

## The Revelation of British Medical Image Engineering and Technology Education

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**Abstract.** Comparing with China medical image engineering and technology specialty, the paper detailed analyzed British medical image engineering and technology developments, their training model, teaching methods, course design, and professional trend characteristics. In this paper, author Combining our conventional imaging engineering and techniques specialty teaching conditions in recent years, current problem was revealed. based on the British medical image engineering and technical specialty experience, our medical image engineering and technology curriculum system has been adjusted. initial results was coming. How to improve image engineering and technical specialty constructions, concise course system, how to integrating practice teaching , research and theoretical teaching were constructive discussed.

### Introduction

From professional point of view, medical Imaging division can be divided into medical image diagnosis and medical imaging engineering. Medical image diagnosis is to locate the disease, qualitative and quantitative diagnosis by using various imaging tools. While medical imaging engineering is mainly engaged in the management of imaging equipment, operation, repairing, maintenance and functional development. Both are complementing each other and indispensable. Quality control and quality assurance of imaging diagnosis relies heavily on image engineering and technology. Medical image diagnosis can be subdivided into two professional directions of image diagnosis and radiology diagnosis. Image engineering and technology can also be subdivided into medical image engineering, medical image technology and medical radiation physics majors. Graduated students are playing very important roles in their professional fields. With the rapid development of medical imaging equipment and technology, particularly CT (computed tomography), intervention radiology has gradually spread and MRI (magnetic resonance imaging) technology improvement, in order to adapt the needs of modern medicine and social development, further training worldwide, solid foundation, wide knowledge, ability, high quality medical image professional persons, curriculum systems of medical image technology and engineering direction and teaching contents must reform without delay. Medical imaging engineering is an integrated technology of mathematics, physics, computer science, information technology and medical science[10]. It has characteristics of integration of science, engineering and medicine, and dominates with engineering. The main professional training of this partiality are training research, development

and technical support and high-level application engineer in computer X-ray machine (CR), digital X-ray machine (DR) imaging devices, X-ray CT, nuclear medical imaging device (PET / SPECT), magnetic resonance imaging, ultrasound imaging equipment and other medical imaging equipment[8,9]. The graduates should have ability of design, application development, manufacturing and management in the field of medical imaging aspects [1,2].

### **The Medical Image Education Status and Current Problems**

**The professional design direction is not clear.** Many medical universities set up medical imaging diagnostics (image engineering) specialty. Image diagnosis direction intergraded with image engineering direction. Within five years, the courses are almost identical to students who engage in image diagnosis and in image engineering direction. There will be many malpractices. First, medical image diagnosis (imaging Engineering direction) is not an education ministry authorized specialty. Therefore, some hospitals do not agree those students to be clinical image doctors and even some provinces reject these students participating practitioner exam. This will brought student employment difficulties. So, how to set up a image engineering and technology specialty is an urgent problem need to be solved correctly.

**Lower enrollment level.** Our country's medical image engineering student enrollment level is lower. So, junior student should first conduct basic training in medical, science, mathematics, computers, English, and others. This training can not reach a high level of science and engineering bachelor's degree student have, so these students in learning complex courses of "physical image", "medical image processing," "medical imaging equipment", "medical digital circuit" are more difficult. It is hard to reach a high level which medical Image engineering specialty required.

**Practical, research and teaching are not integrate.** Theoretical courses and practical courses ratio of British union countries medical image engineering and technical specialty is about one to one. Some university of them even separate out certain credits practical classes. Medical university of our country's practice teaching is relatively weak and the theory and practice courses ratio is about three to one. Practical base construction of medical image engineering has become a major bottleneck which will limit medical image development [5]. As part of medical university medical specialty uncontrolled expansion, the student practical ability is decreased. In addition, less medical practice, teachers hardly understand modern medical imaging equipment operations, hardware and software, teacher's practical and theory activity were heavily affected. Current research directions of image engineering technology faculty are confusion. Teaching content and the teachers and scientific research direction were different. Researches are independent of the teaching. Researches are not factions of merge, direct and service for the teaching.

### **British Medical Image Engineering Course Curriculum and Specialty Design**

Author studied abroad for many years, always pay close attention to the development of education of British Medical Imaging. British medical education is in forefront of the world of medical education. Comparing British medical education with our country's medical education is very helpful for solving problems which facing by our medical education, and to overcome our management, teaching, research and other problems.

**British medical specialists training goals and entry requirements.** In British, medicine school enrollment generally have very high demands. Surgery and dentistry students need highest

requirements, follow by Students of pharmacy, medical imaging direction and then health medicine, medical management, psychology, rehabilitation, nursing, pathology, genetic biology and other life sciences. Due to the different levels of enrollment requirements, Life science (including biology), nursing, pharmacy, health, pathology selected by outstanding achievements of college entrance examination, oral examination to add pharmacy. Surgery and dentistry students selection is very strict and need academic excellence. All students must also participate the UMAT test. Total score of excellent candidates be invited to attend an interview. [1,6]. New students enrolled in Imaging Science and Technology, have a strong base of physics, mathematics, computers, and other basic courses of study, undergraduate academic full time study need three years. Students can directly into specialized courses study.

**British medical imaging technology and engineering course curriculum.** UK Radiology Imaging Technology specialty course curriculum is: human anatomy, regional anatomy, imaging anatomy, physiology, pathology, clinical medicine, imaging physics, radiation protection, imaging equipment, imaging diagnostics, imaging inspection methods, medical image post process techniques, cell biology, and other major courses. There are many other elective courses for students to free select. Graduate students can psychological communicate with patient, able to assess the quality and medical imaging system status, able to independent operate various imaging equipment, and image inspection.

**Closely combination and teaching.** British Institute of British Medical image school research projects undertaken by most teachers are closely related to teaching activities. Students actively participate in teacher research activities is same as students complete a specific course research project and can accumulate credits. Teacher research is usually open to students in summer and winter holidays. Students can get credits, to improve the knowledge structure, improve the ability of research. Such research really integrated into the teaching and guidance of teaching.

### **Medical Image Engineering and Technology Experience and Effectiveness of Reform Program**

**Explicit training objectives.** Through system learning with a broad base of engineering and general medical knowledge, the students have mastered electronics, computer software and hardware scientific theory, Mastered the basic theory and techniques of medical imaging equipment, basic knowledge and basic skills. Mastered of bio-medical information collection, analysis and information processing skills, engaged in medical imaging equipment maintenance and management, understand various diagnostic imaging techniques in diagnostic radiology, ultrasound diagnosis, radio nuclei diagnostics diagnosis [7,8].

**Program structure adjustment.** Comparing with British medical image engineering and technology specialty, the course curriculum were adjusted (Table 1). Main course include: the foundation of medicine, medical image processing technology, medical image physics and digital electronics, imaging equipment, medical image technology, computer C language, computer theory and application, human anatomy (including local anatomy and image anatomy), physiology, pathology, medical image diagnostics, Medical imaging equipment. Social science course can be elective to further enrich the course curriculum. Medical image engineering and medical image technology specialty are peeling off from medical image diagnostics to form their own unique specialty structure [9].

Table 1 The course curriculum

Science and engineering	foundation of medicine	General and Social science
Medical image processing	The foundation of medicine	Politics
Medical image physics	Anatomy	English
Digital electronics	Physiology	Physical education
Computer C language	Pathology	The foundation of computer
Computer theory	Medical image diagnostics	Ethics
Medical imaging equipment	Medical image technology	The career development

**Scientific research can improve teachers' teaching ability and quality.** Combining research and teaching closely, this will encourage and guide the medical image engineering and technology specialty teacher to apply research projects which their teaching activities closely related to. Encourage students to actively participate in the teacher's scientific research projects. students who participate in and complete the project, will get some credits. Teacher's research projects are opened to students. Participating in teacher's projects effectively improved student knowledge structure, improved their innovation ability, inspired student teamwork spirits. Research enriches the teaching content and provided material for scientific research at same time.

## Conclusions

British medical image engineering and technical specialty and course curriculum design have their own characteristics. Comparing with our medical image engineering and technical specialty, In this paper, author Combining our conventional imaging engineering and techniques specialty teaching conditions in recent years, current problem was revealed. based on the British medical image engineering and technical specialty experience, our medical image engineering and technology curriculum system has been adjusted. initial results was coming. it is very helpful for how to improving image engineering and technology concise course curriculum, how to combining practical, research and teaching and how to innovate.

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## References

- [1] Zhou Zhi Zun, Ding Jing, Sun Yanbin et al: United Kingdom medical education comparison with our country and analysis, *Medicine and Philosophy*, vol. 2(2009), p. 69-70.
- [2] Qiu Hui, Ding Jing, Zhou Zhi Zun, et al: The reform of medical imaging physics experiment teaching material construction, *Chinese Journal of Medical Physics*, vol. 3(2009), p. 1246-1248.
- [3] Zhao Yun, Liu Ai Hua, Cai San Jin: Medical Imaging undergraduate course system construction, *Chinese Higher Medical Education*, Vol. 5(2007), p. 70-71.

- [4] Zhang Yan, Ren Jia Shun, Wu Shu Xing: The view of medical image specialty course curriculum reform, *Clinical Ultrasound Medicine*, vol. 4(2008), p. 287-288.
- [5] Wu Ren Hua, Yang Jin Hua: The revelation of Medical Imaging Toronto University teaching to our student creative ability, *Chinese Higher Medical Education*, vol. 2(2008), p.72-73.
- [6] Fu Qiang, Zhao Yu: Learn from the advanced experience of foreign countries and the promotion our medical image specialty education reform, *Journal of Medical Education*, vol.6(2006), p. 94-96.
- [7] Liu Xiao Qin, Wang Hua Feng, Chen Wu Fan: Scientific construction medical image engineering course curriculum, *Zongshan University Review*, vol. 2(2000), p.205-206.
- [8] Zhizun Zhou, Hongyu Zhang, Yanfang Yang: *The Research of Irregular Volume Calculation Methods for Vivo Organs*, *MEIC*, vol. 5(2014), p.954-957.
- [9] QIU Hui, ZHANG Hong-yu, ZHOU Zhi-zun, Hu Ming-cheng , GAO Yang: Based on Medicine and Science Combination Character of Medical Imaging Technology Specialty Medical Physics curriculum system and teaching content reform practice, *mathematics, Journal of physics and medicine*, vol. 5 (2015), No.3, p.311-314.
- [10] Zhang hong-yu, Zhang zhi-peng, Jin zhao, Xue ge, Ren yuan-yuan, Yu ning, Zhou zhi-zun :The application and design of medical image post-processing experiment simulation, *Journal of Mudanjiang Medical University*, vol. 1(2015)No.1, p.34-36.