Research on the integration of teaching content of core courses in Agro-ecological environmental specialties of higher vocational colleges

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Abstract. Curriculum is the means to cultivate higher vocational talents. On the basis of analyzing the core curriculum problems of curriculum reform and Agro-ecological environmental specialties in higher vocational colleges, this paper puts forward the optimization and integration measures of 6 core courses, including "Eco-environment Repair Technology", "Agro-environmental Management Plan", "Environmental Engineering Design", "Environmental Pest Management Technology", "Agro-chemical Pollution Control Technology", "Agro-environmental Testing and Analysis". It integrates the vocational qualification certificate education and professional induction certificate training items, and enhances the adaptability, skills and professionalism of professional core curriculum.

1. Introduction
China's higher vocational education has developed rapidly in recent years. With the rapid expansion of the scale, various problems emerge in the curriculum reform in higher vocational education, thus the personnel training goals cannot be achieved. This is mainly reflected in the following aspects: first, the curriculum system design is unreasonable and the subject-based curriculum system is adopted. Second, teaching content and theory are out-dated and theory and practice are disconnected. Third, the technical application of higher vocational education and the theoretical principle of "being necessary and enough" are simple and one-sided, which is not beneficial to practical skills training. Fourth, teachers have little knowledge of the production, the actual community and lack technical practice background and teaching experience [1-4].

By analyzing the existing problems of higher vocational education in our country, it can be seen that the traditional vocational education system with the teaching material and teaching method as the core is incompatible with the training goal of talent, which obviously fails to keep up with the requirements of the high-quality personnel training by the industrial development. The education of Agro-ecological environmental specialties in higher vocational colleges is no exception. Therefore, it is necessary to achieve the teaching reform of the integration of production and teaching, engineering and teaching in Agro-ecological environmental specialties of vocational colleges through the integration of curriculum.

2. The integration of names of core courses of Agro-ecological environmental specialties
According to the current social needs of environmental professionals training specifications, environmental professional qualification certification, vocational skills appraisal and job post...
requirements, this paper conducts integration and development of related courses based on the environmental professional training programs.

This paper integrates the core courses and increases the practical teaching content based on the core skills and takes the initiative to adapt to the development of ecological environment protection industry and related industries, highlight the actual needs. The 6 courses are identified as the core of environmental professional courses, including "Ecological Environment Repair Technology", "Environmental Management Plan", "Environmental Engineering Design", "Environmental Pest Management Technology", "Agro-chemical Pollution Control Technology", and " Agro-environmental Testing and Analysis".

### Table 1. The list of core curriculum integration of agro-ecological environmental specialties.

| Core curriculum | Integrated curriculum | Integration benefits |
|-----------------|-----------------------|----------------------|
| Eco-environment Repair Technology | Environmental Ecology, Plant Cultivation and Conservation, Afforestation, Plant Afforestation, and Ecological Agriculture | Meet the needs of ecological, urban construction and ecological environment construction jobs. |
| Agro-environmental Management Plan | Environmental Management, Environmental Planning, Environmental Auditing, Environmental Sanitation Engineering Drawing, CAD, Water Pollution Control Project, Air Pollution Control Project, and Environmental Engineering Design | Reduce theoretical knowledge, increase application technology, to meet job demands. |
| Environmental Engineering Design | Environmental Pest Management Technology | Cutting theory, increasing operations to meet the needs of environmental engineering design jobs |
| Environmental Pest Management Technology | Environmental Engineering Design | Meet the needs of environmental pest management and ecological protection jobs. |
| Agro-chemicals Pollution Control Technology | Plant Protection, Agricultural Environmental Protection, and Soil &Fertilizer | Meet the needs of professional posts for agricultural chemicals pollution control. |
| Agro-environmental Testing and Analysis | Environmental Monitoring, Environmental Chemistry, and Instrumental Analysis | Meet the needs of environmental inspection and analysis jobs. |

### 3. Core curriculum content integration for Agro-ecological environmental specialties

#### 3.1. Core teaching content integration of “Eco-environment Repair Technology”

This is a new environmental subject course, highlighting the skills of creating a good ecological environment and integrating the content of the environmental ecology, ecological engineering, agricultural ecological environment projects, nature reserves and maintenance, plant cultivation and conservation, green plantation, biodiversity, biosecurity, bioremediation, ecological maintenance, eco-agriculture, eco-city construction, ecological planning. It aims to develop a new application technical course on vocational education ecological environment to meet the current requirement of ecological environment restoration technology talents in ecological city construction and ecological environment construction.

#### 3.2. Core teaching content integration of “Agro-environmental Management Plan”

“Agro-environmental Management Plan” is a new subject involving environmental science and systems science, management, planning, forecasting, sociology, economics, computer technology, etc. Therefore, a special emphasis is given on the modular system of environment Management and planning practice in the curriculum integration and development of research content, in which the content and application technology of industrial environmental management, agricultural environmental management, urban environmental management, environmental data statistics,
ISO14000 environmental management system, and environmental audit is integrated with the relevant vocational qualification certificate training, highlighting ISO14000 environmental management system certification, reducing the content of theoretical knowledge and but increasing the application of technology. This will be intended for the application technical course of vocational ecological environment class to meet the technical personnel demand of industry's environmental management planning.

The integrated course teaching content has the following five modules: environmental management system and rules, environmental management technical support and assurance, the International Environmental Management Series (ISO14000), environmental management applications, environmental planning content and application.

3.3. The core teaching content integration of “Environmental Engineering Design”

The existing teaching materials related to environmental engineering design can be broadly divided into three categories. The first category is environmental engineering principle about environmental engineering design, especially the theories of disposal of three wastes, such as sedimentation principle, absorption principle and so on; the second category is about disposal techniques of three wastes, such as physical treatment biological chemical treatment and of water, etc.; the third category is the basis of environmental engineering design, mainly about the design principle, site selection, pollution source strength calculation, process drawing etc.. Each of these books focuses on different aspects and has different target readers. But for the students of higher vocational colleges, some of these books are inappropriate [3].

Therefore, on the basis of these existing books, we have developed the curriculum and strive to meet the teaching requirements of vocational Agro-ecological environmental specialties. Integrate the engineering drawing, computer aided design, three waste treatment technology design, water supply and drainage system, sewage treatment system and pipe network design, network design, landfill and sewage treatment site design etc. to develop a new application technology curriculum of ecological environment of higher vocational education, so as to meet the requirements of environmental industry for engineering design talents.

First of all, retain part of the environmental engineering principles, including fluid flow and fluid transport machinery. As this part is the basis for the selection of design parameters and the choice of equipment; while the design basis, including site selection, layout, pollution source intensity calculation, process design, is preserved because this part is conducive to improve the practical ability of students. In addition, the design of waste treatment facilities is also retained for this part is the theme of environmental engineering design.

Secondly, the design of sewage channel system, the landfill and sewage treatment plant site as well as computer aided design are introduced into this course. With the further development of environmental engineering design, the computer graphics has become an irresistible trend. Using CAD for environmental engineering design not only improves the speed but also the accuracy. Students in higher vocational colleges can acquire knowledge of computer aided design, which will undoubtedly improve their competitiveness in the future job market.

Finally, part of the design principles will be deleted as the theoretical knowledge is too difficult for students of higher vocational colleges. Meanwhile, some unusual treatment process of the three wastes treatment is deleted.

3.4. Core teaching content integration of “Environmental Pest Management Technology”

This is a new environment professional course, highlighting the development of skills in the management of environmentally harmful organisms and integrated mainly with the ISO14000 environmental management system to do a good job of environmental sanitation management and environmental green management.

This course incorporates environmental sanitation, urban entomology, garden plant pest control, with pest management to develop a new application technical course intended for vocational
ecological environment class to meet the demand of talents of environmental management industry on environmental pest management and ecological protection.

3.5. Core teaching content integration of “Agro-chemicals Pollution Control Technology”
This course integrates pesticide, chemical fertilizer, agricultural film, pesticide residue, agricultural non-point source pollution, and soil agglomeration analysis to develop a new application technology course of educational ecological environment in higher vocational colleges to meet the demand of talents of environmental protection industry on agricultural chemicals pollution control.

The teaching content of the integrated course has the following six modules: agricultural chemicals base, agricultural chemicals pollution pathways, agricultural chemicals pollution control methods, chemical fertilizer pollution control, chemical pesticide pollution control, and other agricultural chemicals pollution control.

3.6. Core teaching content integration of “Agro-environmental Testing and Analysis”
The original environmental monitoring, environmental chemistry, and instrumental analysis are integrated, with the actual application of environmental testing work as the core, to develop a new application technology course intended for vocational ecological environment class to meet the demand of talents of environmental protection industry on environmental testing and analysis.

The teaching content of the integrated course has the following seven modules: basic knowledge and skills of environmental testing, environmental physical and chemical testing, instrument analysis and testing, water pollutant detection and analysis, soil pollutant detection and analysis, air pollutant detection analysis, and analysis of other pollutants.

4. Conclusion
The curriculum is the core of the education and teaching process in higher vocational colleges, which is directly related to the teaching quality and the effect of personnel training. It is necessary to continue to explore more suitable program and actively carry out curriculum reform for vocational students in the teaching process [6-8].

Based on a comprehensive and in-depth analysis of the teaching content and practice teaching of Agro-ecological environmental specialties in higher vocational colleges in our country, and in line with the rules of necessity, moderation, sufficiency and applicability, this paper conducts a scientific integration of the core teaching content of Agro-ecological environmental specialties in higher vocational education, which lays a good foundation for improving the practical skills of advanced applied talents of environmental professions. Meanwhile, the curriculum reform also pays special attention to the link between vocational qualification certificate education and professional induction certificate training, highlighting the professionalism, skills and application of the course, and providing a useful exploratory case for the core curriculum teaching reform of environmental classes in vocational colleges in China.

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