The Diversified Informationized Blended Teaching Reform of Internet of Things Course under the New Situation

Wei Li[1, *], Qinghua Yang[2]

[1] *Department of Computer School, China West Normal University, Shida Road, Nanchong, China*
[2] *Department of Medical Imaging, North Sichuan Medical College, Nanchong, China*
**nos036@163.com, forbyyoung@126.com*

Abstract:
Under the new situation of vigorous development of emerging technologies such as big data, artificial intelligence and Internet of things, the cultivation of compound, innovative and engineering talents is the mainstream requirement of new engineering education, which makes the information-based teaching reform and exploration of Internet of things engineering inevitable. In view of the above situation, this paper explores the reform of the teaching of Internet of things engineering course under the new situation, and puts forward a diversified blended information-based teaching reform scheme of Internet of things engineering course fused emerging technologies. The scheme constructs a informationized multimedia teaching resource database, designs compound teaching contents, and sets up a diversified evaluation mechanism, so as to carry out the diversified information-based teaching reform with the characteristics of knowledge integration, flexible expansion, framework design, independent practice, comprehensive application and active innovation. The analysis shows that the scheme has good practicability, adaptability and effectiveness for cultivating compound, innovative and engineering talents under the new situation.

Keywords: *Compound talents; New engineering education; Informationized education; Blend teaching; IoT; AI*

1 INTRODUCTION

At present, in the new era of technology wave of integrated development of emerging technologies such as big data, artificial intelligence (AI) and the Internet of things (IoT), the urgent demand for compound talents in various smart markets at home and abroad, and the macro policy of China's intelligent manufacturing, make the Internet of things enter an inevitable stage of cross-border integration, integrated innovation and scale application. At the same time, under the new situation of the integration and development of emerging technologies, a certain consensus has been formed on the connotation and characteristics of new engineering and the path choice for the construction and development of new engineering. The rich connotation of new engineering involves such typical characteristics as cross-border integration, advancement, derivation, innovation drive, application practice, diversity and personalization. In recent years, in view of the new engineering or engineering education under the new situation, some researchers have conducted relevant research and exploration from the perspectives of engineering education [4] [6] [7] [11], informationized education [2], talent training [2] [8] [12] [13], curriculum model [5], teaching forms and means [1] [3] [9], teaching content and methods [10], innovation and design [2] [12], etc.

The IoT course, one of the important components of the new engineering course, has the characteristics of compounding, crossover, practice and innovation, which are very consistent with the connotation of the new engineering course. At the same time, it also has common educational laws and characteristics with other engineering courses in the new engineering course to varying degrees. Some of the above-mentioned documents directly involve the IoT courses. The other macro and meso research documents for new engineering or engineering education are also closely related to the IoT teaching. There are also some documents related to other engineering courses that have common or similar characteristics and teaching laws with the IoT. Under the background of integrating innovation and development,

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as well as informationized education and blended teaching, the teaching reform and exploration of the IoT course is also imperative. How to combine the IoT courses with educational information technology, blended teaching method and emerging technologies such as AI to further adapt to the development of the times and meet the requirements of new engineering courses on practicality, complexity and innovation is a common challenge for relevant universities and enterprises.

According to the new situation of the integration and development of emerging technologies and the compound requirements of new engineering talents, as well as the informationized education and blended teaching, this paper explores the blended informationized teaching reform of the IoT course, and puts forward a diversified informationized blended teaching reform scheme of the IoT course. The scheme mainly considers three aspects: teaching resources, teaching contents and evaluation settings. It designs a informationized multimedia teaching resource library, compound teaching contents and diversified evaluation mechanism to realize the diversified, informationized and blended teaching characteristics of resource integration, content compound and evaluation combination. It provides practical, adaptive and effective scheme and method worthy of reference in terms of cultivating compound, innovative and engineering IoT talents.

2 THE DIVERSIFIED INFORMATIONIZED BLENDED TEACHING REFORM SCHEME OF IOT COURSE

2.1 Composition Structure Design of Teaching Reform Scheme

See Figure 1 for the composition structure of the overall reform scheme of the diversified informationized blended teaching of IoT course. As you can see from Figure 1, this scheme is mainly composed of three aspects: construction of teaching resources, design of teaching content and setting of teaching evaluation. Among them, the construction of teaching resources involves the informationized multimedia teaching resource database, which focuses on the construction of information-based curriculum resources from the perspective of resource integration. The design of teaching content involves compound teaching content, which focuses on the design of blended course content from the perspective of knowledge synthesis and content compound. The setting of teaching evaluation involves a variety of evaluation mechanisms, which focuses on the setting of evaluation mechanisms from the perspective of multi evaluation combination.

Under the general framework of the overall teaching reform scheme of the IoT course shown in Figure 1, this paper designs the scheme function modules, as shown in Figure 2.

2.2 Functional Module Structure Design of Teaching Reform Scheme

As can be seen from Figure 2, in terms of teaching resources construction, the informationized multimedia teaching resource library mainly refers to the teaching resource library based on the integration of various informationized multimedia resources, involving multimedia resources such as images, audios, texts, programs, animations, videos, software, etc. In terms of teaching content design, compound teaching content mainly refers to the blended teaching content based on the integration of IOT related knowledge and related contents with IoT knowledge and contents as the core, involving the comprehensive knowledge of IoT, big data, AI and intelligent computing, as well as the compound contents of big data IoT, BIoT, AIoT and intelligent application. In terms of teaching test setting, the diversified evaluation mechanism mainly refers to the evaluation mechanism based on the combination of multiple test methods, involving four types of test evaluation: daily performance evaluation, test result evaluation, exam result evaluation, design performance evaluation.

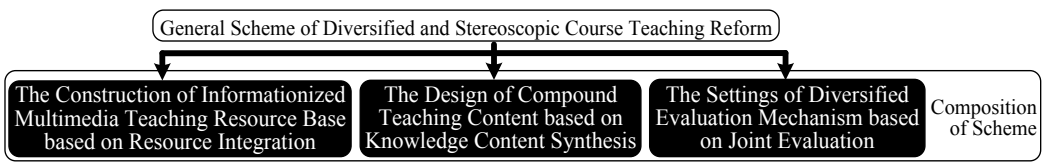

Fig.1 Composition structure design of curriculum teaching reform scheme

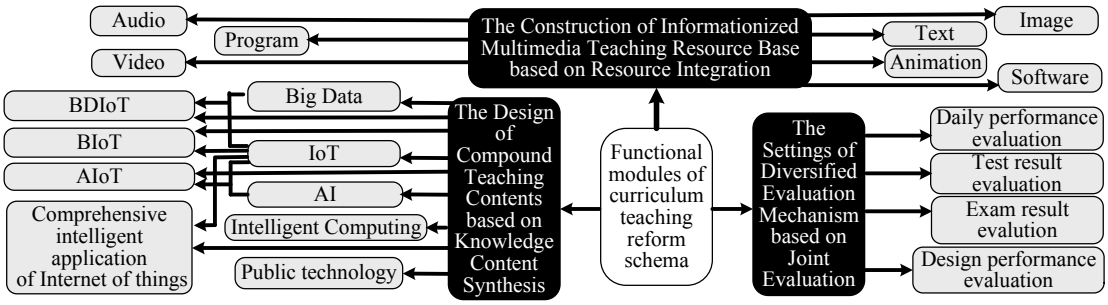

Fig.2 Functional module design of curriculum teaching reform scheme

3 THE CONSTRUCTION OF INFORMATIONIZED MULTIMEDIA TEACHING RESOURCE BASE BASED ON RESOURCE INTEGRATION

Under the new situation, the IoT course has many teaching characteristics, such as comprehensiveness of theoretical knowledge, technical complexity, engineering of ability, innovation of application and so on, which makes the learning of the course have very strong practicality and complexity. A single or a small number of traditional teaching resources can't meet the needs of teaching. For example, relying solely on the single PPT course wares, it can't achieve more thorough theoretical learning if there is no micro-class video or live video, or it can't achieve the combination of software and hardware if there is no physical image and physical video. For example, if the simple exercise library or test question library does not cooperate with experimental data, case code, demonstration animation, operation video, software resources, project examples and other resources, there is no way to cultivate application practice ability and project engineering ability. Therefore, this paper considers to fully combine the advantages of various informationized multimedia resources in their own information expression, carry out adaptive cross integration of informationized multimedia resources according to the categories of chapters and knowledge points, and build a multi-sensory multimedia teaching resource base based on resource integration, so as to provide teachers and students with rich materials and resources needed for online and offline teaching, for supporting comprehensiveness, complexity, engineering Innovative characteristics of IoT teaching. The structure of informationized multimedia teaching resource base is shown in Figure 3. As can be seen from Figure 3, the informationized multimedia resources base can be subdivided, crossed and integrated into some more specific sub resources, such as images, audios, texts and other resources, which can be cross integrated into specific resources such as PPT course wares, electronic teaching materials, exercise libraries, test question libraries and homework libraries. Program resources are subdivided into specific case codes, experimental materials, Virtual simulation instances and Project instances. Video resources are subdivided into micro-class videos, operation videos, experimental video, training videos, physical videos, live videos, live videos and other resources. The purpose of resource segmentation, intersection and integration is to serve the modular chapter knowledge points, task points and ability points, with the goal of integrating the advantages of various multimedia materials and pushing students to master knowledge, complete tasks and cultivate their ability at the best rate.

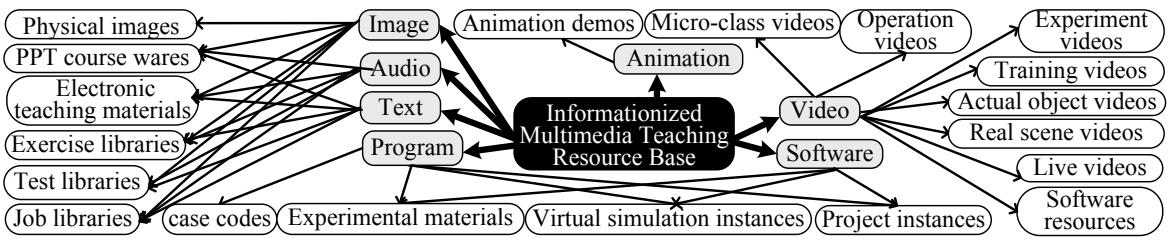

Fig.3 Multimedia Teaching Resource Base

4 THE DESIGN OF COMPOUND TEACHING CONTENT BASED ON KNOWLEDGE BLEND AND CONTENT SYNTHESIS

For the IoT course itself, it has the teaching characteristics of interdisciplinary, complex knowledge, multiple technologies, combination of software and hardware, and combination of macro and micro. In the new situation, due to the characteristics of new engineering courses, and the integrated development trend of emerging technologies, as well as the development requirements of education informationization and blended teaching, the traditional teaching content, which limited to the core technologies under the three-tier architecture of the IoT, can no longer meet and adapt to the new teaching requirements.

Therefore, the design of compound teaching content is very necessary and urgent. This paper designs the compound teaching content based on comprehensive optimization of knowledge and contents, as shown in Figure 4.

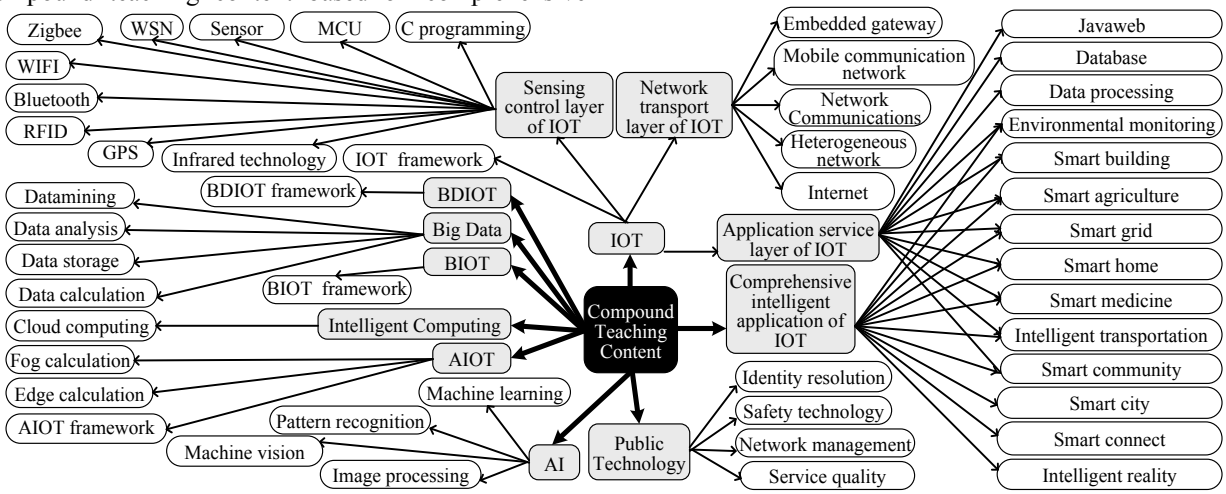

Fig.4 Compound teaching content

As can be seen from Figure 4, in addition to retaining the core technologies (such as sensors, WSN, Zigbee, RFID, MCU, embedded gateway, network communication, data processing, Java web, smart home, etc.) of the traditional three-tier architecture (perception control layer, network transmission layer, and application service layer), the compound teaching content also adds the IoT architecture so that students can acquire architecture design ability through learning and design practice, It has also joined the learning of typical application systems of intelligent applications of IoT, such as smart home, smart transportation, smart medicine, smart reality, etc. At the same time, in order to improve the comprehensiveness of knowledge, some public technologies such as identity resolution, security technologies and network management are added. In addition, in order to further improve the comprehensiveness of knowledge and the compositionality of content, and to keep pace with the times and adapt to the tideway and trend of the integrated development of the IoT and other emerging technologies, it added the composite contents of several aspects in big data, intelligence artificial, big data Internet of things, IoT, intelligent computing, intelligent Internet of things and related technologies of IoT, such as data mining, machine learning, BDIoT architecture, BIoT architecture, cloud computing, AIoT architecture, etc.

5 THE SETTINGS OF DIVERSIFIED EVALUATION MECHANISM BASED ON JOINT EVALUATION

As a very important part of teaching, evaluation is an indispensable means. The traditional evaluation is mainly reflected in classroom performance, attendance, homework and final examination. For the evaluation under the new situation, due to the new requirements of the new engineering and IoT courses, it is necessary to consider adopting a more diversified and comprehensive evaluation mechanism. This paper puts forward a diversified evaluation mechanism based on the combination of various evaluation methods, mainly based on the ideas of usual progress, process stage, participation attitude, design ability, comprehensive evaluation, practical application, collaborative innovation, etc., as shown in Figure 5.

As can be seen from figure 5, the evaluation mechanism mainly includes four aspects: usual daily performance evaluation, test result evaluation, exam result evaluation and design performance evaluation. Among them, the usual daily performance evaluation mainly involves the quantitative evaluation indicators of preview and review, classroom performance, discussion and exchange, learning progress, homework completion, team cooperation, practical application and innovation ability. The test result evaluation mainly involves four quantitative evaluation indicators: unit test, process test, stage test and comprehensive test. The exam result evaluation mainly involves two quantitative evaluation indicators of the mid-term exam and final exam. Design performance evaluation mainly involves four quantitative evaluation indicators: curriculum design, graduation design, innovative design and entrepreneurial design. For the relevant indicators of usual scores, test scores and examination evaluation, the quantification, recording and statistics of indicator data can be completed during the course teaching of lower grade students through online and offline integration, the support of relevant informationized resource databases and platforms, and the support of blended teaching of relevant teacher teams. As for the relevant indicators of design performance evaluation, due to involving the relatively high-level comprehensive graduation design and innovation and entrepreneurship design, it may be necessary to cooperate with the relevant departments of

the university, the teacher team (such as the innovation and entrepreneurship department, graduation design instructors, etc.) and the relevant internship enterprises (such as the school enterprise cooperation training internship enterprises),in order to informationize, quantify, record and count the data of the design performance indicators, so as to achieve the design performance evaluation.

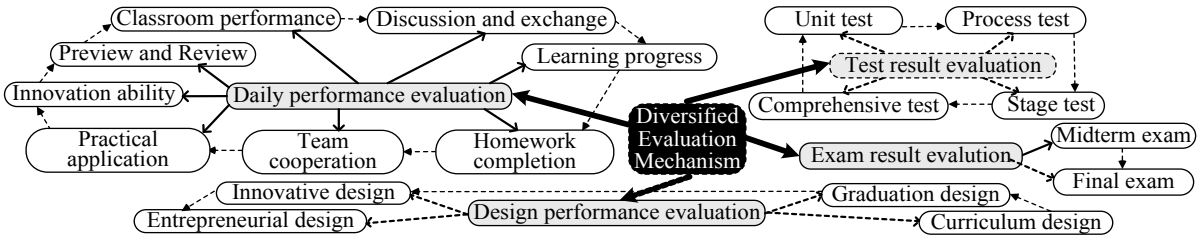

Fig.5 Diversified Evaluation Mechanism

6 ANALYSIS AND CONCLUSION

6.1 Analysis of Reform Scheme

In view of the three aspects of teaching resource base, teaching content and evaluation mechanism in the reform plan, this paper discusses the support of the three aspects of reform to composite engineering talents from the perspectives of knowledge technology, practical ability and talent accomplishment, as shown in Table 1. It can be seen from table 1 that the inforamtionized multimedia teaching resource library has a high degree of support in mastering basic knowledge, core knowledge and comprehensive knowledge technologies, cultivating comprehensive application ability and cultivating personal professional quality due to the richness of multimedia.

As for the compound teaching content, due to the comprehensiveness and complexity of knowledge content, it has better support for the mastery of expanded knowledge, the cultivation of problem analysis, system design and in-depth research ability, and the cultivation of adaptive literacy of the times. Furthermore, on the basis of the compound teaching content, the joint evaluation mechanism has better support for the mastery of engineering knowledge and technology, the promotion training of problem analysis, system design, development and realization, innovation and expansion ability, as well as the cultivation of team cooperation, independent practice, cross innovation and engineering compound literacy.

Table 1. The support degree of the functional modules of the reform schema for the Compound engineering talents

Talent requirements \ Functional module		Inforamtionized Multimedia Teaching Resource Base	Compound Teaching Content	Diversified Evaluation Mechanism
Knowledge technology	Basic knowledge	H	H	H
	Core knowledge	H	H	H
	Comprehensive knowledge	H	H	H
	Engineering knowledge	M	M	H
	Expand knowledge	M	H	H
Actual capacity	problem analysis	L	M	H
	system design	L	M	H
	Development implementation	M	M	H
	Comprehensive application	H	H	H
	Innovation and expansion	M	M	H
	Deep research	L	M	M
Talent accomplishment	Personal specialty	H	H	H
	Teamwork	L	L	H

	Independent practice	M	M	H
	Cross innovation	M	M	H
	Engineering composite	M	M	H
	Adaptation to the times	L	H	H

6.2 Conclusion of the Scheme

From the contents of Table 1 and the above analysis, it can be seen that for the training of compound innovative engineering IoT talents, the three aspects of the teaching reform scheme of IoT courses under the new situation proposed in this paper well support the mastery of basic, core and comprehensive knowledge and technologies, the training of comprehensive application ability, and the cultivation of personal professional quality. Under the strong support of the integrated and optimized informationized resource base, compound teaching contents and diversified evaluation mechanisms are integrated and applied to teaching, so as to help further improve the support for mastering engineering and expanding knowledge and technologies, and the support for cultivating practical engineering abilities (such as problem analysis, system design, development and realization, innovation and expansion, and in-depth research), as well as the support for the cultivation of engineering talents' quality with adaptability to the times (such as team cooperation, independent practice, cross innovation, engineering compounding). To sum up, the three aspects of reform cooperate with each other, integrate and interact with each other, and act on the course teaching through adjustment and combination with flexible proportion with Integrating the concept of information education and blended teaching, so as to give full play to the greatest advantages of the reform scheme with the highest efficiency and obtain the best teaching effect.

Through analysis, it can be seen that the scheme fully considers the three-way integration characteristics of resource form, knowledge content and evaluation mechanism, has good multi-dimensional characteristics, has good effectiveness, practicality and adaptability in cultivating innovative engineering compound IoT talents, and has good adaptability and feasibility in the era of emerging technology integration development trend, as well as good features of informationationized education and blened teaching. In addition, it is worth mentioning that due to the common characteristics of engineering education courses, such as applicability, compounding, engineering and innovation, the program also provides teaching reform plans and methods worthy of reference and promotion for the teaching of other engineering courses in the new engineering and emerging technology era.

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