American English has a "research study" meaning the closest acronym, called PBL (Project-Based Learning), which means "project-based learning" (also can be used Problem-Based Learning solution, which means "problem-based "The study, this article does not take this righteousness), in the United States, the research study, also known as PBL. A Purdue University study shows that, if properly implemented, the research study can not only improve the students' learning attitude, but also to enable students to acquire the knowledge and skills to keep longer. Therefore, the study of learning in the United States widespread attention.

US research study has a variety of types. In accordance with the time to divide, there are short-term and long-term research study. Short-term research study generally at the end of the implementation, at the end of the semester about to let students to do a project, teachers were scored according to certain criteria, it included students of the semester grades. It refers to long-term research study throughout the research study throughout the semester, academic year or even learning segment. In some American high school, especially in some charter schools, teaching activities organized entirely around the project implementation, teaching content from one project to link up, one year down, you can do five or six to ten research projects. In accordance with the study and research content to divide, the research study can be divided into two categories and comprehensive discipline, comprehensive research study do interdisciplinary research projects, while learning the discipline of study within the discipline to do research projects.

**First, the research study of the organization and implementation methods**

Research Study by the most criticism is that some students during the group study lazy, put everything onto others dry. To solve this problem, some experts have suggested the United States to teach "comprehensive Group + the Group of Experts," the learn organizational methods, namely grouping Implementation Act. The so-called grouping Implementation Act, is carrying out a project-based learning, will

Students were randomly divided into several groups of experts, each expert group to assign a research mission, a specialized research projects on specific issues; subsequently, the class many students to freely combined into an integrated group, each integrated by the expert group each group send a representative to attend. For example, a class wants to study environmental problems in the community, the class can be divided into four specialist groups: group air, soil group, water group, human impact on the environment group. Students are free to form and then by the number of integrated groups, each group consisting of a comprehensive air expert, a soil expert, a water resources specialist, a personal impact on the environment composed of experts.

After the packet is complete, each member of the expert group needs access to relevant knowledge in the art through the Internet, libraries, science centers, museums, research institutions near the school and the relevant government departments. Teachers generally help students contact the relevant professionals or directly lead students to field visits and consultation. For example, to fly a balloon sounding, usually subject to approval by the national air traffic control sector, which requires teachers to come forward coordinated.

After completing the study of knowledge in this field, various experts will begin turn to other members of their own group about areas where a comprehensive knowledge of their grasp. Because each student only mastered the knowledge or information in a field, everyone's role is irreplaceable, no one can be lazy. Because there are "teaching mission", every student must learn to understand, a good grasp of their own content to be taught, but also for themselves and other members of the study to evaluate the situation, so that each student participate in the research study must be very investment, which Ensures that the learning of independence. When students in the consolidated group lecture each other, they learn to cooperate Learning ways to generate a conceptual diagram associated with the project, which for student learning and thinking adds an important dimension, and each group can be integrated by several group meetings continue to improve and perfect the concept map. If a project plan with six weeks to complete, students can LEG group will meet twice a week and two groups combined group will be discussed.

After the students with an integrated teaching each other within the group finished, he began to design and make research results, these results reflect the need to understand the different aspects of their research projects: air, soil, water, man's impact on the environment. Based on the results of performance includes the production of three-dimensional model, performing comedy, little drama, debate competition, the establishment of a network exchange platform, the development of digital games, community members (such as city council or community organizations) to speak, filming documentaries, production of radio and television programs, organization of meetings, get-togethers or Film Festival.

Evaluation of students in two ways:

1. Individual evaluation. It refers to the evaluation of each student. Typically include students' research notes, lesson notes, and observations of teachers. In addition, the arrangement may also include teachers' research papers, thesis topic usually consists of students to choose at major theme throughout the research study under.

2. The Group evaluation. It refers to a comprehensive evaluation of each group. Each group must make a comprehensive and present their own work, select persons other than teachers and students carried out assessment.

**Second, the results of the research study presentation**

In the US, the results of the research study presented in an appropriate manner, both natural extension study of the learning process, but also an important way to stimulate students' enthusiasm for learning effective means, but also the community and government departments to get funding and policy support. Therefore, the United States attaches great importance to research and development of school learning outcomes presentation. The following physical discipline as an example, several US studies of learning outcomes presentation.

(A) speech

Speech is the most common American school learning outcomes research presentation. Here's speech, is that students in the completion of their work (such as small paper, small production, small surveys, etc.), the public (which can be a teacher and students, it can be parents, communities and local government officials) made descriptive explanation or defense. Speech has a display function, organized a number of lectures is the project itself, such as "cinema physics" project.

In the United States, in addition to physics teachers to teach students how physics problem solution, but also give students an interest in the physical world around him, learn Awareness Day Physical phenomena in everyday life, and found that the use of physical knowledge was wrong; but also allow students to study complex real-world environment, learn the physical models used in specific situations, the use of physical tools to analyze what is happening and be able to The analysis process will be shared with people. Based on this, a physics teacher designed the "cinema physics," the research study project, the specific content is: to enable students to choose a 3-5 minutes of a movie or cartoon clips, to find out some of the meet or violate intellectual or physical Examples of the law, through measurements and calculations to prove or disprove the possibility of the above snippet, and then prepare a 15-minute speech to explain to the class in the classroom so that teachers and students to comment. Lecture will be shooting a video, so the speaker can see what are their lack of speech in order to make changes. After appropriate modifications, the speaker can then make a speech, but the speech of the time change in the school, both from the audience throughout the area of ​​teacher and students, but also live in the community of scientists.

Students participating in the project selection a great deal of knowledge of physics related to movie content. A student to calculate the height of the cliff, in order to determine if a movie in which the hero how long it takes to drive the car fell to the bottom. Another student distorting mirror to explain the principles of the movie appears in the speech. In his speech, the student to show the audience a huge convex and concave, distributed to the audience a variety of small curved mirrors. Also a student to the audience about the one with the theory of relativity-related films relativistic principles of various misunderstandings and misreading. These presentations give students a personal experience is "Physical everywhere."

Through a period of observation, the teacher found a good speech there are two key factors: First, the speech itself to be attractive; the second is to teach the audience to participate. He encouraged the students to try to get the audience in his speech involved, as in the previous two questions prepared speech to the audience to ask questions, make use of the concept of visualization tools and so forth. He also found, so as the audience share the experience of students and speakers to listen to the speech, telling them that the most wonderful places, can greatly enhance the effect of the speech, the speaker can get immediate feedback effect of speech, as the audience of students to understand What good speech standards.

About speech, one thing should arouse the attention of teachers. When the student's speech is a problem, such as speech, when an error occurs, teachers need to help students struggling to overcome the podium jump siege impulse. To get the students responsible for their own speech, we must let them feel the speech from beginning to end is their own thing. To do this, the teacher asks students to prepare their own speeches, including the posters and arranged speech class. Teachers must understand that the student's speech is to show what students have learned, what

will not. Students appearing in a speech problem, just as the focus of the subsequent class discussion. In this way, students will be able to be converted to an error of teaching resources.

(B) Competition

More challenging than the speech contest. Here are examples of an electric boat racing game. The project is carried out in the end of the semester, the purpose is to allow students to high school physics knowledge to life. Students several weeks at home, electric boat design, to participate in a race for the last five meters of racing game. In boat design and production process, students are required to discuss the related physical problems, such as problems with the force of the movement, issues and problems of electromagnetic energy and the like.

Teachers of specific provisions on the size of the project and the use of power boats and so on, such as the length of the ship does not exceed 35 cm, a width of not more than 9 cm, a draft of no more than 6 cm, battery rated voltage does not exceed 9V Wait. In addition, as a small motor boat and propeller power sources, both can be purchased from specialty stores, can also be obtained from discarded electric toys, but the hull must be hands-on production by the students themselves.

In order to make the process more convenient, easy to participate in this project teachers and students set up a special website. The site consists of four main pages: the project rules, related videos and pictures, related resources and teachers reading content. The first three pages are for the students to complete the design and production preparation, and the last page is for the teacher to prepare. It provides teachers with the relevant rules of participation in the project and required to form for teachers to print out distributed to students, teachers also told how to organize power boat racing game.

Web page provides detailed guidance for the students design and production processes. Design and production process can be divided into four stages: First, let the students look at the real picture or video of HM inspiration; secondly let students go to the store or on the Internet looking for parts that may be needed; so that students are familiar with the production process again hull, and How to install small motors and propellers; and let the students debug boat, ensure the boat has a good competitive state.

The following pages provide help for teachers: how to organize the game, how to prepare for competition with sink and timing with the stopwatch, how to use the score sheet and the like. In addition, the site also made a number of follow-up exploration problems, mainly used to improve the speed of the boat. The website also provides teachers in physics curriculum standards relevant content requirements, to enable teachers to combine competition and teaching. The final contest will usually invite local media to participate, so you can inspire enthusiasm for learning, but also to learn the best reward for their efforts. 1 is a champion in the racing game photograph of an electric boat.

figure 1

figure 2

 (C) Video

image 3

Compared with lectures and contests, video is more conducive to research data, especially motion picture preservation and dissemination of information. Here is a video showing the use of the results of the research study examples - making flying balloons and recycled.

The project by the United States Department of Physics, New York State University at Buffalo School of two students completed the instructor is Dr. Dan L.MacIsaac. May 3, 2013, they produced the balloons with payloads including temperature detectors, pressure detectors, GPS locator, high-definition digital camera, including, penetrate the Earth's stratosphere, reaching the highest altitude of 3000 After rice, natural burst balloon, which payload safe return to the ground under the protection of its own parachute, brought back a lot of real data and video information. The whole process lasted 175 minutes. The project is divided into three stages: the first stage is the production, the main production payload, it must meet two conditions: First, we must be able to endure extreme temperatures (minus several degrees and 101 degrees); Second, we must stand the recovery from the ground crashing. The second stage is flying, this process need to focus on record several data: First change of height over time; the second is the change in temperature with height; the third is the pressure change over time. The third stage is recovered, the basic requirement is to return the payload ground, it could not be any damage.

They did. Figure 2, Figure 3 is a high-definition video capture their photos and gas balloon flying time after penetrating the stratosphere. Figs. 4 and 5 are graphs of their success to obtain the relevant data, and Figure 4 is a balloon inside and outside of the relationship between temperature and height of the graph, Figure 5 is a GPS to detect the flight path of the balloon.

140120100

80604020

005000-20

-40-60

T-Int T-Ext

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15,000

20,000

Figure 4

1200 1,000,800,600,400,200

Pressure (p) v. Altitude (m)

                                           0

0 5,000,100,001,500,020,000 250,003,000,035,000

 (4) Exhibition

Figure 5

In the US, the research study also presents the results of a very common way that the exhibition, namely in the form of poster presentation focused student research. Content panels generally include the name of the research project, a summary of research methods, research hypothesis, research process, findings, conclusions and discussion, usually also equipped with charts and pictures. Its form and general international academic conference papers on display panels are very similar. Exhibition period sometimes fixed and sometimes not fixed, but generally once each semester there will be. Here are a few pictures exhibition of achievements in the research study of an American high school, each poster shows the results of a group of 6 is on the corridor wall panels; Fig. 7 is a study of water quality cleanliness of panels; Figure 8 is a piece of inquiry Basketball hits the ground after the rebound height of the panels.

 Figure 6

(Zebian week Priscilla)

Figure 7

Figure 8

The above text briefly introducing the basic situation of American schools research study. In fact, the content of the research study is very complex, such as the main line to the PBL teaching, its curriculum and teaching materials, teaching methods and the specific organization of teachers teaching evaluation methods, evaluation of students' learning methods and other issues, not may in this specific and comprehensive presentation, interested readers can follow the relevant literature or reported. In addition, we are pleased to see that, in order to enhance the quality and effectiveness of the research study, the domestic is gradually increasing teacher training efforts. Some local school teachers organized the holidays to attend short-term training to university, although the training time is not long, but already has a good start. We believe that the correct guidance of public opinion, there is a modest emphasis on education administration, the active participation of school teachers, research study in China will certainly bear more fruitful results.

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