Empirical Research of Farmer College Students' Learning Ability and Learning Effect in the Digital Environment

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Abstract In the course of training farmer college students, there have been a number of problems facing the modern distance education based on digital learning environment, such as weak learning adaptability and ability of farmers and diverse learning needs. Using the empirical methods of questionnaire survey and interview, this article conducts an analysis of the farmer college students' digital learning ability and learning effect, and based on the theoretical study and practical achievements, explores some aspects, such as the information literacy and entrepreneurship ability training for farmer college students, the reform of course teaching and practice teaching, and the building of digital learning platform and special resources. And finally some innovative ideas and recommendations are put forth.

Key words Learning needs, Digital learning environment, Learning effect, Empirical research

1 Introduction

The digital learning environment has many features, such as multimedia information display, information transmission networking, intelligent information processing and virtual teaching environment. Compared with the traditional learning environment, it is more virtual, open, interactive, personalized, *etc.* [1], and its rich learning resources and flexible of convenience and flexibility can provide more learning opportunities and conditions for the educationally weak areas, especially for people in rural areas, which has become an important way to enhance the quality of rural labor, and cultivate practical rural personnel[2]. However, the digital learning environment has posed higher requirements on the learners' application ability of information technology and self-learning ability. The learners must cross the digital divide, to effectively obtain the learning opportunities provided by the digital environment[3-4]. Given the particularity and complexity of the issues concerning agriculture, countryside and farmers, the forms, tools, mechanisms and effects of education training for farmers are always the problems troubling the educational institutions[5]. Therefore, in the digital learning environment, the farmer college students face the dual problems of digital learning ability and learning needs. In order to optimize the teaching model and improve teaching effectiveness, this article uses the empirical methods of questionnaire survey and interview to analyze the farmer college students' digital learning ability and learning effect, explore farmer college students' digital learning ability and learning needs, and put forth innovative ideas and recommendations.

2 Research methods

2.1 Methods The study uses questionnaire survey, interview and teaching inspection. Through the statistical analysis of the questionnaire survey results, I get the data and information on farmer college students' digital learning conditions and capability, learning aspiration, learning needs and learning effect. On this basis, for the reality of farmer college students' learning ability and learning needs, it is necessary to explore new ideas and initiatives for training farmer college students.

In the digital learning conditions and ability and readiness to learn, the survey was conducted on freshman, and 539 questionnaires were distributed; in the learning needs, two kinds of questionnaires were distributed to sophomores, juniors and graduates, 318 for sophomores and juniors, 434 for graduates. The response rate of questionnaires was 100%.

In order to improve the efficiency and reliability of survey and have in-depth understanding of the status of teaching implementation and learning for farmer college students, the teaching examination was conducted on the province's 19 teaching points (40% of the total teaching points); informal discussion was carried out with 318 students and interview was conducted on 10 farmer college students (8 major growers and breeders, 2 village committee members). The topics for interview design are as follows: the evaluation of teachers, face-to-face teaching effect, teaching resources, practice teaching and learning support services; the evaluation of curriculum setting, course content and assessment methods; learning outcomes and recommendations.

2.2 Samples This study takes freshmen, sophomores, juniors and graduates as research samples. 539 freshmen are distributed in Zhejiang's 37 teaching points; 318 sophomores, juniors and 434 graduates are distributed in Zhejiang's 19 teaching points. The 10 farmer college students interviewed are distributed in 10 teaching points. The sample size and sample distribution meet the requirements of educational statistics.

3 Results and analysis

The farmer college students' learning ability in the digital environ-

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ment directly affects the learning effect and teaching quality. Understanding and grasping the farmer college students' learning ability and needs on the use of modern information technology, is not only the premise of carrying out feasibility study of cultivating farmer college students in the digital environment, but also the basis of reforming and innovating upon the teaching mode and training mode for farmer college students.

3.1 The survey results and analysis of farmer college students' learning ability and learning needs

3.1.1 Farmer college students' digital learning conditions and learning ability. The survey results on the farmer college students' digital learning conditions and learning ability are shown in Table 1. Table 1 shows that in Zhejiang's economically developed rural areas, the Internet and information technology have gradually spread, and farmer college students' ability to use information technology has reached a certain level. Most students can use digital tools for learning, and their learning ability in the digital environment has been greatly improved. They become strongly interested in the digital learning. Thus, using the new generation digital education service system to train farmer college students is of practical feasibility, and is one effective way to solve the problems concerning higher education for the rural population, such as costs, universal access and fairness is[6].

Table 1 Farmer college students' digital learning conditions and learning ability

Items	Percentage//%
Students having computers	70
Students able to operate computers	74.1
Students equipped with broadband Internet access	73.4
Students knowing how to search information on Internet	82
Students interested in self-study online	66.7

Farmer college students' learning ability is closely related to age, original cultural foundation and other factors. The age of farmer college students is generally too high. The students aged over 30 account for 52.3% (Fig. 1); 32.6% of students have poor cultural foundation; 57.7% of students lack learning time. Their high age, low computer application ability and other factors make the digital learning repellent to them, deterring the improvement of interest in learning and learning ability; due to weak foundation of high school education and stepping into the world too long, they face the difficulty of bridging cultural knowledge when they carry out professional learning at the level of junior college; the farmer college students mainly come from major growers and breeders, the village committee members, small and medium-sized enterprise owners, rural cooperative managers and self-employed households, who are usually very busy, with little time composing themselves to study.

Thus we see that to make up for the shortcomings in learning ability and achieve the desired teaching objectives and learning outcomes, the farmer college students need to make great effort.

3.1.2 Farmer college students' learning needs. Sophomores and juniors' learning needs are shown in Table 2. The results show that the students urgently want to learn and grasp some practical techniques in rural areas, which is the common purpose for almost all students; face-to-face teaching is a necessary complement to the remote self-learning, and the face-to-face tutoring one or two times a week is the necessary guarantee for improving the learning effect; the student activities are carried out to achieve the purpose of mutual exchange and mutual learning, which is the practical need of most farmer college students, indicating that farmer college students want to take advantage of this learning platform to promote mutual exchange and joint venture.

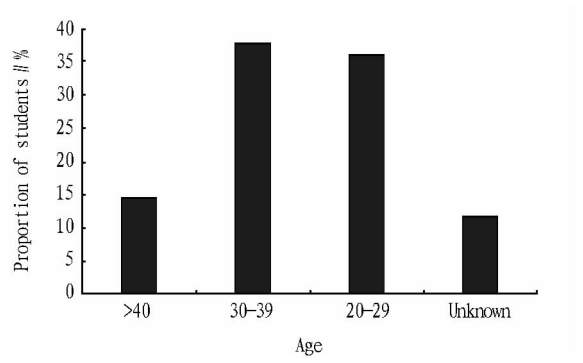

Fig. 1 The age distribution of farmer college students

Table 2 Sophomores and juniors' learning needs

Types of learning needs	Proportion of students//%
Mastering practical skills in rural areas	99.8
Diploma + technique	78.8
Face-to-face tutoring one or two times a week	61.2
Exchange of learning	88.0

Follow-up survey of graduates shows that the learning needs are diversified (Table 3). Through the practice of engaging in rural affairs, the graduates have a deeper understanding of learning needs, so the graduates' learning needs are diversified. For the skilled students with rich practical experience, consolidating the professional knowledge is the most important factor in learning needs, and one of the main driving forces for their learning. Graduate Ge Lingteng believes that in order as soon as possible to make up for the blank of knowledge of modern agricultural technology and grow high quality grapes, it is necessary to systematically learn the professional knowledge; enhancing the overall quality is another crucial factor in farmer college students' learning needs, and many of them once missed the opportunity to receive general higher education for a variety of reasons; the distance education based on digital learning facilitates their study and can meet farmer college students' strong needs for improving computer skills and entrepreneurial capacity, and this open distance education mode different from the traditional education mode is another important factor for their learning needs; the training mode of "education plus skills" can meet the learning needs of students lacking practical experience and skills, and the enhancement of practical skills

is of great avail in the practical work, thereby stimulating their enthusiasm for learning; the pursuit of economic efficiency and self – worth is another important factor influencing many farmer college students' learning needs.

For some major breeders, the adoption of systematic learning can not only quickly resolve the sudden breeding problems, but also broaden horizon to look for more sophisticated farming methods, improve breeding efficiency, and promote common prosperity for local people. In addition, using the digital learning to improve their interpersonal skills is also one of motives for their learning.

Table 3 Distribution of graduates' learning needs

Types of learning needs	Proportion of students//%
Basic theory	16.50
Professional knowledge	19.20
Computer skills	21.50
Practical skills	19.30
Entrepreneurship and innovation capability	19.30
Interpersonal communication skills	4.20

In summary, farmer college students' comprehensive needs for theoretical knowledge, practical skills, entrepreneurship capacity, information technology application ability and interpersonal skills, not only reflect the current farmer college students' advanced ideas and concepts, but also propose a new proposition for the innovation of training mode for farmer college students. How to realize the enhancement of theoretical knowledge, practical skills, entrepreneurship capacity and information literacy, becomes the topic that must be researched.

In order to train farmer college students, we must grasp the actual needs of agriculture, countryside and farmers for education, take full account of the particularity of farmers as the educational object, optimize training programs, teaching objectives, learning content, tools and methods, to build a digital learning environment suitable for the farmer college students' current learning ability and level, really making the farmer college students obtain effective knowledge and skills, improving the overall quality and comprehensive development.

3.2 The survey results and analysis of farmer college students' learning effect In order to grasp the farmer college students' teaching and learning effect, the survey items include face-to-face tutoring, practical aspects, learning resources, formative assessment, upgrade of knowledge and ability and so on.

The survey of sophomores and juniors' learning effect is focused on the assessment of their satisfaction with various teaching and management aspects, and the results are shown in Fig. 2.

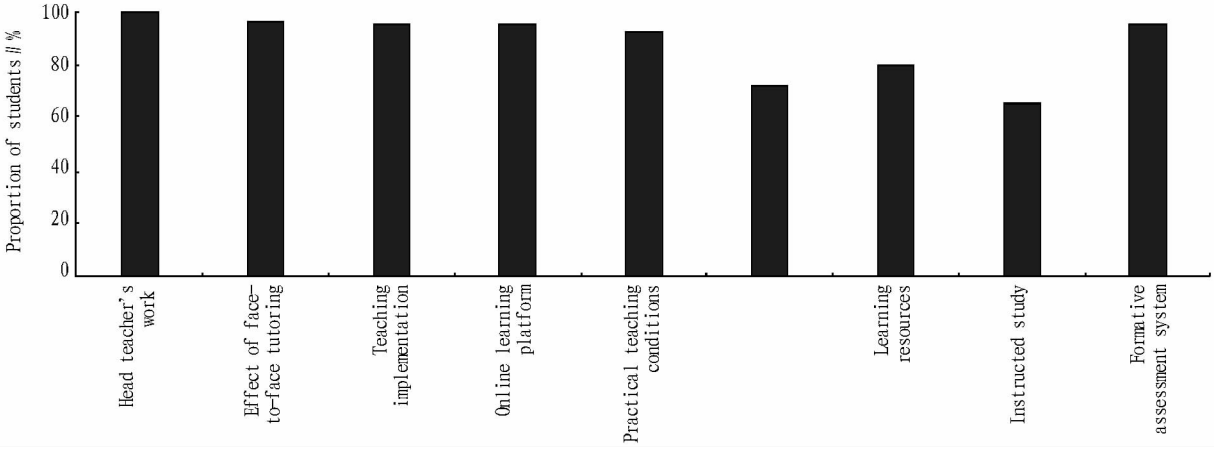

Fig. 2 Students' satisfaction assessment

From Fig. 2, we see that the sophomores and juniors speak highly of the head teachers and face-to-face tutors, and the teaching examination results also confirm this point. Farmer college students' head teachers have made great effort to provide more services, and establish affinity with farmer college students; face-to-face tutoring teachers not only explain the theoretical knowledge to solve practical problems in production, but also guide farmer college students to solve technical problems in their spare time. Given the characteristics of farmer college students in the digital learning environment, teacher's instructed learning ability, management methods and professional ethics, and face-to-face tutoring teachers' professional level, can play a positive guiding and motivating role in meeting students' learning needs and improving the learning effect.

Whether the school's practice teaching facilities are complete and whether there is relaxed learning atmosphere play a positive role in safeguarding the generation of the students' motivation for learning and improvement of learning effect. Their satisfaction with formative assessment system and the teaching platform of provincial radio and television university also reflects the extremely important role of the quality evaluation system in modern distance open education and learning support service system in meeting the students' learning needs, as well as the significant role of practical teaching and teacher's guided teaching in enhancing learning effect, employment and entrepreneurship capacity.

The follow-up questionnaire survey results of farmer college students are shown in Table 4. Since the students have different needs, the option is relatively dispersed when the students opt for

"the main achievement during the learning in radio and television university". Overall, through the learning in radio and television university, it is of great help in improving the level of basic theory and professional knowledge, ability to think, analyze and solve problem, and professionally skills.

Table 4 The main achievement during the learning in radio and television university

Items	Proportion of students//%
Learned the basic theory and professional knowledge	25.50
Fostered ability to think, analyze and solve problem	27.10
Fostered and improved the professional skills	21.70
Developed the capacity for innovation and entrepreneurship	10.90
Made new friends	14.80

Learning effect is also reflected in the career competence, the amount of employment and entrepreneurship, position in the rural affair administration, and change in the farmers' technical titles. 69.8% of students believe that it plays a great role in improving the career competence; approximately half of the students are employed after graduation, and the entrepreneurship is changed (30.2% of students' employment units and positions are changed and 13.6% of students choose to be self-employed); 38.4% of students' positions and technical titles in the village committees and rural cooperatives are promoted after completing their studies. Data show that by learning, farmer college students' career competence, employability and entrepreneurial ability, and job titles have been significantly improved after graduation. Various teaching links play their respective role in training farmer college students. 36.1% of participants feel that the teaching link helping their job most is practice, followed by face-to-face teaching in the classroom (29.5%); 22.1% of participants think that the online learning helps them most.

During the interview, some students have made useful suggestions on training farmer college students. They believe that it is necessary to further increase the practice teaching, to provide a basis for farmer college students to start their own businesses; build a provincial and even national exchanges and cooperation platform for farmer college students, and promote farmer college students' entrepreneurship exchanges and cooperation; increase the learning inspection based on the actual work, and enhance mutual exchanges and learning between students; appropriately increase the face-to-face tutoring, make the classroom teaching content associated with the rural actual situation or give some vivid examples to teach; increase publicity of training program for farmer college students, so that more farmers and friends can participate in the study.

These recommendations indicate that the major setting and curriculum system should be closely related to employment, entrepreneurship and rural economic and social development; it is necessary to strengthen the training of practical ability and build cooperation and exchanges platform of learning and entrepreneurship while imparting systematic professional theoretical knowledge. Only by doing these can the farmer college students' needs be better met, their enthusiasm for learning be greatly stimulated, and the teaching effect of distance open education of radio and television university be improved.

Due to the differences in farmer college students' educational background, knowledge structure, the ability to learn and work, social experience, values, ways of thinking, interests and hobbies, it poses varying degrees of requirements on the teachers' operational capacity, professional and ethical standards, learning support services, formative and summative assessment system, and learning atmosphere, indicating that the teaching content of current distance open education of radio and television university is not closely enough linked up with the career and posts. In this regard, the colleges still need to strengthen experiments, internships and other practical aspects, further enrich teaching resources, and provide the special resources answering for the development needs of the local rural areas.

4 Countermeasures and recommendations

Based on the survey and analysis of farmer college students' learning ability, learning needs and learning effect, the open education mode for farmer college students in the digital environment is incompatible with farmer college students' learning ability and needs in some ways. Therefore, it is necessary to conduct reform and innovation on the teaching objective positioning, platform and resource building, teaching content and form, practice teaching, skills training and other aspects[7]. The training objectives of farmer college students should adhere to serving agriculture, countryside and farmers, and meeting the needs of regional economic development; take into account the learner's values, practice experience, professional knowledge base, motivation for learning; take into account the appropriateness of teaching objectives.

In order to achieve the organic integration of digital education technology, network culture and training of farmer college students, it is necessary to expand process performance, and improve organizational effectiveness in the open learning environment, to achieve truly effective teaching[8]. On the one hand, there is a need to help farmer college students as the special groups to gradually adapt to the digital learning environment, and strengthen the cultivation of information ability. On the other hand, it is necessary to constantly adjust and improve the teaching mode, and strengthen practice teaching, so that farmer college students can foster and strengthen their entrepreneurial and innovative ability while accumulating knowledge and improving skills.

4.1 Integrating the training of farmer college students' information literacy into the professional curriculum system

The new countryside construction needs a large number of modern farmers with the quality of modern agricultural laborers, and requires them to meet the requirements of today's rural development in terms of knowledge, skills, moral values, career awareness and behavior, and lifestyle[9]. We must enhance awareness and ability to obtain information, interpret and use information. Therefore,

information literacy is essential quality for the future farmer college students, and also the basic requirement of enhancing the entrepreneurial and innovative ability, and serving new countryside construction. The training of farmer college students in the digital environment needs to focus on farmer college students' awareness and ability to use modern information technology to study.

Although farmer college students have some information technology application ability, the overall level and information literacy are not high. It is urgent to establish Information Literacy for New Farmers and other courses in the professional training programs of agricultural science; use the technical means to strengthen the teaching and learning process online and force the students to study online; establish farmer college student forums and virtual communities, to carry out various forms of online activities, and cultivate farmer college students' interest in online communication; regularly publish agricultural information to attract farmer college students to surf the net; give play to the faculty and technological advantages of radio and television university, to form powerful rural information technology training and promotion team; take the informatization of agricultural enterprise as the focus to actively carry out demonstration, so that farmer college students literally feel the importance and effectiveness of information literacy, in the process of learning information technology and using agricultural information. Through these reforms, we aim to change farmer college students' production and management concepts and business habits in the traditional agriculture, strengthen information awareness, and improve information literacy.

4.2 Innovating upon the teaching form to inspire farmer college students' enthusiasm for learning A variety of realistic needs drive these promising young people in rural areas to participate in the study, but when they really step into the learning process, they are not psychologically well prepared for the learning. Their learning initiative is not strong in the process of self-study, and the attendance rate of face-to-face tutoring is around 60%. There are many reasons for this: it is difficult to adapt to the learning environment when they are always busy with rural affairs and suddenly re-enter the learning environment; the poor cultural basis leads to objective learning disability; there is also the problem of psychologically repulsing the modern distance education[10]. The course teaching mode is regarded as the basis for the construction of whole teaching mode; the rationality of its design and optimization of teaching form is of great significance to stimulating farmer college students' enthusiasm for learning[11].

Only by innovating upon the course teaching model and increasing interactive and discussion-style teaching methods can the farmers learn with readiness. For examples, we can establish "village official forum", "rural cooperative forum" and "farm fun business and management forum" in the classroom, to make the students talk about what they have learnt and understood on how to be a good village official, well develop rural cooperatives; we can organize the major growers and breeders, responsible person of cooperatives to carry out new agricultural technology forum and entrepreneurial and innovative forum, to discuss the agro-enterprise development model and the new technology application. Through a variety of forums, we can strengthen the interaction between teaching and learning, promote the farmer college students' participation in the learning process and the training of their innovation ability; we can also make the teaching content constantly enriched and deepened. There is a need to employ the teachers and agricultural technicians who boast rich teaching experience, strong practical ability, farmer training experience, and familiarity with the local agricultural industry, to undertake the task of teaching of various core courses. They can adopt mantel forms of teaching, such as on-site guidance, and speaking combined with training, to make the students improve practical skills while learning the theoretical knowledge and stimulate students' enthusiasm for learning and entrepreneurial aspiration.

4.3 Taking on-the-spot teaching and practice teaching as a carrier to cultivate farmer college students' entrepreneurial and innovative ability On-the-spot teaching and practice teaching is not only an integral part for the training of rural advanced practical talents in local areas, but also an important way for farmer college students to learn practical skills and enhance the entrepreneurial capacity, and an important part of education and teaching reform for farmer college students in the context of new countryside construction. This requires farmer college students to be based on the principles of actuality, practicality and validity, to establish modular theoretical teaching system and the practice teaching system with vocational technique application ability as the main line, and explore the teaching mode of "close integration of theoretical teaching, skills training and entrepreneurial practice".

On the one hand, there is a need to take full advantage of farmer college students' planting and breeding bases to carry out on-site teaching, and make farmer college students participate in practice teaching in the farms and orchards; on the other hand, in farmer college students' planting and breeding bases, we can make the students talk about their journey as an entrepreneur, and explain the special practical techniques, to achieve the purpose of combination of theoretical knowledge and practical experience. Through the demonstration style teaching, it can not only promote the implementation of teaching practice links, but also play a demonstration role in the entrepreneurship and innovation, thereby inspiring and nurturing farmer college students' entrepreneurial and innovative capacity. On-the-spot teaching is not only an effective means to strengthen practice teaching, but also an important way to enhance farmer college students' aspiration and entrepreneurial ability.

4.4 Enriching the local special resources to meet the needs for training talents in local areas Digital teaching resources, as the basic element of teaching activities and main carrier of teaching content[12], are the basic conditions for training farmer college students in distance learning environment, and one aspect that farmer college students believe that they need to further enrich and strengthen. Based on the needs for talent cultivation in local

areas, the learning resource construction for farmer college students should not only consider the breadth of learners and diversity of learning needs in terms of content, but also build a number of local special curriculum resources in accordance with the local characteristic economic development and farmer college students' needs for practical skills training, to truly make farmers' study serve the practical purpose.

Zhejiang Radio and Television University has played the advantages of system, and taken into account the local agricultural characteristics, to develop Loquat Cultivation Technology, New Three-dimensional Development Mode of Tea Plantation, Pecan Processing Technology and other television programs and curriculum courseware on the local characteristic courses; compile and publish Farm Fun Business and Management, Bamboo Cultivation and Utilization, New Farmers' Civilization and Literacy and other special teaching materials; open New Deal on Agriculture, White Tea Cultivation Technology, High-quality Grape Cultivation Techniques and other seminars, to meet farmer college students' needs for local special curriculum resources. Local special resource construction must focus on practicality and vividness, having both print media and video or flash animation and other digital media, both online demand and CD player, to facilitate farmer college students to select the media type according to their own conditions and needs. Through the development of local characteristic curriculum resources, it can make farmer college students start an undertaking while learning, and play a positive role in promoting the formation and development of local agricultural characteristic industry.

4.5 Building multi-terminal ecological learning environment to meet farmer college students' learning needs The shift from merely focusing on the data content management of learning resources to paying attention (even more attention) at the same time to the support and management of learning resource application environment, is a new trend in the current research and development of the digital learning resources management[13]. The new generation Internet technology and digital technology offers new possibilities for the construction, application and sharing of learning resources. It is necessary to apply "print media + PC + mobile phone", or "print media + IPTV + PC + mobile phone", or "electronic book + PC + mobile phone", to achieve diversified expression forms of learning resources and facilitate the learners to learn anytime, anywhere. At the same time, it is necessary to actively explore the gradual transformation from digital learning environment to intelligent learning environment[14], to meet new farmers' learning needs.

Based on the new farmers' learning needs, the core is the rational selection and scientific combination of learning content, learning strategies and learning media. It is necessary to build a multi-terminal resource application environment based on computer-based Internet, mobile Internet, digital television network and other forms of transmission[15], to provide comprehensive support services to meet new farmers' diverse learning needs.

4.6 Taking promoting all-around human development as the values positioning for training farmer college students to cultivate pragmatic, trustworthy, industrious and kind new farmers For the training of farmer college students, we should not only focus on the practical skills training, but also pay more attention to the enhancement of the overall quality and comprehensive human development. Currently, the construction of new socialist countryside is being carried out vigorously, and rural economic and social development is the central task of new countryside construction. Making study serve the practical purpose is an important objective of training for farmer college students, but we can not ignore the overall development of modern farmers and harmonious development of man and society[16]. Only by achieving all-round human development can the role of farmer college students be highlighted, in promoting rural economic and social development.

5 Conclusions

The development of modern information technology provides a new way to train entrepreneurial and innovative farmer talents in the digital learning environment and intelligent learning environment. According to the actual needs of new farmers, Zhejiang Radio and Television University has explored the training objectives, training modes, teaching modes and other aspects on farmer college students, and achieved certain results. Practice shows that enriching the form of teaching, strengthening the on-the-spot teaching and practice teaching, and building the digital learning platform and local special resources suitable for the needs of farmers, can significantly improve the relevance and effectiveness of the training for farmer college students, and enhance farmers' entrepreneurial and innovative capacity, so that farmers embark on entrepreneurship and innovation while acquiring knowledge.

Vigorously carrying forward national spirit, times spirit and the Zhejiang spirit with entrepreneurship and innovation as the core, actively promoting the contemporary Zhejiang people's common values characterized by "trustworthiness, pursuit of kindness and upholding science", have promoted the overall development of farmer college students. However, due to the particularity of the educational needs of farmers and restriction of rural informatization development and farmers' informatization level, the digital learning in rural areas still face many practical difficulties, and it is necessary to further research and explore how to improve the training program, build intelligent learning environment, promote the comprehensive human development, and foster common values.

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