

Promoting “Three-Whole Education” through Back Feeding Teaching of Scientific Researches

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ABSTRACT

The importance of the ideological and political work in colleges and universities is pointed out in the coming high education in China. Accordingly, three-whole education in colleges and universities for undergraduate and graduate students is a comprehensive reform for extending and deepening the ideological and political education. However, how to effectively carry out three-whole education poses a big challenge to all the staff in the university. In the present investigation, the back-feeding teaching of scientific researches is investigated for carrying out both professional knowledge and professional skill education and meanwhile the ideological and political education. It is demonstrated that the back-feeding teaching of scientific researches is a useful way for promoting the three-whole education, i.e. whole staff education, whole direction education, and whole course education in the investigated discipline - Material Science and Engineering. Particularly, a whole practice training course with an experiment about electrospun nanofibers is demonstrated to be a facile approach for telling the students about “three-whole education”. The back-feeding teaching of scientific researches is able to promote three-whole education, which can ensure the students to become both innovative talents and successors of socialism in the future.

Keywords: *Three-whole education, Undergraduate Students, Graduate Students, Back-Feeding Teaching, Scientific Researches*

1. INTRODUCTION

The document “The opinions on strengthening and improving the ideological and political work in colleges and universities under the new situation” is issued by the Central Committee of the Communist Party of China and the State Council three years before [1]. The importance of the ideological and political work in colleges and universities is pointed out clearly in the coming high education. Since the eighteen Party's Congress, the Party Central Committee with Comrade Xi Jinping as its core has put the ideological and political work in colleges and universities in a prominent position, has made a series of major decisions and plans, and has adopted effective measures in various regions and relevant departments and universities.

“The opinion” points out that the construction and management of classroom teaching and various ideological and cultural positions should be strengthened in a parallel manner. The full explorations and usages of the ideological and political education resources contained in various disciplines, and the improvements of the management methods on classroom teaching in colleges

and universities are very important for fostering the students. It is necessary to strengthen the standardized management of all kinds of ideological and cultural positions on campus, to strengthen the management of campus network security, to create a clean and positive network environment, and to take advantage of useful sources for implementing ideological and political educations.

Under the spirit of Comrade Xi Jinping and the guidance of the document, all Chinese universities should take moral education as the fundamental task, integrate ideological and moral education, cultural knowledge education and social practice education, run ideological and political work through the whole process of education and teaching, and guide ideological value through the whole process and all links of education and teaching. Among all the teaching activities such as classroom lessons, scientific researches, practice, management, services, and so on, how to dig out more and more useful teaching materials from the scientific researches is vital and poses a big challenge to the teachers for effectively promoting the comprehensive reform of “three-whole education” in their universities. In the present study, scientific research popular in the discipline of Material

Science & Engineering (i.e. electrospinning and electrospun nanofibers) is exploited as an example to excavate the teaching materials for promoting the “three-whole education” and for improving the ideological and political work in universities.

2. THREE-WHOLE EDUCATION IN HIGH SCHOOL FOR UNDERGRADUATE AND GRADUATE STUDENTS

The overall goal of the comprehensive reform of "three-whole education" is to adhere to and strengthen the party's overall leadership of the university under the guidance of Xi Jinping's new socialist ideology with Chinese characteristics, closely around the fundamental task of moral education, and give full play to the advantages of China's socialist education, with the core of ideal and belief education and the socialist core values as the guide. The key is to improve the ability of personnel training, improve the affinity and pertinence of the work, strengthen the foundation, highlight the key points, establish norms and implement responsibilities, build an integrated ideological and political work system of colleges and universities with perfect contents, sound standards, scientific operation, powerful guarantee and remarkable results, so that the ideological and political work system can be connected with the discipline system, teaching system, teaching material system and management system, forming the whole process of all-round education pattern in teaching [2].

In the high education for the undergraduate and postgraduate students in the Chinese university, the emphases of three-whole education can be further refined to a more concrete level. A diagram is shown in Fig. 1. The three sections of whole direction education, whole staff education, and whole course education will act in a synergetic manner to foster high quality talents for the University of Shanghai for Science and Technology. The whole staff education should include those members such as counselors, head teachers, party and government management cadres, "Two Courses" professional teachers, library staff, logistics service personnel, students at different stages, and also advanced elements among the students. As for the whole direction education, it should refer to making full use of all kinds of education carriers, mainly including comprehensive evaluation and scholarship evaluation of students, financial aid and work study for poor students, construction and management of student organizations, construction of campus culture, construction of learning style, integrity education, social practice, etc., in which ideological and political education is integrated.

Certainly, the main battlefield is still the whole course education, which comprises the main body of the students' university life, and the most important section for implementing the three-whole and ideological and political education. This type of education can be further divided into different branches such as whole theoretical teaching

course education, whole practice training course education, and whole daily life course education. For the students lacking social practice experiences, the most important courses for improving their labor quality should be intensively associated with the practice training. Corresponding, the practice training course education can act as a key element for fostering both the students' innovation capability and form a synergistic effect on “strengthening morality education”, the fundamental task of education.

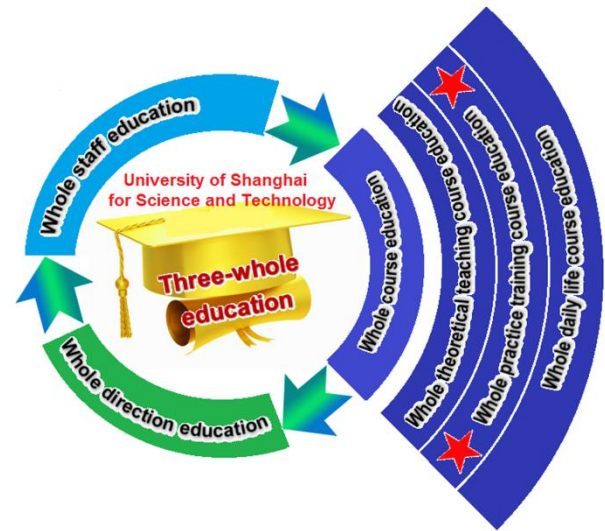


Figure 1. A diagram about the typical three-whole education for undergraduate and postgraduate students with whole practice training course education as a key element for fostering the students' innovation capability.

3. BACK-FEEDING TEACHING OF SCIENTIFIC RESEARCH

On the most feasible way for carrying out the practice training course education for “killing two birds with one stone” is the back-feeding teaching of scientific research. Scientific research is a systematic process, which contains rich teaching resources, especially the integrated teaching of theory and practice. Of course, the scientific research process and achievements can be systematically fed back to the teaching of undergraduate and graduate students, to the implementation of “three-whole education”, and to carry out the ideological and political education.

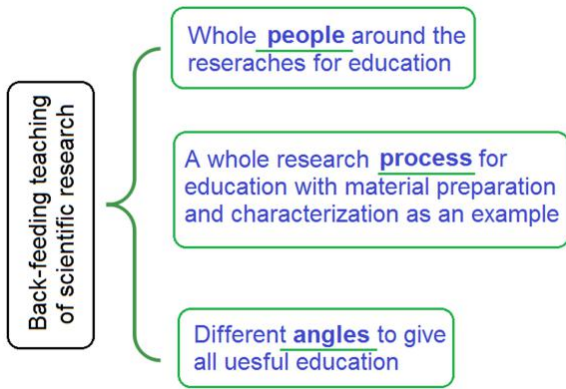


Figure 2. The elements are embedded in the back-feeding teaching of scientific research.

Shown in Fig. 2 is a simple conclusion about the back-feeding teaching of science research. Firstly, all the people around the researchers can give education on graduate and undergraduate students. These people at least include the supervisors, the experimenters, and the safety officers. Secondly, from a standpoint of materials science and engineering, the research processes include the reasonable selection of raw materials, the optimization of experimental parameters, and the characterization of resultant products. All these working processes are precious teaching materials for the students to improve their professional capability. Thirdly, the preparation of the scientific manuscript and even the submission for publication also holds many useful elements for teaching. Fourthly, scientific research can be explored to teach students from different angles. For example, cooperative operation, e.g. to set a working group containing several students, can be used in collective spirit education besides the theoretical and practical educations about professional knowledge and skills.

4. WHOLE PEOPLE AROUND THE SCIENTIFIC RESEARCH FOR EDUCATION

A student can be taught from all the people who have a close relation with scientific research such as director or supervisor, lecturer, assistant or instructor, experimenter, cleaner, safety officer, and other students in Fig. 3. The professor, the director or the lecturer are able to teach the students professional knowledge. The supervisor, the assistant, the instructor and the experimenter can teach the students how to carry out the experiments about scientific research. The safety officer, the cleaner and the ideological and political instructor can teach the students how to integrate themselves into the environment for better learning and promotion.



Figure 3. A diagram showing the possible staff and the students at different grades for a whole study.

Certainly, the other students can be models for learning about all the things. Just as Sakyamuni once said, "no matter whom you meet, he is the one who should appear in your life. It's not an accidental thing. He will teach you something." Similarly, a household word coming from the Analects of Confucius: "Among three people, there will be one of my instructor". The meaning is clear that the students should choose the good one to follow and should avoid the bad one and change it. Confucius said, "there must be something worth learning about other people's words and deeds." Understanding other people's merits and shortcomings will help and teach the students to regulate their owns' behaviors. This is important to train students to be a high-quality socialist successor with noble ideological and moral quality.

5. AN EXPERIMENT RESEARCH FOR EDUCATION

An experimental scientific research process can be extremely useful for systematically teaching students about professional knowledge and skills. With scientific research on new material as an example, some possible professional educations about the modern methods of material preparations and characterizations are shown in Fig. 4.

Starting from identifying a research topic, scientific research needs to carefully select the raw materials and design the potential functional applications. Then, a series of preparation methods and characterization methods can be taught to the students regardless of undergraduate or postgraduate students. This is because the contents have no bottom limitations to disclose. With a medicated fiber as an example, on one hand, traditional wet spinning, advanced filament-forming methods, and also nano methods (i.e. all sorts of electrospinning techniques) can all be tried for finishing the goal and meanwhile to provide teaching materials to the students [3-5]. Certainly, on the

other hand, the material characterization methods about the materials' morphology, inner structures, components' compatibility, and the functional performances can be similarly explored to teach the students [6-9].

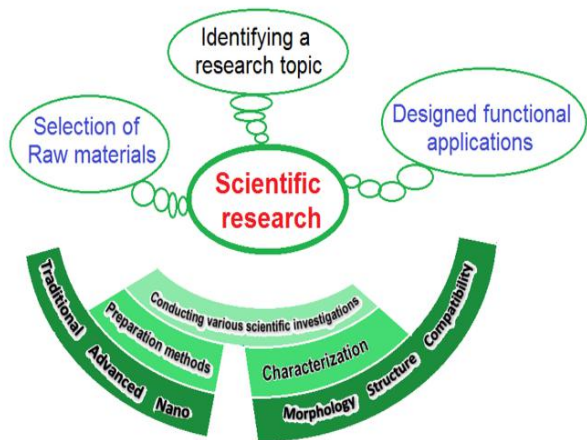


Figure 4. A diagram showing professional education about the modern methods of material preparations and characterizations.

What is more, scientific research can be fed back on the most fundamental educations on the basic courses such as mathematics, physics, chemistry and engineering. An example of electrospun nanofibers for educations on these basic courses is exhibited in Fig. 5. electrospinning, a sister method of electrospraying, is very facile for creating polymeric nanofibers [10-13]. Although the core-shell nanofibers can be generated through a single-step process, the micro formation mechanism of electrospinning is complex [14]. Up to date, no mathematics equation can be concluded for all the electrospinning processes. However, the application of electrospun nanofibers can be regressed using mathematics models, for example, the drug release profiles can be treated using the Peppas equation [15]. The materials have their chemical formula, which a practical example for chemical education. Meanwhile, the morphology of nanofibers can be detected using a scanning electron microscope, a famous physical method. Certainly, the electrospinning itself is an engineering issue with a wide variety of mutual influence parameters that need to be optimized for successful fabrication of nano products [16,17].

What is important is that all the things that happen during the process from the experiments to the scientific publications can be effectively explored as teaching materials to carry out three-while education. The people, no matter teachers or senior students, can take part in the “whole-people” education. The doing of experiments, the fabrication, the analyses and characterization, the searching literature, and the preparation of the manuscript can ab a typical “whole-process” education. Certainly, the professional knowledge and skills such as preparation of the working fluid, adjustment of the experimental parameters, knowledge about electrohydrodynamic, knowledge about polymer science and engineering can be

“whole-direction” education. And often, the experiments in science are numerous, thus, the teaching materials for “three-whole education” are similarly numerous. What important is that the teachers should be good at refining these materials to get the most suitable ones.

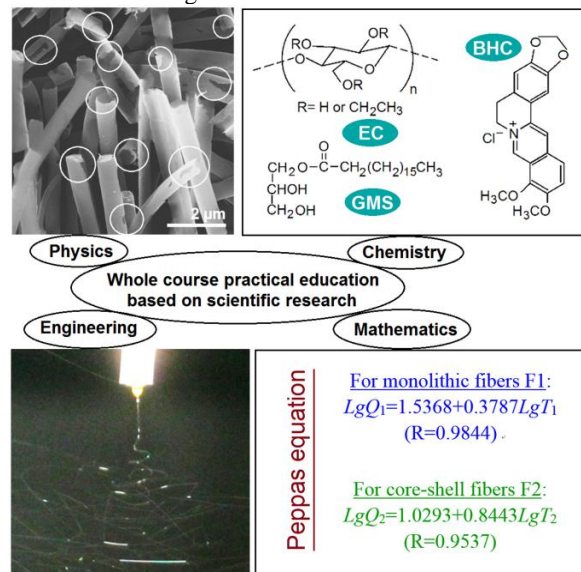


Figure 5. An example of electrospun nanofibers for educations on basic courses such as mathematics, chemistry, physics, and engineering.

6. DIFFERENT ANGLES TO GIVE ALL USEFUL EDUCATIONS TO THE STUDENTS

Scientific research is both a natural activity and a social activity, and thus it has both social attributes and natural attributes. Many useful teaching materials can be refined from it for a wide of different educations. These educations include firstly the professional practical education, which can be further divided into professional knowledge education, professional practice education, harmonious life between man and nature education, and education on hardworking quality. With the deepening of scientific research, the influences and effects of the back-feeding from research on teaching should be increased gradually in Fig. 6.

Secondly, the social attribute of scientific research is inevitable to make them comprise excellent educations for improving the social qualities of graduate students and undergraduate students. These qualities should at least include the safety consciousness, the environmental protection consciousness, the social responsibility consciousness, and the honest and realistic spirit. These excellent social qualities are important for them to become the successors of socialism in the future.

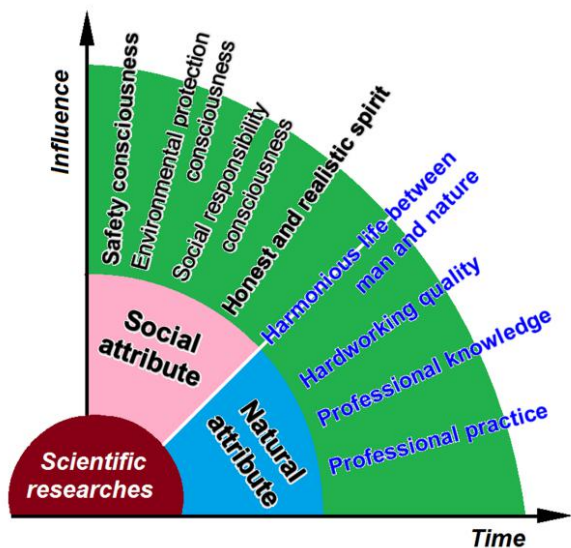


Figure 6. A diagram showing all the different kinds of useful educations that can be taught to both the graduate students and undergraduate students through the back-feeding of scientific research.

7. CONCLUSIONS

Three-whole education in Chinese colleges and universities for undergraduate and graduate students is a useful comprehensive reform, which can be effectively utilized for extending and deepening the ideological and political education along with the professional knowledge and skills education. Scientific research, containing rich teaching resources for “killing two birds with one stone”, can be systematically fed back to the teaching of undergraduate and graduate students, to the implementation of “three-whole education” for conducting the ideological and political education. The examples of back-feeding teaching of scientific research including whole staff education, whole direction education, and whole course education are explained in detail. Particularly, a whole practice training course with an experiment about electrospun nanofibers is suggested for fostering the students to become the innovative talents and meanwhile the successors of socialism in the future.

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