

Research on the construction of “Internet of Things + X” compound characteristic course cluster in vocational normal education

Xingzhi Lin, and *Xiang Pan**

School of Computer and Information Engineering, Guangxi Vocational Normal University, Nanning, China

Keywords. Vocational normal education, Internet of Things + X, Compound characteristic course cluster.

Abstract. The construction of "Internet of Things+X" compound characteristic course cluster is an important link in the development of new engineering subjects in vocational normal education. This paper analyzes the mechanism of the "Internet of Things+X" composite course cluster, and puts forward the construction idea of "Internet of Things+X" compound characteristic course cluster, including the condensation of the characteristics of the course cluster based on specific industries, the integration of the four chains of "training objectives - course content - professional ability - teacher training ability", and the introduction of composite characteristic course resources. Then it puts forward some suggestions on the construction of compound characteristic course cluster in vocational normal colleges.

1 Introduction

The "Internet of Things + X" is the embodiment of the new model of "Internet+" in education, as the Internet of Things (IoT) provides technical support for the transformation and development of vocational normal education. The development of vocational normal education based on the Internet of Things inserts IoT knowledge system and cross-border thinking in the traditional curriculum, and relies on the integration of industry and education and collaborative education to converge enterprise resources, multi-channel vocational education and normal education, thus forming the "Internet of Things + X" compound characteristic course cluster.

* Corresponding author: panxiang_px@126.com

2 Function mechanism of "Internet of Things + x" compound characteristic course cluster

The "Internet of Things + X" compound curriculum meets the development needs of vocational education in the Internet of Things era. Vocational colleges and universities should combine the needs of social productivity with their own development status to build a characteristic "Internet of Things + X" compound disciplines, cultivate skilled professionals, and solve the lack of technical personnel in the Internet of Things industry. The "Internet of Things + X" compound curriculum differs from traditional vocational education. It innovates the content, approach, mode and evaluation of teaching. The content changes from single to compound features, showing diversification. The approach is more intelligent, and the mode shifts from classroom teaching to distance teaching, online and offline teaching, hybrid teaching, being more diversified [1]. Accordingly, the learning space and teacher-student relationship have also changed, with the space shifting from monism to pluralism and the teacher-student relationship shifting from mutual antagonism to equal interactive subjects. Therefore, the teaching form of vocational education under the Internet of Things background must be a composite posture. Through the construction of "Internet of Things + X" compound characteristic course cluster, the transformation of vocational education can be achieved. First is the transformation of the curriculum concept, with the meaning of curriculum changing from "point" to "space"; second is the transformation of student learning mode from the traditional classroom lectures to intelligent adaptive learning; and third is the transformation of teacher teaching, where the role of teachers has been logically displaced to "teacher with dual qualifications" in digital era.

3 Structure of "Internet of Things + X" compound characteristic course cluster

The "Internet of Things + X" Compound course cluster is based on the core algorithms, hardware and systems of the Internet of Things, and injects sensing data collection, learning emotion recognition and knowledge network transfer into the course system of computer, electronics technology, Internet of Things, intelligent architecture, software engineering, logistics management and technology, etc., forming a new intelligent technology permeated course system. This will make the new curriculum system develop in the direction of universality, transferability and permeability, and form a group of courses that will act as a chain reaction in its entire specialty, in the various knowledge of the entire discipline, and in the theoretical and practical systems constructed. A series of courses and knowledge are associated to develop across borders to achieve new innovations, new practices and new products, pushing vocational normal education to a new realm of teaching with innovative capabilities.

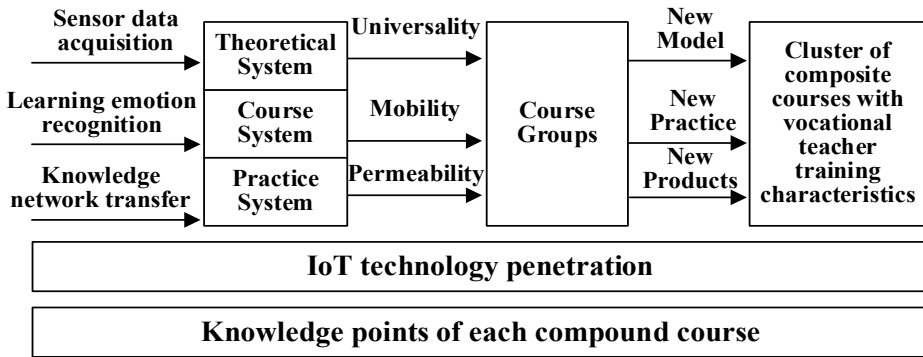


Fig. 1. Structure of "Internet of Things + X" compound characteristic course cluster.

4 Construction of "Internet of Things + X" compound characteristic course cluster

4.1 The condensation of the characteristics of the course cluster based on specific industries

Taking Guangxi Vocational Normal University as an example, the industrial base of the university to carry out industry-education integration is the transportation industry and logistics industry, and the more specific and deeper science-education integration fields are intelligent production network-connected vehicles and intelligent water transportation logistics. Focusing on those two industry sectors, combined with the university's applied electronics education, Internet of Things engineering, information management and information systems and other majors, the "Internet of Things + X" course cluster features are condensed. Starting from the selection and setting of courses in the cluster, we analyze the basic knowledge, core technologies and vocational skills required by the above industries, introduce industry-related intelligent equipment and project cases, and build corresponding practical training scenarios such as "Intelligent Networked Vehicle Simulation Laboratory" for learning. The condensation of the characteristics of the course cluster based on specific industries brings vocational education a broader development space in the context of the Internet of Things.

4.2 The integration of the four chains of "Training Objectives - Course Content - Professional Ability - Teacher Training Ability"

The chain of training objectives is a logical chain composed of different training goals in the compound course cluster, including goal types, levels, capable positions, talent types and technical skill requirements in talent training [2]. In the chain of training objectives, the upstream nodes are the basis for the realization of the downstream nodes. In order to realize the chain nodes, the corresponding course content chain should be constructed. The course content chain nodes should correspond to the nodes of the chain of training objectives, and the logical relationships between the nodes correspond to each other. The professional ability chain is extracted from the chain of training objectives and is the occupational competence that must be achieved after the completion of the course content chain nodes, including basic occupational competence and key competence. The chain of teacher training ability is a series of competencies for teacher training, including theoretical competencies of vocational education, psychological education competencies, traditional

teaching methods application competencies, information technology education competencies, and "Internet of Things +" intelligent education competencies [3]. The four chains of "training objectives - course content - professional ability - teacher training ability" are inseparable. They are the essence of "Internet of Things + X" compound characteristic course cluster.

4.3 The introduction of composite characteristic course resources

The construction of "Internet of Things + X" characteristic course teaching resources library will introduce composite characteristic course resources, and realize the sharing of teaching resources for vocational normal education. The focus of the composite characteristic course resources is "composite" and "characteristic". First of all, the course resources should be built with specific industry application cases. For instance, the curriculum resources involved in the new energy intelligent networked vehicle industry can be divided into several categories: automotive electronics, intelligent hardware, communication software, intelligent control and integration technology, etc. Each category corresponds to a specific application on the car, while the split items correspond to different knowledge of several courses, reflecting the composite nature of the resource [4]. The introduced resources can be divided into knowledge/skill level resources, course level resources and cluster level resources according to the hierarchical relationship. The first-level granular resources include text and images, instructional courseware, micro-lessons, animations, videos and virtual simulations. The second level includes course content, teaching tasks, cases, teaching materials and exercise tests. The third level is the integrated practical training that can be carried out only after completing the course cluster learning. When introducing resources, we should pay attention to the reconfiguration, integration and development of coupling logic among resources, and maintain the unity of individuation and demonstration.

5 Suggestions for the construction of “Internet of Things + X” compound characteristic course cluster in vocational normal education

Figures and tables, as originals of good quality and well contrasted, are to be in their final form, ready for reproduction, pasted in the appropriate place in the text. Try to ensure that the size of the text in your figures is approximately the same size as the main text (10 point). Try to ensure that lines are no thinner than 0.25 point.

5.1 Standard construction of “Internet of Things + X” compound course in vocational normal education

We should strengthen the standardization of the certificate system of "Internet of Things + X" compound course in vocational normal education. Vocational qualification certificates are evidence of competence obtained by students after passing theoretical and practical examinations in the process of professional teaching. It is a necessary condition for a profession in the future career. The standardized development and management of vocational education competency level certificates facilitates the optimization of students' vocational skills qualifications, so that they have competency levels that correspond to their occupational positions in terms of skill levels and qualifications.

5.2 The establishment of compound vocational normal teacher groups

We should incorporate the construction of compound vocational normal teacher groups into the overall planning of the university, so as to take advantage of the system to guarantee the continuous enhancement of the teaching force. We should establish an applicable incentive mechanism, a technical rating system, and a recognized qualification system, and introduce a third-party certification and evaluation system. We can recruit part-time teachers from enterprises and society, such as artisan teachers can inject fresh blood into the faculty because they have professional and technical as well as managerial work experience [5].

5.3 The construction of teaching quality assurance and accreditation system in "Internet in the Things + X" compound characteristic course

To promote the improvement of the teaching quality assurance and accreditation system in the "Internet of Things + X" compound course, the first is to highlight the main position, which requires teachers and students to be clear about the role requirements and responsibilities. The second is to strengthen the internal systematic nature of the system by integrating the implementation units, supervision units, management units and evaluation units in education and teaching at all levels, enhancing the interconnection and support among them, and forming the action force to coordinate and control the key points and elements of the system, so as to ensure the benign operation of the system. The third is to pay attention to the talent training target of vocational education in the context of Internet of Things, and make appropriate adjustment to the talent training target of "Internet of Things + X" compound majors according to the teachers' resources, career development, job market and the planning layout in the Internet of Things industry.

We should establish sound operation organization of teaching quality assurance and accreditation system in the "Internet of Things + X" compound course. According to the needs of education teaching quality assessment, relevant system operation agencies should be set up, including monitoring agencies, scoring agencies and guarantee agencies, with each agency operating independently and dividing work among themselves to complete the assessment together.

We should adapt the structure of the elements of the teaching quality assurance and accreditation system in the "Internet of Things + X" compound course. We should establish the training goal of composite and applied talents and make it become the consensus of students, teachers, education and teaching administrators. We can improve the code of conduct for student learning, teacher teaching, and administrator education and teaching management. We can also take the means of taking a temporary post, dispatching, and introducing teachers to achieve the improvement of the business capacity of teachers, supervisors, administrators, and evaluators [6].

Finally, we should expand the scope of monitoring and management of the teaching quality assurance and accreditation system in the "Internet of Things + X" compound course. At the student level, the "intelligent technical skills" indicator should be added, and students will be assessed on the extent to which they have achieved various vocational skills from the moment they enter the university. At the teacher level, the indicators of "teacher development" and "teacher structure" should be added to improve and guarantee the level of teachers in terms of their composition. At the school level, a three-level progressive teaching quality monitoring system by semester, academic year and graduate should be established.

6 Conclusion

The construction of "Internet of Things + X" compound characteristic course cluster in vocational education is an important element in the cultivation of composite application-oriented talents in vocational education in the era of artificial intelligence. The development mode of artificial intelligence + vocational education can solve the educational and teaching drawbacks of traditional vocational education and make vocational education develop to the high-end form of intelligent teaching.

This work was supported by New Engineering Research and Practice Project of the Ministry of Education under Grant No. E-JSRJ20201332, Guangxi Higher Education Undergraduate Teaching Reform Project under Grant No. 2019JGZ172, Humanities and Social Sciences Research Project of the Ministry of Education under Grant No. 20YJA880028, Guangxi High Level Innovation Team and Outstanding Scholar Program of University under Grant No. GuiJiaoShiFan (2019) 52-6.

References

1. M. Sean, Leahy, H. Charlotte, W. Francis, The digital frontier: Envisioning future technologies impact on the classroom. *Futures. J.* 113(2019)
2. Z. Olaf, I. Victoria. Marín, B. Melissa, G. Franziska, Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education. J.* 16(2019)
3. Subagyo et al, The Development of Curriculum School Model Based on the Internet of Things. *International Journal of Engineering & Technology. J.* 96(2018)
4. Y. W. Huang, J. Wang, Quality Evaluation Model of Education in Remote Learning and IoT Based on College Students' Quality Cultivation. *Wireless Communications and Mobile Computing. J.* 15(2022)
5. Y. H. Chen, Evaluation of teaching effect of internet of things education platform based on long-term and short-term memory network. *International Journal of Continuing Engineering Education and Life Long Learning. J.* 31(2021)
6. F. Borges, Adriano, C. Fortuna, Magali et al, Analysis of professional implication as a tool of permanent education in health. *Revista latino-americana de enfermagem. J.* 27(2019)