

# ***Based on Life Examples, Guide Students to Think and Understand Physics Knowledge Step by Step---- Case Study of “Refraction of Light” Teaching Design***

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**Abstract:** taking life examples as scenarios, this paper studies the topic of guiding students to think and learn physics knowledge step by step, and makes a case analysis through the teaching design of “refraction of light”. Physics is an important part of human science and culture. It is a natural science that studies the law of matter, interaction and motion. Our daily life contains a variety of physical knowledge and physical laws. Students can explain many phenomena in life by learning physical knowledge. Therefore, it is a matter of concern for junior middle school physics teachers to make students interested in physics at the beginning and in the process of learning, which requires teachers not to teach with old teaching methods, Instead, we should adopt some teaching methods that are easy for students to understand and close to students' life. Taking the teaching design of “refraction of light” as an example, this paper briefly discusses the application of “guiding students by life situation” in junior middle school physics teaching.

## **1. Introduction**

The 2011 edition of physics curriculum standard for compulsory education clearly points out that physics curriculum for compulsory education should pay attention to the connection with production, life reality and the development of the times. At this stage, physics curriculum should pay attention to students' cognitive characteristics, strengthen the connection between curriculum content and students' life, modernization and scientific and technological development, pay attention to social progress and problems brought by technology application, and cultivate students' sense of social responsibility and correct world outlook <sup>[1]</sup>. There is physics everywhere in life, physics is everywhere, from life to physics, from physics to society. In the process of Physics Teaching in our junior middle school, we should be close to students' life, conform to students' cognitive characteristics, and stimulate and maintain students' interest in learning <sup>[2]</sup>. Only in this way can students master the basic knowledge and skills of physics through learning and exploration, and apply them to life practice, so as to lay a foundation for future study, life and work. This is also the requirement of the core quality of physics discipline. Physics teaching should be connected with life. Through science and its education, people can learn to understand life, feel life and create life,

with the core of cultivating “people with all-round development” [3].

## 2. Current Situation of Physics Classroom Teaching in Junior Middle School

Due to the influence of exam oriented education, teachers blindly pursue achievement and short-term teaching effect in the teaching process, and do not pay close attention to the all-round development of students. In the teaching process, they are divorced from reality and life, and do not connect physics teaching with real life, which leads to the failure to stimulate and mobilize students' interest in learning, and then affect the final academic achievement.

## 3. Teaching Examples and Analysis

Now take the teaching design of “light refraction” as an example for case analysis.

### 3.1 Teaching Case 1: Introduction Process of New Course Teaching -- Introduction with a “Fork Fish” Small Experimental Activity

Teacher: in the last lesson, we learned “the characteristics of plane mirror imaging”.

OK, today we learn a new knowledge. Before learning, let's do an experiment. Students, I believe you have fished or speared fish. You fork along the position of the fish. Can you fork the fish?

Students think and answer.

Sheng A: Yes.

Sheng B: No.

...

Teacher: can you fork a fish? Now let's do a fish insertion experiment. Then, the teacher put the prepared teaching aids for the simulated fish insertion experiment on the desk and asked three students to operate it (Note: each student can only fork once).

Student: raise your hand and experiment on the stage. The following students watch and think.



*Fig.1 Fish Insertion Experiment*

As a result, none of the three students forked the fish.

Teacher: it's obviously going to fork the fish in the direction of the fish. Why didn't the three students fork the fish?

Student: answer.

Teacher: OK, let's learn the section of refraction of light with questions.

On the blackboard, the teacher read the topic of the next lesson - refraction of light.

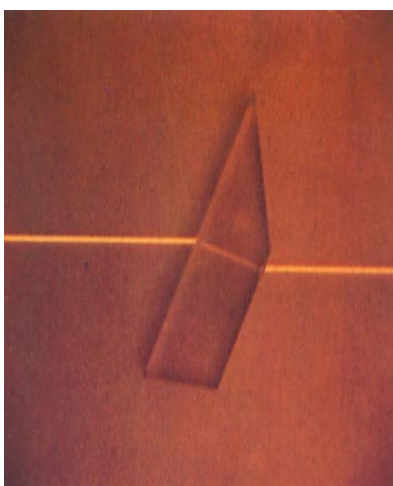
Case 1 Analysis:

Fork fish and fish fishing are familiar examples in our life, but this small example contains an

important physical knowledge - the refraction of light. Through the explanation and experiment of this example in life, the teacher is not only close to the students' life, but also easy for the students to understand. At the same time, through the introduction of this experiment, the students have a "cognitive conflict", and then the students have an internal drive to solve their doubts. Consciously "set" some cognitive conflicts in the teaching process, promote the fierce conflict between students' original knowledge and new knowledge that must be mastered, stimulate students' passion for exploration, promote students' enthusiasm for learning, leave students with profound experience and experience, and it is not easy to forget.

### 3.2 Teaching Case 2: Guide Students to Establish the Concept of Light Refraction

Teacher: show the students some pictures about the refraction of light. The first one is the light path after a beam of light shines on a prism. The second one is the picture of an explorer in the desert suddenly seeing a pavilion in the air. The third one is the picture of chopsticks "breaking" after they are put into the water.



*Fig.2 Life Case Diagram*

Student: observe and think.

Teacher: question: Why are some of the above strange phenomena?

Sheng C: it is due to a light phenomenon at the interface between water and air.

Teacher: This is the refraction of light to learn in this section. Then, please define the refraction of light.

The student answered.

Then teachers and students summed up the definition of light refraction - when light is obliquely emitted from one substance into another, the propagation direction will usually deflect. This phenomenon is called light refraction.

Case 2 Analysis:

Students have learned the reflection of light and have a certain understanding of the concept of light reflection. Light refraction is a new and difficult concept to understand. This teaching case is introduced through some specific life examples that are easy for students to understand, so that students can observe and think, find out and summarize the commonness of several examples of light refraction in life, and teachers and students jointly summarize the definition of light refraction. Through some specific life examples to summarize the definition of, students are easier to understand and remember.

### 3.3 Teaching Case 3: Example and Explanation of Light Refraction in Life

Teacher: tell you some examples related to the refraction of light in life.

(1) Why can I see coins again

When an appropriate amount of water is added into the cup, the light deflects due to the refraction of light, enters people's eyes, and people can see coins again. In fact, what people see is the virtual image of the coin. The position of the virtual image of the coin is higher than that of the real object.

(2) Why does the immersed part of the pencil seem to bend upward?

Because the light PA and Pb emitted from point P into the air are refracted at the water surface. The refracted light is viewed by AQ and Bq / eyes against the refracted light, and it seems that the light is emitted from point P' in the water. The P' point is above the P point. Using the same method to analyze the points of the pencil in the underwater part, The final result is that the part of the water seems to deflect upward.

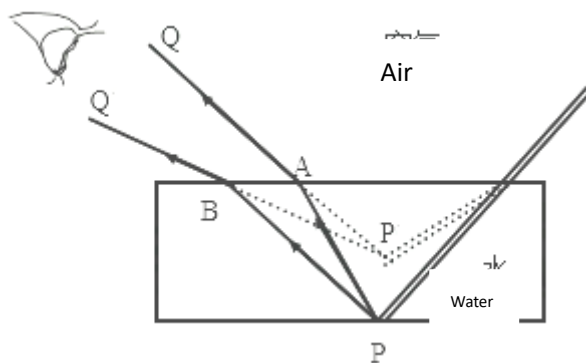


Fig.3 Schematic Diagram of Light Refraction

(3) When the diver looks at the object AB on the shore underwater, is it higher or lower than the actual? High

(4) "Mirage"

On the highway in hot summer, there seems to be water in the distance. There are reflections of cars, electric poles and other objects in the water, but when you drive there, the water disappears. This is actually a "mirage" on the highway.

S: listen carefully and think.

Teacher's question: students, in addition to the examples mentioned by the teacher just now, what are the refraction phenomena of light?

Students think and answer.

Student: the stones in the water become shallow.

Case 3 Analysis:

Through the explanation and analysis of life examples and pictures, this teaching clip deepens students' understanding of the principle of light refraction, makes students feel that the phenomenon of light refraction is everywhere in life, and then inspires students to think and find examples of light refraction in life, shortens the distance between physics and life, and makes students not afraid of physics.

### 4. Conclusion

In a word, there is physics everywhere in life. Junior middle school physics teachers should pay attention to the cultivation of students' learning interest, and should pay attention to the integration

of physics with practice, production and life. In teaching design, teachers should pay attention to connecting some examples in students' life, make students happy to explore the principles of physics in daily life, and guide students from nature to physics, from life to physics, and from physics to society, so as to cultivate “people with all-round development”. Let students learn knowledge from familiar situations, which is not only conducive to students' understanding of concepts and mastering laws, but also enhance students' awareness of connecting theory from practice.

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