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The Design and Application of " Connected Learning " in High School IT Teaching

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Abstract

The study takes the integration and application of Connectivism learning theory in high school IT teaching as the selected topic. Cultivating subject core literacy is the starting point, and building a new classroom application model for teaching and learning is the landing point. In this paper, we firstly sort out the core ideas of Connectivism learning theory and use them as the theoretical basis to generate a new practice model, that is, "Connected Learning." Then, Action Research is used to apply the theoretical solutions to real-life practice. Action Research was conducted in two rounds based on the educational internship. The program was implemented, reflected on, and revised in the field, then implemented, reflected on, and revised again, resulting in significant improvements in educational and teaching activities. The program also won the first prize in the first national full-time education master's modern education technology teaching skills competition. The Action Research results and the competition results proved that "Connected Learning" can improve high school IT teaching and promote the implementation of IT subject core literacy.

Keywords

Connectivism Learning Theory; High School IT Teaching; Action Research.

1. Introduction

With the rapid development of information and technology, China has stepped into the new era of education informatization 2.0. In this stage of convergence and innovation of the transition upgrade, the impact of information technology on education development can be said to be more and more profound. In 2017, the Ministry of Education promulgated the Information Technology Curriculum Standards for General High Schools (2017 Edition). The new IT curriculum standards put forward the subject of core literacy. The promulgation of the new curriculum standards has clarified the requirements for talent cultivation, formed academic quality standards based on core literacy, and pointed out the direction for developing the subject curriculum. Traditional teaching methods and teaching tools are difficult to achieve the root and cultivation of students' core literacy. So how to grasp the requirements of the curriculum? How to help students to realize the core literacy of the subject in the IT course?

If we want to solve these problems, we need to reform various factors in the teaching process and build a new subject teaching system. Connected Learning", which is based on Connectivism learning theory, will try to explore some ideas to promote the core literacy of IT subjects.

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2. Research Design

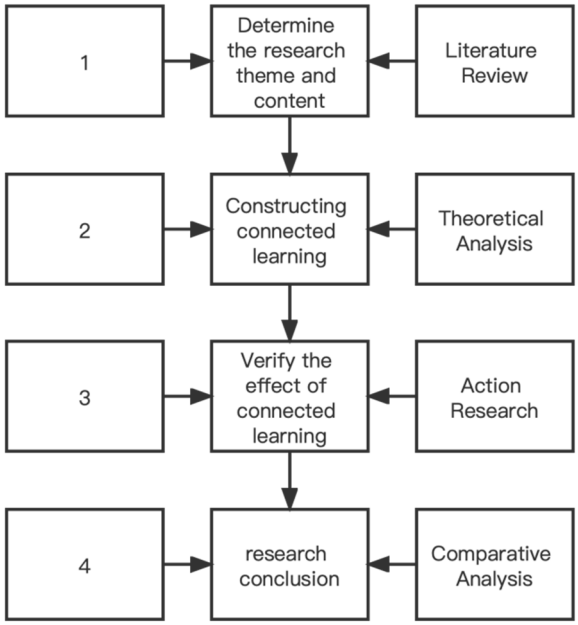

Figure 1. Two or more references

3. The Design of "Connected Learning" in High School IT Classroom Instruction

3.1. Theory Basis

The proposal and existence of "Connected Learning" in high school information technology are reasonable, which is rooted in a deep theoretical background and a complete theoretical basis. Learning in the new era is characterized by dynamics, networks, and tools and is no longer a passive acceptance by students and a "dictatorial rule" by teachers. The basic ideas of Connectivism learning theory match the requirements of the times. Connected Learning, which is based on the basic ideas of Connectivism, is also in line with the trend of educational development. The theoretical underpinnings of the Connectivism learning theory on "Connected Learning" are shown in Table 1.

3.2. Substance

"Connected Learning" is a connected learning process. As an approach to transferring learning experiences, "Connected Learning" in high school IT subjects has distinct connotations and rich functions. "Connected Learning" is a learning philosophy, but also a learning method or learning process that has been developed to achieve teaching goals and learning outcomes. In the process of designing Connected Learning for high school IT, the most important feature is that it allows students to gain experience directly with their hands and brains and to experience the connection with the nodes. The second is to strengthen students' collaboration and communication, to explore together, to return the classroom to the students, and to highlight the students as the center of the classroom.

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Table 1. Theoretical support points of Connectivism learning theory on "Connected Learning"

The "Connected Learning" concept	8 Principles of Connectivism Learning Theory
View of knowledge: Knowledge has characteristics such as sharing and non-stationary. Emphasis on learning to apply and digital learning; (digital learning and innovation)	Learning and knowledge exist from different perspectives. Current knowledge (accurate, up-to-date knowledge) is the aim of associationist learning activities.
View of learning: The learning mode emphasizes "problem-solving" as the key and truly "teaching people to fish." The purpose of learning is to cultivate and improve moral, sensory, and skill aspects; (computational thinking) View of students: students are the protagonists of the classroom, the subjects of learning, and the future masters of society; (social responsibility) View of knowledge: Knowledge has characteristics such as sharing and non-stationary. Emphasis on learning to apply and digital learning; (digital learning and innovation) View of the environment: Emphasis on technology to support learning and deep immersion of resources and learning. Allow learning to exercise information screening skills in rich resources. (Information Awareness)	Learning is a process that connects different professional nodes or sources of information. Facilitating continuous learning requires fostering and maintaining a variety of connections. The ability to see connections between ideas and concepts from different fields is critical. The ability to continue learning is more important than the acquisition of current knowledge. Decision-making is a learning process. Choosing what to learn and understand the meaning of new information is based on changing realities.
View of the environment: Emphasis on technology to support learning and deep immersion of resources and learning. Allow learning to exercise information screening skills in rich resources. (Information Awareness)	Learning may exist in artifacts. (Field study)

"Connected Learning is a connected way of delivering instruction. Connected Learning in high school is not only a process of learning for students but also a way of teaching for teachers. In high school IT teaching, the teacher creates a context in which the goals and tasks of the project activities are given. Under the guidance of the teacher, students play their full role as the subject and use rich resources and tools to complete the connection of the nodes. In the classroom, teachers, and students, students and students, and humans and machines communicate and inspire each other. This will stimulate students' interest in learning, realize the construction of knowledge, and make students learn to learn more while understanding knowledge so as to achieve the purpose of cultivating students' core literacy.

Based on the above discussion, the author defines "Connected Learning" as a classroom application model of teaching and learning through the reorganization of teaching subjects and the organic integration of teaching links, with Connectivism learning theory as the guiding idea and the goal of supporting students' learning and promoting their subsequent learning outcomes.

3.3. Key Elements

Teachers, students, and resources constitute the "three elements" of the "Connected Learning" teaching body, and their interactions are shown in Figure 2.

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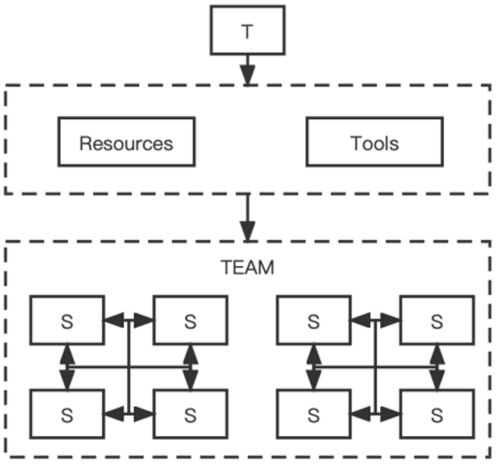

Figure 2. The relationship between the main elements of "Connected Learning"

3.3.1. Teachers

"Connected Learning is a break from the traditional teaching model. Instead of being the authority in the classroom, the teacher acts as a "project mentor," creating optimal learning situations for students and providing a wealth of resources and tools. They help students learn and improve their skills.

3.3.2. Students

As the main body of learning, with the help and guidance of teachers, using group inquiry and sharing, combined with rich resources and tools, to complete the connection between information and nodes personally, to achieve the construction of knowledge, to complete the understanding of knowledge. In the process of practice, they will get hands-on experience and apply the knowledge so that they can apply what they have learned and improved their ability.

3.3.3. Resources and Tools

In a broad sense, all people, objects, and information that help students grow and develop can be called learning resources, which are the material basis for teaching and learning. In a narrower sense, the resources and tools referred to in Connected Learning include teaching materials, teaching environments, and teaching support systems that combine hardware and software is the pathway for students to connect to the nodes.

When organizing and arranging resources and tools, teachers need to pay attention to diversification, informatization, and thematization of resources and tools.

3.4. Structure Illustration

The Connected Learning implementation process model is shown in Figure 2. In the Connected Learning process, the teacher influences and assists students in the teaching and learning process. If teachers do not respect students' learning characteristics and patterns, it is difficult to ensure that the Connected Learning process meets students' cognitive needs. Therefore, in this basic process of learning, the following four aspects are considered.

Section 1: Creating a suitable context to link the target nodes.

Section 2: Using activity-driven, complete node linking.

Section 3: Enriching learning resources and promoting network convergence.

Section 4: Paying attention to the whole process of evaluation and attaching importance to the learning effect.

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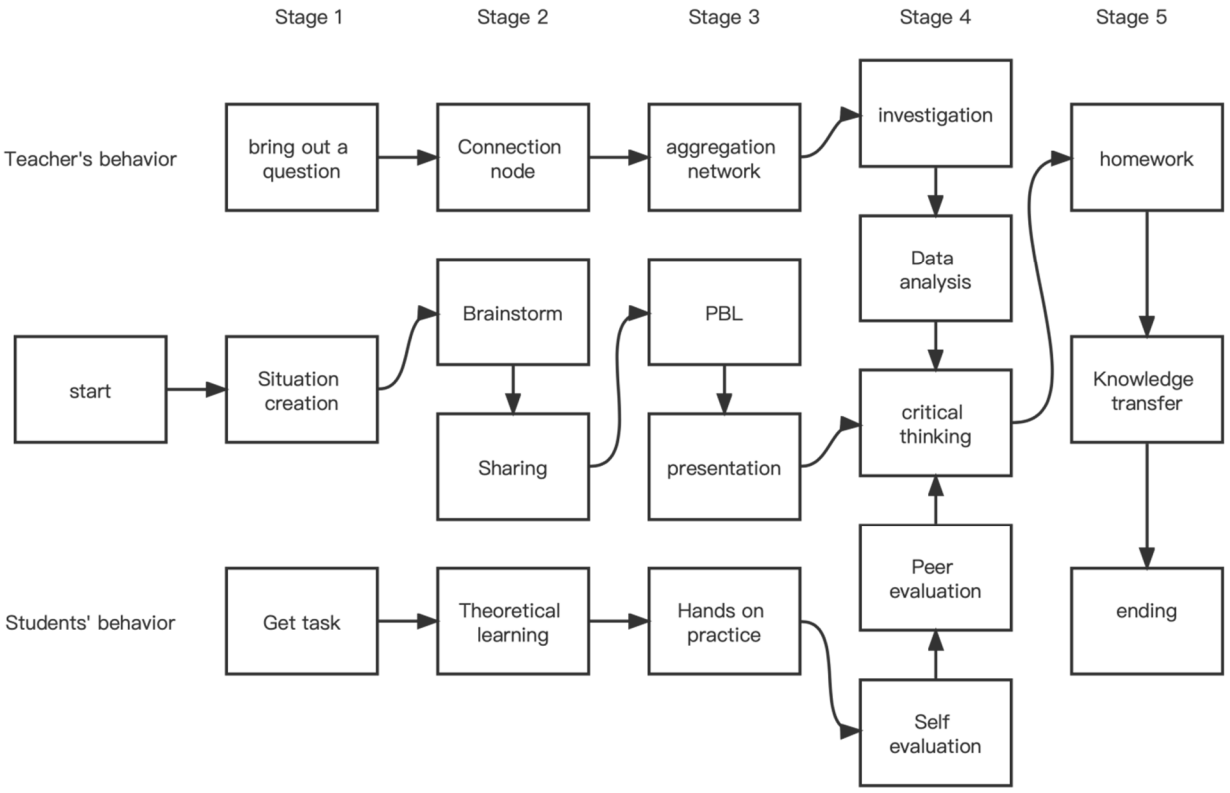

Figure 3. Structure illustration

4. Application of Connected Learning in High School IT Lecture

4.1. The First Round of Action Research: Take "Knowing and Making QR Codes" as An Example

The first round of the Action Research course was "Understanding and Creating QR Codes," and the teaching design was based on the "Connected Learning" model. Using the combination of educational internship and the first national full-time Master of Education modern educational technology teaching skills competition (preliminary round) as a basis for testing, the Action Research was completed based on the results of both the competition and the actual teaching, thus confirming the hypothetical teaching effect of "Connected Learning" in high school IT lecture.

Activity 1: Brainstorming about QR codes

Requirements: Work in groups to collect information, learn about QR codes, sort out and summarize them, and present the group's learning results in a mind map.

Activity 2: Making a QR code

Requirements: (Each group of students should make at least three QR codes and name them with ID numbers): First, find information about the tools and methods of making QR codes, the types of QR codes and the contents they can carry; second, group members should plan together to design the group's QR code, determine the group's design goal and the information to be carried through the QR code (e.g., group name, group icon, phone number, WeChat, email address, website, etc. choose at least three types); finally, according to the planning, collect materials, choose appropriate tools and methods, and make the QR code.

4.2. The Second Round of Action Research: Take "Algorithms and Their Characteristics" as An Example

The second round of Action Research focuses on improving and optimizing the problems revealed in the first round of Action Research. The course content of the second round of Action

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Research is "Algorithms and their Characteristics," and the teaching design is based on the "Connected Learning" model. Using the combination of educational internship and the first national full-time Master of Education Modern Educational Technology Teaching Skills Competition (final) as a basis for testing, the Action Research was completed based on both the results of the competition and the actual teaching, thus confirming the hypothetical teaching effect of "Connected Learning" in high school IT lecture.

Activity 1: Brainstorming about algorithms

Requirements: The teacher asks students to work in groups to collect information. Understand the algorithm and its characteristics (required to combine with cases), and sort out and summarize, and present the group's learning results with a mind map. The teacher moves around in the process of students' collaborative learning, actively guiding and motivating students when necessary. The teacher provides the QR code of the online evaluation platform of the thinking map work in the rendition session of the students' thinking maps. Teachers provide learning resources: QR code encyclopedic knowledge, thinking map making tools, and examples of students' work.

Activity 2: Describe and design algorithms

Requirement: Show a video of a fully automatic washing machine washing. Ask two students to come to the blackboard to describe the washing process of the washing machine, the first one is limited to the natural language method, and the second one uses the storyboard diagram method. Play the "Guess the Price" game. The teacher shows the picture of the washing machine and asks the students to guess the price of the washing machine. The teacher helps the students to narrow down the answer gradually by saying "higher" and "lower." Depending on the field control, the teacher gives certain hints, such as "its price is a three-digit number," "each digit is the same," and "it is the largest three-digit number." The teacher shows the second picture, a rice cooker, and asks the students to work in groups to design an algorithm that can guess the price of the rice cooker correctly within 10 guesses by looking up the information on the Internet. Students describe the structure of the algorithm they designed and experimentally tested it, completing the experiment record sheet.

4.3. Comparison of the Effects of Two Rounds of Action Research

Table 2. Comparison of the effects of two rounds of Action Research

	The first round of Action Research	The second round of Action Research
Evaluation of students' works	Most groups complete as required. Single tool for completing the work. There are hardly any citation marks on the work.	The vast majority of the group finished in quality and quantity as required. Tools for completing the work are abundant. The vast majority of the groups had citations on their work, and most of them were labeled in a standard way.
Evaluation of students' learning experience	Students remembered what they learned very solidly and discovered new knowledge in the process of exploration. A significant number of students felt that the knowledge learned was fragmented.	Students remember what they have learned very solidly, discovering new knowledge and accepting it systematically in the process of exploration.
Classroom observation	Active classroom atmosphere. The group division of work was not effective. Some groups operate in a disorganized manner when students are producing their work.	Lively classroom atmosphere. Group division is clear. Students are able to follow a set solution and follow a step-by-step process when producing their work.

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The author combines Connectivism learning theory with the characteristics of high school IT education and teaching and theoretically constructs the "Connected Learning" model based on the experience of previous students. The essence, concept, and functions of Connected Learning are presented. The components of Connected Learning are analyzed, and the flow of Connected Learning is shown in a structure diagram.

5. Conclusion

Two rounds of Action Research were implemented through the author's educational internship, and the first national full-time Master of Education in Modern Educational Technology Teaching Skills Competition was used as a reference test. The theoretical model of Connected Learning is applied in practice to test the hypothesis in practice. Connected Learning is well designed to achieve its predefined functions.

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