

Design and Thinking about Driven Problem in Project-Based Learning

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Abstract: Project-based learning is a popular teaching mode, which cultivates students' problem-solving ability, innovative awareness and ability through students' independent inquiry and collaborative learning. Driven problem is an important part of project-based learning, and a good driven problem is related to the smooth development of project-based learning. Based on clarifying the concept of driven problems, this paper discusses the basic types and characteristics of driven problems, and reflects on the design of driven problems from three aspects: clarifying learning objectives, refining essential problems and presenting authenticity.

1. Introduction

Project-based learning has entered the vision of education in China for many years and has received certain attention and development. In march 2022, the latest China "Compulsory Education Curriculum Plan (2022 Edition)" clearly stated: "Explore large-unit teaching, and actively carry out comprehensive teaching activities such as subjectivity and project-based learning [1]", It highlights the important role of project-based learning in primary and secondary education. Project-based learning can be traced back to the educational concept of "learning by DOIng" put forward by American educator Dewey, and in 2008, the Barker Institute of Education in the United States defined project-based learning: "Project-based learning is a process, which is the process of exploring real problems and complex problems, the process of planning and implementing project tasks, the process of designing and realizing project works, and a complete set of systematic teaching methods. In this process, learners can acquire the corresponding knowledge and skills. [2] "It is also pointed out that project-based learning includes problem creation, continuous inquiry, real-life experiences, equal dialogue, student reflection, knowledge construction, and sharing. Problem creation is the first step of project-based learning, which is related to the quality of the project, and the driven problem is the core of problem creation, and a suitable driven problem determines the quality of project-based learning from the beginning.[3]

2. The Definition of the Concept of Driven Problems

Whether a driven problem is suitable or not is directly related to the quality of project-based learning, how to judge a problem is a suitable driven problem? The first, it needs to be identified that the conception of the driven problem. The driven problem is that teacher designs guiding question which is suitable for students' age through learning situation analysis and teaching objectives, which can stimulate students' learning motivation and guide students to learn deeply and comprehensively.[4] The second, asking question has always been an important part of teaching activities, and the "question" in the driven problem means "ask question".[5] A good question can stimulate students' interest in learning and trigger students' thinking.[6] The best point which is to stimulate students' interest in learning is to start from students' real life and real situations. Real situations as the source, it can design a driven problem that is related to reality and guide students to acquire certain knowledge and skills. A good driven problem not only can guide students acquire knowledge and skills, but also guide students to think further and trigger higher-order thinking. In short, it is a good driven problem that the students can draw inferences from after solving it. The third, a good driven problem has a problem-based organizational structure while also providing a meaningful purpose for information and content.[7]

For example, Question 1: "How to design a card" and Question 2: "Mother's Day is coming soon, how to design a Mother's Day gratitude card for mom".[8] Question 1, it is flat and straightforward, lack of attractiveness, no specific situation, it seems that there are many situations involved in the question, it is no way to bring students into the real situation, and lack of guidance direction, students cannot correctly carry out inquiry and learning according to the question, and cannot contact and master certain knowledge and skills, and cannot realize knowledge internalization and transfer. Question 2, it creates a real situation for students' learning, that Mother's Day as the background, and it uses students' love for their mothers, and guides students to use interdisciplinary knowledge to design a project that can express "gratitude" cards. At the same time, question 2 is both challenging and divergent, stimulating and nurturing students' higher-order thinking. So, question 1 is not a driven problem, and question 2 is a driven problem.

3. The Basic Types of Driven Problems

Driven problem is one of the driven forces of project-based learning, and it's divided according to different classification methods. For example, according to the problem-oriented functions, it can be divided into: controversy-driven problems and outcome-driven problems; According to the source of the problem, it can be divided into: school-driven problem and socially-driven problem.[9]

3.1 School-driven Problem

School-driven problem is a driven problem that arise from the school curriculum, teachers' expertise, and students' campus life. The drivers come from the materials which is used in the subjects in schools, the learning materials that teacher use to extend them teaching to students' learning, and what student see and hear when he live in school. The process that the driven problem is solved is a process of helping students understand and internalize knowledge, master and apply skills in learning. For example, in Unit 4 of Primary 5 Science Class "Environment and Us," the theme of the large unit is based on a driving problem related to Earth's ecosystem: "How can we design a micro-ecosystem to study current environmental problems such as water use, waste disposal and reuse, and resource regeneration in the global environment?"

3.2 Socially-driven Problem

Socially-driven problem, which emphasize that question is from life and is more authentic, is often driven problem developed by combining relevant knowledge with real question encountered in students' daily life or based on real question in society.[10] The socially-driven problem is closely related to the economy, science and technology, politics, culture and other aspects of the current society, and can reflect the development of problems with the times, and help cultivate students' sense of responsibility to serve the society. For example, during the epidemic, how to design and make a disinfection area at the entrance of the home to establish the first line of defense for the family?

4. The Characteristics of Driven Problem

From the definition and classification of the concept of driven problem, it is not difficult to find that a good driven problem should have the characteristics of authentic situationally, moderately challenging and multi-dimensional openness. [11][12][13].

4.1 Authentic Situationally

Driven problem is divided into school-driven problem and socially-driven problem according to their sources, but they are not completely separate, and have the important connections, complement and support each other. Whether it is a school-driven problem or a socially-driven problem, it is necessary to take attention to students, make students as the main body, and use students' cognitive curiosity to promote the development of problem exploration. The key to stimulating students' cognitive curiosity is that the questions are relevant to the students themselves and give the students an immersive feeling, and it mean that high-quality driven problem should be real, situational. In essence, authentic situationality does not require that every element of the problem-solving and inquiry process be true, but students can discover and understand that there is some connection between knowledge and the real world.

4.2 Moderately Challenging

Stimulating students' learning motivation is an important purpose of Driven problem, and the influencing factors that stimulate students' learning motivation are divided into external factors and internal factors, and challenging question is one of the important external factors that stimulate students' learning motivation. What kind of driven problem is challenging? On the one hand, from the point of view of the difficulty of the problem, it should be a problem of medium difficulty, and the problem that students can solve through hard work under the guidance of teachers is in line with Vygotsky's theory of recent development zones. On the other hand, the driven problem of high quality is to integrate core knowledge into it, so that students can gradually solve complex problems through continuous inquiry, follow the law from easy to difficult, and students continue to understand and internalize core knowledge in the process of problem-solving inquiry, while challenging students' thinking and values.

4.3 Multi-dimensional Openness

Driven problem cannot be answered simply with "yes" or "no", generally speaking, students think about the essence of the problem from multiple angles through the collation, analysis and evaluation of information, and at the same time seek solutions from multiple dimensions, and the

results of problem solving may also be diverse results. Therefore, a good Driven problem should have multi-dimensional openness, it mean that the process of problem solving is diversity, problem solving methods is diversity, and the results of problem solving is diversity. The openness of the Driven problem does not imply a certain degree of unknowability in its constituents, blurred or nonexistent boundaries for the goal. Instead, it signifies that there are multiple solutions available simultaneously, with a general model serving as a reference. Moreover, the process of problem-solving involves open interpersonal interaction where learners express their personal understanding or views on the problem and engage in communication and cooperation with each other.

5. The Design of Driven Problems

The effect of project-based learning is related to the quality of the problem being addressed. To design a good problem, it is important to clarify its concept and characteristics. This process should begin with three steps: clarifying the learning objective, refining the essential problem, and selecting the rendition as shown in Figure 1.

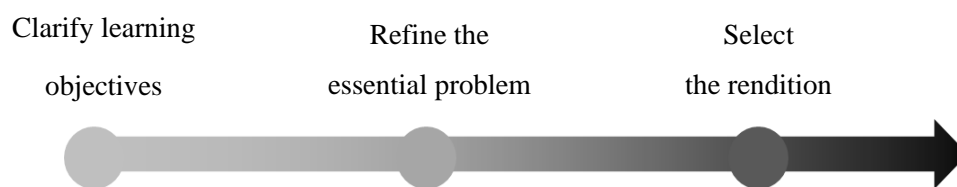


Figure 1: Three steps of Driven problem design

5.1 Clarifying Learning Objectives

The essence of project-based learning design is instructional design, and the determination of learning objectives is an indispensable part of project-based learning.[14] Driven problem play a role in project-based learning, and the direction of driven problem must be based on the learning objectives of project-based learning, understand and grasp the learning objectives on the basis of clear learning objectives, and formulate the core tasks of project-based learning. The core task is achieved by pointing to the learning goal, and the effective implementation of the core task is centered on the driven problem. Therefore, the first task of driven problem design is to clarify the learning objectives.

5.2 Refine the Essential Problem

Project-based learning contains essential questions in discipline and interdisciplinary learning, which motivate teachers to think about learning: "What is the significance and value of this project?" "How can the project be carried out more conducive to students' mastery?" "What can students gain from the project?" The essence of the problem must be refined on the basis of clear learning objectives. The design of driven problem must be based on the essential problem, and the driven problem is concrete, the essential problem is abstract, and the driven problem is the embodiment of the essence problem. Therefore, the distillation of the essence problem is the second step in the design of the Driven problem.

5.3 Presenting Authenticity

On the basis of clarifying the learning objectives of project-based learning, after extracting the essential problem in project-based learning, it is necessary to select the appropriate form of problem presentation under the condition of fully considering the learning situation, teaching situation and teaching environment. The expression of driven problem is to combine the essential problems refined in project-based learning with a certain real situation, and then present them in the form of certain real problems to guide students to explore and solve. When a driven questions is presented in the form of authenticity questions, it should be considered to feasibility, interesting, situationally, value and ethics.[15]

5.3.1 Feasibility

Faced with the same essential problem, teachers should fully consider various influencing factors, such as learning situation, learning objectives of the school section, learning resources and teachers' ability, etc., and design a driven problem that it can be control, can be completed by students, and is real and feasible.

5.3.2 Be fun

Interest is the best teacher. When driven problem is expressed, it is necessary to be consider the use of language that can stimulate students' interest in learning, fully mobilize students' internal drive, and make them better engaged in project-based learning.

5.3.3 Contextual nature

The essential problem points to the core concept and is generally more abstract. In order to facilitate students' understanding and shorten the distance between learning and life, essential problems can be integrated into specific situations and processed into more specific and real driven problem.

5.3.4 Value

Driven problem is a question which should avoid "yes" or "no", and should be expressed as nice constructed question that point to sustainable inquiry into multiple solutions or products whenever possible.

5.3.5 Ethics

When a driven problem is expressed, it is necessary to be consider to convey positive values to students, and guide students to seek national, natural, social, and cultural development through problem-driven and real practice.

6. Prospect

The design and development of driven problem is one of the important aspects of project-based learning. The design and development of driven problem is critical for project-based learning to work well, but there are many other factors involved. Driven problem can be applied not only to project-based learning, but also to other learning models. By making good use of the real situationality, moderately challenging, and multi-dimensional openness of driven problem, we can introduce driven problem into other teaching modes and give full play to the value of driven

problem.

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