

# Course Teaching Reform in the Mode of New Agricultural Talent Training: A Case Study of Effect of Scientific Teaching Method PAD Class on Agrometeorology Teaching

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## **Abstract:**

The curriculum is the smallest training unit in the talent training program, and its teaching effect directly determines the talent training effect of higher agriculture and forestry education. In this paper, the effect of the application of the scientific teaching method PAD (Presentation-Assimilation-Discussion) to classroom teaching in agrometeorology is discussed by selecting 44 students from the 2017 Yan Jiaxian class (Plant Protection) as the experimental group A, 44 students from Class 1 of Plant Protection of the same grade as the experimental group B, and 44 students from Class 2 of Plant Protection of the same grade as the control group (CK). Students in the experimental group were taught in the agrometeorology course with the PAD class teaching method, while those in the control group were given the traditional classroom teaching method (mainly by teachers). After the course ended, the examination performance, the usual performance, the operating performance of the experimental skills, and the final overall score of the three groups were compared, and 12 evaluation indicators, such as imparting methods and enlightening thinking, were scored in the traditional classroom and the PAD class. The results show that the students in the experimental group had higher final examination scores, normal scores, experimental skill operation scores and final total score than those in the control group, showing a significant difference ( $P < 0.05$ ); The scores of the 12 evaluation indicators such as imparting methods and enlightening thinking are higher in the PAD class than in the traditional class. Therefore, the PAD class teaching mode plays an important role in improving the teaching effect of agrometeorology, enlightening the students' thinking, cultivating their critical thinking ability and cultivating their positive feelings and attitudes towards learning.

**Keywords:** *New agricultural science, PAD class, Traditional class, Agrometeorology, Teaching effect.*

## **I. INTRODUCTION**

In the new era, an unprecedented important mission has been put forward for higher agriculture and forestry education. Under the background of new agricultural construction, it is urgent to cultivate new talents who can adapt to and lead the future development of agriculture and forestry to the strategic needs of "poverty alleviation, rural revitalization and ecological civilization". The ideas of cultivating talents with both ability and political integrity, all-round development and meeting the needs of agricultural and rural modernization are embodied in the professional talent training scheme. The curriculum is the smallest training unit in the talent training program, and its teaching effect directly determines the talent training effect of higher agriculture and forestry education.

Agrometeorology, as a science to study the relationship between agricultural production and meteorological conditions and their laws, is one of the basic disciplines of agricultural science and an important branch of applied meteorology in meteorology, whose course teaching covers meteorology, meteorology, climatology and applied meteorology and other fields of related professional knowledge, abstract content, with strong theoretical, comprehensive, practical and other characteristics, so it is a basic course in higher agricultural and forestry colleges and universities of non-agricultural meteorology major [1]. Therefore, this also determines that agrometeorology has some commonalities of general professional basic courses in practical teaching, such as students' low learning enthusiasm, boring teaching content, and weak sense of experimental operation [2]. However, this course is one of the required professional basic courses for students majoring in agronomy, forestry, horticulture and plant protection in agricultural and forestry colleges and universities, and the teaching effect is related to the degree of students' mastery of subsequent professional courses. How to improve the quality of course teaching has become a common concern and discussion of teachers, and even by the attention of the school (the author's school has 18 professional courses of agricultural meteorology), because the teaching effect is related to the survival and development of the school, the quality of classroom teaching is the whole quality system of higher education one of the core links [3]. Therefore, it is of great significance to discuss a set of scientific and perfect teaching methods which are practical, meet the needs of the development of the times and improve the teaching effect.

The scientific teaching method puts forward a brand-new teaching mode, whose core idea lies in that the class consists of three parts: presentation, internalization and discussion [4], i.e. the teacher's teaching takes up part of the class time, while the other part of the time is dominated by the students to conduct interactive learning in the form of fully prepared

discussion, student-student interaction, teacher-student interaction, both of which are separated in time (for example, one week) to ensure that students have sufficient time to internalize and absorb knowledge between the two processes, so it is also known as PAD class [5]. In class, the teacher explains the framework, basic concepts, key and difficult points of the teaching content. After class, the students complete the learning tasks assigned by the teacher by reading the teaching materials and expanding the materials, etc. to further deepen the learning content, absorb and internalize it, and prepare for the next group discussion or sharing of learning results in the classroom, so as to improve the learning effect in the classroom. In the second class, students are arranged to have group discussions, exchange problems encountered in internalization and absorption, and conduct interactive learning [6-8]. The PAD class teaching method has been discussed in many courses in colleges and universities, but without relevant report on the application of it in the teaching of agrometeorology.

In this paper, 44 students from the 2017 Yan Jiaxian class (Plant Protection) were selected as the experimental group A, 44 students from Class 1 of Plant Protection of the same grade as the experimental group B, and 44 students from Class 2 of Plant Protection of the same grade as the control group (CK). Students in the experimental groups A and B were taught in the agrometeorology course with the PAD class teaching method, while those in the control group were given the traditional classroom teaching method. After the teaching ended, the examination performance, the usual performance, the operating performance of the experimental skills, and the final overall score of the three groups were compared, to analyze the influence of the scientific teaching method PAD class on the teaching effect of agrometeorology.

## **II. RESEARCH OBJECTS AND METHODOLOGY**

### **2.1 Research Objects**

44 students from the 2017 Yan Jiaxian class (Plant Protection) were selected as the experimental group A, 44 students from Class 1 of Plant Protection of the same grade as the experimental group B, and 44 students from Class 2 of Plant Protection of the same grade as the control group (CK). The experiment was conducted in groups (four to five students) in the links of operation of experimental skills, discussion and result reporting, which could be appropriately adjusted combined with the students' personality and learning performance and following the principle of "heterogeneity within a group and homogeneity among groups" [9].

## 2.2 Methodology

Students in the experimental groups A and B were taught in the agrometeorology course with the PAD class teaching method. The course of agrometeorology is given twice a week for 2 class hours (45 minutes per class hour). The teaching is carried out according to the following steps: First of all, the teacher explains the content of the chapter and analyzed the key and difficult points. Secondly, the teacher uses the "rain classroom" to push the chapter materials and asks students to collect relevant materials to teach themselves relevant knowledge points in combination with the teaching contents of teachers, and complete the exercises pushed on the Rain Classroom teaching platform, and finally put forward personal opinions and questions, so as to internalize and absorb the knowledge contents. Thirdly, after class, through self-study, internalization and absorption, combined with personal views and summarized problems, students will discuss in groups in class, and teachers will guide and supervise accordingly, and organize students to carry out targeted exchanges and discussions within groups, between groups and within the whole scope, so as to solve the problems encountered in self-study.

Students in the control group (CK) were given the traditional classroom teaching method (mainly by teachers) in the agrometeorology course. The teaching is carried out according to the following steps: First of all, the teacher explains the content of the chapter and analyzed the key and difficult points. Secondly, the teacher uses the "rain classroom" to push the chapter materials and asks students to collect relevant materials to teach themselves relevant knowledge points in combination with the teaching contents of teachers, and complete the exercises pushed on the Rain Classroom teaching platform to complete the review. Finally, the teacher will analyze and answer the questions in the whole class based on the high-frequency questions in the students' answers.

## 2.3 Examination and Evaluation

The students' total score is composed of three parts, including 60% of the examination performance (theoretical examination), 20% of the operating performance of experimental skills and 20% of the usual performance (8 exercises on the rain classroom platform).

## 2.4 Statistical Method

Origin 2019 software was used for statistical analysis of the data, and the measured data was expressed by the mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ). The data were compared by one-way analysis of variance, and the pairwise comparison was conducted by t-test. The difference was statistically significant with  $p < 0.05$ .

### III. THE RESULT AND ANALYSIS OF IMPROVING TEACHING EFFECT BY PAD CLASS

#### 3.1 Analysis of Different Types of Performance

The examination performance, usual performance, operating performance of experiment skills and total final performance of experimental groups A and B and the control group (CK) were analyzed, as shown in Table I.

**TABLE I. Comparison of different types of academic achievements of agrometeorology courses among students in each group**

STUDY GROUP	DIFFERENT TYPES OF ACADEMIC ACHIEVEMENTS (UNIT: POINT)			
	EXAMINATION PERFORMANCE	USUAL PERFORMANCE	OPERATING PERFORMANCE OF EXPERIMENT SKILLS	TOTAL FINAL PERFORMANCE
CONTROL GROUP CK	75.57 ± 10.77 c	77.82 ± 5.15b	84.75 ± 1.01 c	77.86 ± 6.73 c
EXPERIMENTAL GROUP A	87.56 ± 5.91 a	87.43 ± 7.34 a	91.85 ± 3.22 a	88.38 ± 4.76 a
EXPERIMENTAL GROUP B	83.02 ± 6.13 b	85.80 ± 7.59 a	88.18 ± 0.95 b	84.61 ± 4.24 b

The numbers in the same column followed by different lowercase letters indicate significant differences among the scores of each group ( $P < 0.05$ ).

As shown in Table I, examination performance, usual performance, operating performance of experiment skills and total final performance of experimental groups A and B were significantly higher than those of the control group CK ( $P < 0.05$ ), and the difference in the examination performance was most significant, the results of the experimental group were increased by 12.9% on average (Table I) as compared with the control group. The difference in the operating performance of experimental skills was the smallest, with only 6.2% increase. The results of the analysis of the scores of the two experimental groups showed that, except for the fact that there was no significant difference in usual performance, the examination performance and other three scores of the experimental group A and the group B showed significant differences ( $P < 0.05$ ).

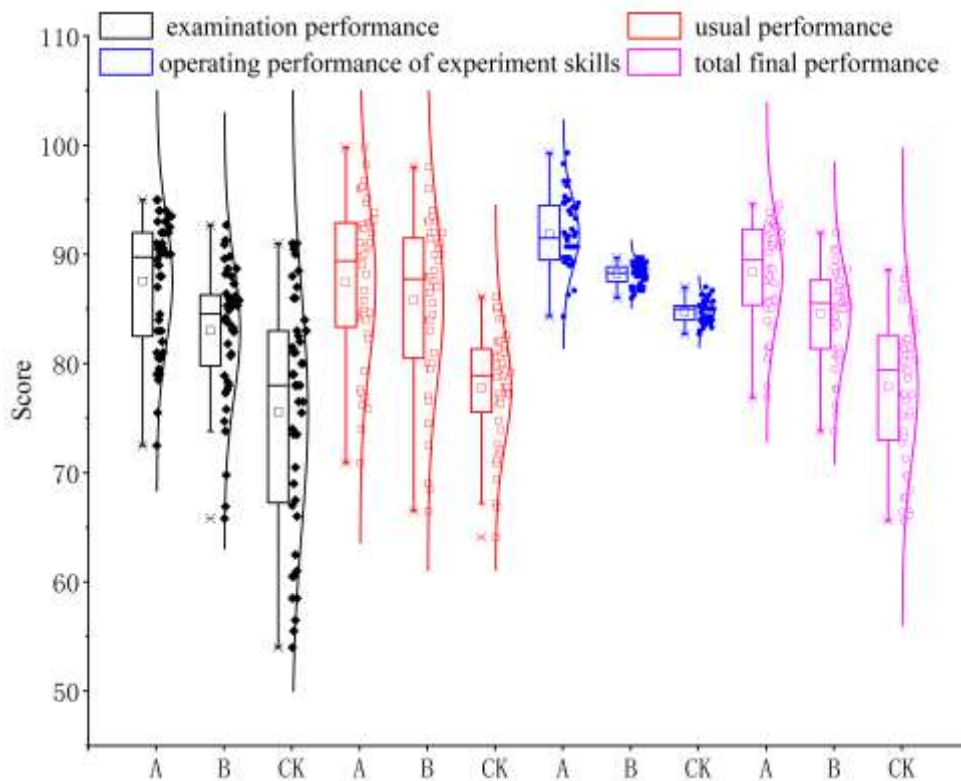


Fig. 1: distribution of different types of performance in agrometeorology courses of each experimental group (A: experimental group A; B: experimental group B; CK: control group)

The distribution of the scores of the three experimental groups is shown in Fig. 1. There is no abnormality in the distribution of the four performances of each experimental group. Among them, the students' performance of the control group CK was the closest to the normal distribution, and that of the experimental group showed a skewed distribution. The figure also shows that the performances of experimental groups A and B are higher than those of control group CK (Fig. 1).

### 3.2 Analysis on Evaluation Indicators between Traditional Classroom and PAD Class

12 indicators of imparting methods and enlightening thinking, cross-synthesizing knowledge in different fields, actively adopting different teaching forms according to the characteristics of chapters, satisfaction with teaching content, satisfaction of teaching organization, online homework inspection, online homework supervision, learning promotion

by online course data (courseware, videos), learning promotion by classroom activities on critical thinking skills, providing a diversified view of cognition and a multi-angle way of thinking, cultivating the ability of searching documents and materials and cultivating positive feelings and attitudes towards learning were selected for comparison on the performances of the traditional classroom and the PAD class. The score range of each evaluation indicator was 0-10. The results of the questionnaire survey for the students in the experimental group are shown in Fig. 2.

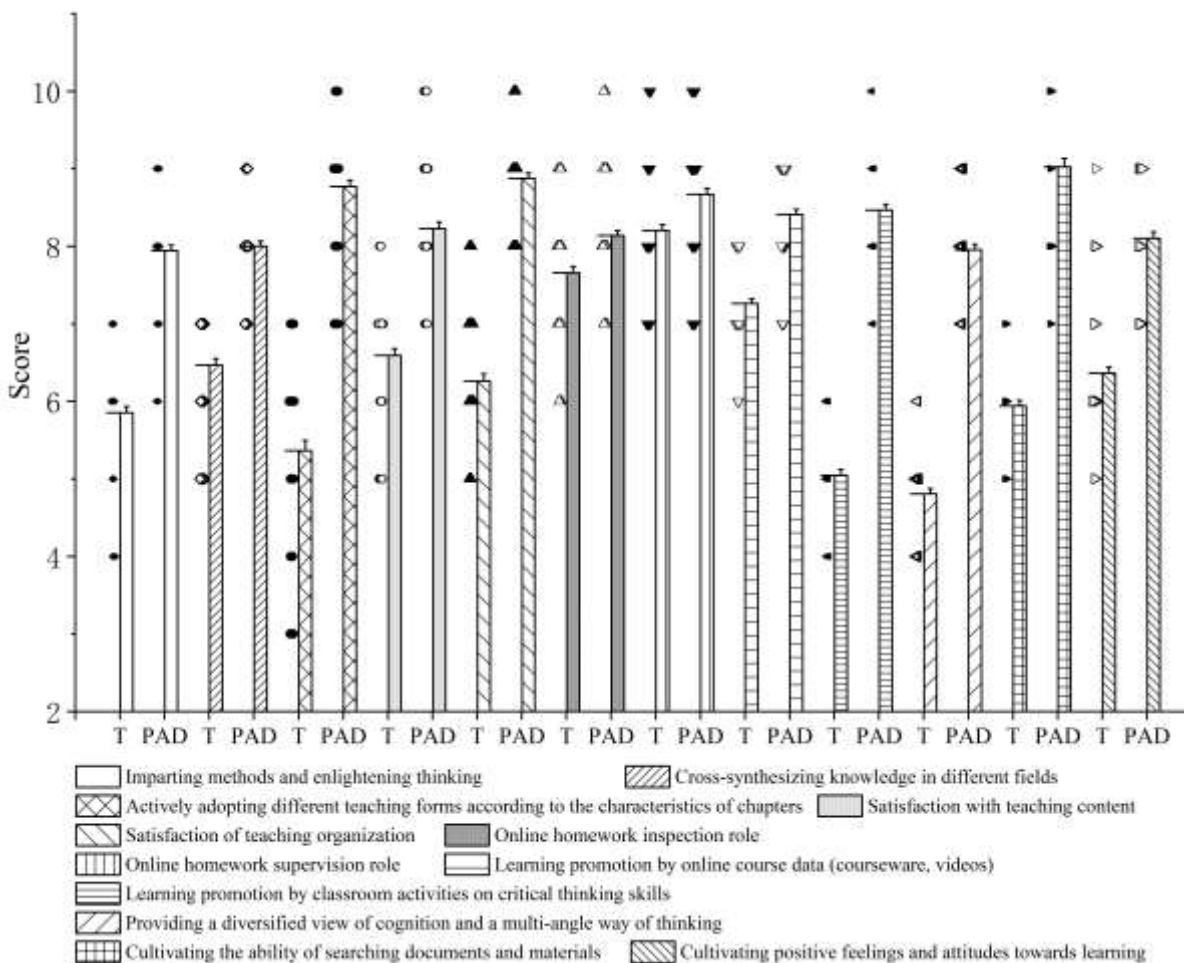


Fig. 2: comparison of evaluation indicators between traditional classroom and PAD class (T means Traditional classroom; PAD means PAD class)

According to the figure, the scores of the 12 evaluation indicators, such as paying attention to the teaching of methods and enlightening thinking, are higher in the PAD class than in the traditional classroom; 8 evaluation indicators, such as actively adopting different teaching

forms according to the characteristics of chapters, learning promotion by classroom activities on critical thinking skills and cultivating the ability of searching documents and materials even got full scores in the PAD class mode. 42.3% of the students gave full scores in the evaluation indicator of cultivating the ability of searching documents and materials, 15.9% of the students gave full scores in the evaluation indicator of satisfaction of teaching organization. The evaluation indicator of online homework inspection role and supervision role got close scores both in the traditional classroom and PAD class, especially the supervision role that were scored high by students.

#### **IV. DISCUSSION AND CONCLUSION ON IMPROVING TEACHING EFFECT BY PAD CLASS**

In this study, the teachers of experimental groups A and B only combed the framework of knowledge points of agricultural meteorology and analyzed the key points and difficulties. Then, in the other half of the time, students searched relevant literature through the information provided by teachers in class, and internalized knowledge absorption through self-study and summing up questions, and conducted interactive learning in the form of discussion to feedback their mastery of knowledge. In this teaching mode, students often ask questions deeply in class after full preparation before class, which requires teachers to enrich their professional knowledge and achieve the purpose of teaching and learning, which not only realizes the transmission of knowledge, but also helps students master knowledge. Moreover, the teacher-student relationship based on this interactive discussion mode is of great significance to stimulate students' subjective initiative in learning and improve classroom efficiency.

##### **4.1 Influence of PAD Class on Teaching Process of Agrometeorology**

The results of the survey of the students in the experimental group showed that the score of the evaluation indicators such as paying attention to the teaching of methods and enlightening thinking, adopting different teaching forms dynamically according to the characteristics of chapters, and cultivating the ability of searching documents and materials in the PAD class was significantly higher to that of the traditional classroom teaching (Fig. 2), because the role of the teachers in the FAD class was more to guide, supervise and introduce the discussion form into the classroom teaching, thus creating a favorable environment for the interaction between teachers and students. In this mode, teachers pay more attention to the teaching of learning methods, enlighten students to think [10], guide students to collect documents and materials according to chapter topics, put forward personal opinions and questions, and carry out interactive learning in a prepared way. At the stage of internalization and absorption, teachers



provide more effective guidance, and lead students to explore the comprehensive intersection between agricultural meteorology knowledge and core knowledge of each major through thinking questions, so as to provide students with diversified understanding vision and multi-angle thinking mode, and can adopt different teaching organization forms according to the knowledge characteristics of the course chapters and students' feedback on the degree of knowledge mastery.

In contrast, it is rare to see interaction between students and teachers in the traditional class teaching mode, in which teachers teach in the original mode, and the students passively accept the knowledge. This teacher-centered, indoctrinating teaching mode is bound to make students lack initiative in learning, are not interested in learning, perfunctory in homework, and will not ask teachers and other students for help after class. Therefore, the PAD class teaching mode provides a solution to the difficulties faced by the traditional classroom.

#### 4.2 Influence of PAD Class on Teaching Effect of Agrometeorology

The results of the research on the examination performance, usual performance, operating performance of experimental skills and total final performance show that the experimental group is higher than the control group, with significant differences ( $P < 0.05$ ) (Table I), mainly because the impact of PAD class on the teaching process is that half of the time is given to the teachers, and the other half is given to the students. Through the supervision and guidance of the teachers throughout the process, the learning potential of the students is continuously developed, the learning subjective initiative is continuously mobilized, and the self-learning ability is continuously improved. Thus it is obvious that this mode is a kind of self-education learning and teaching mode based on gradual autonomous learning [11-13].

In this study, the students in Group A were from Yan Jiaxian Class (plant protection major) of our school, while those in Group B were students of plant protection major in the ordinary class at the same grade. Therefore, the examination performance, operating performance of experimental skills and total final performance were significantly higher than those in Group B, which was mainly due to the differences in learning background between the two. Furthermore, in terms of experimental operation skills, Group A had special scientific research training courses. On the other hand, the usual performances of group A and group B were not significantly different, but significantly higher than that of the control group CK, which to some extent reflected the positive effect of the PAD class teaching mode on students' learning process, learning behavior and learning initiative [14]. Autonomous learning and discussion strengthened the students' learning process and strengthened the internalization of knowledge, so as to achieve the purpose of improving their learning effect [15].

### 4.3 Conclusions

FAD class is a new teaching mode put forward to adapt to personality teaching and information education. Its core lies in allocating half of classroom teaching hours to teachers and half to students for thinking and discussion, respecting students' personality development, maximizing their learning time, making them make full use of extracurricular time to collect information, reading literature to assist understanding, and mastering the knowledge of course chapters in advance, so that they can learn more clearly in class and have stronger enthusiasm and initiative.

Split-class not only helps to improve students' thinking ability, can inspire students to think, stimulate students' divergent thinking, improve students' ability of cross-integration of knowledge in different fields, provide students with a diversified understanding of vision and multi-angle way of thinking, but also helps to enrich the presentation of teaching content, so that teaching organization and content become diverse, thus greatly cultivating students' positive feelings and attitudes towards learning. Through group discussions or group presentations, students are virtually under pressure to learn that if they show agricultural meteorology in a step-by-step manner, the knowledge points will appear to be single and boring and they will definitely not be able to win the first place in the group display. Therefore, students have to find ways to demonstrate in a more attractive personal opinion or presentation, so that the originally abstract and boring agricultural meteorology problems can be presented more visually. PAD class is good for students to learn from each other and enhance friendship, because it is faster to learn by brainstorming and the sense of teamwork is constantly increasing. Based on the group discussion, it realizes the information transmission between students and sharing of resources, and changes the situation of low efficiency in the use of information resources in traditional teaching. PAD class is a double-subject class that can make classroom teaching return to the two-way interaction between teaching and learning, in which teaching subjects can accurately understand students' learning needs and learning obstacles through dialogue, implement precise teaching guidance according to learning needs, and carry out in-depth interaction and communication at learning obstacles, so that students can move from closed to open and constantly surpass, thus constructing an interactive teaching paradigm that both teachers and students have a sense of gain. In conclusion, this teaching mode is of great practical significance for improving the teaching effect of courses, helping to build national first-class courses, achieving the training goal of professional talents, and cultivating new talents to adapt and lead the future development of agriculture and forestry.

## **ACKNOWLEDGEMENT**

This research has been financed by Fujian Agriculture and Forestry University undergraduate education reform key project in 2020 "Reconstruction of teaching organization and reform of talent training mode of agriculture specialty under the background of new agriculture construction" (111420001).

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