode in entrepreneurship education for students from the perspective of psychological capital. Sun et al. [25] investigated the influences of students' entrepreneurial psychological capital (optimistic, hopeful, daring to take specific actions and actively growing) and work values (ease and comfort, competence and independence) on their entrepreneurial intentions through a questionnaire survey of 644 college students. According to the questionnaire structure, the paper analyzed the relationships between 6 independent factors and students' entrepreneurial intention, and constructed a prediction model of entrepreneurial intention using the BP neural network. Studies have pointed out that in a more fragile environment, individuals tend to be more resilient and show higher entrepreneurial intentions. Taking into account the reviews of the importance of self-efficacy, self-determination, self-regulation and social context in determining resilience profiles, Pita and Costa [26] linked the existing theoretical contributions with empirical results and took resilience and entrepreneurship as the fundamental research areas. The empirical results demonstrated a relationship between personal resilience and entrepreneurial initiative. Madondo and Phiri [27] regarded background knowledge and perspectives in innovation as the challenges to drive the discourse on micro-entrepreneurship in Southern Africa. It attempted to figure out how the endogenous innovations in Mvuma micro-enterprises in Zimbabwe are made and found that the background perspectives of micro-enterprises such as social creativity, capital, resilience, and motivation all came from this Mvuma community.

Based on the existing research results, it can be seen that the entrepreneurial environment and entrepreneurial resilience have been studied for a long time, but there are still some deficiencies in all these studies. For example, there are few theoretical and

empirical studies on college students' entrepreneurial resilience as a dependent variable, and no in-depth research has been carried out on the cultivation of college students' entrepreneurial resilience in an entrepreneurial ecological environment. Therefore, this paper explores the qualitative analysis method for cultivation of college students' entrepreneurial resilience from the perspective of entrepreneurial ecological environment. Section 2 first shows the relationship among the main roles in the entrepreneurial ecosystem, expounds the homogeneity-driven integration process of the strategies for college students' entrepreneurial resilience cultivation, and constructs a knowledge interaction model for college students' entrepreneurial resilience cultivation. Section 3 constructs a conceptual model of college students' entrepreneurial heterogeneity, and provides a dynamic evolution analysis on the homogenization-oriented complementary adjustment of college students' entrepreneurial ecological environment. Section 4 presents an experiment, which shows that the empirical results of the constructed model can basically meet the theoretical expectations. Finally, it provides and discusses the experimental results under the states of completely heterogeneous, generally homogenized and completely homogeneous to verify the effectiveness of the homogenization-oriented complementation strategy.

2 Knowledge interaction system for cultivation of college students' entrepreneurial resilience

A stable and harmonious entrepreneurial ecosystem consists of five tangible participants, namely scientific research organizations, cooperative enterprises, governments, incubators, and college students, and three intangible participants, namely macroeconomic environment, industrial development environment and entrepreneurial cultural environment. Figure 1 shows the relationships among these participants in the entrepreneurial ecosystem. All the participants involved in entrepreneurship interact with each other and act together on the core role of the system - college students. The negative impacts from the risk factors of any participant will bring psychological pressure to college students, and what is more, different college students also live in different entrepreneurial ecological environments. Therefore, it is necessary to construct a hierarchical system of barriers to college students' entrepreneurial resilience cultivation, and identify the barriers that are caused by the heterogeneity of the entrepreneurial ecological environment. This paper introduced the knowledge interaction process model to study the dynamic evolution path of the homogenization-oriented complementation of college students' entrepreneurial resilience cultivation from the perspective of entrepreneurial ecological environment and to describe the path of realizing college students' entrepreneurial resilience cultivation.

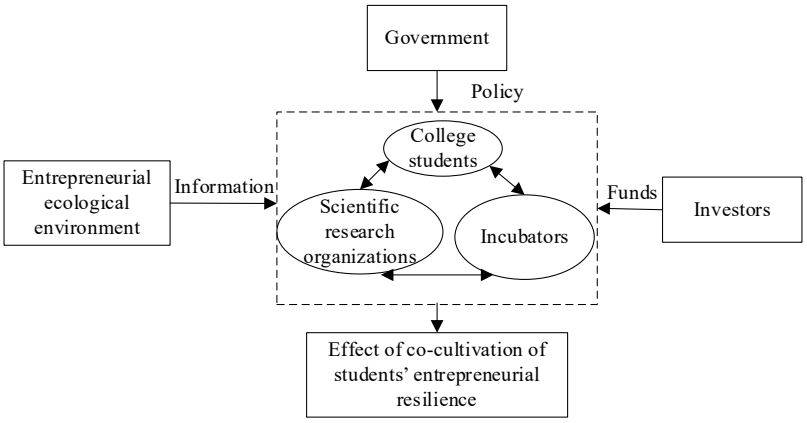

Fig. 1. Relationships of the main roles in the entrepreneurial ecosystem

The cultivation process of college students' entrepreneurial resilience is, in essence, a process where the participants in the entrepreneurial ecological environment share and create cultivation strategies, so as to form the optimal strategies for cultivation of college students' entrepreneurial resilience. It is also regarded as a knowledge interaction process. The complementarity of the cultivation programs and focuses of different participants in the entrepreneurial ecological environment is the basis for the formation of synergy among them, manifested in the complementarity of the knowledge on basic training, practical training and entrepreneurial network formation and operation. Only when cultivation strategies interact with each other can the complementary cultivation by the participants in the entrepreneurial ecological environment of college students be effective and better than the superposition of partial entrepreneurial resilience cultivations. Therefore, this paper regarded the process of college students' entrepreneurial resilience cultivation as a knowledge interaction process, in which the complementary integration and synergistic effect of the entrepreneurial resilience cultivation strategies for college students should be realized. Figure 2 shows the homogeneity-driven integration process of college students' entrepreneurial resilience cultivation.

In the knowledge interaction process of college students' entrepreneurial resilience cultivation, to allow the sharing of cultivation strategies among the participants to gradually shift to the implementation of an overall cultivation strategy, the participants in the entrepreneurial ecological environment need to carry out closer communications and interactions, and in this process, the explicit and implicit knowledge will be transformed and act as supplements to each other within and between the participants.

In order to simplify the constructed knowledge interaction process model, this paper only considered the internalization and externalization of the overall cultivation strategy in the model, to characterize the mutual transformation of explicit and implicit knowledge. Let us take the content of entrepreneurial resilience cultivation of college students as a model knowledge base. Suppose that the knowledge stock of the

knowledge base at time φ is $L(\varphi)$, where the stock of explicit knowledge is $L_x(\varphi)$, and that of implicit knowledge $L_y(\varphi)$, and the initial stock of explicit knowledge $L_x(0)=L_{x0}$ and the initial stock of implicit knowledge $L_y(0)=L_{y0}$, and suppose that the implicitness of explicit knowledge, which represents the internalization degree of explicit knowledge, is represented by L_{xy}, and the explicitness of implicit knowledge, which characterizes the externalization degree of implicit knowledge, by l_{yx}. Since the difficulties are different in the internalization of explicit knowledge and the externalization of implicit knowledge, it is considered that $0<l_{yx}<1$ and $l_{xy}=1$. Equations (1) and (2) provide the model expressions for the mutual transformation of explicit knowledge and implicit knowledge:

$$\frac{dL_x(\phi)}{d\phi} = l_{yx}L_y(\phi) \tag{1}$$

$$\frac{dL_y(\phi)}{d\phi} = l_{yx}L_x(\phi) = L_x(\phi) \tag{2}$$

Combine the above two equations, and there are:

$$L_x(\phi) = X_1 d^{\sqrt{l_{yx}}\phi} + Y_1 d^{-\sqrt{l_{yx}}\phi} \tag{3}$$

$$L_y(\phi) = X_2 d^{\sqrt{l_{yx}}\phi} + Y_2 d^{-\sqrt{l_{yx}}\phi} \tag{4}$$

where, X_1, Y_1, X_2, and Y_2 are all constants. Combine Equations (1) and (3), and there are:

$$X_1 = \frac{L_{x0} + L_{y0}\sqrt{l_{yx}}}{2} \tag{5}$$

$$Y_1 = \frac{L_{x0} - L_{y0}\sqrt{l_{yx}}}{2} \tag{6}$$

From Equations (3), (5) and (6), the following can be obtained:

$$L_x(\phi) = X_1 d^{\sqrt{l_{yx}}\phi} + Y_1 d^{-\sqrt{l_{yx}}\phi} = \frac{L_{x0} + L_{y0}\sqrt{l_{yx}}}{2} d^{\sqrt{l_{yx}}\phi} + \frac{L_{x0} - L_{y0}\sqrt{l_{yx}}}{2} d^{-\sqrt{l_{yx}}\phi} \tag{7}$$

Similarly, there is:

$$L_y(\phi) = X_2 d^{\sqrt{l_{yx}}\phi} + Y_2 d^{-\sqrt{l_{yx}}\phi} = \frac{L_{y0}\sqrt{l_{yx}} + L_{x0}}{2\sqrt{l_{yx}}} d^{\sqrt{l_{yx}}\phi} + \frac{L_{y0}\sqrt{l_{yx}} - L_{x0}}{2\sqrt{l_{yx}}} d^{-\sqrt{l_{yx}}\phi} \tag{8}$$

And the following can be further obtained:

$$L(\phi)=\frac{\left(L_{x0}+L_{y0}\sqrt{l_{yx}}\right)\left(1+\sqrt{l_{yx}}\right)}{2\sqrt{l_{yx}}}d^{\sqrt{l_{yx}}\phi}+\frac{\left(L_{y0}\sqrt{l_{yx}}-L_{x0}\right)\left(1-\sqrt{l_{yx}}\right)}{2\sqrt{l_{yx}}}d^{-\sqrt{l_{yx}}\phi} \tag{9}$$

Take the derivative of the above equation, and there is:

$$\frac{dL(\phi)}{d\phi}=\frac{\left(L_{x0}+L_{y0}\sqrt{l_{yx}}\right)\left(1+\sqrt{l_{yx}}\right)}{2}d^{\sqrt{l_{yx}}\phi}+\frac{\left(L_{x0}-L_{y0}\sqrt{l_{yx}}\right)\left(1-\sqrt{l_{yx}}\right)}{2}d^{-\sqrt{l_{yx}}\phi} \tag{10}$$

When L_{x0}-$L_{y0}L_{yx}^{1/2}$>0 and $dL(\varphi)/d\varphi$, $L(\varphi)$ increases with the increase of time φ. When L_{x0}-$L_{y0}L_{yx}^{1/2}$<0, it can be known from the above equation:

$$\frac{dL(\phi)}{d\phi}>\frac{\left(L_{x0}+L_{y0}\sqrt{l_{yx}}\right)\left(1+\sqrt{l_{yx}}\right)}{2}+\frac{\left(L_{x0}-L_{y0}\sqrt{l_{yx}}\right)\left(1-\sqrt{l_{yx}}\right)}{2}L_{x0}+l_{yx}L_{y0}>0 \tag{11}$$

At this time, L(φ) also increases with the increase of time φ.

It can be seen from the above analysis that whether Lx0-Ly0Lyx1/2 is above or below 0, L(φ) is an increasing function of time φ. This means, with the passage of time φ, the knowledge stock in the knowledge base of entrepreneurial resilience cultivation for college students continues to increase in the mutual transformation between explicit and implicit knowledge, until it reaches the upper limit of knowledge stock allowed by the collaborative cultivation of college students' entrepreneurial resilience by the participants in the entrepreneurial ecological environment.

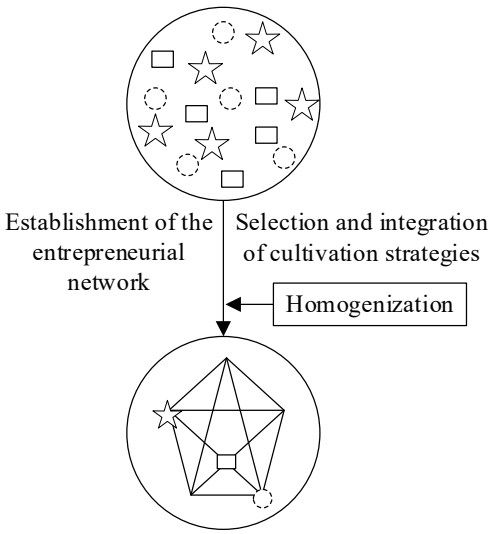

Fig. 2. Homogeneity-driven integration process of the strategies for college students' entrepreneurial resilience cultivation

3 Dynamic evolution of the homogenization-oriented complementation of the entrepreneurial ecological environment for college students

Figure 3 shows the conceptual model of college students' entrepreneurial heterogeneity established in this paper. There are interactive relationships among the heterogeneity factors like individual, interpersonal relationship and situation, and there is also mutual promotion among the factors within individual heterogeneity and interpersonal relationship heterogeneity.

Under normal circumstances, in the complementary network of cultivation strategies and knowledge aimed to cultivate college students' entrepreneurial resilience, there is no substantial interactive behavior like sharing and creation of training strategies among the participants. The interactions among participants are infrequent and last for only a short time, so the knowledge stock in the knowledge base of entrepreneurial resilience cultivation for college students increases at a low speed. If the participants in the entrepreneurial ecological environment carry out division of labor and specialization according to their advantages and focuses in cultivation, the communications and interactions among the participants will be more frequent and last for a longer time, and the knowledge stock of the knowledge base will increase faster. The collision between and integration of the complementary training strategies from the participants in the entrepreneurial ecological environment will promote more in-depth exchanges and interactions between them, prolong the durations of the activities and further increase the growth of the knowledge stock of the knowledge base.

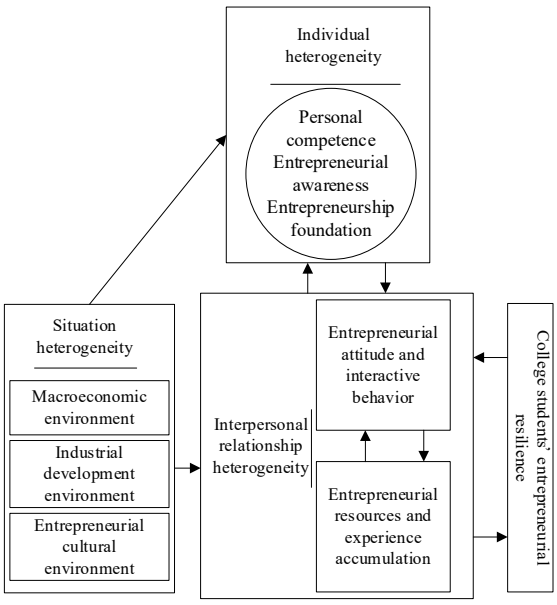

Fig. 3. Conceptual model of college students' entrepreneurial heterogeneity

Suppose that the initial knowledge stock of the entrepreneurial ecological environment knowledge base for college students is L_0, that after the initial, division of labor and integration stages of the knowledge interaction process of college students' entrepreneurial resilience cultivation, the increments of knowledge stock are represented by ΔL_1, ΔL_2 and ΔL_3, respectively, that the co-cultivation effect coefficient λ of the participants in the environment remains unchanged, and that the homogenization level of the entrepreneurial ecological environment for college students satisfies $0<F<F^*$. Equation (12) gives the expression of the total co-cultivation effect realized by the participants in the entrepreneurial ecological environment after the initial stage:

$$TSE^{(1)} = \mu FE = \mu F\left(1-F\right) = \frac{\Delta L_1}{L_0} \tag{12}$$

After the division of labor, the total co-cultivation effect realized by the participants in the entrepreneurial ecological environment is expressed as follows:

$$TSE^{(2)} = \mu FE = \mu F\left(1-F\right) = \frac{\Delta L_1 + \Delta L_2}{L_0} \tag{13}$$

After the integration stage, the total co-cultivation effect realized by the participants in the entrepreneurial ecological environment is expressed as follows:

$$TSE^{(3)} = \mu FE = \mu F\left(1-F\right) = \frac{\Delta L_1 + \Delta L_2 + \Delta L_3}{L_0} \tag{14}$$

Solve the above three equations, and then there are:

$$F^{(1)} = 0.5 - \sqrt{0.25 - \frac{\Delta L_1}{\mu L_0}} \tag{15}$$

$$F^{(2)} = 0.5 - \sqrt{0.25 - \frac{\Delta L_1 + \Delta L_2}{\mu L_0}} \tag{16}$$

$$F^{(3)} = 0.5 - \sqrt{0.25 - \frac{\Delta L_1 + \Delta L_2 + \Delta L_3}{\mu L_0}} \tag{17}$$

Based on the above three equations, it can be known that $F^*>F^{(3)}>F^{(2)}>F^{(1)}>0$, and thus the homogenization level of each evolution stage corresponding to the co-cultivation effect of the participants during the entrepreneurial resilience cultivation of college students can be obtained.

Based on the obtained solution results, a dynamic evolution path model for homogenization-oriented complementation of the entrepreneurial ecological environment for college students can be further constructed. As the entrepreneurial resilience cultivation of college students progresses along the process of "cultivation strategy organization - cultivation strategy integration - cultivation strategy proliferation", the interactions among the participants in the entrepreneurial ecological environment will show different characteristics and advantages of cultivation, and the co-cultivation

effect will be increasingly better. Along with this, the required homogenization level of the entrepreneurial resilience cultivation will also be raised higher.

4 Experimental results and discussion

In the experiment, this paper firstly explored a second-order model about the effects of the entrepreneurial ecological environment on college students' mental resilience training. After determining that the former has a significant effect on the latter, this paper further discussed the effects of the four tangible participants (namely scientific research organizations, cooperative enterprises, governments and incubators) and the three intangible participants (namely macroeconomic environment, industrial development environment and entrepreneurial cultural environment) on the factor level. To this end, the models Sx, Sy and Sz were established respectively to test the effects of the heterogeneity factors of students, namely individual, interpersonal relationship and situation, on their mental resilience. On this basis, the models S'x, S'y and S'z were used to explore the effects of the seven participants on the stability (I), sensitivity (II) and adaptability (III), which constitute the mental resilience of college students.

Based on the constructed second-order model S, the grouped data of individual, interpersonal relationship and situation in the mental resilience training of college students were first imported, and then the weight structure of the model was set up. The degree of difference in the mental resilience training quality of college students was fitted by testing multiple simulations. During model testing, it is necessary to ensure that the fitting form of the group model is basically consistent with that of the baseline model.

Table 1 shows the fitting data of the baseline model and the equivalent one under the individual, interpersonal relationship and situation groups, and it can be seen that the fitting effects of the models are satisfactory. Specifically, under the group models for individual, interpersonal relationship and situation heterogeneity, the path coefficient of the entrepreneurial ecological environment affecting college students' mental resilience is not significant. As shown in Table 2, the fitting forms of the models cannot be consistent. Finally, the difference between the baseline model and the equivalent one was compared, with the results shown in Table 3. When the chi-square difference in the corresponding degree of freedom reaches the significant level ($P<0.05$), it means that the assumption of equivalence does not hold, and that the moderating effect is significant.

Since the P value is sensitive to the sample size of the mental resilience training quality evaluation for college students, other indicators also need to be considered comprehensively. Therefore, the individual, interpersonal relationship and situation factors in college students' entrepreneurship play significant moderating roles in the effect of the entrepreneurial ecological environment on college students' mental resilience cultivation. Through the above analysis, it can be seen that the empirical results basically meet the theoretical expectations, and the entrepreneurial ecological envi-

ronment can significantly affect the mental resilience of college students to a certain extent.

Table 1. Fitting data of the model under different groups

Variable	Gender		Age		Education		Time	
Simulation	***BM***	***EM***	***BM***	***EM***	***BM***	***EM***	***BM***	***EM***
X^2	1653.745	1962.382	1526.415	1728.623	1526.918	1458.726	1827.425	1364.852
Df	915	983	947	963	928	918	937	985
X^2/df	1.928	1.836	1.815	1.806	1.859	1.715	1.738	1.982
P	0.02	0.01	0.07	0.05	0.02	0.07	0.05	0.03
RMSEA	0.58	0.52	0.59	0.54	0.56	0.55	0.51	0.57
GFI	7.25	7.06	7.18	7.63	7.48	7.92	7.86	7.28
AGFI	7.38	7.14	6.28	7.05	7.63	7.58	6.18	6.73
NFI	7.47	7.69	7.15	7.37	7.16	7.83	7.08	7.69
TLI	8.55	8.74	8.26	8.11	8.29	8.64	8.05	8.42
CFI	8.06	8.28	8.38	8.69	8.15	8.29	8.37	8.09

Table 2. Path coefficients of the model under different groups

Variable	Gender		Age		Education		Time	
Group	***Male***	***Female***	***Below 25***	***Above 25***	***Below Bachelor***	***Bachelor or above***	***Within 2 years***	***Over 2 years***
Estimated value	2.61	0.68	0.84	2.69	1.37	1.95	2.84	1.05
S.E.	0.68	0.64	0.62	0.74	0.61	0.78	0.86	0.57
C.R.	3.284	1.326	1.849	3.628	2.715	2.693	3.418	1.923
P	0.35	3.81	1.62	0.95	0.15	0.17	0.05	0.76
Standard estimated value	3.84	1.35	1.68	3.69	2.17	3.58	4.27	1.84

Table 3. Comparative data of the model under different groups

	Gender	Age	Education	Time
DF	25	23	27	24
CMIN	33.522	31.485	23.968	22.417
P	1.28	2.95	6.58	7.39
NFI	0.01	0.03	0.05	0.07
IFI	0.03	0.01	0.09	0.05
RFI	-0.08	-0.05	-0.03	-0.01
TLI	-0.05	-0.03	-0.01	-0.07

Figures 4, 5 and 6 show the experimental results under the completely heterogeneous, generally homogenized and completely homogeneous states, respectively. Except the governments, who are not so flexible in collaboration, the remaining three participants, namely scientific research organizations, cooperative enterprises and incubators, have become much more complementary to each other in terms of basic training,

practical training and entrepreneurial network formation and operation knowledge after undergoing homogenization-oriented complementary adjustments. It can be seen from the figure that in the completely heterogeneous state, the participants in the entrepreneurial ecological environment do not have any overlap in their cultivation focuses and are unfamiliar with each other's cultivation strategies. In a completely homogeneous state, the training content and focuses of the participants in the entrepreneurial ecological environment overlap significantly, and there is no obvious need for these participants to complement each other. In the generally homogenized state, there are some overlaps in the training content under industry-university-research cooperation, but the participants still maintain their training focuses and advantages, thus forming the complementarity of the participants in the entrepreneurial ecological environment.

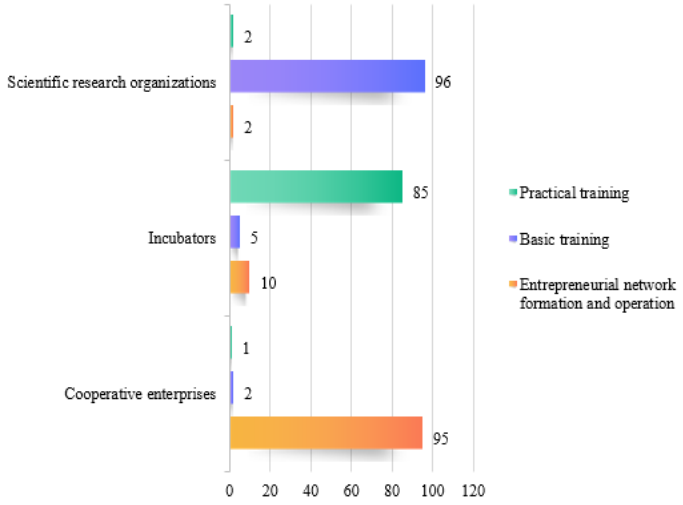

Fig. 4. Experimental results in the completely heterogeneous state

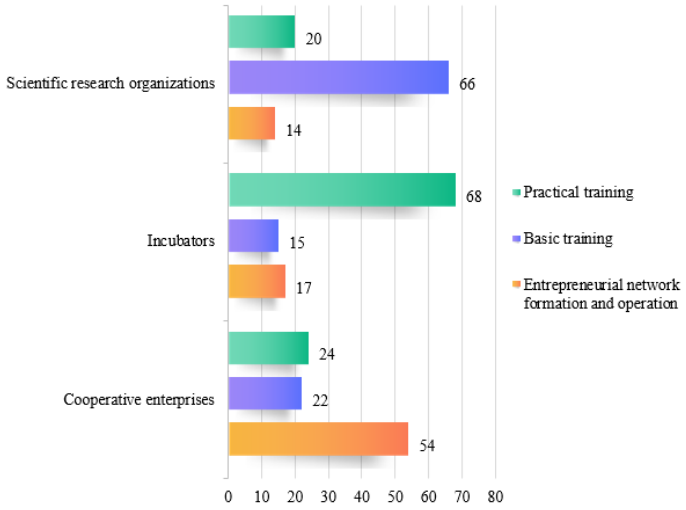

Fig. 5. Experimental results in the generally homogenized state

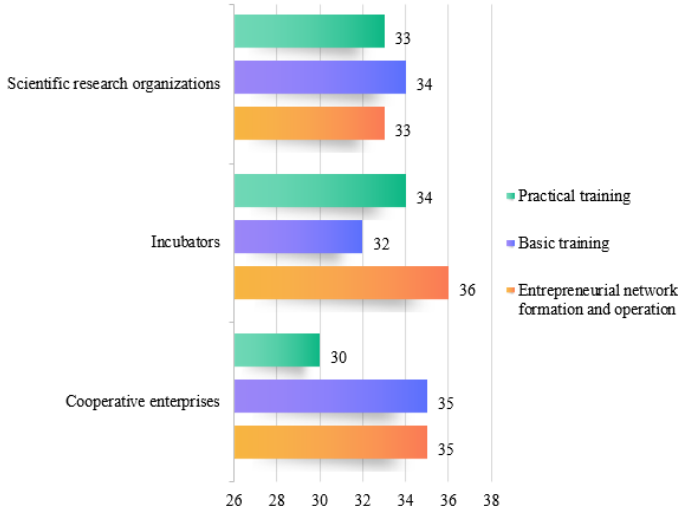

Fig. 6. Experimental results in the completely homogeneous state

5 Conclusions

This paper explored the qualitative analysis method for training of college students' entrepreneurial resilience from the perspective of entrepreneurial ecological environment. First, the relationship among the main roles in the entrepreneurial ecosystem was shown, the homogeneity-driven integration process of the strategies for college students' entrepreneurial resilience cultivation was expounded, and a knowledge interaction model for college students' entrepreneurial resilience cultiva-

tion was constructed. Then, a conceptual model of college students' entrepreneurial heterogeneity was constructed, and a dynamic evolution analysis was performed on the homogenization-oriented complementary adjustment of college students' entrepreneurial ecological environment. The experimental results show the fitting data, path coefficients and comparative data of the baseline model and the equivalent model under different individual, interpersonal relationship and situation groups. Through data analysis, it was found that the empirical results of the constructed model basically met the theoretical expectations. Finally, the experimental results under the completely heterogeneous, generally homogenized and completely homogeneous states were given and discussed, which verified the effectiveness of the homogenization-oriented complementation strategy.

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