

Exploration of Cultivating Students' Self-Learning Ability in Physics Teaching

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Abstract: Self learning ability is a necessary skill for students, and cultivating students' self-learning ability is an important mission and responsibility of educators. If students want to better integrate into society, they need to take the initiative to develop, develop their personality, and develop comprehensively. Good self-learning habits are the foundation of lifelong learning for students. In this context, as educators, we should use various teaching methods, carry out rich and colorful teaching, mobilize students' enthusiasm, optimize guidance for students in all aspects of teaching, and stimulate students' interest in learning. Educators should also follow the requirements put forward to them under the background of the new curriculum reform in the teaching process, regard students as the main body of learning, and achieve the goal of "teaching them to fish", so that students not only learn knowledge but also learn to learn, and cultivate their self-learning ability.

Keywords: Self-learning Ability; Physics Teaching; Teaching Process.

1. Introduction

In today's era of rapid knowledge updates, self-learning ability has become one of the core competencies for students to adapt to future social development. Physics, as a natural science based on experiments and with strong logic, has an abstract and closely related knowledge system to daily life, which puts higher demands on students' autonomous learning ability. However, the traditional "indoctrination" teaching model often overlooks the students' subject status, resulting in passive and fragmented learning, making it difficult to stimulate students' enthusiasm for exploration and independent thinking ability.

This article is based on the educational philosophy of "student-centered" in the new curriculum reform, combined with the characteristics of physics, and systematically explores how to cultivate students' self-learning ability in the three stages of pre teaching, teaching, and post teaching. By using strategies such as scientific preparation, problem scenario creation, experimental exploration, and cooperative learning, students are guided to shift from passive acceptance to active construction, thereby mastering the key to lifelong learning. The article aims to provide practical reference for physics teachers, help students achieve the leap from "learning" to "being able to learn", and lay the foundation for cultivating innovative talents.

2. The Ability to Study Independently

2.1. Definition of Self Study Ability

Self study ability refers to a person's ability to learn independently and acquire knowledge.

2.1.1. The Importance of Self Study Ability

Having self-learning ability not only promotes students' basic listening, speaking, reading, and writing abilities, but also cultivates their comprehensive qualities such as comprehension, critical thinking, empathy, and creativity.

(1) Self study ability is the foundation for mastering knowledge and skills.

(2) Developing self-learning ability is a necessity for moving forward.

2.1.2. Basic Characteristics of Self-learning

Independence: Learners are the main body of learning, possessing a certain learning potential and subjective initiative.

Autonomy: having one's own opinions and taking responsibility for one's own actions.

2.2. Ways to Cultivate Self-learning Ability

By helping learners establish the correct learning attitude, enabling them to master the correct learning methods, and cultivating their self-learning ability; Education practitioners should pay attention to consciously and systematically cultivating students' self-learning ability in various aspects of the education and teaching process.

2.2.1. Starting from the Learner's Perspective

(1) Learners should establish an awareness of active learning

(2) Dare to question and ask questions. The theory and practice of human education development have proven that questioning helps to stimulate the enthusiasm and initiative of learners, and is beneficial for firmly mastering knowledge.

2.2.2. In Terms of Educators

(1) Educators coordinate and arrange various educational and teaching stages, and arrange distinctive educational and teaching work based on the characteristics of each stage.

(2) During teaching, various methods are used to carry out teaching activities, increase the diversity and fun of the classroom, enrich classroom content, and arouse students' interest in learning.

2.3. The Help of Self study Ability in Learning Physics and the Significance of Topic Selection

2.3.1. The Help of Self study Ability in Learning Physics

Compared to other subjects, the knowledge learned in physics is relatively abstract, and some physics concepts are difficult to understand when first introduced. However, the teaching content arranged in physics is mostly closely related to daily life, especially for most knowledge content in middle school. Having strong self-learning ability can help students

explore and learn physics knowledge in their daily lives, facilitating the integration of theory with practice and better understanding and mastery of physics knowledge.

(1) Having self-learning ability enables one to learn knowledge independently and spontaneously, which is beneficial for mastering knowledge.

(2) People with strong self-learning abilities will have more opportunities to learn.

(3) Physics knowledge is often abstract, but having strong self-learning ability makes it easier to break down the barriers between physics knowledge and reality, apply physics knowledge to daily life, and help students better understand and master knowledge.

2.3.2. Significance of Topic Selection

The current physics teaching mostly relies on "indoctrination" teaching, which urgently needs to be changed. The starting point of teaching is to help students acquire knowledge, with students at the center and as the main body of learning. The teaching philosophy under the new curriculum reform also proposes that teachers should teach students that learning cannot be just one-sided imparting of knowledge. In junior high school physics teaching, the improvement of self-learning ability can enhance students' interest, optimize their learning structure, and indirectly promote the progress of physics teaching. However, based on the current situation, the cultivation of students' self-learning ability in junior high school physics teaching still remains on paper, and there are numerous loopholes in the teaching of self-learning ability, which have led to worrying teaching problems. In response to this situation, teachers should analyze the cultivation methods of self-learning ability reasonably, improve teaching concepts, construct high-quality middle school physics classrooms, and enhance students' self-learning ability. Educators play the role of guides in the teaching process, guiding students to engage in learning and returning the initiative of learning to them. In this context, it is increasingly important to cultivate students' self-learning ability.

2.3.3. Main Tasks and Content Arrangement of This Article

Understand the current educational background and the national requirements for educators' education and teaching. Research the characteristics of each teaching link and propose corresponding educational and teaching methods based on the characteristics of each part. Propose one's own viewpoint based on the current situation of educators and learners.

3. Before Teaching: Arouse Students' Interest in Learning and Guide Students to Preview Reasonably

Preview can help students engage in independent thinking before encountering new knowledge, enabling them to discover and solve problems through active exploration. This process not only exercises students' independent thinking ability, but also effectively enhances their self-learning ability. Therefore, previewing plays an important role in cultivating students' self-learning ability. But only by enabling students to master appropriate methods of previewing can they carry out reasonable previewing. Inappropriate previewing may give students incorrect psychological suggestions, which may lead to overly dismissive or worried judgments about the knowledge they are about to learn. Students who are very familiar with it may turn a blind eye and be unwilling to take

the exam. Completely unfamiliar knowledge can easily make students feel frustrated and is not conducive to stimulating learners' interest in learning. Therefore, as educators, we should not only help students develop the habit of previewing, but also guide them to do so scientifically. Effective preparation is necessary to achieve the desired results.

3.1. Guide Students to Read Textbooks

The most basic and direct tool for students to acquire knowledge is textbooks, which are written strictly according to the inherent logic of scientific knowledge and the cognitive development laws of students, with students as the research subject. It not only imparts scientific knowledge, but also permeates scientific research methods and logical thinking. For example, from phenomenon to essence, from concept to law, from law to application, therefore, teachers not only need to let students preview, but also teach them how to preview is particularly important.

For example, in the eighth grade's "Buoyancy" section. Firstly, students can read the opening sentence of the section to arouse their interest in learning. By reading this passage, students can not only understand the concept of "buoyancy", but also use it to explain real physical phenomena and solve related problems. Secondly, guide students to draw two major headings, namely "Buoyancy" and "Factors that Determine the Size of Buoyancy", to give students a preliminary understanding of the knowledge they are about to learn. Again, guide students to read each section in detail. For the experiment of "exploring which factors are related to the size of buoyancy", students can be required to have a general understanding of the purpose, methods, process, and conclusions of the experiment. Students can annotate key points and their own doubts based on their own understanding while reading textbooks, and listen to lectures with targeted focus during class. And encourage students to communicate and cooperate with each other, gradually cultivate a good atmosphere, and develop self-learning ability.

3.2. Teachers Write Pre Study Plans for New Courses

Teachers can prepare a preview study plan before class and distribute it the day before class. The pre arranged content includes: (1) the teaching objectives, key points, and difficulties of this lesson. Help students clarify their learning content and allocate their time reasonably. (2) The problem of previewing. It can serve as a bridge between the past and the future, and physical concepts, laws, formulas, as well as the derivation and deformation of formulas, can be used as a basic preparation problem. It is also possible to incorporate the application of physical laws, the manifestation of physics knowledge in daily life, etc., to help students connect theory with practice and achieve targeted results. (3) Set up a doubt zone. When previewing, taking notes of unfamiliar or incomprehensible content can provide more direction for learning during class, take the initiative in learning, and improve learning efficiency. (4) Write exercises based on basic knowledge and skills. Don't seek too much or too difficult, pay attention to the foundation, be targeted, and have an appropriate amount of questions. By handling the basic exercises in the textbook well, one can conduct preliminary checks on the effectiveness of previewing and promptly identify and fill in any gaps.

3.3. Creating a Flipped Classroom for Micro Courses

Micro courses are deeply loved by students for their short, concise, rich, and dynamic forms. Before class, the teacher can create a micro video of the key and difficult points of a certain knowledge point in this lesson, allowing students to watch it at home and learn independently according to their own situation

For example, in studying the section on "Magnetic Phenomena and Fields", it is not only a new and important content, but also a difficult point. If relying solely on the teacher's explanation is dull and difficult to understand, it is not easy to achieve a good learning effect. So teachers can collect some knowledge related to magnetic fields in daily life, such as the dazzling auroras produced in high latitude regions of the Earth, the necessary compass for sailing journeys, and carrier pigeons that can distinguish directions and send messages. They can create a 3-5 minute video and let students watch these interesting videos to stimulate their interest in learning. In class, teachers can ask students to follow the teacher to understand magnetic phenomena and fields based on their pre class preparation and their own thinking, and master the knowledge of this lesson. You can also communicate and explore what you know about magnetic fields in class based on your daily observations and accumulation, which can increase the learning atmosphere in the classroom and cultivate students' self-learning ability.

4. In Teaching: Student-Centered and Teacher Led Teaching

The traditional one-way teaching method cannot guarantee students' classroom subject status. Over time, this is not conducive to improving students' enthusiasm for learning physics. The classroom should be returned to students, with students as the main body and teachers playing a leading role in the process. It is important to always remember that students are independent individuals and not subject to the will of teachers. We should pay attention to combining the characteristics of the subject with students' learning and absorption abilities, optimize teaching methods, focus on "teaching to fish", guide students to learn how to learn, and continuously improve their self-learning ability

4.1. Introduction of Science to Stimulate Students' Passion for Self-Learning

In physics teaching, teachers can use various flexible teaching methods to stimulate students' interest. Scientific methods should be used to guide students to think spontaneously and ask questions on their own as much as possible at the beginning of the classroom. And before the formal teaching, the teacher has already provided students with preview guidance, so appropriate time can be left for students to ask questions, which not only cultivates students' sense of ownership, but also checks their preview status.

4.2. Flexible Teaching to Cultivate Students' Self-Learning Ability

Introduce inquiry-based learning, assign tasks of appropriate difficulty to students, and provide them with correct guidance.

Firstly, teachers can combine the upcoming learning content with real-life situations, and use relevant events in life

to stimulate students' desire to learn. For example, when studying the section on the hazards and control of noise, specific examples from daily life can be used to stimulate students' interest in learning, stimulate their spontaneous learning, and cultivate their self-learning ability. For example, the current discussion about the "square dance" incident can prompt students to think about why such conflicts arise and why sometimes beautiful music is no longer "beautiful" to us. Following the guidance of the teacher, students will also spontaneously think. At the same time, carry out moral education work for students, help them establish correct concepts, take the right path, and do the right things.

Secondly, teachers can utilize online resources, [5] To arouse students' curiosity about physics knowledge and encourage them to learn more actively. For example, in the physics lesson "Lens" in the eighth grade textbook of People's Education Press, teachers can make full use of online resources to collect diverse video materials that demonstrate the practical application of lenses. By presenting interesting application examples of lenses in different fields such as life and technology, students' curiosity and interest in learning are effectively stimulated, thereby encouraging them to engage in classroom learning with a more focused attitude.

Finally, teachers can combine physics knowledge with real-life practice. For example, organizing students to visit science museums or nature museums, allowing them to intuitively understand the principles of physics by observing various physical exhibits and experimental devices. Teachers should play a guiding role in this process, inspiring students to actively explore and collect relevant information, thereby cultivating their self-learning ability and scientific inquiry spirit.

4.3. Create Problem Scenarios and Guide Students to Actively Learn

In traditional classrooms, most teachers regard themselves as the center of the classroom, and students are more passive listeners. The classroom has become a "one-man classroom" for teachers, and teachers are more likely to implement a "indoctrination style" teaching

Learning method [6], students' learning is a mechanical learning. This teaching mode is not conducive to mobilizing students' initiative and improving their self-learning ability. In order to enhance students' self-learning ability, teachers need to position themselves correctly, realize that they are the guides of education and teaching, and that students are the main body of learning. They should encourage students to actively, spontaneously, and enthusiastically participate in teachers' teaching activities, make students enjoy learning, and let them discover and solve problems on their own. Teachers can provide timely guidance

During classroom teaching, teachers should consciously create problem scenarios, propose inspiring questions that are relevant to the teaching content, and immerse students in the scenarios to stimulate their learning motivation. Asking students familiar yet unsolvable questions can better stimulate their initiative in learning. For example, when studying "Friction", students have already experienced it in their daily lives, but they don't know exactly what it is. For example, it is easier to slip on ice than on asphalt roads; Press your palm onto the desktop and slide it, feeling that the desktop is obstructing your palm's movement; Wearing roller skates makes it easier to slide on the road surface than wearing sports shoes. Encourage students to think about what they can think

of through these phenomena, help them break through fixed thinking patterns, think creatively about problems, and reach a new level of thinking. Therefore, in teaching, appropriate problem scenarios should be created to encourage students to think from multiple perspectives, aspects, angles, and levels, stimulate learning interest, and guide students to actively learn.

4.4. Make Full Use of Experimental Activities to Cultivate Students' Hands-On Ability and Scientific Exploration Spirit

Physics is a natural discipline based on experiments, and in educational and teaching activities, it is important to fully play the role of role-playing, allowing students to fully participate and thus achieve the joy of success. Students' learning cannot be limited to interests alone. We must also strengthen their awareness of self-learning and cultivate their ability to learn on the basis of their interests. However, relying solely on basic knowledge is not enough. It is also necessary to fully utilize the role of physics experiments to exercise students' basic skills. Therefore, in physics teaching, demonstration experiments should be transformed into

exploratory experiments operated by students when conditions permit, fully mobilizing students to participate. In the process of conducting experiments, it can stimulate students' scientific exploration spirit and cultivate their hands-on ability.

4.5. Summarize and Enhance Clear Content

Reading is meaningless for someone who cannot summarize their knowledge. In the process of learning, students should be helped to summarize their knowledge in order to sort out the learned knowledge and clarify the content. If one only studies without summarizing, it is impossible to clarify gains and losses, and some knowledge that is already easy to confuse cannot be clearly remembered, especially in physics learning. If one confuses knowledge without clear content, they will make mistakes when solving problems.

For example, after learning about the concepts of action and reaction forces, as well as equilibrium forces, students may experience confusion in their knowledge points, which can lead to confusion and confusion. At this point, they can summarize the similarities and differences between them by drawing a table to clarify the relevant content.

Table 1. Comparison of Acting Forces, Reaction Forces, and Balance Forces

		A pair of action and reaction forces	A pair of balancing forces
Similarities		Equal magnitude, opposite direction, acting on the same straight line	
difference	Object under force	Acting on two different objects	Applied to the same object
	Dependency relationship	Interdependence, cannot exist alone	No dependency relationship, when one is removed, the other can still exist, but it is no longer balanced
	The effect of force	The effect of two forces cannot be cancelled out, cannot be superimposed, and cannot be calculated as a total force	The effects of two forces can cancel each other out, be superimposed, and the resultant force can be calculated. The resultant force is zero
	The nature of force	It must be the same	Not necessarily the same

You can also use methods such as creating mind maps to summarize learned knowledge and achieve a consolidation effect. It should be noted that 'reviewing the old to learn the new' requires constantly consolidating basic knowledge and skills, and only when applied can it be presented correctly and accurately.

5. After Teaching: Provide Appropriate Guidance and Create a Good Learning Atmosphere

Tao Xingzhi once said, "A teacher should not specialize in teaching, his responsibility is to teach people how to be a good person; students should not specialize in reading, their responsibility is to learn the way of life." The acquisition of knowledge should not be limited to the classroom and books, but should also extend beyond the classroom. Students should change their concept that "opening the textbook is the beginning of learning, closing the textbook is the end of learning." Students should realize that there is knowledge everywhere in life, and all aspects can be learned. Knowledge cannot be isolated from life. Teachers can provide students with appropriate guidance, making them realize that learning is actually a vast world, mobilizing their initiative in learning, inspiring them to think independently, and cultivating their good thinking methods and abilities. Good education should never be limited to the classroom, but should be extended to life. Education is life.

5.1. Form a Collaborative Team to Achieve Common Progress

Physics is a relatively abstract discipline that involves some difficult to understand content. If students lack logical thinking ability or have weak acceptance ability, it will make them feel that physics knowledge is difficult to accept. If students are directly taught or independently expanded, it may exceed the scope of the learner's ability. So, teachers can encourage students to understand and learn difficult problems through cooperative learning, communicate and explore outside of class, and engage in cognitive collisions, thus sparking new sparks of thinking.

Students can be guided to form cooperative groups, summarize the learned content, organize knowledge through communication, broaden their thinking, and find more ways to solve problems. Group cooperative learning can complement each other's strengths, not only improving students' communication and cooperation abilities, making them aware of the importance of cooperation, but also cultivating their self-learning ability

5.2. Identify Gaps and Deficiencies, Identify Problems, and Establish a Foundation for Reflection

Confucius said, "Doubt is the beginning of thought and the end of learning." From this, it can be seen that problems can trigger thinking and are also the foundation of reflection. In

the process of continuous reflection, identify gaps and deficiencies, find problems, stimulate self-learning motivation, and make targeted improvements in this process. Students should review the knowledge they have learned outside of the classroom, do corresponding exercises, promptly identify areas of deficiency, unresolved problems, and lack of clear knowledge, conduct targeted research and learning, and master the knowledge.

5.3. Connecting with Reality, Turning Abstract into Concrete

Theory cannot be separated from reality, and facts cannot be separated from thought. Teachers should not only use real-life examples in their teaching, but also cultivate students' thinking of connecting abstract physics knowledge with concrete examples in daily life, guiding them to use theoretical knowledge to explain physical phenomena and solve physics problems, and bringing physics knowledge into reality.

For example, after learning about the changes in physical states, students can combine real-life examples to turn ice into water; The 'white air' around the popsicle; The camphor balls in the suitcase gradually become smaller and other real-life examples can be used to apply the knowledge learned to practical life. This not only deepens understanding, but also applies abstract physics knowledge to daily life, allowing students to discover the joy of learning physics and have a sense of achievement in learning. In the future, students can learn spontaneously and have the ability to self-study.

5.4. Reading Books and Expanding Horizons

Reading can broaden students' horizons, learn more ways and methods, stimulate their interest, and allow them to read books related to physics knowledge, see a broader world of physics, and thus stimulate their interest in learning. In the process of reading, students can also learn more perspectives, improve their self-cultivation, change their learning concepts, fundamentally arouse and stimulate students' learning

motivation, and cultivate self-learning ability.

6. Summarize

This article mainly puts forward its own opinions and insights on the concept of self-learning, the help of self-learning ability in learning physics, and how to cultivate students' self-learning ability by combining the characteristics of each teaching link. Propose methods based on the three stages of pre teaching, teaching, and post teaching.

Overall, teachers not only bear the task of teaching, but also the responsibility of nurturing students, playing a leading role in their development. We need to constantly innovate, learn and explore, and find better ways to help students set sail.

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