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A Study on the Dilemma and Countermeasures of Science Teaching in Primary Schools

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Abstract: Primary school science is a basic, practical and comprehensive course which is of great significance to the development of students' scientific literacy. Primary school science actually lays the foundation of one's scientific literacy and is an introductory course for people to understand and think about the world, which is of great significance to their future learning life and lifelong development. However, due to many reasons, the current teaching situation of primary school science is not optimistic, so it is necessary to explore the teaching dilemma of primary school science and put forward countermeasures.

Keywords: Primary school science; Science teaching; Countermeasure research.

1. Introduction

In primary education, science teaching is being paid more and more attention to and concern, science class is an important basic subject for children's scientific enlightenment education, a good science class is of great significance to the development of primary school children's ability to love science, learn science and use science, and to improve the scientific literacy of primary school children. [21] In this regard, it is necessary to pay attention to the problems encountered in primary school science teaching, and develop corresponding countermeasures to improve the quality of primary school science education, so as to cultivate and develop students' comprehensive scientific literacy.

2. Dilemmas Faced in Primary School Science Teaching

2.1. Lack of professional primary school science teachers

In the Notice of the General Office of the Ministry of Education on Strengthening the Cultivation of Primary School Science Teachers, it is pointed out that it is necessary to "strengthen the supply of high-quality specialised primary school science teachers at the undergraduate level and above at source, improve the level of science education, and consolidate the foundation for the cultivation of innovative talents". In primary school science teaching, many schools lack professional science teachers, and the post of science teacher is mostly taken up by other teachers, with fewer full-time science teachers, and most of the science teachers in the remaining grades and classes are taken up by class teachers or mathematics teachers.

Although a series of teacher training will be conducted before the formal classes, the content of the real teaching is still too little, and there is the phenomenon of "going through the motions". Moreover, since most science teachers have their own main subjects to teach, they cannot focus on improving the quality and efficiency of science teaching in primary schools. In addition, due to the lack of science teachers, most science teachers have to teach in different grades and classes, and science teachers are generally overloaded with work and have little time and energy to reflect on and improve their own teaching standards.

Secondly, very few colleges and universities offer majors in primary science education. Science is a basic subject, and primary school science contains the basic knowledge of many subjects such as physics, chemistry, biology and geography, etc. Though basic, it involves a very wide range of knowledge, and many of the answers and questions of primary school students in class will not be within your expectations. Therefore, without a professional background in the subject, teachers may encounter difficulties and obstacles in lesson preparation and delivery. As a matter of fact, science is a difficult course to teach well. As a science teacher, you need to have a high level of scientific literacy and proficient teaching skills, a wealth of scientific knowledge and an up-to-date teaching philosophy in order to teach this course well.

2.2. Disconnect between theoretical and practical teaching of primary school science

2.2.1. The combination of theoretical knowledge and practical knowledge is not close enough.

In the primary school science textbooks, some of the knowledge points are simply mentioned in the book without in-depth explanation, unable to present the characteristics of the primary school science subject, and even some knowledge points are too professional, even if the students feel curious, but by the age limitations, lack of development of thinking, and can not be in-depth understanding, can only be ignorant about the general knowledge, which will directly affect the enthusiasm of the students to learn.

2.2.2. Science laboratories are fewer, and the conditions of science education are not guaranteed.

In addition to the theoretical part of primary school science teaching, there is also the need to operate the experimental part of the science class is a great deal of fun lies in the experiments, the most interesting way for students to learn is to experiment and observe. However, very few schools will open their laboratories to students in science lessons other than public lessons. The first reason is that most schools have fewer laboratories, some have only one or two laboratories, and the laboratories are not large enough and the laboratory

equipment is not complete enough to meet the needs of each student.

2.2.3. Science laboratory safety problems and hidden dangers

Because science experiments sometimes use alcohol lamps syringes and other dangerous experimental items, so schools and teachers are worried about students will appear safety problems, when too many students, teachers can not ensure that the laboratory in the safety of each student, once the accident occurred, both the school's safety or the personal safety of students are difficult to guarantee.

2.2.4. The laboratory lacks standardised management

For science teachers, the preparation and use of experimental materials is a more difficult thing, in the preparation of experimental materials often encounter the following problems: First, the old materials can not meet the needs. School equipment can suffer from aging and other problems, and with the passage of time, many of the equipment previously equipped in school laboratories can no longer be adapted to new research projects. Second, new materials cannot be fully equipped. Although the supporting school equipment can reduce the pressure of preparing experimental materials. However, for some materials that cannot be kept for a long time, it is left to the teachers or students themselves to prepare them in due and timely manner. Thirdly, teachers themselves do not have enough time for preparation. Science teachers in primary schools are mostly part-time. As the workload of other subjects is already heavy, and the preparation of science materials takes a lot of time and effort, teachers often feel overwhelmed. The preparation of materials for science lessons has a bearing on the learning and development of science lessons. If this problem cannot be solved, it will inevitably become a "bottleneck" affecting the teaching of science lessons, thus limiting the effectiveness of teachers in teaching science to students.

2.3. Lack of effective support for the professional development of primary school science teachers

The lack of effective support for the professional development of primary school science teachers is mainly manifested in the following aspects:

2.3.1. Insufficient support for scientific research

When it comes to scientific research, many people think that scientific research is something that should only be done by universities or relevant research institutions. However, with the gradual progress of the current new curriculum reform, the enhancement of teachers' professionalism has become the top priority of the various educational reforms. The improvement of teachers' professionalism cannot be separated from the cultivation and improvement of teachers' scientific research ability. However, in China's natural science funds and various types of education planning projects, and science education-related projects are fewer, engaged in primary and secondary school science education research force is weak, especially first-class scientists on science education research participation is low, the science education of the major issues of in-depth research is not enough.

2.3.2. Fewer Teaching Resources for Primary School Science

Teaching resources here mainly include teaching courseware, teaching tools, infrastructure and so on. For primary school science teaching, there are fewer courseware available, and excellent courseware is even more rare. However, if teachers don't look for or download courseware from the Internet, they need to make their own courseware or give lectures without courseware, which puts higher demands on their teaching and classroom control abilities and makes it impossible for them to prepare high quality lectures. Teaching tools and infrastructures generally refer to teaching aids and laboratory equipment, which are also closely related to the advancement and efficiency of the primary science classroom.

2.3.3. Less training for primary science teachers

Training here refers to both the training and development of primary school science teachers in teacher training colleges and universities, as well as the training of the in-service primary school science teaching force. At present, the disciplinary system for training science teachers in colleges and universities is not yet mature enough. Teacher training colleges have not paid enough attention to the training of science teachers, and high-level comprehensive universities are seldom involved in the training of primary school science teachers. In terms of the current situation of science teachers in primary schools, there are few teachers with a scientific or technical background, part-time teachers account for a disproportionately high proportion of the total number of science teachers, and there is a lack of teaching, research and training activities to support the professional development of teachers.

2.4. Science is not taken seriously in primary school teaching and learning

In primary schools, science, as a minor subject, is not taken seriously by students, parents and schools, and even some science teachers, who do not seem to attach great importance to science.

2.4.1. Low participation of students

For students, most of the students default science is a relaxation, to regulate the pressure of weekday learning for "play" courses, sometimes need to take notes, many students do not want to write, or just write two words to fool the teacher. In class or when doing science experiments, sometimes discipline is extremely difficult to manage. Not everyone participates in the classroom. Those who answer questions and interact with the teacher may be a fixed number of students, while the others are busy doing their own things, talking, or doing their own homework in their main subjects.

2.4.2. Parents' lack of understanding of science lessons

For parents, many of them think that science teaching is not as important as maths and language subjects, which are so-called secondary subjects, and often do not pay attention to students' learning of science. On weekdays, they don't ask students about their science learning. For parents, the main subjects such as language, maths and English, which determine the students' promotion rate and whether they can enter a good secondary school, are more worthwhile to invest their energy in, so they pay more attention to the teaching of the main subjects such as language and maths. Over time, the efficiency and quality of teaching science lessons in primary schools will continue to decline, and students will find it difficult to learn science lessons in depth.

2.4.3. Primary schools lack of attention to science classes

In daily teaching, schools often tilt resources to the so-called main subjects, while for the so-called secondary subjects is to take as much as possible to reduce expenditure. For example, other teachers such as maths or language are

made responsible for the teaching of science lessons, and there are fewer professional science teachers. However, due to the special nature of science teaching, it requires a lot of input from the school. But since its importance is not as high as that of the main subjects, the investment in resources is unsatisfactory, which will ultimately affect the teaching effect of science lessons in primary schools.

2.4.4. Primary school teachers are rusty to science teaching

For some teachers, science class is often not valued in comparison with other subjects such as language and mathematics. In teaching, many teachers think that science is not as important as maths and languages, and it is a so-called secondary subject, so they do not attach importance to science education, and their preparation is not as adequate as that of languages and maths. In addition, the so-called secondary status of science classes also makes some teachers reluctant to engage in the education of science programmes. This has resulted in a serious shortage of qualified personnel in the field of science education in primary schools. Due to the special nature of the science curriculum, teachers are required to be very specialised and have a wide range of knowledge, however, in actual teaching, many teachers do not come from the subject but are deployed on an ad hoc basis. In the absence of relevant training and a substantial knowledge base, the effectiveness and quality of teaching are often not as good as expected.

3. Improvement Strategies for Improving the Effectiveness of Primary School Science Teaching

3.1. Expanding the scale and optimising the structure of the primary school science teaching force

Science is a comprehensive course, which has high requirements on the professional ability, knowledge reserve and scientific literacy of primary school science teachers. However, the current number of reserves and specialisation level of professional primary school science teachers in China cannot match the needs of China's science curriculum reform. Primary school science teachers are the key to determining the quality of primary school science education. At present, primary school science teaching puts forward two requirements for the high-level development of the primary school science teaching force, namely, professional matching and academic upgrading. To this end, it is necessary to expand the size of the primary school science teaching force and optimise the structure of the primary school science teaching force.

Firstly, it is necessary for teacher training colleges to actively play a leading role in opening undergraduate majors related to primary school science education, expanding the number of enrollment of master's degree students in science education, and cultivating and strengthening the practicality and professionalism of primary school science teacher talents.

Secondly, it is necessary for teacher training colleges to actively introduce science and technology featured colleges, high-level comprehensive universities, as well as scientific and technological resources such as research institutes, scientific and technological venues, high-tech enterprises, etc., so as to transform the results of China's scientific and technological innovations in a timely manner, to provide more resources for the cultivation of scientific and technological science teacher trainees, and to support the excellent primary school science teachers and scientists to work part-time in teacher training colleges, so as to optimise the process of teacher cultivation.

Lastly, it is necessary to broaden the source of science teacher training, enrich the reserve of science teachers, and increase the supply of primary school science teachers with S&T backgrounds. Colleges and universities with an advantage in science and engineering are encouraged to set up primary school science education majors, focus on training primary school science teachers, and make full use of their own disciplinary advantages. Alternatively, they can cooperate with teacher training colleges and universities to jointly offer science education courses, set up special training for science teachers, and encourage outstanding science and engineering students who are interested in primary school science education to study science teacher training, so as to optimise the personnel training system of primary school science education, and to solve the problem of low quality and lack of primary school science teachers at the root of the problem.

3.2. Strengthening the interface between theoretical and practical teaching of science in primary schools

3.2.1. Combining theoretical and practical knowledge

Knowledge learning and application are two different stages, if teachers only carry out the teaching of theoretical knowledge, can not let students have a deep understanding of scientific knowledge, and the acquisition of knowledge is an important stage in the learning process of the students, teachers in the teaching should be the combination of learning and application of knowledge, to ensure that the students have a preliminary understanding of the relevant knowledge of the curriculum, they will take advantage of the iron while it is hot to organise them to carry out the relevant Science experiments, guiding students to apply the knowledge learnt in the classroom in the experiments. In the process of the experiment to find out the deficiencies in learning, and make corresponding improvements, through the experiment and then a review of knowledge and consolidation, so as to establish their own knowledge structure.

3.2.2. Continue to strengthen the conditions of science education guarantee

Although most primary schools in China generally have the conditions for building science laboratories and implementing science education, there are serious imbalances between regions, between schools and between subjects, especially for some schools in remote areas, their facilities for science education are very simple, and even for schools with science laboratories, it is not possible to provide students with laboratories in every section, so it can be said that The vast majority of schools have difficulty in meeting the requirements for implementing the new curriculum. For such primary schools, more investment is needed to continuously build more science laboratories as well as the experimental instruments and facilities needed to equip the laboratories, in an effort to make every primary school have the conditions to carry out science education in a standardised manner.

3.2.3. The laboratory safety education into the student training links

Teachers should strengthen the safety management of the

laboratory, regular safety education for students, the development of laboratory emergencies, emergency plans, to master the experimental injury rescue knowledge. The laboratory should have fire, explosion, poison, anti-theft and other related safety measures, dangerous drugs should be managed by a special person in a special cabinet, and timely and accurate records should be made from the time of purchase, storage, collection, use and disposal. In the process of carrying out science experiments, teachers must strictly implement the necessary safety measures to ensure the personal safety of students and themselves.

3.2.4. Strengthen the standard management of the laboratory, adhere to the "good" "enough" "practical" three principles

In the experimental process, teachers should ensure that the laboratory is fully functional, the number and quality of various types of laboratory equipment to meet the needs of teaching, the supply of laboratory supplies in a timely manner, adequate. To create a create a safe, environmentally friendly and modern experimental environment for students and teachers. Before carrying out teaching activities, teachers should combine the actual situation, clarify the specific tasks and learning objectives of the laboratory for the current year, and formulate the annual work plan of the laboratory. Conduct experiments in advance, pre-do experiments and make preparations to ensure that the teaching effect is realised.

3.3. Creating good pathways for pre-service and post-service science teacher training

3.3.1. Building a national support system for science education

It is possible to set up topics related to science education research specifically in education funding and science popularisation funding, establish a sound mechanism for the common construction and sharing of out-of-school science and technology education resources, and make full use of the functions of various colleges and universities and science popularisation sites, such as planetariums, museums and science and technology museums, as well as of organisations such as science popularisation sites, science and technology parks, scientific research institutes, and hi-tech enterprises, so as to provide full use of the function of training reserve talents in science, technology and innovation, and improving the youth and children's Provide a full range of services for scientific literacy. In the implementation of science education, schools around the world are encouraged to organically combine in-school and out-of-school learning according to their own actual conditions, and to make science education closer to practice, nature and life through study and practice, field trips, nature classrooms, environmental protection actions, etc., in order to strive to make the science education curriculum in primary schools more vibrant and to increase the infectiousness and attractiveness of the science classes.

3.3.2. Strengthen the integration of science education resources

Strengthen the integration of science education resources, develop curriculum resources and teaching materials and aids that can meet the needs of teaching, and fully equip experimental equipment and teaching kits that match the content of the teaching materials, so that they can better serve classroom teaching. The Internet platform can also be used to provide teachers with scientific and reliable reference materials, videos, animations and pictures for good science lessons. Strengthening home-school-society co-operation, so that popular science writers, out-of-school science and technology counsellors, and highly educated parents can serve as part-time science and technology teachers. Certify a number of qualified science museums to make them a second classroom for students to have good science lessons.

3.3.3. Strengthen teacher training and improve the scientific quality of the existing teaching force

Special supervision can be carried out on the quality of science teaching in primary schools, and surveys on the scientific quality of ordinary primary school teachers, especially science teachers, can be carried out to put forward targeted training programmes to improve their scientific quality, and to seek to ensure that the majority of science teachers have already studied undergraduate courses in science education. Innovations can also be made to the collaborative training mechanism for primary school science teachers, deepening the collaborative training mechanism between primary schools, local governments and teacher training colleges, enhancing the training of talents to meet supply and demand, and giving full play to the guiding role of science and technology counsellors, first-line primary school teachers and others in the training of teacher trainees.

3.4. Focusing on collaborative parenting between home and school and active participation in science education

3.4.1. Cultivate students' interest in science in a student-centred manner

Focus on practice and stimulate interest; adhere to the student-centred approach, teach students according to their abilities, promote exploratory-based science teaching, give full play to students' imagination, curiosity and desire to explore, bring their interest in science learning into full play, let them actively participate in scientific inquiry experiments, let them do so in the process of learning, learning and thinking, consciously learn scientific knowledge, improve the Scientific quality, cultivate the spirit of science, enhance scientific and technological self-reliance and self-confidence, thick planting family and national sentiment, and strive to plant the seeds of science in the hearts of students, so that they can weave the ideal of becoming a scientist in their hearts.

3.4.2. Implementing family science education

Carry out family science education and promote the collaborative education of families, schools and communities. It is necessary for all regions to focus on the value of science leadership, gather the strength of science experts, launch open courses on family science, organise various forms of family science activities, and build science education positions at the "doorstep", so as to make science education reach thousands of households, and to improve parents' awareness of science and students' scientific quality.

3.4.3. Deepen the reform of school teaching and improve the quality of science education.

All districts should optimise teaching management and offer full and good science courses in accordance with the curriculum programme. Teaching plans and lesson plans should be constantly optimised, and targeted guidance on science education for students should be strengthened. Implementing the standards for equipping teaching equipment for science and related subjects and strengthening the construction of laboratories. Fully integrate internal and external resources and promote the interface between the

main school front and the social classroom, so that students can receive better quality science education, so that their scientific literacy can be comprehensively upgraded and a group of young people with the potential of scientists can be nurtured.

3.4.4. Strengthen the construction of science teacher faculties and give play to the leading role of teachers

Set up more teacher-training programmes in primary school science education in colleges and universities, improve teachers' ability in experimental teaching, and train and select high-level, complex and high-level teachers with science backgrounds. Increase the proportion of science teachers in programmes such as "publicly-funded teacher training". Encourage high-level comprehensive universities to participate in the training of science teachers, so as to increase the supply of primary school science teachers at source. Cultivate high-level science teachers who are aware of and competent in science education and capable of conducting professional science experiments. Implement the establishment of primary school science teachers and stimulate the enthusiasm and creativity of teachers to participate in science education. Allow teachers to play a leading role in implementing inquiry-based and inspirational teaching, fostering students' depth of thinking and improving their problem-solving abilities.

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