

The Effective Ways of Improving the Scientific Literacy of College Students*

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Abstract - Scientific literacy has been important intension, and improving the scientific literacy of college students is the key link of training high quality talents. The countermeasure has been indicated according to the current situation of the college students' scientific literacy from building better environment of scientific education and proper system of course, establishing efficient teaching team of scientific literacy, adopting flexible education model, developing colorful practice of science and technology. High quality talents of knowledge-, ability-, quality-coordinated development could be trained by building scientific way of thinking and innovative awareness to improve the sustainable development capacity of college students.

Index Terms - Scientific literacy; college students; effective ways; countermeasure

"Scientific literacy" concept was first proposed in 1958 by the American scholar, Professor Hurd (P. D. Hurd), which means that individuals have a basic understanding of scientific capacity. With the development of the times, the connotation of scientific literacy are constantly enriched and expanded. Despite the domestic and foreign scholars expressed differently about the connotation of scientific literacy, its essence is basically the same^[1]. Scientific literacy has become an intrinsic quality of the modern human, with its emphasis on attitudes toward science, observation and thinking problems of science and scientific critical spirit, including the ability of technology to solve practical problems. Our article will focus on the status of college students' scientific literacy and explore countermeasures to improve it.

1. The status of college students' scientific literacy

In recent years, there have been many studies on college students' scientific literacy issues, and investigation about its status has been reported many times^[2-6]. For example, the investigation from senior undergraduate student shows that contemporary college students better grasp on the basis of the traditional knowledge, but they are lack of the understanding about the modern scientific and technological knowledge and principles. Also, they have poor understanding on scientific and technical terms of the scientific frontier. College students can use the scientific method to deal with the relatively simple general daily problems, but they do not really grasp the nature of science and scientific research awareness is not strong. Because students lack to identify and judgment of the pseudo-science of feudal superstition, they are showed the lack of the spirit of science and the scientific method. Another

investigations show^[3] that college students understand some hot social issues relatively well, but fail to understand the high- tech applications and new areas of research. The scientific and technological knowledge of college students is still relatively old and dont kept pace with the rapid development of science and technology era. They lack the necessary understanding and grasping about the essence of the scientific method, scientific spirit and scientific value orientation deviation. Universities are the places which are lack of a rich scientific literacy atmosphere, due to students' scientific skills are not well trained and exercised. As lacking of spaces and channels, and funding to carry out research activities, Ordinary college students, therefore, have few of access to improve their scientific and practical ability.

National College Students' scientific literacy also faces a lot of problems. Ren yufeng had made a survey about Inner Mongolia College Students' Scientific Literacy^[5], and meanwhile designed for ethnic minority areas of local knowledge and technology in order to know the level of understanding and attitudes of college students in Inner Mongolian on grassland ecological environment in the case of modern environmental science and medicine widely used and dissemination. However, Mongolian students' knowledge of literacy is not higher than the Han students. From the results of the survey, Inner Mongolia indigenous knowledge (for example, Mongolian and nomadic knowledge) have been threatened under the impact of modern knowledge. At the same time, some university students in the Inner Mongolia region are short of a deep understanding about the problems that modern science and technology will intervene and affect their lives and other related issues.

In general, the overall level of scientific literacy of college students in China was significantly higher than the average level of society, but the contemporary college students generally know little about the application of high technology, the emerging field of scientific research and technological development history and scientific practice ability, and lack of understanding and grasp of the scientific method and scientific spirit. Contemporary college students' level of scientific literacy will directly affect the overall level of scientific literacy of the public, therefore, to strengthen the students' science literacy education and improve the students' scientific literacy have become the entry point and the main content of the institutions of higher learning education, improving the

* This work is partially supported by the research funds in education and teaching of Inner Mongolia for the Nationalities # 09037 to L. Duan.

students' scientific literacy making it a key part of high-quality talent.

2. Way to improve students' scientific literacy

(1) To create a good science education environment

Good science education environment plays a very important role in improving the students' scientific literacy. School education has always been a place of science education, University leadership, teaching and management staff, the majority of teachers and students should reach a consensus, fully aware of the importance of scientific literacy education for college students, emphasis on imparting knowledge of the science and technology base, at the same time, strengthen the education of the scientific method, scientific research ability, focusing on the effect of science and technology the information, , encourage students to actively participate in the practice of scientific research, develop students' awareness of innovation, to carry out a variety of scientific and technological activities for the students to create a good environment for science education.

In today's information age, higher education is facing serious challenges, and university Library plays an important role in students' quality education and innovative ability. The education of scientific and technological information help to promote students to gain awareness and use of information, and help to train the students' creative ability, while classroom teaching is no longer the main channel of the students to access to scientific and technical information, the Internet, television, newspapers and magazines have become an important way for the students to access to scientific and technical information. Universities should pay attention to cultivating students to gain all kinds of information, especially network to access to scientific and technical information. Carry out a wealth of scientific and technological activities, to enable students to master scientific methods in the activity, to understand the spirit of science, to improve students' scientific and technological innovation. The same time, most domestic universities, scientific skills of university students lack of training and exercise generally, as ordinary college students should provide more opportunities for research activities, research establishments, research funding and instructor. However, college students scientific and technological innovation activities, must have a certain innovation base (including the necessary lecture hall, exhibition halls, laboratories, computer room, library and other learning base and practical base) for the protection, the path of a combination of research, in order to improve the quality and effectiveness^[7].

(2) Construct a reasonable curriculum system

To improve the level of scientific literacy of college students, we must accelerate the pace of construction of curricula and teaching materials, continuously enrich the content of science education, at the same time, to enable students to keep abreast of the latest scientific developments, the results of scientific research and application of technology

knowledge, and learning to grasp the spirit of science, the scientific method and scientific way of thinking, and encourage students to across the Department course, a minor in science education courses or pursue a dual degree. The majority of colleges and universities have been opened through the election of the comprehensive and interdisciplinary courses, proposed to improve and increase such as scientific cutting edge of technology, science and technology development history (or General History of Science) environmental protection and sustainable development, science and technology information retrieval and use, English for Science and Technology, academic norms and thesis writing, creative thinking, logical Introduction to operations research and new energy, new materials and other courses to expand students' thinking, enrich students' knowledge and improve students' scientific literacy.

Curricula, as an important means to achieve the aims of education and culture, has a direct impact on the quality of education, thus the construction of curriculum system is an very important part of training high-quality personnel , so the existing curriculum should be appropriately adjusted by ways of building a new scientific course system and modules, achieving penetration of liberal arts and sciences and expanding the vision and content of science education, to make the scientific quality of education into practice. Colleges and universities should attach importance to the HPS education for students^[7], and it is promoted that scientific and educational content should be understood, screened and presented from the view of the history of science, philosophy and science sociology, for the HPS education plays a vital role in improving the students' scientific literacy. In addition, it is It is noteworthy that, not all science education courses are set to elective courses in the scientific literacy education modules or the scientific literacy education platform. It can be set up by different forms, such as required courses, elective courses and restricted courses, and at the same time the loose manners by which the large majority of colleges and universities manage public elective courses should be avoided^[8]. The management of teaching and assessment of public elective courses should be strict to avoid making the curriculum and teaching a mere formality.

(3) The construction of teaching team for high efficient scientific literacy

Teachers' scientific literacy and attitude to scientific literacy education has a great influence on the pros and cons of the quality of college students' scientific literacy education. Consequently, construction of efficient scientific literacy education team is the top priority. Under the condition of the existing teachers, we should fully tap potential teachers and pay attention to the advantages of each subject teacher. We integrate teacher resources and screen cross knowledge background of excellent teachers by a wide range of scientific knowledge, open way of thinking and rich teaching experience of teachers formed the interdisciplinary knowledge combination, in order to form an effective scientific literacy

education teaching team. At the same time, teachers must pay attention to enrich and expand the knowledge of science and technology. They should have access to broaden horizons, continuously learn new scientific knowledge, and construct the reasonable structure of knowledge.

For many colleges and universities, the biggest problem is improving teachers' scientific literacy and updating teachers' education concept. The key to keep people's quality sustainable development lies in whether there is the ability of scientific thinking and a way to learn for a whole life. University education strategies should be based on the idea of lifelong education and lifelong learning, and is not limited on repeat knowledge of special education; therefore, high efficient scientific literacy teaching team's construction is particularly important. Teachers should attach importance to the innovation of education concept and the transformation of teaching methods, to cultivate having scientific thinking and lifelong learning students who are sustainable development of talents.

(4) The flexible pattern of education

For college students' scientific literacy education, we should change the traditional teaching method, adopt flexible and varied teaching mode and pay attention to cultivate students' creativity, imagination, problem analysis and problem solving ability, which contributes to form students' scientific and dialectical way of thinking. In school the time of studying is limited, or it temporarily is unable to open more science education curriculum. Teachers can be encouraged to penetrate in the related topic in each link of teaching content, to master professional knowledge and improve students' scientific literacy as well. Through academic lectures, online course and guiding of extracurricular to make students not study high, new technology and have development science, but also to grasp scientific research and cultivate the innovative consciousness.

Scientific literacy education can effectively cultivate students' scientific world outlook and scientific thinking method. The important meaning that scientific literacy education must be combined with professional education should be valued. Chemical disciplines, for example, attach great importance to the history of chemistry, chemical philosophy dialectics of (or chemical), chemical methodology, chemical literature retrieval and utilization, and chemical frontier of knowledge. By taking advantage of natural dialectics and penetration in the subject teaching knowledge, let the students know the development of the discipline of history, which is the goal of our teaching and is one of the effective ways to implement quality education. On the premise of professional, we should use a variety of ways and means to the spread of scientific information so that it will become more vivid, flexible, and easy to be accepted and that the college students of different disciplines background could be scientific literacy cultivation, eventually to expand students' scientific vision and improve their scientific quality. For contemporary college students, the most common applications are the

Internet and mobile new media. The school related agencies and communities should make good use of the two media platform, using a variety of ways for students in science education. In improving the students' professional knowledge level and at the same time, teachers should focus on developing students' intelligence, enlighten students' scientific thinking and improve their learning ability, and try to guide students to set up the correct world view, master the scientific methodology, begin to think dialectically and solve problems to improve the students' scientific literacy.

(5) Carry out rich and colorful activities of science and technology

Technology practice is an effective way to cultivate college students' scientific literacy. All kinds of practice teaching activities can exercise the students' ability, analysis and problem solving skills, and effectively foster students' scientific thinking methods, science and technology innovation ability as well through the investigation, experiment, data collection, analysis, reasoning, judgment, and exploring activities such as reflection. We should as much as possible take various measures to encourage students to participate in all kinds of science and technology competition, science and technology activities; Increase research and exploratory experiment content, open the laboratory to all students, assure space and time of experiments; Let the students participate in teacher's scientific research work as soon as possible; Associate the curriculum design with the actual process when learning professional knowledge; Make sure everyone participate in social practice activity and carry out rich and colorful technology practice; Let students go deep into the rural areas, factories and research sites as early as possible to watch and learn. Through the above practice, there are a variety of ways to cultivate students' interests in science and scientific skills, which enable students to understand and master the scientific knowledge and scientific method better to develop the good scientific quality.

Improving the innovation consciousness of college students is an important aspect of scientific literacy education. Only when students possess strong innovation consciousness, can they work and study willfulness and bold innovation, so the cultivation of innovative consciousness plays an increasing important role on the development of college students in the future. Practice has proved that carrying out undergraduate scientific and technological innovation activities not only can cultivate students' all power but also is an effective form and the main route to cultivate and improve college students' scientific literacy.

In a word, in order to effectively improve students' scientific literacy, we need to take effort in creating a good science education environment, constructing reasonable curriculum system, improving teachers' scientific quality, applying flexible mode of education and carrying out various aspects of science and technology practice. "The future of illiteracy is no longer illiterate people, but do not learn to learn". We hope that the exploration and practice mentioned

from the above can improve the scientific literacy of college students and enhance their sustainable learning ability of college students, that they are able to communicate and cooperate harmoniously with others and focus on relevant developments in the field of science when they enter society, and that from an wide, interdisciplinary thinking viewpoint, they can use dialectical point of view to analyze and effectively solve practical problems, adapt to the complex work environment, and confront different challenges, and will become high-quality talents who makes progress with knowledge, ability and quality.

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