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An Empirical Study of Situational Teaching: Agricultural Location in High School Geography

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Abstract: In China's most recent round of curriculum reform, the "one situation to the end" (OSTE) situational teaching method has been successfully introduced in geography classes to improve students' ability to solve problems in real-life situations. Taking an agricultural location course as an example, this study analyzes the implementation of situational teaching and discusses the effect of the OSTE method on the topic of sustainable development in the teaching of geography. Using a quasi-experimental design and by distributing a questionnaire to teachers in a Chinese high school, the following findings were obtained: (1) almost all teachers use some form of situational teaching, and the OSTE method has been widely used; (2) OSTE contributes to students' awareness of sustainable and circular development, but it is not associated with an improvement in geographical skills; and (3) students are mostly interested in the promotion of higher-order thinking, a positive emotional experience, active learning, and the acquisition of systematic knowledge instead of fragmented knowledge. In short, OSTE is an efficient teaching method for geography classes, especially given how it fosters students' sustainable development ideas. We suggest enriching the understanding of OSTE through teaching-training, jointly developed situations using students' existing experiences, and well-designed question chains with more opportunities for interaction.

Keywords: one situation to the end; quasi-experiment; circular development; geography

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1. Introduction

With China's rapid economic development, advanced science and technology sectors, and profound social life changes, a new round of general secondary school curricula revision began in 2014 [1]. The new geography standard develops and refines the four core competencies that students should possess to meet the demands of lifelong development and social flourishing through the study of geography [2]. The vision of harmony between human beings and the earth is one of these competencies and relates to ethical and moral values regarding the relationship between humans and the geographical environment [2]. This competency brings geography and sustainability together and ties into China's sustainable global goals for 2030 and the construction of an "ecological civilization" [3].

Therefore, geography plays an important role as the forerunner of education in the establishment of an ecological civilization [4] and China's 2030 agenda. In the past, students have been passive recipients of knowledge in geography classes; the ideas of sustainable development were often integrated through "preaching", and through disconnected and abstract case studies, which lack relevance to students' lives. This causes students to become lost in fragmenting knowledge [5]. In this setting, it is difficult for students to understand the relationship between economic, social, and environmental development. Constructivism assumes that learning is actively constructed by students and that knowledge can only be truly understood through activities in actual situations [6]. Situational teaching

methods originate from the constructivist learning theory, aligning with the new curriculum rationale. Learning should be combined with situational social practice activities [7].

Core competencies comprise the key knowledge that an individual must have to deal with various complicated and uncertain real-life environments [8]. They enable creative solutions to complex practical problems in real situations [9] and integrate the three-dimensional goals of "knowledge and skills", "process and method", and "emotions, attitudes and values" [8]. Creating real situations and emphasizing problem-based learning in the classroom has thus become the new direction for geography-teaching and assessment. However, several factors pose great difficulties to the teaching of geography in the real world and social settings rather than in the classroom. Therefore, it is crucial to create a situation that matches students' levels of knowledge as well as their everyday and social reality [2,10,11].

In recent years, a new situational teaching method has appeared in high-quality geography courses called "one situation to the end" (OSTE). In OSTE, a single situation runs through the duration of the course, a format that has attracted the attention of geography teachers. The aim of this study is to verify whether OSTE is appropriate for cultivating students' sustainable development ideas in teaching geography. Agricultural location is a required topic in the Geography II high school curriculum, and it relates to sustainable development and the circular economy. This study takes agricultural location as an example with a focus on the following two research questions:

(1) What is the current status of situational learning in geography education?
(2) Are the effects of teaching with OSTE better than those of traditional teaching methods?

The study centered around these questions and consisted of surveying the implementation of situational learning and OSTE in agricultural location education, designing an OSTE-based geography class on agricultural location, and comparing the effectiveness of teaching methods through a quasi-experimental method and questionnaire. In contrast to previous studies, this study explores and defines the OSTE, and we provide an empirical basis for the effectiveness of OSTE in cultivating students' sustainable development ideas and other teaching objectives for the first time. Suggestions that will allow OSTE to work more effectively in classrooms are also provided.

2. Literature Review

The word "situation" appears 58 times in China's high school geography standard, and great importance is also attached to situational skills in college entrance examinations [12]. Different scholars have different perspectives concerning the concept of a situation. What they all share is the assertion that a situation is an environment that will affect people's activities. Specifically, a situation is considered the interaction between students and their environment [13], the environment needed for role-playing [14], and the artificially optimized environment [15].

Situated learning, rooted in constructivism, argues that learning as it normally occurs is a function of the activity, context, and culture in which it transpires [6,16]. The traditional teaching concept holds that knowledge can be transmitted [17], and generalized knowledge is the core content of learning. Thus, the originally lively and interesting knowledge becomes an abstract symbol, far removed from the students' lives. It is often difficult for students to apply the knowledge acquired in school to solve questions in reality. Therefore, the situation becomes an indispensable resource for students to construct knowledge and the scene in which they apply knowledge [17].

Situational teaching should create learning opportunities similar to real situations so that students may solve the problems they encounter in real life [18]. This requires learning to be based on the learner's situation and psychological level, to guide students through authentic tasks [19] that demonstrate an exploration process similar to that of experts solving problems in reality, and to reflect the effect of learning through the solution process of specific problems [20] or context-driven evaluation consistent with the learning process [17].

Situational teaching first appeared in language teaching [21–24] and technology-based learning activities for schools [25]. In recent years, it has been applied in the context of medicine [26], programming [27], and multimedia [28,29]. In China, situational teaching began with the practice of Chinese situational teaching by Li Jilin in 1978 [15]. Based on the theory of "artistic conception" in ancient Chinese literature, Li summarized the four core elements of situational learning as truth, beauty, feeling, and thinking, and thus connected the classroom with real life situations. This theory was regarded as an educational theory with local Chinese cultural characteristics [30]. However, it is translated by Chinese psychologists as "affective teaching" [31] because it pays more attention to the emotional experience of the situation.

Situational teaching can produce significantly better results [32]. Modern brain science research showed that children in rich environments have a higher IQ [33], and situational teaching can meet the needs of students' development from novice learners to autonomous learners. Situational learning helps students maintain interest in class [34–38], feel happy, and increases their motivation [31,39,40]. Real situations create knowledge that is rooted and connected, promoting learners to actively construct it through interaction with the environment [41,42], and improves students' problem-solving ability [27,43]. Situational teaching also improves abstract logical thinking by creating targeted situations with logical procedures and ideas [31], cultivating children's aesthetic feelings and abilities [44], and correcting their values [45–47].

Inspired by "one shot films", full-length movies filmed in one long take by a single camera, OSTE was created for the classroom teaching practice by Chinese educators. As the best way to implement the new standard, OSTE highlights students' subjectivity and constantly stimulates their thirst for knowledge and thinking with clear logic and interlocking connections. This was first observed in research on ideological and political teaching in China [48,49]. Situational teaching is mostly dynamic and developmental [50–52], which has been widely implemented in the design of teaching geography. There are different types of situations, including tourism situations [5], role-playing situations [53], and special topic situations [54].

Situational teaching is also used in education for sustainable development. It brings students into realistic settings so that they can understand the complexities of decision-making concerning the environment and economic and sustainable development as well as practice the concepts of sustainable development in daily life. For example, role-play, rooted in a real-world situation, has been an effective means for teaching students' sustainable development ideas [55,56].

Most papers concerning the teaching design of "agricultural location" in high school geography have focused on local resources to create situations [57–60], use different cases [61,62], and organize geography fieldwork [63]. Some of these situations include using jasmine in Hengxian [58], pineapple in Xuwen [59], apple in Luochuan [64], and tea [65].

In short, the research into and practice of situational geography-teaching began to appear in the last two years, and OSTE has been implemented in middle and high school geography-teaching. Previous studies have reported OSTE's strengths, its implementation challenges, and suggestions for its teaching design and reflection. However, quantitative methods such as questionnaires and experiments were not used in these studies. All the papers in the field of geography-teaching have been developed by middle school geography teachers. In addition, there is no consensus on the definition of OSTE; rather, geography teachers and graduate students simply form an understanding of the concepts by themselves. We hold that OSTE is one form of situational teaching and demonstrates a realistically themed situation with logical question chains that endure throughout the entire class to achieve lesson objectives such as knowledge, skills, and effectiveness. In this study, we investigate the effects of the implementation and teaching of OSTE on cultivating students' awareness of circular development in a geography class through a questionnaire and quasi-experimental design.

3. Materials and Methods

This study focused on "agricultural location" as a subject of high school geography, randomly examined the application of situational teaching in a particular city, then tested the teaching effect of OSTE through a quasi-experiment. All procedures performed in this research were in accordance with the ethical standards of East China Normal University, and the approval number is HR336-2022. Ethical review and approval were waived for this study due to this research being carried out in daily classroom teaching.

1. Literature review. To obtain broad and highly accurate results in our search, we first searched for the terms "situational teaching" and "situational learning" on Google and EBSCO, and in education psychology books and the Chinese social science citation index database in which high-quality papers were collected. We then searched the literature for "OSTE" to locate related studies. Finally, we focused on the terms "geography and situation", "geography and OSTE", and "agriculture location" separately in China's national knowledge infrastructure database to see how geography standards present situational teaching, how geography teachers teach agricultural location, and what the research status of OSTE is in the teaching of geography. Ultimately, we located six papers about OSTE, all of which were authored by geography teachers.

2. Questionnaire Survey. Geography teachers from a specific city in southern China were selected for this study. The authors used the online platform WeChat to randomly survey geography teachers. They voluntarily participated in the research and interviews with an understanding of what their participation entailed. In the end, 90 valid questionnaires were collected. Among them, 30 were men, accounting for 33.3%, and 60 were women, accounting for 66.7%. Almost 51% of geography teachers were from state model high schools and 24.5% were from municipal model high schools and ordinary high schools. In terms of teaching experience, 15.56% of new teachers had been teaching for less than five years, 33.33% of geography teachers between 6–15 years, 32.22% between 16–25 years, and 18.89% of geography teachers had been teaching for more than 25 years. The questionnaire had 18 multiple-choice questions (Appendix A) constructed specifically for this study.

3. Quasi-experiment. According to the academic results, the authors selected two parallel classes of a model high school at the state level. The two classes had the same geography teacher, the same learning progress, and the same number of classes. The ratio of boys to girls and the learning characteristics of the students were essentially the same. The experimental group was taught using the OSTE method (Figure 1), and the control group was taught using the traditional teaching method (Figure 2). The geography learning level of the students was medium.

The class assessments (Appendix B) were based on the requirements of the geography standards and county development. Through group discussion and expert consultation, the questions were revised three times for number, difficulty, and consistency between the two sets of tests. Finally, two multiple-choice questions met the requirements of the geography standards, and three short questions were used to test students' understanding of circular development. The total score was 28 points, and students were asked to complete the test within 20 min.

The results of the pretest were analyzed with a *t*-test for independent samples to determine if the learning levels of the students in the two classes were essentially the same. After the experiment, the posttest results were also analyzed to determine if there were any differences. Then, the Mann–Whitney U test was used to analyze which components caused the differences in overall scores.

To fully reflect the teaching effect of OSTE, the authors designed a questionnaire for students based on the Likert scale and Bloom's Taxonomy (Appendix B). It includes 10 questions with two dimensions (knowledge and affection) and four sub-dimensions (understanding/knowledge, higher-order thinking, willingness, and affection). Prior to the formal experiment, another class of 23 students was selected to test the reliability and validity. Twenty-one questionnaires were collected, and the results showed that the questionnaire had relatively good validity (KMO = 0.720, Bartlett's test $p = 0.000 < 0.05$).

However, the results concerning reliability were not satisfactory; therefore, we had to modify the knowledge-based dimension. After discussion and expert consultation, the questionnaire was revised and adjusted to make the representation more specific and intelligible to the students. For example, according to the evaluation index of higher-order thinking [66], "this class can improve your level of higher-order thinking" was revised to "this class can stimulate the generation of new opinions or ideas, and this class improves your logical thinking or reasoning ability." The second survey showed that the reliability of the two dimensions in the questionnaire was improved (Table 1). After the experience, the students in both classes were investigated, and the results were tested by an independent sample *t*-test and the effect size.

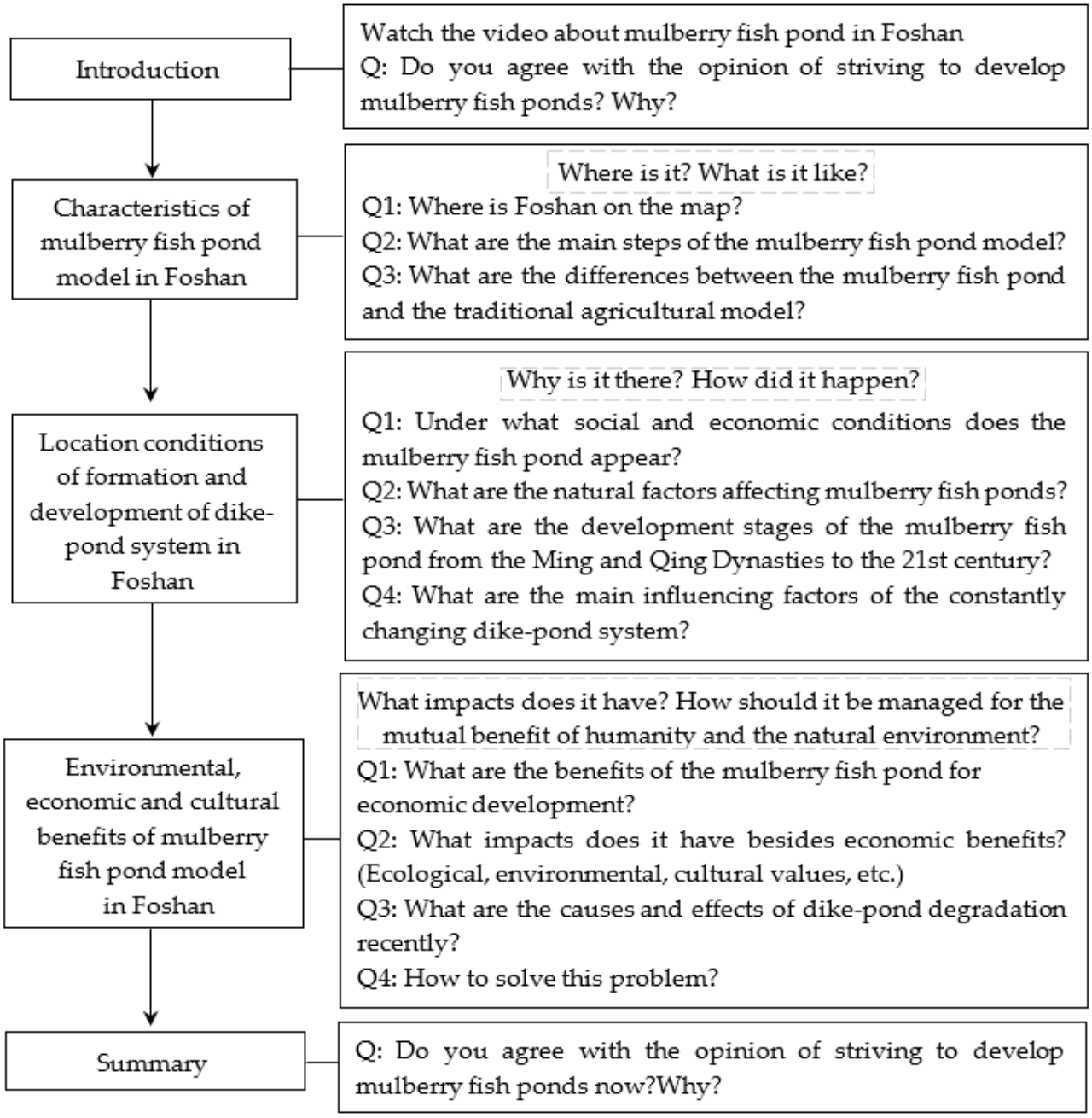

Figure 1. The teaching process of OSTE.

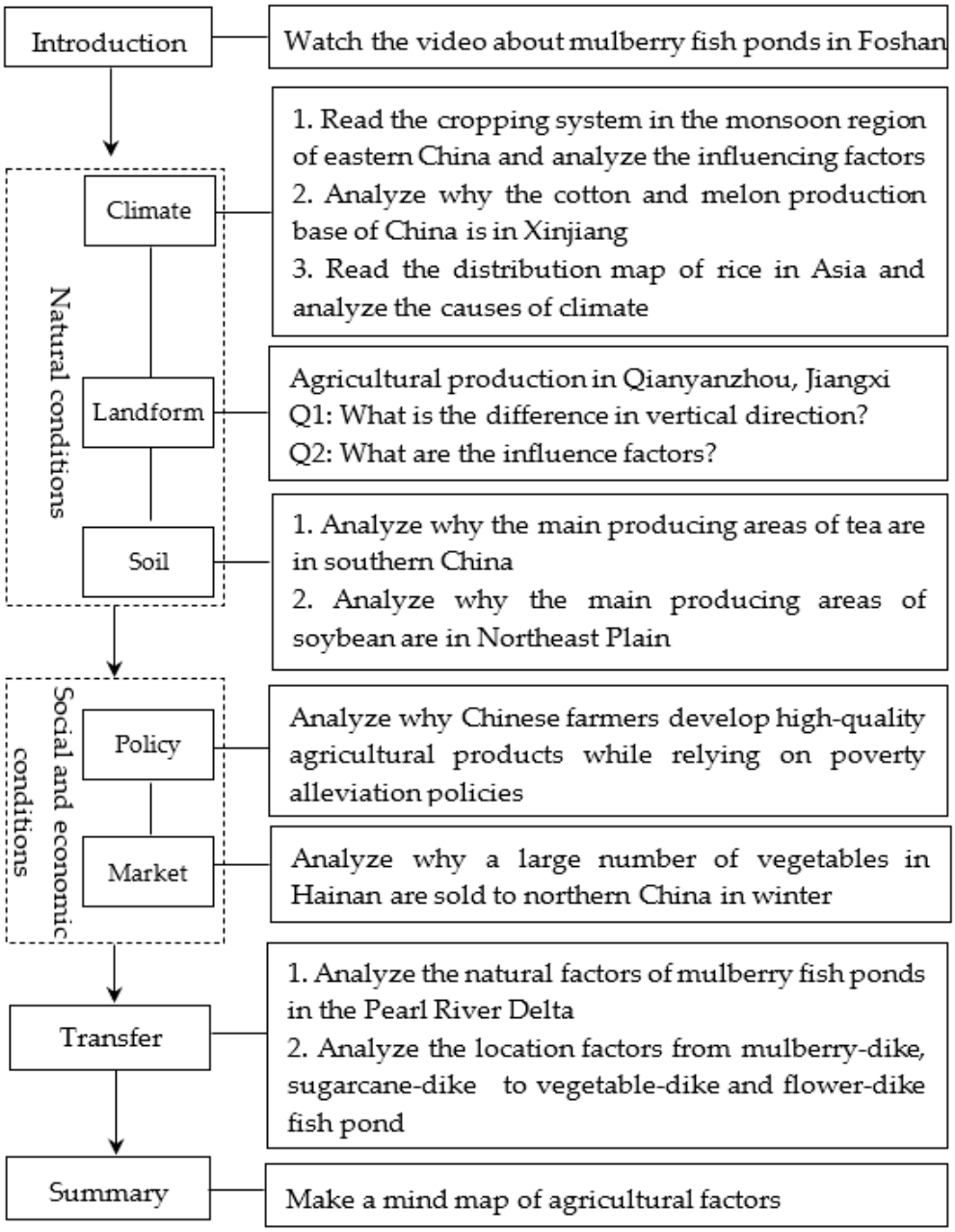

Figure 2. The teaching process of control group.

Table 1. Reliability of questionnaires in two surveys.

Dimension	Cronbach's Alpha Based on Standardized Items (First Survey)	Cronbach's Alpha Based on Standardized Items (Second Survey)
Knowledge-based	0.897	0.925
Affection	0.751	0.801

4. Results

4.1. The Result of Survey of Geography Teacher

Situational teaching was widely used in the geography classes in the surveyed city. Overall, 96.67% of geography teachers created situations in class and asked questions within the situations. The geography teachers generally agreed that teaching agricultural location contributed to the cultivation of the four core competencies of geography and the

promotion of sustainable development, and 84.44% of the geography teachers agreed that the agricultural sites can promote students' awareness of circular development (Figure 3).

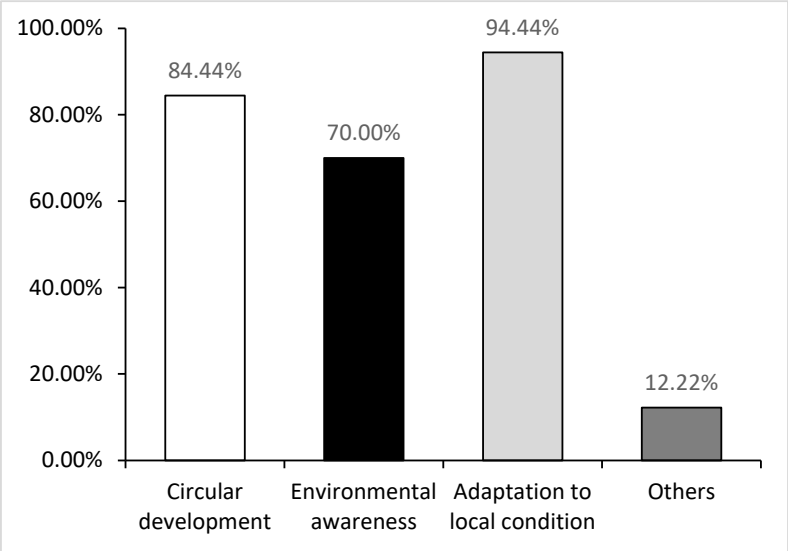

Figure 3. Understanding of the concept of sustainable development cultivated by teachers of agricultural location.

Although there is currently little research on OSTE, this teaching method has been widely implemented in geography classes. This survey shows that nearly 63.3% of geography teachers in this city use the OSTE teaching method in daily teaching. This contradicts the findings of previous research, which indicated that the method is predominantly utilized in demonstration classes and high-quality classes.

At the same time, there were some limitations to the survey. First, most of the situations were domestic situations that were not directly related to students' lives. Q6 of the questionnaire (Figure 4) showed that 43.3% of the situations are from life and production, which is also reflected in Q7 and Q8. Domestic situations account for 56.7%, while only 27.8% were local situations (Q7), and just 21.1% of geography teachers believed that the situations that were created were directly related to students' life experiences (Q8). This could be due to the local economic development. The share of agriculture is relatively small, so students are less familiar with agriculture in this city.

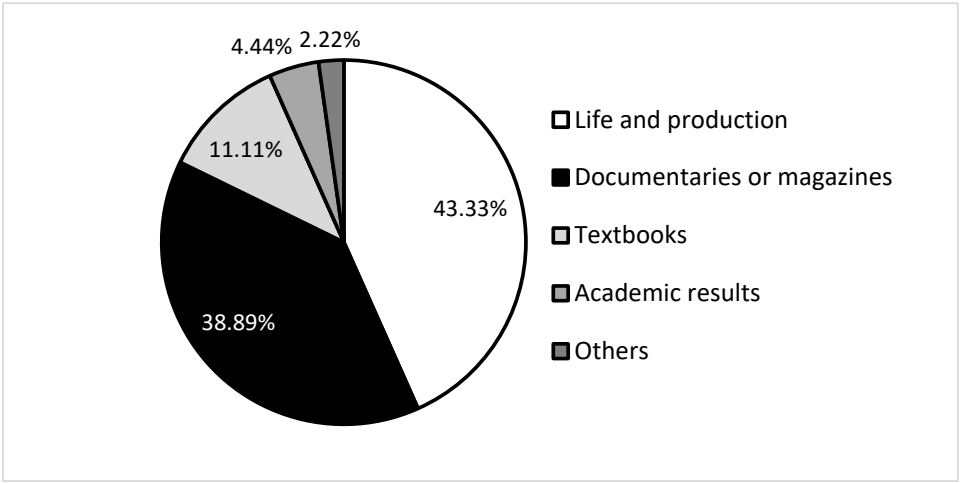

Figure 4. The source of situations.

Second, the majority of the geography teachers set up question chains, but there was no consensus on how to set up the questions. From the analysis of Q13, 77.78% of geography teachers asked three or more situational questions, and 22% of teachers asked only one or two questions (Figure 5). Most geography teachers relied on their personal experience in the setting. For example, in Q14, 43.33% of geography teachers paid attention to the logical relationship between the questions (Figure 6), 33.33% of geography teachers considered how to achieve the core competencies, and 22.22% of geography teachers gave priority to geography knowledge points. This is in line with the inability to formulate questions and establish hierarchical relationships between questions arising from the related research [36].

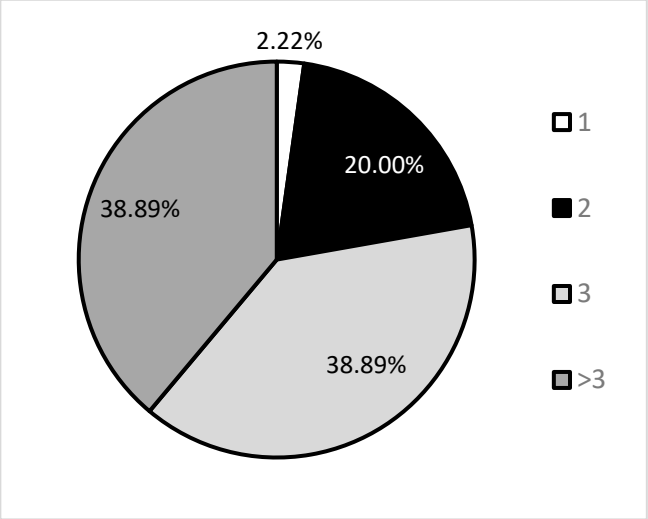

Figure 5. The number of questions set in each situation.

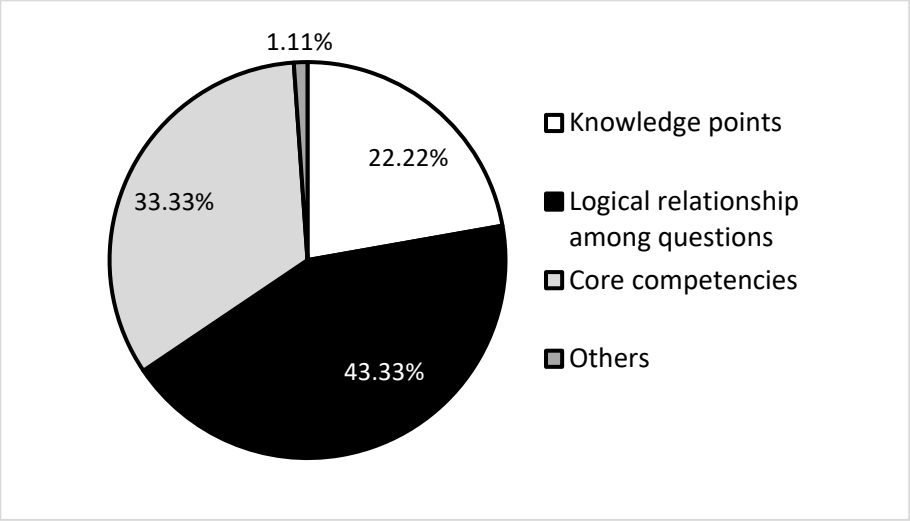

Figure 6. The factors to consider in setting the question.

Third, we analyzed case-by-case teaching situations, but hands-on activities and situations were rare. The analysis of Q9 shows that 87.78% of teaching situations were presented in the form of cases or facts, while only 5.56% of situations were activities and there were no geo-experiments or practical situations (Figure 7). From the survey, we know that there is a great correlation between the difficulty of creating lessons and limited teaching hours.

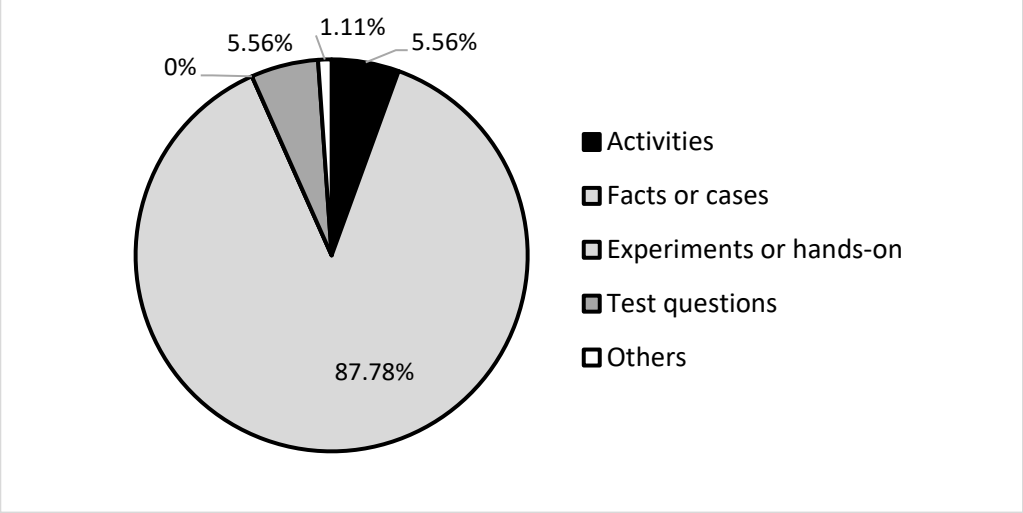

Figure 7. Types of teaching situations.

Fourth, a further understanding of situational teaching's potential is needed. Nearly 90% of high school geography teachers believed that situational teaching plays a very important role in improving students' comprehension and knowledge transfer, problem-solving ability, and learning interest (Figure 8). However, they reported possessing inadequate knowledge about other aspects, such as students' thinking ability. Situational teaching focuses on "thinking" and allows students to experience the development of geographic thinking in a situation that occurs throughout the class [2]. The new curriculum standard for high school geography links thinking activities with observation, imagination, language expression, and practical application. It promotes students' transition from concrete-picture thinking to abstract logical thinking and improves the level of abstract logical thinking.

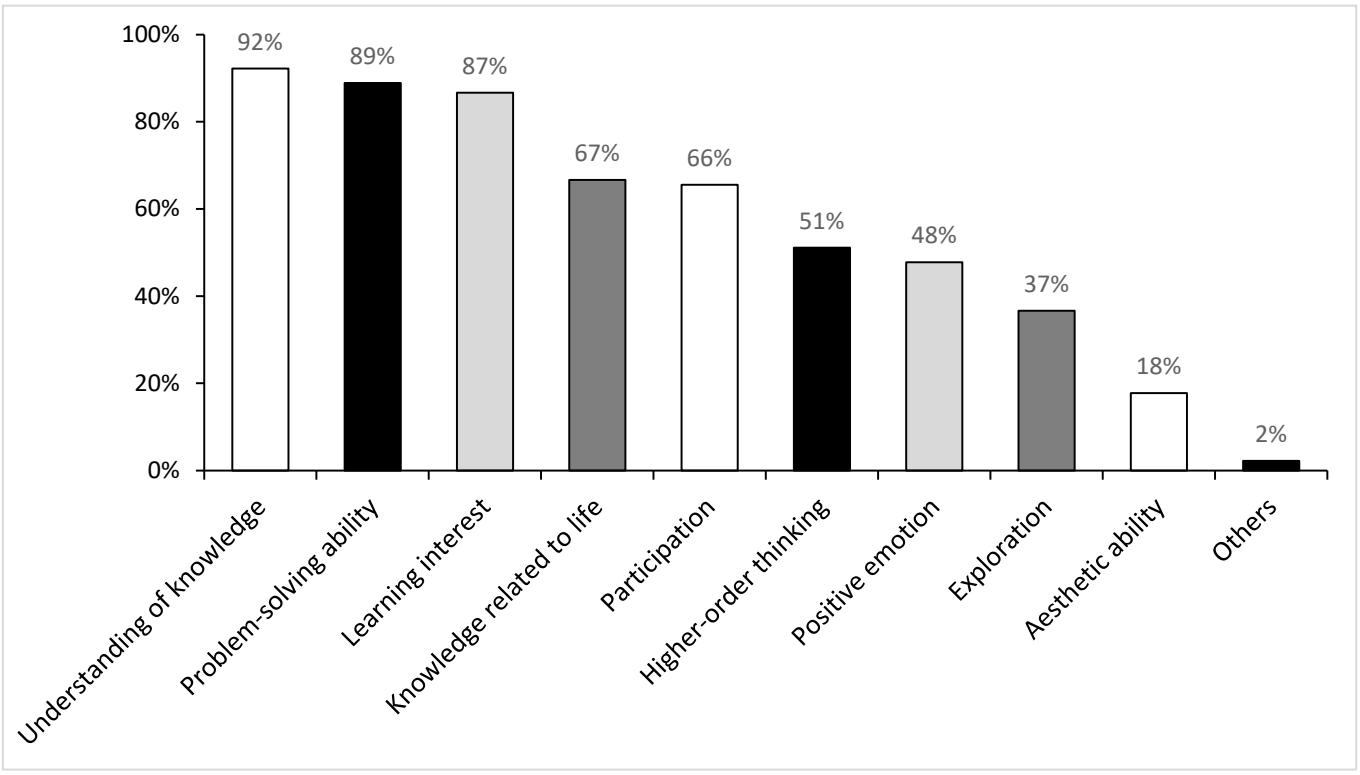

Figure 8. The main roles in designing a situation.

Fifth, teachers must create the situations themselves. Limited teaching hours and heavy teaching tasks are important limiting factors. As shown in Figure 4, only 11% of the situational materials are directly sourced from textbooks. In comparison, more than 80% of situational materials need to be created by teachers. This increases the teaching burden and reduces teachers' enthusiasm for creating situations. This was well reflected in Q16; 83.3% of geography teachers thought that class hours and teaching tasks were the main factors that restricted situational teaching. More than 55.5% of geography teachers believed that there were not enough resources for middle school geography teachers, which are difficult to develop. This is also consistent with the current research finding that it is difficult to select and assemble cases, spend a lot of time on preparation, and meet the high demands for students' learning skills [67,68].

Situational teaching has been recognized and widely used by geography teachers in this city. It is still unclear whether the OSTE method is more effective than traditional teaching, so we conducted an experiment to test this hypothesis.

4.2. Experimental Results

Comparative Analysis of Test Scores before and after the Test

This study's authors compared the changes in test scores between the experimental class and the control class. Both the pretest and posttest were standardized tests, and the average scores of the two classes are shown in Table 2. From the average score, it is evident that the level of agricultural location's determination and circular development for the two classes was about the same. The score of the control class was slightly better than that of the experimental class, but the total sample failed the test for significant differences ($p = 0.907 > 0.05$), so the two classes were suitable for the quasi-experiment. After the experiment, the average grade of the experimental class was significantly different from that of the control class ($p = 0.001 < 0.05$), and the average grade of the experimental class was significantly higher than that of the control class.

Table 2. The pretest and posttest results of two classes' Independent-samples *t* tests.

Test	Mean (S.D.)		Independent-Samples *t* Test	
	Experimental Class ($n = 33$)	Control Class ($n = 33$)	*t*	Sig. (2-Tailed)
Pretest	10.48 (3.768)	10.61 (4.562)	−0.118	0.907
Posttest	22.09 (3.440)	13.15 (5.063)	8.389	0.001

The average score of the students in the experimental class improved greatly after the application of OSTE. Moreover, the decrease in the standard deviation shows that the performance differentiation of students in the experimental class improved to some extent. The results of the comparison of academic achievement show that the experimental class had a significant improvement compared to the control class. To some extent, the results show the effectiveness of OSTE.

To further explain the differences between the two classes, five posttest questions were tested using the Mann–Whitney U test. The results showed that there was no difference in the performance on questions 1 ($p = 0.317 > 0.05$) and 2 ($p = 0.496 > 0.05$), but the results of questions 3, 4, and 5 were different in both classes ($p = 0.000 < 0.05$). So, the main factor affecting the difference in students' total score was their understanding of circular agriculture, as there was no difference in the requirements of the geography curriculum standards. The traditional teaching method can still meet the requirements of certain geography standards, but students' knowledge of circular development has not improved.

4.3. Achivement of Other Teaching Objectives

After classroom instruction, this research's authors conducted a survey of students and compared students' perceptions of achievement of other instructional goals.

As shown in Table 3, the overall *t*-test for independent samples indicates that the achievement of knowledge-based and affective objectives was better in the experimental class than in the control class. There is a significant difference in the achievement of knowledge-based and affective objectives ($p = 0.001 < 0.05$). In a further analysis of the effect size, Cohen's SD = 2.66 > 0.8 shows that the data for the two classes are quite different. Therefore, the teaching effect of OSTE is more significant than the traditional teaching method.

Table 3. Comparison of each dimension and question.

Sub-Dimension	Questions	Mean (S.D.)		Independent Sample *t* Test		Cohen's d
		Experimental Class	Control Class	*t*	Sig. (2-Tailed)	
Comprehension of knowledge	Q1	4.48 (0.508)	3.66 (0.602)	6.009	0.001	1.47
	Q2	4.55 (0.506)	3.34 (0.653)	8.311	0.001	2.07
	Q3	4.52 (0.508)	3.38 (0.707)	7.449	0.001	1.85
	Sum	13.55 (1.481)	10.38 (1.497)	8.582	0.001	2.23
Higher-order thinking	Q4	4.52 (0.508)	3.28 (0.813)	7.317	0.001	1.83
	Q5	4.52 (0.508)	3.25 (0.718)	8.221	0.001	2.04
	Q6	4.48 (0.508)	3.31 (0.693)	7.801	0.001	1.93
	Sum	13.52 (1.439)	9.84 (1.609)	9.705	0.001	2.41
Willingness	Q7	4.45 (0.506)	3.06 (0.914)	8.062	0.001	1.88
	Q8	4.52 (0.508)	2.94 (0.914)	8.570	0.001	2.14
	Sum	9.06 (0.966)	6.00 (1.646)	9.176	0.001	2.27
Affection	Q9	4.45 (0.506)	3.19 (0.644)	8.834	0.001	2.18
	Q10	4.52 (0.508)	3.47 (0.671)	7.103	0.001	1.76
	Sum	8.97 (0.951)	6.66 (1.066)	9.238	0.001	2.29
Overall		45.09 (4.619)	32.88 (4.549)	10.740	0.001	2.66

The results of the independent-samples *t*-test for each dimension and question show that the students in the experimental class had higher improvements than the students in the control class in the dimensions of comprehension, higher-order thinking, readiness, and affection, with the differences being significant ($p < 0.05$, Cohen's d > 0.8). In addition, the largest effect size of the two classes was in higher-order thinking (Cohen's d = 2.41). This indicates that the OSTE teaching method promotes more higher-order thinking among students. As for the effect size of the questions, there were three major differences between the two classes. They were Q9 "This lesson made me have a positive emotional experience" (Cohen's d = 2.18), Q8 "This lesson made me actively participate in activities or sharing" (Cohen's d = 2.14), and Q2 "This lesson made me acquire more systematic knowledge" (Cohen's d = 2.07). Therefore, the OSTE teaching method was most recognized by students for its value in promoting students' positive emotional experience, enhancing their active learning, and acquiring systematic rather than fragmented knowledge.

In summation, through the questionnaire and quasi-experiment, the OSTE is recognized and widely used by geography teachers in this city, and it is a more efficient teaching method than traditional teaching for cultivating sustainable development ideas and other instructional goals.

5. Discussion

The survey shows that middle school geography teachers in this city believe that the agricultural site helps to cultivate the concept of sustainable development among students, and 84.4% of geography teachers agree with its role in county-run development. Almost all geography teachers use a situational teaching method, and OSTE is widely used in teaching geography in this city. However, there are some problems to consider.

First, the situations are often medium-sized and domestic. The local geographic resources directly related to student life are underdeveloped. Life is the source of situational

design; therefore, the high school geography curriculum prescribes that situation selection should consider students' level of knowledge, life, and social reality. The classroom can relate to life situations, and it is possible to link symbolic cognition and one's feelings so that teaching geography can move from a closed to an open form. If necessary, new materials can be constructed to create situations based on students' existing experiences. Nevertheless, the materials must come from real cases and be combined in a meaningful way to achieve an effect stemming from students' lives but also transcending them.

Second, situational teaching pays attention to the case studies, but offers few hands-on activities. Situational teaching is put forward based on constructivist theory. If the activities corresponding to situations are unreasonable and students' subjectivity is ignored, it will lead to a class ruled by the voice of one person alone. Situation creation must be enriched as much as possible to provide students with more hands-on opportunities, to carry out teacher–student interaction, and to stimulate students' subjective consciousness. For example, students must be able to demonstrate the situation in kind [41], experience the situation through role-playing, and reproduce the situation with experiments and other activities.

Third, most geography teachers will set up question chains, but have not reached an agreement on the method of the question chains' implementation. They must ensure that the teaching design is based on students' cognition level and knowledge background. Question chains at different levels are designed to center on an initial question, emphasizing the intrinsic relevance of geographical knowledge; then, the content to be learned is logically integrated into operable learning chains [2]. For example, the ladder of concept generation is built using the zone of proximal development theory [69]. The former problem is based on the zone of proximal development of students, and the solution of the former problem provides the zone of proximal development as a resource for the solution of the latter problem, including knowledge, experience, and method guidance. Although most questions are presupposed before class, the actual learning process should pay attention to the problems generated in class to develop students' thinking and encourage and motivate them to constantly discover and ask new questions.

Fourth, the potential for situational teaching must be further explored. Teachers' education can enrich the understanding of situational teaching. Teachers should consider thinking as the core, beauty as the breakthrough, feeling as the link, and the real world as the source to connect scientific knowledge with feelings and values. Situational teaching focuses on respecting students' individual life experiences and offers unique value for cultivating students' higher-order thinking, aesthetic feelings, and values.

Fifth, teachers must create the situations themselves, and limited teaching hours and difficult teaching tasks are the main factors that prevent them from doing so. Since it is time-consuming and difficult to develop OSTE materials, schools must jointly develop teaching situations to strengthen geographical teaching and research activities.

Finally, teachers and students share the perception that situational teaching can help students acquire systematic knowledge to understand and transfer knowledge. However, there are some differences between them. Further teaching practice and research is necessary in the near future to elucidate these.

The OSTE is consistent with international 21st century competences [70], especially curriculum rationale in China, and it helps students to better master systemic knowledge and skills [52] for real situations, achieve and acquire higher-order thinking [31], and improve their ability to solve practical issues [27,43] and construct sustainable development ideas. This teaching method can be effectively adopted in geography and other subjects. In this study, we integrated the geographer's way of thinking into OSTE. Particularly, where is it, what is it, why is it there, how did it happen, what impact does it have, and how should it be managed for the mutual benefits of humanity and the natural environment? [71]. OSTE provides an efficient way for middle school geography teachers to integrate geographical thinking and sustainable development. However, the OSTE teaching method is not a

panacea for all students and content. Therefore, geography teachers must carefully choose their instruction goals and teaching content while considering students' characteristics.

6. Conclusions

The objective of this study was to verify the pedagogical effect of the OSTE teaching method for sustainable development towards teaching geography. Through the literature review and questionnaire, we gained knowledge on the implementation status of situational teaching, including OSTE. A quasi-experiment followed, covering agricultural location in two parallel classes of a model high school at the state level in the selected city. This study first supports previous study opinions of OSTE through qualitative methods, such as grasping systemic knowledge, improving students' higher-order thinking, learning interest, and initiative. The experiment proved that the OSTE method had a better effect on learning compared to traditional teaching methods. This was mainly seen in three aspects: (1) Students' awareness of the development of circles improved significantly, though there was no difference in their geographical skills; (2) OSTE better helps students achieve cognitive and affective goals, and has obvious advantages in promoting students' higher level thinking; and (3) compared with traditional teaching methods, its most recognized role is to promote positive emotional experiences, active learning, and the acquisition of systematic rather than fragmented knowledge. Due to the limitations of the sample size and differences in the teaching content, future research should verify the effectiveness of the OSTE teaching method through longer experiments and larger sample populations.

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Appendix A

The Implementation of Situational Teaching in the Unit of Agricultural Location

Dear Teacher,

The purpose of this study is to understand the application of situational teaching methods to Agricultural Location for high school geography teachers. There is no right or wrong answer to the questionnaire. Please choose letter of the most suitable option and fill in bracket.

This survey is anonymous, and the survey results are only used for research purposes. Please feel free to fill it out according to your actual situation. I really appreciate your help.

1. What is your gender ( )

A. Male B. Female

2. Your teaching experience is ( )

A. Less than 5 years B. 6–15 years C. 16–25 years D. More than 25 years

3. Your school is ( )

A. State-level Model High School B. Municipal-level Model High School C. Ordinary High School

4. Do you create teaching situations for the Agricultural Location course ( )

A. Yes B. No

5. How many situations do you create in a class ( ) (multiple-choice)

A. 1 B. 2 C. 3 D. More than 3

6. The situations you create are based on ( )

A. Life and production B. Documentaries or magazines related to geography

C. Textbooks D. Academic results E. Others____

7. The situation you created is ( ) to students' life experiences

A. Very relevant B. Relevant C. Uncertain D. Irrelevant E. Very irrelevant

8. The scale of the situation is ( )

A. Local B. Province (other cities) C. Domestic (other provinces) D. Foreign countries

9. The situation type is ( )

A. Activities B. Facts or cases C. Experiments or hands-on D. Test questions E. Others____

10. You usually create situations during the ( ) (multiple choice)

A. Introduction to a new class B. Classroom activities

C. Knowledge explanation D. Class exercises E. Others____

11. Do you like to use a situation throughout the whole class ( )

A. Yes B. No

12. Do you ask questions in the situation ( )

A. Yes B. No

13. If you ask questions, the number of questions is ( )

A.1 B.2 C.3 D.3

14. When you set questions, you usually consider ( )

A. Pointing to knowledge points B. The logical relationship among questions

C. Core competencies D. Others_____

15. The main purpose of designing situations is to improve students' ( ) (multiple-choice)

A. Learning interest B. Degree of participation C. Understanding and transfer of knowledge

D. Problem-solving ability E. Positive emotional experience F. Knowledge that geography is closely related to life G. Improving aesthetic ability H. Higher-order thinking I. The spirit of exploration J. Others_____

16. The main factor that restricts situational teaching is ( ) (multiple choices)

A. Class hours are limited B. Heavy teaching tasks C. Insufficient resources for lesson preparation D. Students E. Teachers F. The teaching effect is not obvious. G. Qther ____

17. Agricultural location contributes to ( ) (multiple-choice)

A. Recognition of regions B. The development of practical skills in geography

C. Comprehensive thinking D. The vision of human-earth harmony

18. What agricultural location contribute to students' concept of sustainable development ( ) (multiple choices)

A. Circular development B. Environmental awareness C. Adaptation to local condition D. Others

Thank you again for your cooperation and support!

Appendix B

The Pretest

Multiple choice questions:

In 2015, China designated 2.68 million mu in Hainan Province as a breeding reserve to cultivate crop seeds and conduct scientific research. At present, the annual export of hybrid rice seeds in China is about 47,000 tons, accounting for more than 95% of the national seed export; 100% of hybrid rice breeding research is conducted in Hainan. Complete 1–3 questions.

1. The main factors that affect the designation of 268,000 mu in Hainan province for scientific research and breeding reserve are ( )

A. Thermal conditions B. Water resources C. Market demands D. Agricultural science and technology

2. The main factor that affects the export of hybrid rice seeds in China is ( )

A. Climatic conditions B. Soil conditions C. Topographic conditions D. Agricultural science and technology.

Huzhou, Zhejiang Province, is located in the economically developed Yangtze River Delta. As early as 2500 years ago, local ancestors adapted to the local conditions and formed a traditional agricultural circulation system of mulberry fishponds. In recent years, with the use of chemical fertilizer and artificial fish diets, farmers have gradually reduced the use of pond mud and silkworm excrement. Given that the economic benefits of traditional Sangji fishponds are too low, most farmers have expanded their fishponds and chosen aquaculture with higher benefits.

3. Please draw a diagram to explain the production mode of circular agriculture in a mulberry fishpond.

4. Do you agree with Huzhou local farmers' decision to expand fishponds and carry out aquaculture with higher economic benefits? Please state your opinion and explain your reasons.

5. Please suggest a production mode of recycling agriculture to farmers.

The posttest

Every year, from the middle of December, the strawberry garden in the suburbs of Shanghai begins to welcome guests. Picking strawberries has become a new trend for citizens to relax. Complete 1~2 questions.

1. Strawberry gardens in the suburbs of Shanghai use intelligent greenhouses to grow strawberries, which mainly improve ( )

A. Light conditions B. Soil conditions C. Heat conditions D. Water source conditions

2. The main factors that ensure strawberry's growth and maturation in Shanghai in winter are ( )

A. Climatic conditions B. Agricultural science and technology

C. Cosmetic conditions D. Market demand

II. Simple questions. Read the materials and complete the following questions.

Gongcheng County in Guangxi province is located in a karst mountainous area. Before 1980s, local people mainly used firewood for cooking, and went to the mountain to cut down trees from the forest. Year after year, the vegetation on the mountain has been significantly reduced. The mountain spring that spewed for thousands of years began to dry up, and the green hills became bare stone mountains. Floods, droughts, and insect disasters followed one after another. In the 1980s, the local government promoted "biogas instead of firewood" and established an agricultural model of "livestock breeding-biogas-fruit planting", which finally solved the problem of cooking without firewood. The county also successfully entered the "National Sustainable Development Experimental Zone."

3. Please draw a diagram to explain the circular agriculture mode of "poultry breeding-biogas-fruit growing."

4. Please analyze the benefits of this ecological circular agriculture model.

5. Can you add a new production mode in "poultry breeding-biogas-growing fruit" to refine the circular economy? Please explain your reasons.

Questionnaire scale for students

1. This lesson strengthened my understanding that geography is closely related to life ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
2. This lesson made me acquire more systematic knowledge ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
3. This lesson improved my ability to apply knowledge ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
4. This lesson improved my problem-solving ability ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
5. This lesson stimulated new opinions or ideas ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
6. This lesson improved my logical thinking or reasoning through materials ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
7. This lesson improved my interest in learning ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
8. This lesson made me actively participate in activities or sharing ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
9. This lesson gave me a positive emotional experience ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree
10. This lesson made me appreciate the beauty of nature and society ( )
A. Strongly disagree B. Disagree C. Undecided D. Agree E. Strongly agree

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