

Exploration on the Construction of Applied Optics Course Resource

Gang Chen¹

¹School of Information, Southwest Petroleum University, Nanchong, 637000, China.

Abstract

This paper firstly described knowledge structure and function of applied optics course from the point of training needs for professionals. Secondly, It proposed the idea that course resource is the carrier of knowledge and ability and also the component of teaching process. Besides, students are the acceptors of course resources. As a result, it is necessary to grasp the key period of freshmen because of their openness, inclusiveness and plasticity. What's more, It analyzed the construction of course resources from four aspects to show that it has positive influence on cultivating learning skills, practical skills, professional abilities and innovative consciousness of students, which can result in higher quality of teaching.

Keywords

Applied optics; course resource; course construction.

1. INTRODUCTION

Applied optics course is a core curriculum for photo-electric major. In the new period, students are required to have a grasp of essential knowledge of natural science and specialized field, and possessing good learning ability, practical ability, professional ability and innovation consciousness[1]. The characteristics of knowledge structure of applied optics include inheriting of classic knowledge, updating and developing of knowledge system, activity of frontier research and application, it provides conditions for cultivating students of their comprehensive quality.

In the course, practical engineering applications such as telescopes and cameras are introduced, for learning elementary knowledge and skills. It also provides initial samples and theoretical foundation for the development and optimization of novel optical systems, it can conducive to improve professional capabilities and innovation awareness of students.

Professional abilities are that students can be capable of relevant work in the field of applied optics, solve common problems in the applied optical industry, and accomplish scientific research in the field of applied optics by learning the course. From a pragmatic point of view, learning knowledge will promote the development of knowledge receptors and society. Applied optics course possesses an irreplaceable role in cultivating talents that meet the needs of society with solid foundation, strongly practical ability and strong consciousness of innovation.

2. THE ANALYSIS ON THE RESOURCES OF APPLIED OPTICS COURSE

Talents cultivation is taking further focus on the training processes and goals. The achievement of goals depends on the process of teaching and learning. Curriculum resource is the main medium that enrich teaching process. Curriculum resource is the carrier of knowledge, ability and quality. students are the recipients of course resources. Cultivate students' basic knowledge, practical skills, research capabilities, students ought to be given corresponding

knowledge and skills materials of course resources. Students can acquire knowledge, the connotation of the curriculum system, and the humanistic ideas that are contained in curriculum. It will achieve the purpose for moral values establishment and people cultivation.

On one hand, It is an open and active state for students who just contact with the study of professional courses. They are keeping with strong plasticity and high enthusiasm for the study of professional courses. They are also keeping with highly subjective initiatives. Students want to gain more knowledge and skills that are beneficial for development from the study of professional courses. On the other hand, the learning methods and strategies of them are not finalized, when encountering the new and effective learning method and experience, they usually take the method and experience as subsequent learning methods and develop a good learning habit. It is especially important to give students high-quality guidance and advice at this point in time. low-quality guidance is not conducive to cultivate effective methods and good habits of study, and following the "sea" tactics method. It is not conducive to the study of the course too. The applied optics course possesses extremely intense applicability. When facing the actual problems in the course, students often do not know what is the entry point to solve the problems, they are puzzled about the solution, and they are uncertain about the correctness of the result, however the actual application problems are not easy to find a perfect result.

3. THE ENLIGHTENMENT FROM THE CONSTRUCTION OF COURSE RESOURCE OF APPLIED OPTICS

3.1. Regaining the Foundation of Course Resource

Applied optics is regarded as a basic module course that should be paid much attention on the foundation of the course. The fundamental concepts and elemental laws are emphasized, the typical applications and practical contents are comprehended, the optical components and typical optical systems are analyzed. The basic theory and professional knowledge are consolidated, it provide theoretical support for analyzing the imaging laws of modern optical systems, practical activities and innovation processes. Ignoring the basic nature of resource tends to weaken the awareness of attaching importance to basics. The awareness of attaching importance to foundation will be weaken when we ignore the fundamental character of course resource.

Applied optics can establish an universal foundation of optics for students, so the basic principles are usually interspersed in subsequent chapters and other courses. When telling the components and systems, those involved basic knowledge ought to be prompted so as to enlighten students to pay more attentions on the importance of the foundation. For example, when determining the position of the aperture stop, we frequently use the principle of reversible optical path, it is convenient to find out the object distance and image distance of the components that behind the system. The object-image conjugate relation is used to analyse the position of the entrance window and the entrance pupil of the illumination path of Kohler illumination system.

We adjust the methods of teaching and guide students toward a better mastery of the methods of learning. The teaching time of the laws that have already been deduced is reduced, and the derivation of simple formulas is left to students for training self-learning and logical mind. The derivation of important formulas has been supplemented and given a meticulous lecture. The sphere of lens is simplified into a circle surface, combining with the principle of equal optical path principle and Taylor expansion, then the object-image position relationship is derived and the position relationship of paraxial image is given. The key points of basic content have been emphasized and the difficult contents have also been highlighted. We have summarized plenty of subjects such as lens subject, drawing subject, object-image subject, prism subject, beam limitation subject, etc. The course is taught in the form of special subjects.

students experience effective methods of learning and master them, it can be beneficial to enhance the effects of learning and improve the quality of teaching.

3.2. Shaping the System of Course Resource

Applied optical contents include basic knowledge, design and optimization of optical systems, design and processing of components, development and forming of system products, and later maintenance. It constitutes a complete system of contents, and show the features of systemicness and completeness. With systematic teaching, the structure of knowledge is complete and the context is clear. Knowledge is effectively used, the application is supported by theory, and students receive systematic training in all aspects. The undergraduate course introduces geometric optics, aberration theory, preliminary of optical design, and typical optics systems. Each part also possesses a complete system, such as geometric optics part has offered the properties of relationship between objects and images, which are suitable for all paraxial systems. The modular system of knowledge is conducive to understanding, and it help to train modular methods to solve problems.

The renovation and development of the knowledge system are the characteristics of professional courses. In the original knowledge system, the recent achievements such as new theories and applications that are beneficial to enhancing knowledge and ability are added. Basic knowledge and difficult knowledge points are expanded, and we also supplement practical applications, research status and development trends of the course. The new contents are introduced that will inevitably affect the original knowledge system of curriculum, however the class hours remain invariant, basing on the training plan and the curriculum outline, the course content and hours will be adjusted appropriately. The integrity of the knowledge system should be considered, we have paid more attention on the internal relationship connection between the supplementary content and the original content, and it lets the supplementary content be integrated organically into the original knowledge system. It maintains the integrity of the curriculum system, it increases the diversity of the class, and it enriches the content of the curriculum, the enthusiasm and effectiveness of learning have been improved.

3.3. Strengthening the Practicality of Course Resource

The concepts are very abstract and the laws are highly theoretical that are the characteristic feature of applied optics course[2]. For example, there are several sets of concepts of beam limiting part that are too abstract to understand, and the position and virtual or reality images are difficult to be determined. The students have been showing the mood of study-weariness and the signs of passive reception. In the course, the material objects are introduced into the classroom, the course is taught by combining with the use of the optical systems, and the theory is intuitively displayed to the students. In the anonymous teaching evaluation at the end of the period, students have reported that they are very interested and inspired by the combination of object lesson. The contents of applied optics mostly originate from life, we have been paying more attentions to knowledge that is applied to practice, and connected with engineering issues, it is good for reflecting the practicality and social value of the course, it is also good for students to enhance the recognition and approval of the course. At the same time, it is beneficial to enrich the atmosphere of classroom and the content of teaching, and it is beneficial to improve the ability to perceive life and stimulate the source motivation of learning. We have supplemented enough of application examples, they contain abundant types. An example is difficult to be liked by all students, and there will always be an example to stimulate students' interests and break through the critical point of learning inertia.

We have integrated the scholarship relate to production and manufacturing into the procedure of teaching. Using the platform of school-enterprise cooperation, students go personally into the workshop to observe the manufacturing of optical devices and listen the

experience of engineers. It offers an opportunity for hands-on operation by guiding, it creates practical opportunities, experiencing the practice without teaching materials, it is good to develop practical skills of students. Students experience the difference between actual problems and theory, the actual problems are analyzed realistically, it change the understanding of learning methods, improving the learning methods of professional courses, which is conducive to student development and rapid integration into work. Theoretical lessons are difficult to reflect the characteristics of professional courses[3], which is not conducive to the formation of effective learning methods for professional courses, integrating practical teaching into courses, and cultivating engineering awareness.

3.4. Integrating Innovation into Course Resource

Innovation is an important content of quality education. There are many innovation cases in professional courses, and the professional courses also contain innovative thoughts, Because of that professional course teaching is the main means of innovation education for students. Applied optics course has the characteristics of the integration of science and engineering technology, the course is provided with not only deep theory, but also wide application. It is active for frontier research in the subject area, and rich transformation of innovative achievements. It is beneficial to the formation of innovative methods, creative thinking and innovative consciousness for students.

With the student-centered teaching mode[4], cultivating innovation into a values concept. The teacher plays a leading role, giving students the knowledge materials that can train innovative thinking, showing the point of view of the innovation cases, grasping the innovation methods and innovation achievements. We provide a wealth of innovative cases as much as possible, so that students can see more outstanding achievements. The creation processes that are based on the basic theory have been extended, and the innovation opportunities in the basic theory have been tapped, it endow the basic theory with the atmosphere of innovation, and it is beneficial for students to find breakthrough points of innovation. For example, aperture synthesis technology to improve radar resolution, super-resolution microscopic technology that breaks the diffraction limit, and the design techniques for event horizon radio telescope that successfully takes photos of black hole.

We have paid much attention to the cultivation of innovation process, and we have set up innovation training projects, students can gain the opportunity to practice the creative process. Students participate in the complete innovation process, it will help to form a thinking mode for independent learning, applying knowledge, discovering and analyzing problems, and solving problem creatively. Our laboratories provide an extra-curricular and cross-disciplinary experiment console which is open for every student, open experiments are designed to highlight the flexibility to develop better thinking of creation for students, and there are not a fixed processes and goals of experiments. Many opto-electronic innovation teams have been formed to create competition works and collide in thinking, for experiencing the innovation process.

4. CONCLUSIO

In order to meet the new requirements that are put forward for training goals, the course resource should be effectively organized. The characteristics of knowledge structure of applied optics that provide conditions for cultivating students of their comprehensive quality, the relationship of teaching process, course resource, students who play a carriers or receptors role will be clarified. We have emphasized the guidance of learning method and course application to students who learn professional courses for the first time. When organizing course resource, it have paid attention to the foundation, taking into account the development and systematization of the knowledge, using applicability and practicality, and integrating

innovation. It can effectively train practice ability, cultivate innovative consciousness, and form an effective learning model for professional course. Through the research in this paper, the construction of applied optical course resource has achieved some result, and it is conducive to improving the effect of teaching and learning for courses.

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