System Dynamics Based Modeling of Group Green Cooperation Experiment Teaching

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Abstract

Facing with the increasingly prominent global environmental protection problems, green teaching, as the basis of global sustainable development, has been advocated in China. Especially green experimental teaching have been carried out in most majors with outstanding environmental protection issues in China's higher teaching. However, current literature shows that, except for the pollution-related experiment such as biochemistry and chemical engineering, other majors attach less importance to green experiment teaching, which is due to people's insufficient cognition of generalized green experiment. To make full use of resources, deal with pollutants rationally, and improve green experimental effect, based on the universal requirements of green experimental teaching, for protecting the ecological environment of experimental teaching, research on the influencing factors and driving performance of green experiments in group collaboration is proposed. Firstly, through questionnaire survey, the influencing factors of group green cooperation experiment are analyzed. Secondly, its model is further established based on system dynamics. Finally, simulation on the model should be carried out by Vensim PLE software for the green experiment teaching. The findings suggest that, group is a better way to carry out green experiment effectively in

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colleges and universities. It should be emphasized that the key to popularize green experiment teaching in colleges and universities is to master the group green cooperation features and the green management ability of laboratory managers. In other words, the performance of group green collaborative experiments is mainly driven by the features of group green collaboration and the green teaching management capabilities of laboratory managers. Specially, we should be careful of the consistency between the collaboration characteristics of the experimental group and the green management ability, otherwise it is easy to conflict in the concept, specific operation and other aspects, resulting in inefficient green experiments. At the same time, the group's green cooperation features are limited by its cooperation conditions and are subject to it. Moreover, we also need to identify that laboratory managers' experimental organization capabilities are not equal to their green experimental management capabilities, too rigid experimental management is not conducive to play the performance driving role of green experimental management. The paper aims to provide some theoretical references for developing China's higher green experimental teaching performance through green experimental management mechanisms.

Keywords: System dynamics (SD), green cooperation experiment (GCE), green teaching, simulation.

1 Introduction

Due to excessive consumption of global resources and destruction of ecological environment, protecting environment and realizing global sustainable development has become a severe challenge for mankind. To answer it, China has taken resource conservation and environmental protection as its basic state policy, and green actions such as energy-saving organization, green families and green schools would be called for. Moreover, the key to green development lies in the implementation of green teaching. Green teaching is the basic guarantee and important strategy for green development [1]. Only by cultivating talents with ecological awareness and comprehensive sustainable development, can we further promote environmental protection measures and obtain teaching promoting sustainable development.

The concept of green teaching fundamentally breaks through the boundary of "environmental protection" and formally integrates population quality teaching and humanistic quality for sustainable development, so as to promote the ultimate goal of human progress [2]. As far as green teaching

is concerned, in the experimental teaching of colleges and universities, the problems of group green cooperation (i.e. GGC), innovation, saving of experimental materials and environmental protection are more prominent, which can better reflect the connotation of green teaching. The main reason lies in the fact that higher teaching undertakes the important task of transporting talents directly for the society. And by integrating the concept of green environmental protection into experimental teaching, professional talents with sustainable development of society can be cultivated [3]. In particular, the group cooperative experimental teaching under the concept of green education not only broadens the space and content of experimental teaching, but also achieves the goal of systematic, professional, regular and innovative experimental teaching, which is a new experimental teaching method to cultivate students' practical ability and innovative ability [4]. Therefore, it is necessary to carry out green experimental teaching.

Some experiments with obvious environmental problems, such as biology and chemistry, are easy to attract our attention, why is the researches on green experiments are more focused on these disciplines with environmental risks. Such as, in the biological experiment teaching of colleges or universities, once students have poor consciousness of asepsis, self-prevention and non-standard operation, infection and environmental pollution events are prone to occur, which implies that it is necessary to introduce green concept and carry out green teaching [5]. To reduce experimental pollution and improve the environmental protection, green chemistry experiment teaching in colleges or universities should be carried out from experimental items, experimental teaching means, experimental environment and green teaching idea [6]. In China, the research on green chemistry experiment in middle school mainly focuses on the introduction of teaching strategies and the requirements of "green" chemistry experiment, while the green chemistry experiment in higher teaching presents the research on relevant green teaching methods and teaching examples based on qualitative research [7]. What should be emphasized more is that some economic and management experiments, although few biochemical reagents, are also facing the urgency of green teaching reform. Because some students do not have good environmental protection habits, arbitrarily dispose of and use a large number of disposable shoe covers, waste of power and paper are serious, and the efficiency of group cooperation experiments and group green actions are also often ignored. To break through the situation limited to the research of green experiment teaching in individual disciplines and comprehensively study the problems of efficient green experiment, the research questions are put forward.

- *Research Question 1. Comprehensively, what aspects should be analyzed in the green experimental teaching of colleges and universities? What form of green experimental teaching should be the main research object?*

Especially, most experiments should to be implemented in groups. Therefore, group based green cooperation experiment (i.e. GCE), this paper will study the related green experiment teaching problems. However, actually, students' group cooperation consciousness is poor, lack of innovation ability, and even some students in the group are lazy and rely on individual students to make achievements. As a result, the "big pot" phenomenon is serious, it is difficult to quantify the assessment, the students' enthusiasm for cooperation is very poor, they can not stimulate students' learning enthusiasm, and students' creative potential can not be developed. Moreover, most experimental processes are prepared in advance. Students often carry out experiments mechanically, which can not effectively improve students' adaptability to problems, resulting in students' lack of confidence to break through the tradition and innovate [8]. Hence, it is particularly important to carry out the research on green experimental teaching of group cooperation. To do it, the second question should also be proposed.

- *Research Question 2. What are the influencing factors of the effective group collaboration form of green experimental teaching, and how to effectively drive the the green experimental learning?*

To study on relevant issues deeply, based on the literature review, this paper will put forward research models and hypotheses, and design questionnaires to carry out questionnaire survey. On the basis of statistical analysis of influential factors, the dynamic model of group green cooperative experimental teaching is constructed by dynamic modeling theory, and the Vensim software is used for simulation. Finally, the conclusion should be discussed.

2 Literature Review

2.1 Power Consumption in Data Centers

With the increasingly prominent environmental problems, green teaching has been paid more and more attention, and its connotation has been gradually enriched. At present, there is no unified definition of green teaching, but the relevant connotation has gradually risen from ecological protection to sustainable development.

2.1.1 Definition of green teaching

Green teaching involves professional and technical teaching directly related to green development. It also includes humanistic teaching in green concepts, environmental ethics, laws and regulations [9]. It emphasizes the integration of environmental protection and sustainable development, as well as the integration of humanities and technology [10]. At present, most scholars think that "green teaching" is "Ecological teaching" + "Attitude teaching" [11]. In addition, it should also be focused that the compliance of individual behaviors with environmental regulations and the consciousness of green behaviors [12]. The purpose of green chemistry teaching is to cultivate green and sustainable technological innovations professionals, create effective cutting-edge knowledge, and transform it into more environmentally friendly and sustainable products and processes [13].

Based on the above views, this paper holds that green teaching aims at maintaining the ecological environment, takes the cultivation of environmental protection technical personnel and environmental protection habit personnel as the means, and integrates the concept of sustainable development, environmental protection knowledge and environmental protection methods into the process of green teaching.

2.1.2 "Green teaching" in higher teaching

Schools are an important base for promoting green teaching. Especially in China, there are many researches on green teaching in universities. University-based green teaching not only focuses on the dissemination of green science knowledge, but also on the cultivation of green skills. It is an important measure to promote environmental protection and an important strategy for ecological civilization construction [14]. "Green teaching" in universities refers to the teaching of environmental protection knowledge in the relevant aspects of higher teaching. Classroom teaching and teachingal practice are used to equip students with the idea of sustainable development, and make their knowledge structure and comprehensive quality have the relevant concept of green environmental protection [15].

Generally, most of the related researches are the training of teachers related to green teaching [16], green teaching methods [17], and research on the principles and curriculum framework of college green teaching under the regulation of sustainable development [18]. At the same time, from the teaching place, there are researches on classroom green teaching and green experimental teaching. Most of the research on green experiment teaching

focuses on the chemical industry with high environmental pollution [19]. At the same time, from the teaching place, there are also research on classroom green teaching and green experimental teaching. During the operation of university laboratories in China, there are pollution problems such as the discharge of toxic gases and waste water, biological pollutants, solid waste, electromagnetic radiation and noise pollution [20]. The research on green experimental teaching mostly focuses on Chemical Engineering and other majors with high environmental pollution [21]. From the perspective of higher teaching, the scope of green teaching research needs to be expanded, especially the content and methods of green experimental teaching need to be innovated.

2.2 Group Based GCE

2.2.1 Collaborative learning

Collaborative learning is behaviors in which students participate in the form of a group to achieve common learning goals, and maximize the learning results of individuals and others under a certain incentive mechanism [22]. This method has unparalleled advantages over other teaching modes in terms of cultivating learners' teamwork spirit, developing social skills, and promoting higher-level cognitive development, and has received unanimous attention from teaching researchers and practitioners [23]. Collaborative learning is different from general teaching activities. Previous collaborative learning activities are mostly designed from the information space, such as task presentation (task information, method information and related media materials), collaborative process (role setting, task division, group processing process and communication rules), achievement presentation (presentation form, achievement evaluation rules) and process support (power maintenance) And other aspects [24]. To do it, cooperative learning with several students as a group will be very common in experimental teaching. According to the synergetic theory, through the cooperation of the members within the experimental group and the cooperation among the members in different group, students' learning enthusiasm can be greatly stimulated and their capabilities of experimental inquiry and cooperative learning can be cultivated [25]. Some studies have shown that the collaborative inquiry hybrid learning mode based on digital twin technology significantly improves students' self-learning efficacy, cooperative learning tendency, cognitive load, learning experience and academic performance than the control teaching group [26]. Moreover, team cooperative

learning ability is directly related to the performance of cooperative learning [27].

2.2.2 GCE in group

Besides, to the ideal state of low material consumption, low energy consumption, and zero waste and zero emissions, green construction of experimental teaching system should follow the people-oriented and green experimental idea, and finally realize it through a series of whole-process control such as innovative experimental teaching content, advanced experimental technology and methods, standardized experimental teaching management, and intensive experimental equipment configuration [28]. But, there are very few studies on green collaborative experiments. Combining the concept of green teaching, collaborative learning and green teaching experiments, the paper believes that group based green collaborative experiment should mainly focus on the green group form of experiments, innovative and flexible experimental content, low energy consumption in the experimental process, convenient and efficient collaboration, dynamic experimental evaluation, and experiments. The laboratory environment is clean, the furnishings are standardized, the energy consumption is saved and the experimental resource is saved, the environmental protection of the experimental resource treatment and the standardized management of the polluting experimental process are high, and so on. An example of cooperative learning related to teaching for sustainable development is group-based practice or experimental activities, aiming to help students try to solve a certain problem by applying theory to practice, thereby increasing their knowledge of specific environmental issues [29]. In the case of the complex system of green experimental teaching, conducting green experimental learning in groups can better grasp the system boundaries and achieve the purpose of green experiments efficiently.

2.3 Summary

Most of the current researches on green teaching and green experiments in higher teaching are related to experiments that are highly polluting. From the perspective of green universities, research on the factors, effective performance driving mechanisms, methods, and approaches for conducting green experiments as a whole is still lacking. Therefore, from the perspectives of energy saving, environmental protection, efficiency and deepening innovative knowledge, this paper will study GCE issues under group experiment environment.

3 Methodology

3.1 Survey Design

3.1.1 Variables design

Here, literature analysis was conducted from four dimensions of GCE measures and features, laboratory green management and performance of group based GCE, and 13 measurement variables of green cooperative experiment were initially determined, as shown in Table 1.

Table 1 Variables design

Dimension Variables	Observable Variables	Specific Description	
Measures (M)	Green collaborative behavior quality (M1); Green experiment content (M2); Green collaboration encouraging (M3)	To ensure the smooth implementation of the green collaborative experiment by the group, measures to promote the green collaborative experiment were proposed.	[20, 21, 28]
Green cooperation features (E)	Flexible teaching environment (E1); Barrier-free collaboration (E2); Strong clear objectives forcing (E3)	The effective completion of green cooperative task is based on a reliable experimental environment. The indexes proposed here can measure the features of green cooperative experimental environment.	[29–31]
Green management capabilities (MM)	Experimental organizing capability (MM1); Safety supplies (MM2); Healthy environment (MM3)	These four indicators reflect the green management level of the laboratory, which is the necessary condition for effective green collaborative experiment.	[8, 10, 11]
Green cooperation performance (C)	Growth in knowledge (C1); Sustainable environment (C2) Group experimental efficiency (C3); GGC cost (C4)	It mainly reflects the group collaborative performance of performing green experiments.	[32, 33]

As shown in Table 1, measurable variables are designed from the four research dimension variables according to the research problems. For the convenience of follow-up research, these variables are represented by the symbols in parentheses. The questionnaire will also be designed and surveyed based on the table.

3.1.2 Sample

Randomly, 40 students would be selected for a questionnaire survey from the majors of chemical engineering, biochemistry, medicine, material textile, economics and management. 160 valid questionnaires were obtained from 200 questionnaires distributed. The questionnaire covered a wide range of subjects.

3.2 System Dynamics Theory

System dynamics (SD) is a cross-discipline based on management science and system science, which can be used to solve complex dynamic system problems. It has dynamic mechanism of input, interaction and output, which makes the system evolve various behavior states. System dynamics theory provides us with a research idea to analyze the composition and interaction of the system from the perspective of the whole system. Through dynamic simulation, the dynamic behavior and trend of the system under different parameters or different strategic factors are investigated [34].

Research based on SD involves many fields, including industrial economy, energy, ecological environment and enterprise management, etc. [35]. Some scholars have established the environmental economic system model of a city by using SD method [36]. Based on the two systems of industrial structure and environmental pollution, the SD model of industrial structure's influence on environmental pollution is constructed [37]. In recent years, its application research in environmental protection has also gradually become a hot spot. For example, SD based a model of energy consumption and pollutant emission for industries in resource-based areas was constructed to provide a realistic basis for industrial environmental regulation policy innovation [38]. Besides, its research on water pollution control [39], industrial air pollution governance [40], optimal treatment of municipal solid waste [41], green manufacturing, green process flow and transformation of green enterprises [42] have also been paid more and more attention. To a certain extent, these studies can provide reference for for the research of green education.

System dynamics modeling is a modeling method to describe complex system problems. Considering that green cooperative experiment is a

subsystem of experimental teaching system and has the characteristics of nonlinear complex system, it is suitable for system dynamics modeling.

4 Identifying the Influencing Factors of GCE

4.1 Reliability and Validity

The reliability, validity and constructs analysis based on SPSS22 software is as follows in Table 2.

It can be seen from Table 2 that the value of reliability coefficient is 0.961, greater than 0.9, which indicates that the research data has high reliability quality. The KMO value is also higher than 0.9, which shows that the data validity is very good. Moreover, from the commonality of the corresponding relationship between each factor and its corresponding items, which are greater than 0.5, indicating that the measured items are consistent with the research expectations and need to be retained. Also, the Average Variance Extraction (AVE)values and the Combined Reliability (CR) values, shown in Table 2, present that there are good correlations between factors and measurement items. These indicate that questionnaire data are suitable for factor analysis.

4.2 Factor Analysis

To further condense factors and explore the importance of variables, a factor analysis based on questionnaire data is performed. A total of 3 factors were

Table 2 Reliability and validity

Factors	Items	Communalities	Cronbach's Alpha	KMO	AVE	CR
M	M1	0.674	**0.954**	0.941	0.638	0.84
	M2	0.691				
	M3	0.754				
E	E1	0.719			0.672	0.86
	E2	0.709				
	E3	0.762				
MM	MM1	0.677			0.725	0.888
	MM2	0.702				
	MM3	0.731				
C	C1	0.825			0.752	0.924
	C2	0.733				
	C3	0.849				
	C4	0.779				

Table 3 Factor loading (rotated) coefficient

Item	Factor 1	Factor 2	Factor 3	Communalities
M1	0.561	0.605	0.237	0.737
M2	0.31	0.764	0.256	0.746
M3	0.34	0.471	0.696	0.822
E1	0.191	0.7	0.44	0.719
E2	0.201	0.751	0.346	0.724
E3	0.279	0.826	0.258	0.826
MM1	0.363	0.328	0.759	0.815
MM2	0.415	0.36	0.694	0.784
MM3	0.386	0.404	0.708	0.814
C1	0.815	0.238	0.331	0.831
C2	0.805	0.318	0.192	0.785
C3	0.824	0.228	0.349	0.853
C4	0.769	0.243	0.361	0.78

extracted through factor analysis, and their cumulative variance interpretation rate after rotation was 78.742%, suggesting that the factors could be better explained by measuring items.

Moreover, through the maximum variance rotation method, the relationship between the newly extracted factors and the measurement items can be reconstructed according to Table 3.

The corresponding common degree value of all research items is higher than 0.4, which means that the factors can effectively extract information. According to the factor loading coefficient, the composition of factors are shown in Table 3 (different components showing by different colors). Surprising, M1 and M2 are more appropriately grouped under environmental factors. M3 should also be explained in terms of green management factor.

The weights of these three factors are calculated according to the following equation.

$$\begin{aligned}\text{Factor 1} = {} & 0.172 * \text{M1} - 0.028 * \text{M2} - 0.146 * \text{M3} - 0.174 \\ & * \text{E1} - 0.136 * \text{E2} - 0.059 * \text{E3} - 0.133 * \text{MM1} - 0.076 \\ & * \text{MM2} - 0.109 * \text{MM3} + 0.362 * \text{C1} + 0.401 * \text{C2} + 0.362 \\ & * \text{C3} + 0.318 * \text{C4} \qquad (1)\end{aligned}$$

$$\begin{aligned}\text{Factor 2} = {} & 0.247 * \text{M1} + 0.399 * \text{M2} - 0.057 * \text{M3} + 0.274 \\ & * \text{E1} + 0.360 * \text{E2} + 0.450 * \text{E3} - 0.203 * \text{MM1} - 0.153\end{aligned}$$

$$* \mathrm{MM2} - 0.122 * \mathrm{MM3} - 0.124 * \mathrm{C1} + 0.010 * \mathrm{C2} - 0.142 * \mathrm{C3} - 0.128 * \mathrm{C4} \quad (2)$$

$$\text{Factor 3} = -0.279 * \mathrm{M1} - 0.234 * \mathrm{M2} + 0.410 * \mathrm{M3} + 0.060 * \mathrm{E1} - 0.077 * \mathrm{E2} - 0.250 * \mathrm{E3} + 0.546 * \mathrm{MM1} + 0.433 * \mathrm{MM2} + 0.439 * \mathrm{MM3} - 0.089 * \mathrm{C1} - 0.284 * \mathrm{C2} - 0.066 * \mathrm{C3} - 0.037 * \mathrm{C4} \quad (3)$$

According to the composition of variables, factor 1, factor 2 and factor 3 are still represented by C, E and MM in Table 1 respectively. In other words, the four factors in Table 1 were integrated into three after factor analysis.

4.3 The Influence Relationship Among the Three Factors

Dynamic capability is an important factor for organizations or individuals to update their resources in order to adapt to the rapidly changing environment and meet the requirements of the rapidly changing competitive environment. Dynamic capabilities are often directly proportional to behavioral capabilities and an actor performance [43]. The group of green cooperative experiment has the characteristics of "green", "cooperative" and task-oriented, and the characteristics affect the construction and implementation effect of dynamic capability [44]. Research on the relationship between collaboration, organizational capabilities, and collaboration performance is generally viewed positively. For example, the strength of cross-organizational enterprise collaboration (rather than the willingness to collaborate) can promote the electronic integration capability of the supply chain, and the improvement of the electronic integration capability of the collaborative supply chain can promote the performance of the supply chain [45]. The characteristics of alliance partners have a positive impact on the alliance management capability among organizations and the performance of inter-organizational collaboration. And, alliance management capability plays a part of the mediating effect between the characteristics of alliance partners and the performance of inter-organizational collaboration [46].

Hence, according to the influencing factors of the collaborative experimental teaching system, it should be believed that only certain green management and continuous green management, can make the experimental group to form efficient green collaborative capabilities. At the same time, different management capabilities has different behavioral features. Therefore,

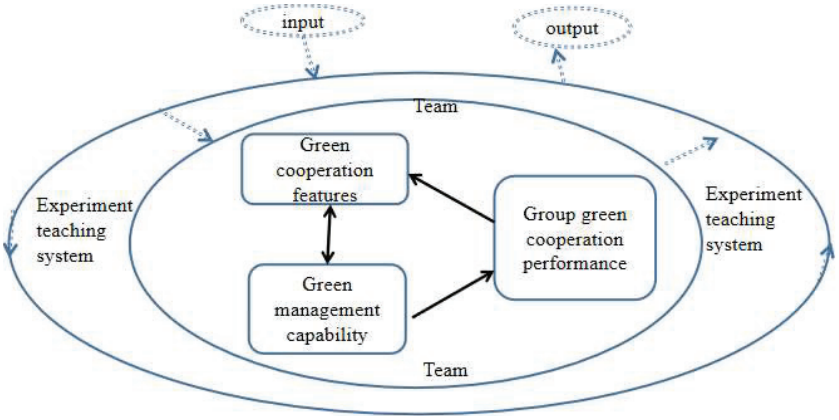

Figure 1 Theoretical relationship of three factors.

we put forward the overall research hypothesis as shown in Figure 1, that is, there is some positive relationship between the features of GGC—the green experiment management ability of laboratory managers—the performance of group based GCE.

Figure 1 also shows system boundaries and system feedback mechanisms. Therefore, this will also provide a basis for the study of operation mechanism.

5 Modeling and Simulation

5.1 System Dynamic Modeling

Compared with other simulation software of system dynamics, Vensim software is favored for its simple and easy-to-use graphical interface [47, 48]. According to Figure 1 and analysis of influencing factors, system dynamics software Vensim PLE was used to build a system dynamics model as shown in Figure 2, and its influencing mechanism and incentive were analyzed.

The index coefficients and factor weights analyzed in Section 4.2 should be seeing as input, and the simulation will be carried out on the basis of equation setting.

5.2 Dynamic Equation of System

The essence of system dynamics lies in the drive of information to system factors. Therefore, we set descriptive equations during information transmission mainly by the information amount, namely information entropy.

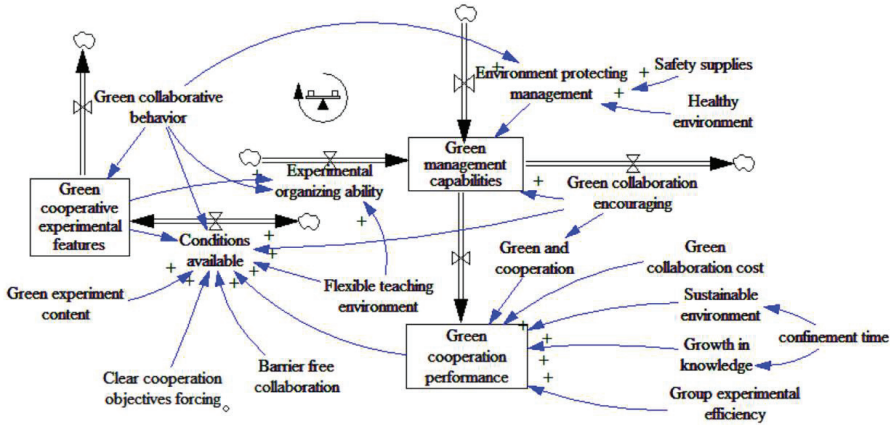

Figure 2 Driving mechanism of group green cooperative experiment.

Conditions available = (M2(information entropy (E1) + information entropy (E2) + information entropy (E3) + information entropy (M2)*SIN (Green cooperation performance)*GC encouraging)*SIN(E)*	(1)
*Green cooperative experimental features = Conditions available*E*	(2)
*Green collaborative behavior = M1*Green cooperative experimental features*	(3)
*Experimental organizing ability = MM1*E1*Green collaborative behavior quality*	(4)
Environment protecting management = Green collaborative behavior(information entropy (MM2) + information entropy (MM3)*	(5)
Green management capabilities = MM(Experimental organizing ability + Environment protecting management) + SIN(M3)*	(6)
GC encouraging = M3(Management capabilities)*	(7)
Green cooperation capability = SIN (Green management capabilities)	(8)
*Green cooperation capabilities = C*Green cooperation capability*(information entropy (C1) + information entropy (C2) + information entropy (C3) + information entropy (C4)*SIN (Green cooperation capabilities)*	(9)

6 Simulation

6.1 Generation Mechanism of Green Management Capabilities of University Laboratory

As can be seen from Figure 3, green management capability is the guarantee condition for the effective implementation of group GCE, which is deeply affected by several factors. Taking three months as the simulation time, the specific formation mechanism can be shown in Figure 3.

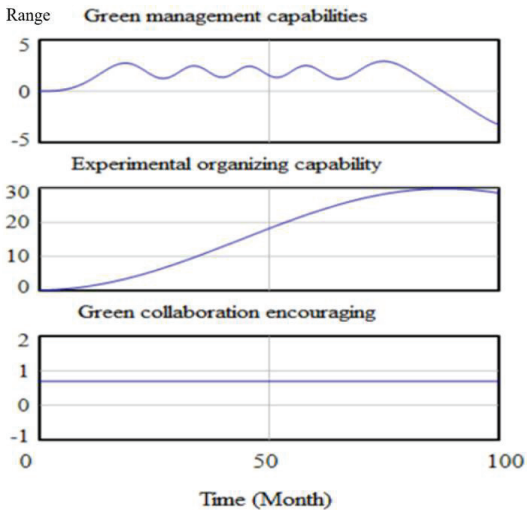

Figure 3 Evolution of green management ability of managers.

Under certain cooperative incentive means, the laboratory's experimental organization ability is continuously improved, and its green management ability is also in a positive shock. Obviously, the three are not linear. Strangely, when the collaborative incentive measures remained at the level of about 0.8, the system evolved to about 85 days. While the organizational ability reached a peak, the green management ability began to decline rapidly. Then, along with it, there will be a slow decline in organizational ability.

The phenomenon may be explained in this respect. In other words, the stronger the experimental organization ability of laboratory managers is, the stronger their green management ability is. When the organization ability of experiment is too high, it indicates that the arrangement of experiment is too systematic, which is not conducive to the development of flexible experiment teaching and the implementation of green innovation experiment. Moreover, under the rigid experimental organization management, its green management ability will be limited and weakened.

6.2 Characteristic Evolution of Group Green Cooperative Experiment

Is the green collaboration characteristic of the experimental task-oriented group fixed? If there are changes, what are the rules of change? This can be explored from Figure 4.

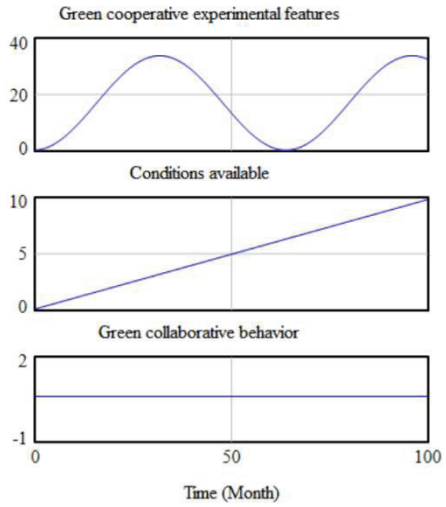

Figure 4 Feature evolution of group green cooperation.

Green collaborative quality team members in a state of benign cases, team green characteristic condition will gradually improve, in the process of its promotion, team green reserves will be more and more collaboration features, under the condition of fully meet the green experiment, these features will decline because of the characteristic condition continuously strengthen, and then presents the evolution of the wave situation as a whole.

The reason may be that, for a certain experimental task, the experimental group should have appropriate green cooperation characteristics, otherwise some excessively high conditions will limit the development of green experiments.

6.3 Group based Green Cooperative Performance

In the case where the influencing factors of green synergy performance are set to a value greater than 0, the performance will slowly improve with the improvement of green management capabilities. The result is shown in Figure 5.

This indicates that the group's green experimental performance will further increase with the improvement of the green management ability of the managers, mainly meeting certain performance conditions. There is only a time lag for the transformation from ability to group cooperative experimental performance, for which the performance will appear a slow rise. This also

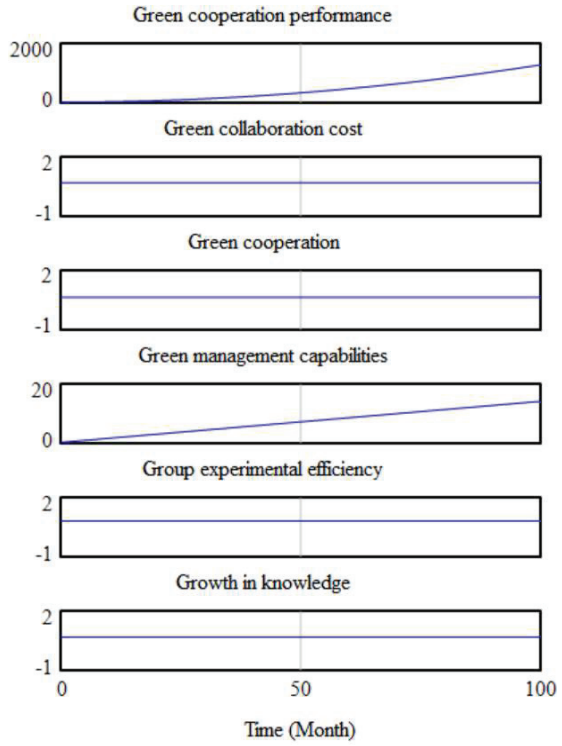

Figure 5 Causes of GGC performance.

shows that under certain conditions, a certain ability will positively affect the performance of actors.

7 Conclusion

On the basis of theoretical analysis, this paper constructs a system dynamics model based on the influence factors of the group's university green collaboration experiment, and based on the influence relationship between the factors, and found some meaningful conclusions through simulation.

First of all, it is inevitable and feasible for universities to generally carry out green experimental teaching. Secondly, experimental teaching in groups is easier to achieve the purpose of green experimental teaching. The reason is that clear mission goals within the group can drive members to better exert their green learning qualities. Furthermore, the experimental group and laboratory managers or teachers are organisms in experimental teaching and

influence each other. Moreover, the manager's ability to organize experiments should be flexible, too high and rigid management methods will frustrate their ability to manage green experiments.

In addition, only when the team's green collaboration characteristics match the manager's green management capabilities, the team's green experiment performance will be highlighted and gradually improved with the continuous improvement of capabilities.

These findings are helpful for universities to carry out innovative green experimental teaching methods and strategies.

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Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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