

# Drive the Boat of Optics and Ride the Sail of Thought and Politics

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**Abstract:** Under the premise of enriching the teaching content, the effective integration of the ideological and political education teaching concept in the course teaching of colleges and universities plays an important role in promoting the socialist core values, guiding students to establish the correct value orientation and cultivating their noble character. Optics curriculum is an indispensable basic course of applied physics and related majors, which carries the important task of cultivating talents in basic disciplines of our country. On the premise of making good use of the main channel of classroom teaching, combining the characteristics of optical subject, combining "optical knowledge" with "ideological and political elements" organically, making the optical curriculum develop in the same direction with ideological and political education, carrying out the fundamental task of "Moral Education", and forming the practical exploration of synergy effect.

## 1. Introduction

The specialized course carries the personnel training of the university and carries on the important mission of the student's ideological and political education. Since the introduction of the socialist core values in 2012, in 2016, the general secretary of Jinping Xi stressed that the ideological and political work should be used well as the classroom teaching of the main channel, and then to the 19-year-long report in 2017, the leading role of the core values should be played, and in March 2019, General Secretary Jinping Xi pointed out that the youth stage is the "jointing stage" of life and needs careful guidance and cultivation.

Optics is an indispensable basic course in higher education. It is logical, profound in thought and unique in method. It is one of the most active research positions in the current science field. It is in optical communication, optical material and device, advanced optical system design, and has strong vitality and inestimable development prospect in the fields of manufacturing and detection technology and the like. The construction and perfection of the optical knowledge contains the simple but profound materialist dialectical thought, the optical history of the optical history is the crystallization of the human wisdom, the in-depth excavation of these resources, while the quality of the teaching is improved, the ideological and political education and the optical knowledge are taught to achieve a win-win result, And realize the correct lead to the student's values.

## 2. The Introduction of the Ideological and Political Elements in the Teaching of the Optical Course

At present, the ideological and political education of the college students in the university is based on the ideological and political class of the university, and is undergoing the transformation from the ideological and political course to the "ideological and political" mode, and the multi-door course construction of the major colleges and universities is actively explored. As a basic subject with a long history, optics plays an important role in the process of personnel training, thus making full use of the characteristics and advantages of the optical courses, and integrating the thinking elements

into the whole teaching process, and realizing the unification of the teaching of the humanities and the science and culture.

Education is divided into explicit education and implicit education. Explicit education is through the indoctrination of Marxist ideas with ideological and political theory as the main way. Hidden education refers to teachers taking historical celebrity anecdotes as the carrier to guide students to obtain healthy physical and mental personality development and cultivate correct value orientation in learning and practice. The teaching content of optical course includes various of ideological and political elements, such as Chinese philosophy, socialist core values, Chinese cultural self-confidence and so on. In the design of optical teaching, these ideological and political elements are deeply dug up, and ideological and political education is carried out in a way that imperceptibly nourishes all things in the teaching process. There are a lot of materials that can be integrated into the course of thinking and politics in optical teaching, teachers integrate the history of optical development in optical teaching, the rare qualities of Optical scientists, the optical achievements in Nobel, and so on, so that students can receive ideological and political education in teaching in music. In order to realize the integration and development of explicit education and hidden education.

### **3. The Enlightenment of the History of Optical Development on Students' Critical Thinking Ability**

The discovery and study of optical phenomena can be traced back to thousands of years ago. However, in the next long years, due to the limitations of various external conditions, the development of optics is relatively slow. It was not until the Renaissance in Western Europe that it once again gave it new vitality. The struggle between different schools of modern optics and the long process of establishing and perfecting the optical system show our awe and curiosity towards natural science, and embody the rigorous scientific research spirit in which scientists adhere to truth and advocate science.

#### **3.1. Recording of Early Optical Knowledge**

The discovery and research of optical phenomena in our country are in the forefront of the world. The straight line propagation of light is the most direct perceptual understanding of light. As early as the Spring and Autumn period and the warring States period, Di Mo recorded the experimental phenomena of small hole imaging in his book *Mojing*. In addition, the plane mirror, concave mirror and convex mirror are described in detail. Huai Nanzi, a philosopher in the warring States period, invented the instrument "Yangsui", which was used to make fire. Kuo Shen of Song Dynasty described the imaging of convex lens, as well as the causes and forecasts of solar eclipses and lunar eclipses in *Sketchbook of Dream Brook*.

#### **3.2. The Contest between Particle Theory, Wave Theory and Electromagnetic Theory during the Development of Optics**

At the end of the 17th century, British scientist Newton put forward the "theory of particles of light", which holds that light emits particles from the light source, which travels from the light source in a straight line to the irradiated object, so it is possible to imagine a beam of high-speed particles emitted from the luminous body to the illuminated object, which can explain many observed optical phenomena, such as the straight line propagation of light, the reflection and refraction of light. However, in the face of Newton's circle phenomenon, it can not be well explained. At the same time, this hypothesis can not give a reasonable explanation for the diffraction phenomenon of light after bypassing obstacles.

During the same period, Dutch scientist Huygens founded the theory of fluctuation of light, but because of Newton's great prestige, the theory of fluctuation has not been paid attention to for more than a century. It was not until 1801 that British scientist Yang's observed the dry emission of light, which verified the correctness of Huygens wave theory and laid the foundation for the theory of light fluctuation. In 1845, the British scientist Faraday discovered the phenomenon that the polarized surface of light rotated in a strong magnetic field, revealing the internal relationship between light

and electromagnetism. Later, in 1865, British scientist Maxwell put forward the concept that light is electromagnetic wave. For the first time, light was brought into a band of electromagnetic wave. In 1888, German scientist Hertz proved the existence of electromagnetic wave by experiments, and measured that the velocity of electromagnetic wave is equal to the speed of light  $c$ , confirmed the conclusion that light is electromagnetic wave, and verified Maxwell's electromagnetic theory.

The competition between the particle theory school of light and the wave theory school has greatly promoted the process of understanding light from an objective point of view. The contest between the two schools fully reflects that human beings always maintain their curiosity about the natural world, and urges us to constantly try our best to expose the "veil" of natural mystery. While teaching optical knowledge, the teacher integrates the academic competition between the two schools into the classroom, makes students familiar with the tortuous course of the development of optical system, trains students' critical thinking ability, and realizes the original intention of educating people in an all-round way.

### **3.3. The Perfection of Modern Optical System**

In 1900, German scientist Planck put forward the quantum hypothesis, which opened the era of quantum optics. Einstein developed Planck's energy quantum hypothesis in 1905, explained the photoelectric effect that could not be explained by the newly discovered electromagnetic theory with quantum theory, and established the photonic theory through the photoelectric effect. In 1909, Einstein put forward the "wave-particle duality of light", which linked the particle nature and fluctuation of light, ended the century dispute between the two schools, and perfected the optical system.

The long process of perfecting the knowledge of optical system is an indispensable part of the process of human understanding of the objective world. It is the process of constantly putting forward hypotheses, revealing contradictions and then perfecting contradictions, and it is a process from ignorance to clarity. Many of his theories are summarized from daily life, but quite a lot of the findings come from the results of long-term experiments about the different phenomena found, which is based on the ability of the previous scientists to think critically.

The teacher will impart optical knowledge on the basis of telling the history of optical development, so that students can think, learn and think deeply, provide them with persistent in-depth thinking and valuable questions, do not expect students to solve all problems independently, ask them their unique views on what they have learned in time, so that the classroom can become a platform for students to progress gradually.

The Ministry of Education has put forward three basic requirements for the cultivation of talents: "Quality, Ability and Knowledge". Among them, at the level of innovation ability, it is pointed out for the first time that the cultivation of students should have "critical thinking ability". Usually, the undergraduate teaching process is that teachers teach students "curriculum standard knowledge" in schools, and students do "after class practice". In the long run, students seriously lack the training of critical thinking ability. Critical thinking is to be able to grasp the key points, be good at questioning, according to their own inference of the problem, get their own unique views, exercise their own thinking agility.

Correcting misunderstandings is far more impressive than indoctrination with correct knowledge. Do not forcefully teach correct knowledge to students, integrate knowledge into problems, let students analyze why mistakes arise, guide them to have a strong interest in the courses they have learned, and at the same time not limited to single courses, develop in an all-round way, and educate people at the same time.

## **4. Optical Development and Chinese Cultural Self-confidence**

### **4.1. The Optical Terrace Led the Development of the Times**

Kun Gao, the father of fiber optics, published a paper entitled "Optical Frequency dielectric Fiber Surface waveguide". The basic principle of optical fiber application in communication is put forward,

and the structure and material characteristics of insulating fiber needed for long-range and high-information optical communication are described. After the theory of Kun Gao was put forward, some people in the field of scientific research call it unimaginable, and some people greatly appreciate it. But in the debate, Dr. Kun Gao gradually turned the theory into a reality, and the optical fiber made of quartz glass is more and more widely used, and then a revolution in the optical fiber era has been carried out all over the world.

Academician Daheng Wang of Modern Chinese Optics is the winner of the "two bombs and one Star Medal for meritorious Service". He has studied in Britain and is the first founder of modern optical engineering in China. After returning to China, Academician Daheng Wang devoted his whole life to promoting the development of optical cause in our country, which is a valuable quality shared by the older generation of scientists. In the current impetuous social environment, the most lacking in society is this kind of people who "can bear loneliness and keep poor", especially contemporary college students, in the era of material rampant, there are countless seductive materials in society, only a very small number of students can withstand temptation and pursue spiritual construction.

Teachers are the lighthouse of students' development road. Inculcating correct values in students is not limited to ideological and political courses, so is physics classroom. At the same time, teaching popularizes the scientific research of outstanding physicists and the dazzling flashing points on them, so that students can establish correct values and moral concepts in the process of being influenced by each other.

#### **4.2. World Optics Motivates Future Generations to Work Hard**

Since the beginning of the 21st century, the development of optics has advanced by leaps and bounds, and the vigorous development of many marginal disciplines and interdisciplinary disciplines dominated by optics can not be separated from the profound optical foundation. With the continuous development of optics, the breakthrough in this field has been recognized by the world. In 2005, the Nobel Prize in Physics recognized the "contribution to the quantum theory of optical coherence" and the outstanding contribution to the development of laser-based precision spectroscopy. In 2009, three physicists, including the Chinese scientist Kun Gao, won the honor for their achievements in the field of optics. In 2012, French scientist Serge Arosh and American scientist David Weinland won the Nobel Prize in physics for their study of the close relationship and interaction between light and matter in quantum optics; in 2018, they also won the Nobel Prize in physics for their groundbreaking contributions to laser physics.

Optics shows a vigorous development trend in today's society. While students have a comprehensive and intuitive understanding of the development of world optics, they will maintain a fear in the process of optical learning in the future, so as to establish a positive world outlook.

### **5. Conclusion**

All the courses in colleges and universities contain rich educational resources. Teachers fully excavate the ideological and political elements in the process of teaching practice, realize the organic integration of professional curriculum content and positive values, and maximize the educational effect of the taught courses. While following the law of students' natural growth and learning, using correct values to guide students to perfect and make progress in thinking mode, natural science should pay attention to the study of the development history of science, the patriotism, drilling and dedication of scientists on the basis of exploring the subject knowledge, so as to realize the synergistic effect of natural science and ideological and political ideas, and realize the common education of people.

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### **References**

- [1] Su Runzhou, Yang Guijuan, Zhang Zhiguo. Basic optics [M]. Higher Education Press. 2019.
- [2] Zhao Lulu. Some Thoughts on the "the ideological and political affairs of the course" of College Physics[J]. Legal overview,2019,5 (21):68.
- [3] Wu Jijiang. Exploration on ideological and political Education Teaching in Quantum Mechanics [J]. Modernization of Education, 2019, 6 (25): 178 -181.
- [4] Zhang Ying. The Exploration of Curriculum thinking and Politics in the Teaching of College Physics experiment [J]. Guangdong Chemical Industry, 2019 (16): 189.
- [5] Bai Liuyang, etc. Exploration and reflection on the integration of ideological and political elements into the college physics curriculum of applied undergraduate colleges and universities [J]. Modernization of education, 2019, 6 (62): 224 - 227.
- [6] Xu Dahai, etc. A probe into the Integration of ideological and political thought into the Teaching of College Physics [J]. Science and Technology Vision, 2019 (20): 133 -135.
- [7] Wang Xiumin. Exploration and Research on Curriculum thinking and Politics in College Physics course Teaching [J]. Science and Technology Education, 2019 (6): 167 / 168.
- [8] Wang Xiangxian. Research and practice of Curriculum thinking and Politics in Optical Teaching [J]. Physics and Engineering, 2019 (2): 43 / 45.
- [9] Xi Jinping. The ideological and political construction of the course must be firmly held in five key links. China Education News Network, 2017.11.16.