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An Analysis of the Causes of Junior High School Students Struggling with Physics and Teaching Suggestions

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Abstract: In the process of junior high school physics teaching, some middle school students show difficulties in learning. This phenomenon not only affects the academic performance of middle school students but also poses a challenge to the teaching effectiveness of junior high school physics teachers. Through the research on the current situation of junior high school physics teaching, it is found that the reasons for students' learning difficulties are multifaceted, including the influence of students' own factors, as well as factors from the teaching environment and teaching methods. To improve this situation, this paper puts forward a series of teaching suggestions, aiming to stimulate the curiosity and exploration desire of middle school students, cultivate their interest in and love for the physics subject, and ultimately achieve an overall improvement in teaching quality.

Keywords: Junior high school physics; Students with learning difficulties; Cause analysis; Teaching suggestions

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1. Exploration of the causes of junior high school students struggling with physics

1.1. Lack of interest in physics and weak learning will

In the process of junior high school physics learning, many students with learning difficulties show obvious problems of interest. In class, they are often absent-minded, lacking curiosity about new concepts and principles explained by teachers, let alone actively exploring [1]. For example, when explaining the content of circuit connection, many students with learning difficulties just mechanically take notes, completely unaware of the fun of hands-on experiments. This state not only makes them lose their due enthusiasm for the physics subject itself but also further affects their academic performance. After-class assignments have become a burden for these middle school students. They easily give up when encountering slightly complex problems and no longer think deeply [2]. Even if they complete the tasks with the help of parents or junior high school physics teachers, they often do it just to cope with inspections, rather than truly understanding the physical principles behind the questions. Over time, a vicious cycle is formed- poor grades lead to a blow to self-confidence, and lack of

self-confidence in turn intensifies the resistance to physics learning. Due to the lack of interest in the physics subject, these middle school students are prone to develop an escapist mentality when facing the pressure of further studies. As the grade level increases, the difficulty of physics courses also increases, and the knowledge points become more abstract. They find it increasingly difficult to keep up with the teaching progress [3]. The experience of frequent failures in mock exams and formal exams gradually makes them lose the confidence to continue working hard. Eventually, they may choose to give up the physics subject and invest more energy in other relatively simple subjects. However, this often only treats the symptoms rather than the root cause, unable to fundamentally solve the learning problems, which seriously affects the all-round development and personal growth of middle school students.

1.2. Poor learning habits and incorrect learning attitudes

In the process of junior high school physics learning, many middle school students have not developed the habit of previewing before class. When facing new knowledge points in class, they feel at a loss and cannot keep up with the teaching rhythm of junior high school physics teachers. [4] Without prior understanding of the content to be learned, when teachers introduce more abstract concepts such as electric field strength and magnetic induction intensity, these middle school students can only passively receive information and find it difficult to form a systematic knowledge system. The review link after class is also neglected, resulting in the knowledge learned on the same day not being consolidated promptly. Over time, more and more knowledge gaps accumulate, ultimately affecting the overall academic performance.

In terms of learning attitudes, some middle school students have varying degrees of incorrect attitudes. Some middle school students think that the physics subject is too complex and difficult to understand, and they develop a resistant mentality psychologically, lacking the spirit of active exploration [5]. They are reluctant to invest enough time and energy in studying difficult problems and tend to give up when encountering difficulties, lacking the tenacious spiritual quality. Some middle school students do not attach enough importance to physics experiment courses, thinking that as long as they remember the theoretical knowledge in the textbook, they can cope with the exams. Therefore, they are careless during the experiment operation, do not follow the standard steps, and are not rigorous and meticulous in recording experimental data. They even fabricate data at will, completely violating the rigor that scientific research should have [6]. Such a bad attitude makes them particularly struggle when facing problems that require hands-on practice and innovative thinking, seriously hindering the development of their physical literacy. At the same time, these negative attitudes also affect the surrounding classmates, which is not conducive to creating a good learning atmosphere.

1.3. Inappropriate teaching methods and unscientific teaching behaviors

Under the traditional teaching model, junior high school physics teachers often adopt the “cram-down” method, continuously imparting knowledge points to middle school students from the beginning to the end of the class, lacking interaction with students [7]. This method makes the classroom atmosphere dull, and middle school students passively receive knowledge, making it difficult to maintain long-term concentration. Especially for more abstract physical concepts and principles, such as electric fields and magnetic fields, if middle school students cannot keep up with the teaching rhythm of junior high school physics teachers in a timely manner, they are prone to confusion and gradually lose their confidence in learning. [8] In terms of experimental teaching, many schools and junior high school physics teachers do not attach enough importance to it. As an experimental science, experimental teaching should occupy an important position in physics. However, due

to the shortage of experimental equipment or the limited experimental operation ability of junior high school physics teachers, theoretical explanations are often used to replace experimental operations in actual teaching. Middle school students can only understand the experimental process through pictures or videos in textbooks, unable to experience the occurrence process of physical phenomena firsthand. Their understanding of physical concepts remains on the surface, and it is difficult to master them in-depth [9]. In addition, junior high school physics teachers also have problems in the classroom questioning session. The questioning methods are single, mostly simple memory-type questions, lacking inspiration and guidance, which is not conducive to cultivating the thinking ability and innovative ability of middle school students. Over time, middle school students will gradually lose their interest in the physics subject and become students with learning difficulties in physics [10].

2. Teaching suggestions for junior high school students struggling with physics

2.1. Innovating classroom teaching concepts and paying attention to teaching students according to their aptitudes

In the context of continuous updates of educational concepts, innovating classroom teaching concepts and paying attention to teaching students by their aptitudes are crucial for improving the learning situation of junior high school students struggling with physics. Taking the teaching of mechanics in the second volume of the eighth-grade physics textbook of the People's Education Press as an example, junior high school physics teachers should pay attention to the individual differences of each middle school student and design diversified teaching plans from different perspectives to meet the needs of various students. For students with learning difficulties, more intuitive and visualized teaching methods can be adopted. For example, abstract concepts can be explained through video demonstrations, physical models, etc. When explaining "friction force", the distance changes of a scooter sliding on different-material surfaces can be used to let middle school students intuitively feel the existence of friction force and its influencing factors [11]. These vivid and interesting teaching methods can help reduce learning difficulties, make it easier for students with learning difficulties to understand physical concepts, and gradually cultivate their interest in the physics subject. For middle school students with a certain foundation but lacking confidence, junior high school physics teachers can guide them to carry out group cooperative learning and encourage them to give full play to their advantages in the team. For example, when exploring the conditions of "two-force balance", group competitions can be organized, and each member can be assigned different tasks, such as some being responsible for experimental operations, some for recording data, and some for summarizing laws. This method can not only improve the participation of middle school students but also enhance their self-confidence, so that they can better master the learned knowledge [12].

2.2. Applying digital information technology to carry out effective teaching

With the continuous development of modern educational technology, digital information technology has brought new opportunities to junior high school physics teaching. For the teaching of the chapter "Electric Current and Electric Charge," junior high school physics teachers can make full use of multimedia resources, online platforms, and interactive tools to make abstract electrical concepts intuitive and easy to understand, thus helping students with learning difficulties better understand and master knowledge points [13].

(1) Animation Display: When explaining the principle of current formation, junior high school physics teachers can play an animation video of electrons moving directionally in a conductor on the big screen, accompanied by voice-over explanations, to show how free electrons move directionally under the action

of voltage to form an electric current. This dynamic display method can not only help middle school students visually understand the essence of electric current but also deepen their memory of relevant concepts.

(2) Virtual Laboratory: In traditional classrooms, some electrical experiments are difficult to carry out due to experimental equipment limitations or safety considerations. However, with the help of virtual laboratory software, such as PhET Interactive Simulations, middle school students can operate various electrical components online, design circuits, and observe the change laws of current and voltage under different conditions. This not only improves the practical operation ability of middle school students but also gives them the opportunity to independently explore physical laws and cultivate the spirit of scientific inquiry [14].

(3) Online Learning Platform: According to the actual situations of middle school students at different levels, junior high school physics teachers can assign differentiated after-class homework or extended reading materials on the platform. For students with learning difficulties, more basic exercise questions can be pushed to consolidate what they have learned in class. At the same time, the learning progress tracking function built into the platform can help junior high school physics teachers timely understand the learning situation of each middle school student, so as to adjust teaching strategies.

(4) Flipped Classroom: Junior high school physics teachers can record micro-lesson videos about "Electric Current and Electric Charge" in advance for middle school students to watch and preview at home. In class, teachers no longer repeat the basic knowledge but organize group discussions, role-playing and other activities to guide middle school students to use the learned knowledge to solve practical problems. This method can help improve classroom efficiency, enable students with learning difficulties to participate in the learning process in a relaxed and pleasant environment, and gradually build up their self-confidence [15].

2.3. Selecting appropriate teaching methods and implementing hierarchical teaching

Hierarchical teaching is an effective way to adopt targeted teaching strategies according to the learning needs of middle school students at different levels. When teaching the chapter "Energy and Sustainable Development" in the ninth-grade physics textbook of the People's Education Press, junior high school physics teachers can divide middle school students into different levels according to their learning abilities, basic knowledge, and learning interests, to develop personalized teaching plans and improve teaching quality. For middle school students with a relatively weak foundation, when explaining the concept of energy, teachers can start from daily life, based on the familiar electrical energy, thermal energy, etc. Through vivid and interesting experimental demonstrations, such as using a hand-cranked generator to generate electrical energy and using a solar water heater to heat cold water, middle school students can visually feel the existence of forms of energy and its conversion process. At the same time, appropriately reduce the difficulty of knowledge points and focus on the understanding of basic concepts to help this part of students establish a preliminary understanding of energy. In the process of implementing hierarchical teaching, junior high school physics teachers should pay attention to regularly evaluating the progress of students at each level, timely adjusting the grouping criteria, and ensuring that each middle school student can receive the most suitable guidance and support. In addition, attention should also be paid to creating a good class atmosphere and a harmonious and progressive learning environment, so that all middle school students can actively participate in classroom interactions and grow and progress together. Through the above measures, the traditional "one-size-fits-all" teaching model can be effectively improved, the learning needs of

middle school students at different levels can be better met, and a solid foundation can be laid for improving the teaching quality of junior high school physics.

2.4. Carrying out interesting teaching activities to stimulate the interest of middle school students

In the teaching process of the chapter "Electricity in Daily Life" in ninth-grade physics, junior high school physics teachers can carefully design a series of interesting teaching activities to make the classroom full of vitality. For example, when explaining safe electricity use, a game of simulating the troubleshooting of household circuit failures can be carried out to enhance the participation of middle school students. Junior high school physics teachers prepare some simple household circuit models in advance, set different types of failures, such as short-circuits and electric leakage. Middle school students work in groups to find and eliminate the failures, so that they can intuitively understand the circuit principle and cultivate their practical ability and teamwork spirit. For the content of the working principles of sockets and plugs, the method of physical demonstration can be adopted. Junior high school physics teachers prepare various types of plugs and sockets in advance, including two-hole sockets, three-hole sockets, and plugs of different specifications, and display and explain their structural features and applicable scenarios in class. To increase the fun, a small competition can be organized. Several students are invited to the stage to try to correctly insert plugs of different specifications into the corresponding sockets, and other students cheer them on as the audience. This highly interactive teaching method can help improve the learning enthusiasm of middle school students. When talking about the content of reading the electric energy meter, junior high school physics teachers might as well introduce a real-life case analysis of the household electricity bill. Let each student collect the electricity bills of their families in the past few months and share and discuss how to calculate the electricity bill in class. In this way, middle school students will find that physical knowledge is all around them, and they will pay more attention to physical phenomena in daily life. At the same time, this also exercises their ability to deal with practical problems. In addition to the teaching of the above-mentioned specific knowledge points, junior high school physics teachers can also intersperse some interesting experiments or small stories related to "Electricity in Daily Life", such as introducing the historical story of the birth of the world's first incandescent lamp or demonstrating the experiment of making a simple electromagnet. These seemingly simple links can greatly enrich the classroom teaching content and let middle school students feel the charm of the physics subject.

3. Conclusion

In conclusion, improving the situation of students struggling with physics is not a one-time task. It requires long-term perseverance and continuous exploration. Junior high school physics teachers should continuously pay attention to the development trends of each middle school student, adjust the teaching plan on time, and through continuous efforts, optimize the teaching model and improve the quality of education and teaching. By doing so, they can help those middle school students who encounter difficulties in physics learning overcome obstacles, build confidence in scientific exploration, cultivate more new-era talents with innovative spirit and social responsibility, and lay a solid foundation for the country to transport more high-quality science and engineering talents.

Disclosure statement

The author declares no conflict of interest.

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