

New Thoughts on Teaching Design of Experimental Course from the Perspective of Activity Theory

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Abstract. Based on the development of activity theory, the elements, subsystems and levels of activity system are analyzed. On this basis, according to the activity theory, the learning activity system of experimental course is discussed. Finally, the inspiration of activity theory to the teaching design of experimental course is put forward.

Keywords: activity theory, activity system, instructional design.

1. Overview of Activity Theory

1.1 The Development of Activity Theory.

Activity theory is a philosophical and interdisciplinary theoretical framework for studying different forms of human activities [1]. It is a psychological theory based on Marxist philosophy and a descriptive theory for the analysis of various activities that exist universally in human society. It puts forward a general conceptual framework for the analysis and understanding of human activities.

Activity theory was first developed in the former Soviet Union. In 1922, Rubinshtein put forward the idea of "human activity as the basic unit of psychoanalysis" and introduced the concept of "activity" which belongs to philosophy into psychology. Subsequently, it was gradually enriched by the research of Vygotsky and Leontev. In 1987, Finnish scholar Engestrom studied and developed the activity theory after Vygosky, and divided it into three generations.

The basic idea of activity theory is that consciousness and activity are unified, that is, the understanding of activity cannot be carried out independently, but should be unified with consciousness, which is the basic hypothesis of activity theory. Activities can be internal or external, and internal and external activities can be transformed into each other. Human activities are a two-way interaction process between human beings and the things that form the social and physical environment, as well as the things created by the social and physical environment, which emphasizes the interaction between the subject and the environment, and this interaction depends on the intermediary role of tools. Activities are purposeful. The purpose is to point to the object of the activity. After the activity is completed, the object is transformed into a certain result. Human activities always exist in a certain community. Community should negotiate and regulate rules to make the community play its role [2].

1.2 The basic Unit of Activity Theory Analysis.

Activity theory is a social and cultural analysis model. Activity and activity system are the basic units of activity theory analysis. The activity system proposed by Engelstom consists of six elements and four subsystems. Among them, the elements of activity system are subject, object, community, tools, rules and division of labor. The four subsystems of the activity system are production subsystem, exchange subsystem, consumption subsystem and distribution subsystem. The production subsystem is the most important part of the activity system, and the other subsystems are the support systems of the production subsystem.

1.3 Levels of Activity.

Leontiev believes that activities are hierarchical, including three levels. Purpose level. Activity is object-oriented. To achieve a certain goal, the motive force driving activity is the motive of the subject. Functional level. Action is the basic component of an activity. It is to achieve the activity and finally



satisfy the motivation. Behavior is often Goa1-oriented. Routine level.Operations refer to operations under certain conditions. Behaviors are performed by a series of operations, which are unconscious, automated and dependent on certain conditions.All operations are actions at first, and need conscious efforts. As practice and internalization proceed, they become more and more automated[3].Activities are decomposed into actions and eventually into operations.

2. Elements of Learning Activity System in Experimental Course

2.1 The Subject of the Activity System of Experimental Course-Learners.

In the experimental environment, learners'autonomy and subjectivity are emphasized. While studying the explicit learning behavior outside the experimental class, the internal psychological characteristics and needs of the learners can not be ignored.

To a certain extent, learner characteristics determine that learners'learning behavior in experimental courses mainly includes learners' intelligence and non-intelligence factors. The characteristics related to intelligence factors mainly include general characteristics of individual cognition and development, knowledge base, cognitive ability, cognitive structural variables, etc. The characteristics related to non-intelligence factors include interest, motivation, emotion and learning style. Anxiety level, will, personality, etc. Intellectual and non-intellectual factors will influence learners'learning activities, which will lead to different learners' different learning behaviors even when they are learning the same learning content. This reflects the complexity and individuality of learning behavior in experimental class.

2.2 The Object of the Activity System of Experimental Course-Experimental Resources.

The object of the activity system of experimental courses refers to the object of meaning construction of learners - experimental resources. In a sense, experimental resources are also learning resources. Learning resources are all the contents that help individuals to learn and operate effectively. Shusheng Shen, a Chinese scholar, puts forward that learning resources refer to a series of internal and external conditions that can influence and change people's cognitive structure or promote people's cognitive structure change. Combining with the research object of this paper, we think that experimental resources refer to all kinds of resources available in the process of experiment design, implementation and evaluation in order to achieve the goal of experimental curriculum. These resources can directly affect and change learners'cognitive structure. For example: laboratory, experimental equipment, books and materials, experimental teaching courseware. In the course of the experiment, the interaction between the learner and the experimental resources is constantly generated.

2.3 A Group of Activity Systems in Experimental Courses-Learning Community.

Learning in an experimental environment is a process of individual activities in which learners interact with experimental resources, but this does not mean that learning in an experimental course is equivalent to learning in isolation. Social constructivism theory and humanism theory of cognitive science also hold that learning is not an isolated activity of learners, but the result of interaction between learners and curriculum content and others. Researchers often use the term "learning community" to describe learner groups in learning activities. Learning community refers to a group composed of learners and their assistants (including teachers, experts, counselors and other learners). They often communicate and communicate with each other in the learning process, share various learning resources, and accomplish certain learning tasks together. As a result, they form interpersonal relationships that influence and promote each other.

2.4 The Secondary Element of Experimental Activity System-Experimental Environment.

The experimental environment is the carrier of the experiment. The experimental environment is the whole world related to the experimental system. According to this definition and the framework of activity theory analysis, experimental activity system refers to the core elements of activity system, including learners, experimental resources and learning community. The experimental environment is the whole world outside these three core elements, the condition for the survival and development of activity system, and the support system for the occurrence of experimental activities. This support system includes the internal world, the external world, the material world and the spiritual world which support learners'autonomous learning. The external world provided by the experimental environment for learners to support their experiments includes experimental tools, experimental rules, experimental division of labor, and learning community. Referring to the activity system diagram, we can specialize according to the above analysis. The classroom experiment activity system diagram is shown in Figure 1.



Fig. 1 Classroom Experimental Activity System

In the experimental activity system, the core elements are interrelated through interaction. Therefore, interaction is the core of the experimental activity system. Only when the interaction between the core elements occurs, the learning behavior will occur. However, the interaction between the core elements is not direct, they are affected and constrained by the experimental environment. The interaction between learners and experimental resources is achieved by using experimental tools as intermediaries. These tools are combined with the organs of the human inner world to become intermediary tools for the interaction between learners and experimental resources, thus forming a cognitive behavioral system. This part of the behavior occurs within learners and mainly completes the meaning construction behavior system, under the constraints of certain rules, learners and learning communities to achieve information interaction. The cooperative behavior system is composed of experimental resources, learning community and experimental division of labor. The learning community interacts with experimental resources through certain experimental division of labor, and finally achieves the expected experimental resources.

3. Enlightenment to the Teaching Design of Experimental Courses

3.1 Focus on Learner Characteristics Analysis.

The learner is the main body of learning. The learner's existing knowledge and skills, learning style and learning motivation will affect the results of learning. In the process of analyzing learner's characteristics, learner's characteristics are mainly emphasized. For example, the characteristics of learner's starting level: any learner brings his original knowledge, skills and attitudes into the new learning process. Therefore, first of all, it is necessary to understand the characteristics of learner's starting level, which will directly affect whether the learner can carry out experiments smoothly and receive information effectively. Second, learner's psychological characteristics: learning style, learning motivation, self-efficacy, attribution style will affect the learner's learning process.

through their behaviour. In the design of experimental teaching, we need to take these important characteristics of learners into consideration, so that we can pay attention to the learning subject.

3.2 Effective Integration of Experimental Resources.

Laboratory is the most important place for experimental courses, and various instruments and equipment in the laboratory are the most important experimental resources. However, experimental resources can not be limited to experimental instruments and equipment only. Some books and materials, experimental teaching courseware belong to the category of experimental resources. Therefore, experimental resources should be considered comprehensively in the process of experimental teaching design, and all kinds of experimental resources should be presented in the most suitable way for learners to learn, so as to realize the effective integration of experimental resources.

3.3 Optimization of Experimental Environment.

According to activity theory, experimental tools, rules, division of labor and learning community belong to the experimental environment. In the existing experimental teaching design, the two elements of experimental division of labor and learning community are less considered. These two elements are particularly important in exploratory experiments and design experiments.

3.4 Focus on the Design of Interactive Links in Experimental Courses.

Interaction is the core of experimental activity system. Only when interaction occurs can meaningful learning be realized. Therefore, in the process of designing the experiment teaching, we should increase the component of interactive activities. For example, through group cooperative experiments, communication activities between learners and learning communities can be realized, and cooperative activities between learning communities can be realized. Interactive experimental resources can be appropriately increased, and interaction between learners and experimental resources can be increased, so as to promote the meaning construction of learning resources by learners.

References

- [1]. Xiang Guoxiong, Lai Xiaoyun. Activity Theory and Its Impact on Learning Environment Design [J]. Electronization Educational Research, 2015. No.6, P. 9-14.
- [2]. Xuning, Liu Qingtang, Zhao Chengliang. Design and Application of Learning Activities [J]. China Education Letter Informatization, 2018. No.1, P. 78-81.
- [3]. Wang Sufeng, Tang Zhizhong. Reflections on the Reform of Experimental Teaching in Colleges and Universities [J]. Modern Chinese Educational Apparel Preparations, 2016. No.1, P. 81-82.