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PROFESSIONAL LITERACY STRUCTURE OF PRE-SERVICE PHYSICS TEACHERS IN CHINA

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***Abstract*— Physics education needs physics teachers have highly qualified professional literacy. Pre-service physics teachers should develop professional quality and then grow with new curriculum reform. Effective strategies can be adopted to improve professional quality of pre-service physics teachers and then become expert teachers via professional development during physics curriculum development.**

Keywords—**Professional development, Professional literacy, pre-service physics teacher, physics education**

I. INTRODUCTION

In the day that the basic education course reform is deep increasingly in China, physics teachers' education is becoming the focus noticed by people [1-3]. With the concomitant need for more highly qualified physics teachers, there has been an increase in demand for quality science teacher professional development [4]. Teacher education plays an important role in the development of pre-service teachers' beliefs regarding teaching and learning [5]. Therefore, effective strategies shall be adopted to improve professional quality of pre-service physics teachers and then become expert teachers via professional development during physics curriculum development, which has become an important topic for physics education teaching reform.

II. PROFESSIONAL LITERACY STRUCTURE OF PRE-SERVICE PHYSICS TEACHERS

A. Correct advanced educational idea

Educational idea reflects teachers' basic views and understanding on objective, value and method of educational activities during education and teaching, which will directly or indirectly determine, guide or adjust the corresponding teaching activities. Thus, pre-service physics teachers must have consistent and advanced educational ideas with new curriculum, specify how to cultivate talents and then improve their own educational ideas. Pre-service physics teachers shall be equipped with the following educational ideas under new curriculum reform.

Advanced educational idea based on student development; new curriculum must be based on student development [6, 7]. Pre-service physics teachers should become progressively more prepared to develop, implement, and share practices, knowledge, and values that answer to the needs of all their students [8].Teachers shall respect students and provide them teaching methods for further active exploration and learning. Students are the subject of learning. Teachers shall guide hem to learn new knowledge and theory via self-exploration and coordination. Meanwhile, students can cultivate their abilities and form good morality intangibly.

Conduct physics teaching based on practical life experience and concern on social & technological dynamics; first of all, teachers shall find physical problems in daily life and then stimulate students' learning motivation and form learning interests. Then, teachers shall reflect the principle that physics is closely related to life in the teaching process. In this way, students can experience physics in life at any time. Further, teaching process shall be closely related to information technology.

Physics teaching idea based on concern on scientific inquiry; pre-service physics teachers must highlight inquiry teaching under new trends. For one thing, teachers shall offer students learning method and thought; for another, teachers shall guide students to find problems during learning and then conduct effective scientific inquiry, during which students can truly experience physics knowledge forming process and master the corresponding scientific methods. Meanwhile, they can obtain sentiment edification so as to establish correct values.

Teaching idea based on equality and dialogue; students shall enjoy the same equality of status as teachers. Teachers are not dominant leaders in teaching processes any more but promoters and guiders of students' learning. Teachers shall eliminate their authority in the eyes of students. That is, teacher-student relationship shall be equal and harmonious. To some sense, teachers shall be friends of students. They shall promote students' leaning via dialogue. Meanwhile, students can achieve certain development physically and mentally, which would be beneficial to their health growth.

Teaching evaluation idea based on concern on development; new education evaluation system shall promote students' all-around development, teachers' gradual improvement and curriculum's perfection so as to deepen teaching reform. Therefore, the corresponding teaching evaluation system must be established to change the current bad condition and then coordinate with new curriculum reform development.

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Teachers related to new curriculum must change their traditional teaching evaluation ideas.

B. Perfect and rational knowledge structure

Knowledge is accumulated continuously in human development process, while students mainly learn scientific and cultural knowledge. As guiders and helpers of students' learning, teachers shall have certain knowledge reverse. Meanwhile, researches indicated that teachers' knowledge level is not closely related to teaching quality [9]. Hence, it shall be knowledge structure instead of teachers' knowledge that affects teaching effects. In this sense, pre-service physics teachers must have perfect knowledge structure as follows.

Scientific and cultural knowledge; pre-service physics teachers shall have knowledge on Marxist philosophy, modern science and technology development frontier as well as theories and views of social sciences etc. The learning of knowledge shall not be confined to pre-employment training. Instead, it shall be improved and developed in the teaching process. More importantly, teaching activities shall be carried out under guidance of new curriculum.

Rich professional physical knowledge; professional physical knowledge is the foundation for further teaching. Pre-service physics teachers shall have comprehensive and deep understanding on teaching materials with certain familiarity on contents and correlations among various aspects. This is not only the basis of physics teaching, but prerequisite of teaching activities.

Knowledge of education view and new knowledge acquiring; pre-service physics teachers shall be familiar with education views of new curriculum so as to adapt to the corresponding teaching requirements. Teachers in the 21st century shall have lifelong learning awareness. Knowledge is endless. Teachers are required to be equipped with all necessary knowledge for further works. More importantly, pre-service physics teachers shall improve themselves to pursue constant development. Therefore, pre-service physics teachers must have the corresponding education views as well as abilities to acquire new knowledge.

C. Diversified and skilled teaching skills

Teaching skills refers to aggregation of behaviors in classroom teaching including promoting teachers to complete their teaching tasks, achieving specified teaching objectives and helping students to conduct efficient learning [10,11]. Teaching skills can better reflect teachers' ability, which is accumulated in the teaching process [12]. It is more like a teaching art that can bring out vivid and interesting teaching so as to improve students' enthusiasm and then promote teaching quality. Pre-service physics teachers shall have the following teaching skills.

Teaching design skills; simply, teaching design means to design teaching processes. It refers to various processes of teaching design according to teaching objectives and students' practical situations. The new curriculum puts forward new requirements on teaching design. Teachers shall not only impart knowledge to students, but cultivate students' emotion, attitude and values. In this way, teachers shall improve and develop themselves during inquiry learning so as to conduct effective teaching based on practical situation.

Teacher-student communication skills; good teacher-student communication skills can allow students to have better learning, which is also the basis to conduct effective teaching. The new curriculum highlights equality between teachers and students. Teachers shall respect students and change their authority image. Besides, it is necessary to conduct good communication with students' patents, which can understand students deeply, conduct teaching in accordance of their aptitudes and improve knowledge level and learning ability. Good communication skills of pre-service physics teachers are the guarantee to conduct effective teaching.

Scientific inquiry teaching skills; classroom is dominated by teachers in the traditional physics teaching process. Teachers only impart knowledge to students without considering their practical situations, while students are forced to accept and adapt to teachers' teaching contents and methods. Such scientific teaching process is not scientific. Under influence of new curriculum, inquiry learning is an effective approach to improve students' abilities. In this way, students' ability can be developed with improved teaching quality. The inquiry learning of students is closely related to that of teachers. Therefore, pre-service physics teachers shall have skills for inquiry teaching.

Rigorous experimental teaching skills; physics is a subject based on experiment. Experimental teaching has great significance in helping students form correct physics concept, master physical laws, cultivate observation and manipulative ability and improve scientific literacy. Therefore, teachers shall strengthen experimental operation skills in the new curriculum teaching. Pre-service physics teachers shall highlight the following aspects in experiment teaching: one, to strengthen experiment awareness; two, teachers shall have innovation consciousness; three, abstract physical objects shall be mostly observed via experiments.

D. Perfect ability structure

Teachers' ability refers to teachers' necessary personal characteristics, which is developed continuously through conversion between theory and practice. The new curriculum poses many new and various requirements for pre-service physics teachers.

Diversified educational ability; educational ability includes various aspects. Generally speaking, it refers to abilities to education the next generation including understanding

students fully, conducting reasonable evaluation on students, training students' scientific attitude and guiding students exchange etc. Pre-service physics teachers must have certain educational ability to teach students in accordance with their aptitudes and then conduct targeted teaching according to principle of "no child left behind".

Rather strong teaching monitoring ability; teaching monitoring ability means to conduct adjustment, supervision, evaluation, feedback and self-control and continuous improvement in teaching processes. The new curriculum advocates students' active participation and independent inquiry aiming to form democratic and open teaching, which requires pre-service physics teachers to organize teaching cautiously and supervise activities rationally according to practical situations. In this way, teachers can complete their teaching tasks excellently so as to allow students to obtain sufficient and ordered development.

Outstanding interpersonal skills; teachers are helpers for students' learning in the teaching process; meanwhile, teachers must contact with parents and conduct social practice activities etc. Those require teachers to communicate with different people and form various interpersonal relationships. The harmonious interpersonal relationship can improve teaching quality and cultivate talented students. Therefore, interpersonal skill is a necessary ability for teachers, especially pre-service physics teachers.

Adept ruling ability of modern education technology; it is necessary for pre-service physics teachers to master modern education technology in the 21st century. The modern education technology is used to conduct teaching activities and optimize learning process so as to bring out more efficient learning. In this way, teachers can guide students' healthy and rapid development and organize classroom teaching activities efficiently so as to promote mutual progress.

E. Healthy physical and psychological quality

Healthy physical and psychological quality means physical and psychological healthy are in perfect conditions. From the perspective of physiology, physical health without any diseases is the basis of mental healthy. From the perspective of psychology, normal and harmonious recognition, emotion and behaviors as well as mental health will react upon physical health. Teachers with healthy and stable physical and psychological quality can play the maximum potential in the education and teaching. Psychological quality is an extremely important aspect among teacher qualities, which is the necessary condition for good education works. Hence, pre-service physics teachers shall be equipped with the following aspects.

Thick educational emotion; teachers must have enthusiasm for education works. The thick emotional emotion is reflected on selfless love for educational business as well as students and Education Administration Office. It can allow students to have the corresponding emotional experience so as to feel physical worlds profoundly.

Good personality; good personality is of great significance to teaching. Many researches indicated that good personality of teachers can help to create and maintain good teacher-student interactive activities with indelible influence on improving teaching quality.

Strong will; strong will of teachers is the guarantee for normal and ordered teaching, which is also a role model of students. Good examples set by teachers will have a subtle influence on students' behaviors or even their lifelong character shaping.

III. CONCLUSION

Pre-service physics teachers' quality is changing with continuously promoted new curriculum reform, which requires pre-service physics teachers to conduct professional development planning, learn to use their own wisdom to solve problems so as to become qualified, competent and responsible teachers.

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