Exploration and Practice on the Construction of Majors of National Grade—A Case Study of Agricultural Resources and Environment in Huazhong Agricultural University

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Abstract. This paper elaborates upon several approaches to strengthening special majors of national grade. It concludes five approaches: we should put personnel training as the main task to innovate training modes and highlight university characteristics; take discipline construction as a leader to drive the development of special majors; regard teaching materials compilation as a basis to enhance the quality of special majors; put practice base construction as a platform to strengthen teaching practice and promote characteristics; put teaching team building as a focus to lead faculty building, promote teaching team to improve faculty quality and protect major construction and put scientific research as a support to expand the contents of special majors. Specific strategies and measures for the construction of special majors of national grade are also discussed, focusing particularly on the experience of the major construction of Agricultural Resources and Environment in Huazhong agricultural university.

Construction of special majors plays an important role and significance in the implementation of the “Project on Teaching Quality and Teaching Reform in Institutions of Higher Education” (referred to as “quality project”). Special majors, formed in years of efforts, demonstrate the teaching edge and characteristics. The major Agricultural Resources and Environment, one of the advantage majors of Huazhong Agricultural University, is originated from the major Agricultural Chemistry set by Academician Chen Huagen in 1948 in Wuhan University. After 60 years, over 1800 college students graduated from this major including several academicians from Chinese Academy of Sciences and Chinese Academy of Social Sciences such as Chen Wenxin, Fan Liuyun and Liu Genglin.

Over the years, advantages and features of this major have been formed in many fields including low-yield soil improvement, micro element fertilizer application, soil testing and fertilization, soil pollution control, environment construction in rural areas. After several years of construction and development, with its choosing as a brand major of Hubei in 2006 and a special major construction site approved by Ministry of National Education in 2008, this major has become a demonstration base for the cultivating of innovative talent of Agricultural Resources and Environment and a practice platform for teaching reform and research. This paper discusses strategies and measures on the construction of special majors of national grade by taking Huazhong Agricultural University as an example.
Take Personnel Training as the Main Task to Innovate Training Modes and Highlight University Characteristics

Talent training scheme is not only the core of major construction but also the programmatic guide serving as top-level design for running a major, hence it’s of great importance to improve the quality of talent training[2]. In recent years, following the demand of “advanced thought, clear target, leading reform, refined teaching team, excellent equipment, outstanding teaching, distinct features”, with the guideline of “solid foundation, broad vision, strong ability, practice-emphasized, unique feature”, staff in our major optimized the training scheme by orientate it to social needs and strive to build a scheme catering to investigative, elite and unique talents. We set flexible major branches choosing system and give independent guide to students of each direction to meet their different development needs. 3 branches have been set: Soil and Environment, Plant Nutrition and Fertilization and Soil and Water Conservation. After receiving liberal and scientific basic education, disciplined-related basic education and discipline basic education, students have rights to choose any one of the three branches as their developing direction.

By adhering to the idea of cultivating talent in practice, we designed a multilevel teaching practice system which combines practice with theory, curricular with extracurricular contents and industries, universities, and research institutions. Students are cultivated progressively starting from learning basic discipline knowledge to frontier theory and from basic experiment operation to independent individual exploration. Our talent cultivating scheme is based in Huazhong area but it serves to agricultural resources and environment industries all over China. We spare efforts to cultivate research-oriented, application-oriented, and interdisciplinary talent with innovative spirits to serve the development of regional economic and social development.

Take Discipline Construction as a Leader to Drive the Development of Special Majors

Discipline construction focuses on the inheritance and innovation of knowledge system. While major construction is a combination of social needs and knowledge systems of different disciplines, focusing on the cultivation of specialized personnel. Discipline is the foundation of a major and in turn major is the extension and embodiment of a discipline [3]. It’s our inevitable choice that when building a major, we take discipline construction as a leader by borrowing its advantage and support to drive the development of special majors.

The major Agricultural Resources and Environment in HAZU is of solid discipline foundation and obvious advantages: its backup core discipline Agricultural Resources and Environment is rated as first-level key discipline in Hubei province; the second-level Soil Science and Plant Nutrition Science are the special disciplines of Hubei Province; There is a post-doctoral research station of Agricultural Resources and Environment, a first-level discipline doctoral station, three second-level discipline doctoral stations and two master stations. Its supporting disciplines Environmental Science and Engineering have two second-level disciplines master station Environmental Science and Environmental Engineering. Support platforms include Key Laboratory of Subtropical Agriculture Resources and Environment of Ministry of Agriculture, Experimental Teaching Demonstration Center of Agricultural Resources and Environment of Hubei Province, Research Center of Trace Elements in Huazhong Agricultural University, Research Center of Environmental Ecology and Soil and Water Conservation Research Center.
Since the beginning of 12th five-year plan, College of Resources and Environment has been sticking to the construction guideline of “enhance foundation, keep advantage, highlight application, construct connotation, develop extension”. Through exploration, innovation and integration, we gradually make the discipline more concentrated and stable with its structure optimized, features highlighted and advantage promoted. We give full play to the traditional advantages of Soil Science and Plant Nutrition Science, insist on the intersection, integration and infiltration of Agricultural Resources Utilization and Environmental Science, integrate resources, transform modern biology and information technology, enhance the disciplines regards Agricultural Resources Utilization, boost vitality of running a university and raise its competitiveness. After turning discipline advantage into a major advantage, an Agricultural Resources and Environmental major system which regards agricultural resources utilization as the advantage, the environment as the core and the information as the support has formally come into being.

**Regard Teaching Materials Compilation as a Basis to Enhance the Quality of Special Majors**

The curriculum is the key to implement the talent cultivation program, achieve the training goal, and constitute the basic structural unit of a major [4]. It is also the main carrier to train the students to acquire "knowledge, ability and quality". Curriculum and teaching materials are the materialized fruits of the major construction and an important symbol reflecting the characteristic of a major. Curriculum construction is the basis of discipline construction projects and can improve discipline quality. Through the implementation of the curriculum construction system "one course with at least two teachers", each course is stably equipped with at least two teachers and each teacher stably takes at least one course. Course groups have been established on the basis of a number of similar course teaching teams. A system with one person responsible for one course has been carried out: teachers of senior titles responsible for the curriculum construction to lead the curriculum group to develop curriculum materials so as to improve the quality of curriculum teaching.

The construction of curriculum system is the core content of university talent cultivation. Scientific and reasonable curriculum system is very important for universities to train high-quality personnel [5]. Therefore, the construction of a sound curriculum system is an important part of discipline construction. To strengthen the construction of the curriculum system, we have taken reforms in theory class, experiment, practice outline, teaching content, teaching methods and approaches and finally formed the curriculum system with sound and excellent classroom theory teaching, practice teaching, production labor, production practice and graduation practice. By using the latest scientific researches combined with the consideration of actual needs of society, we opened new courses, updated course content and optimized the curriculum system. For example, additional courses like Soil Biology, Environmental Soil Science and other cutting-edge courses have been opened according to the development of the discipline and scientific researches. To promote the internationalization of discipline core courses, we carried out bilingual teaching by hiring foreign high-level professors and experts to give classes and selected excellent original foreign language textbooks.

Reforms in curriculum construction contributes to textbook construction [6]. We increased the number of courses and improve the quality with each course developing groups as a team to integrate content, optimize the structure and highlight course characteristics. By focusing
on core curriculums, a three-level course system (“school - province - state”) shall be
done and efforts in optimizing curriculum construction quality and teaching materials
quality shall be continued. At present, we opened two national quality courses "National
Geology and Geomorphology" and "Agrology", one national bilingual teaching demonstration
course Agrology, two competitive courses of Hubei "Plant Nutrition" and "Soil Fertilizers" as
well as many other university-level key courses. Over 10 textbooks are compiled by our
teachers among which Soil and Fertilizer Science won the China Agricultural Science and
Education Fund Award for outstanding teaching materials and Agrology won the Award of
Excellent Agricultural Textbooks in universities nationwide.

We promoted research-based teaching and reduced class scale for the convenience of
carrying out teaching according to each individual student’s ability and interests. To put it
more specifically, for some core discipline classes, we divided our teaching into two
categories, i.e. application-oriented teaching and research-oriented teaching, according to the
needs of students and their English levels, such as courses like Agrology, Soil and Fertilizer.
The difficulty of their teaching content as well as heavy and difficult points are all different so
as to achieve individualized teaching.

We carried out reforms in teaching methods. For instance, in the course Geology and
Geomorphology, multiple teaching methods are used including "research style", "tourism
style", "four in one style" as well as many other teaching methods. Special geological features
constitute tourism resources, therefore we taught by making students learn during “travelling”
around the world and enjoy the joy of learning. We utilized a "four in one" teaching mode
which are classroom teaching, indoor experiment, field practice and self-learning network to
achieve the unity of classroom and online teaching.

Put Practice Base Construction as a Platform to Strengthen Teaching Practice and
Promote Characteristic Development

Practice teaching base is the basic condition of running a school and is also an important
content of discipline construction, especially for those highly practical majors. At the same
time, the development of modern agricultural resources and environmental technology needs
a more modern practice teaching place. Therefore, to build a stable, complete, standardized
practice teaching base inside and outside the university is to ensure that the course practice,
graduation practice and other practical teaching can be carried out. To develop our discipline
Agricultural Resources and Environment, we striving to build our practice site into a
national-level college students practice teaching base. So far, a base with independent
property rights has been completed, namely He Shengqiao Agricultural Science and
Education Comprehensive Practice Base in Xianning, Hubei. We make use of social resources
by cooperating with enterprises to run our university. Up to now, several off-campus practice
bases have already been built in mining areas in Daye, Jiugong Mountain in Xianning,
Jingmen Zhanghe Reservoir in Jinmen, Hunan Zhuzhou Chemical Industry Group and so on.
Funded by special repair program of the Ministry of Education, an agricultural resources and
environmental practice teaching base of nearly 20000 square meters, with complete teaching
practice conditions has been inside HZAU, which has improved the practice teaching and the
quality of practical teaching.

Laboratory is an important base for cultivating innovative talents and equipment inside
laboratories provide key condition for experimental teaching. We implemented central
management, build open, shared, high-quality and efficient public experimental teaching
platform. We invested nearly 1000000 yuan to build one soil and geological specimens
museum inside our resources and environment experimental teaching demonstration center
which is rated as provincial level. The total area of the center is 2000 m². It boasts of more
than 2,000 pieces advanced equipment with a total value of 18 million yuan including a gas
chromatograph, high performance liquid chromatography, flow injection analyzer,
multi-channel micro calorimeter and many other modern equipment, which meet the
development needs of experimental teaching technical approaches. The center has become the
main place of carrying out discipline experimental teaching and an important platform for
students to make technological innovation.

We optimized the structure of teaching practice by building a modular, serialized and
relatively independent gradient experimental teaching system. According to social needs, we
strengthened integration, highlighted innovation, optimized the original combination of
experimental content and set a new, independent experimental course scheme. For example,
we integrated two experimental practices (Agrology, Geology and Geomorphology) into the
Soil and Geological experimental practice courses. We reformed experimental approaches
and experimental methods, introduced advanced and mature experimental techniques home
and abroad, updated experimental teaching content, and added new experimental projects to
meet the discipline development needs.

**Strengthen Teaching Team to Improve Faculty Quality and Ensure Major Construction**

A strong faculty team provides strong protection for the sustainable development of special
majors. We should set up the idea of training faculty in teams with young teachers and
teaching teams as the focus so as to create a high-quality faculty team full of vitality, with
noble morality, excellent skills and reasonable structure [7]. According to the training thought
of "all the teachers in a team, all the professors lead a team", according to their teaching needs,
combined with their academic background, teachers selected their main research direction and
course group and then gained experiences, grow and enhance capacity in the teaching team.
Since 2002, we have set up teaching teams with discipline professors taking the lead in course
groups. For example, Huang Qiaoyun, distinguished professor enlisted Changjiang Scholars
Program and the National Outstanding Youth Science Fund, formed a teaching team on
Agrology with several other lectures in Soil, Geology and Geomorphology, Soil and Fertilizer
Science, Soil and Geological Experimental Practice. In 2010, this teaching team was chosen
as Hubei teaching team and national teaching team. Therefore, we should enhance faculty
level through improving teaching team which can provide a talent guarantee for major
characteristics [8].

We strengthened the training of teachers' teaching and educating ability. We established
teacher training fund to support teachers to learn and receive training, participate teaching
meetings and expand foreign exchanges and cooperation. We lay much attention to overseas
academic experience especially for young teachers, so we selected outstanding teachers and
sent them to study and visit high-level university home and abroad and listen to at least one
set of course during the training. At present, 80% of the teachers in our major have overseas
study and training background. Their vision was broadened and international competitiveness
enhanced. We demand all teachers as well as professors participated in undergraduate
teaching and take the teaching as the primary assessment.

We implemented the "doctoral program", that is to introduce new doctors and at the same
time encourage on-the-job teachers pursue doctor degree to raise the proportion of teachers
with doctoral degree and part-time teachers introduced to further optimize faculty structure. We implemented the "famous teacher project", that is to introduce high-level talents home and abroad as a part-time professor, cultivate famous teachers at all levels and let them play an exemplary role, hire part-time teachers who work in real working environment and have rich practice experience to guide students internship or graduation thesis. The implementation of "Talent Project" also helps to enhance the overall strength and competitiveness of teachers. By now, the teaching staff of our discipline are mostly young and middle-age professors, associate professors and doctors.

There are 42 teachers among whom 36 are full-time teachers and the other 6 are experimental technical personnel. All full-time teachers are under 55 years old among which 30 hold senior titles, accounting for 83.3% (19 professors, 11 associate professors); 34 are doctors, accounting for 94.4%. Outside hired part-time talents account for 68% among which one is Changjiang Scholar approved by Ministry of Education, three are the award winners of the National Outstanding Young Scientists Fund, one is a national candidate for "New Century Talents Project", two are authors of National 100 Excellent Doctoral Thesis and two are their supervisors, two are scientists of the National Modern Agricultural Technology System, two are enlisted the Hundred Talents Program of the Chinese Academy of Sciences, two are distinguished professors of the Chutian Scholars, one is from the Teaching Steering Committee of the Ministry of Education, six are in the list of the New Century Excellent Talents Support Program of the Ministry of Education, twelve are exporters who have done outstanding contributions to Hubei Province. We also have one innovative group funded by Hubei Natural Science Foundation and a group of professors were national-level and provincial-level soil testing and fertilization, soil and water conservation experts. All of our young doctors once hosted the project under National Natural Science Fund. Among the 6 experimental technical personnel, one is doctorate, 3 are masters and the other 3 are senior engineers.

Put Scientific Research as a Support to Expand the Contents of Special Majors.

As a strong support for construction of majors, scientific research expands the major contents and talent cultivation space. This major is aimed at serving for social and economic development. Every teacher of this major has their own researching field and project, actively launching scientific research. Since the 12th fifth year plan, we have finished 200 state and provincial scientific research projects, acquired over 70 million yuan as research fund and 10 state and provincial awards, published 860 research papers, 251 pieces of which are included in SCI, EI and ISIP.

Scientific research promotes professional teaching. During scientific research, we can keep up with the hot topics in this discipline, enrich our knowledge with broadened horizon and thought in explorations and practices, improve teaching method and upgrade teaching level. By introducing achievements in research, we can enrich course contents and promote the upgrading of teaching contents. With the aid of scientific research platform and bases, teachers can transfer research resources into quality teaching materials and students can be introduced to participate in scientific research projects through which they can cultivate innovative thinking and capability so as to integrate “study” and “research.”
Construction Fruits

In recent years, this major has made great achievements through constant transformation, reconstruction and development, and been promoted through course materials, talent training and external service. For example, Pedology, Geology and Geomorphology and Soil Fertilizer Science has been applied in more than 10 colleges. Every year, we admit junior students transferring from Tarim University in Xin Jiang till they graduate. Now, we have 5 overseas students from Fiji and other countries. Besides, we also provide technology services for Fertilizer enterprises in Hubei province, and technical training for soil pollution investigation in Hubei province and national soil testing and formulated fertilization.

Talents training quality has been improved at large. Over the past three years, students of this major passing CET4 at first time account for more than 90%. Postgraduate enrollment rate is over 60%. And our students are highly thought of by their tutors due to their scientific research quality and ability during graduate program. Graduates are well received and acclaimed by enterprises due to their business capability and comprehensive quality so that the first employment rate exceeds 98%. Students’ practical and creative abilities have been enhanced constantly. Science and technology innovation teams made up of college students have won the grand prize of the 5th and 6th Hubei provincial “Challenge Cup” undergraduate business plan race and the gold award of the 7th “Challenge Cup” business plan race. College students have won 2 first prize and 3 second prize in China Undergraduate Mathematical Contest in Modeling, 9 first prize in Hubei provincial MCM, and 4 provincial awards of undergraduate outstanding achievements in scientific research. The student club “Green Association” built on the basis of this major has become the brand of national college student clubs, “national top 100 student associations” and “national top 10 environmental protection student associations”, etc. Club members have visited Korea, Germany, Mongolia and other countries for exchange, and one member has been chosen as youth adviser for the United Nations Environment Program.

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References


