

Design and Application of Personalized Teaching Model Based on Learning Styles and BOPPPS

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Abstract—Personalized teaching is the future development trend, and learners have their own characteristics and talents, so teaching that meets the characteristics of learners can give full play to the “learner-centered” teaching concept. Although the research on learning styles has confirmed that it is not correlated with teaching interaction, the value of learning styles has not been fully explored, and there are still few studies on effectiveness. According to Kolb’s experience and learning theory, this paper analyzes the personality characteristics of learners with each learning style. Based on the characteristics of learners with various learning styles, the teaching model of four different learning styles was designed in combination with the BOPPPS teaching model to realize personalized teaching. According to the designed teaching mode, the corresponding teaching mode is applied to the high school IT course “Processing and Handling of Picture Information” as an example, which fully reflects the application of personalized teaching in the secondary school classroom.

Keywords—learning style, personalized teaching model, Bridge-in, Outcomes, Pre-assessment, Participatory Learning, Post-Assessment, and Summary (BOPPPS)

I. INTRODUCTION

After the reform of college entrance examination, students can choose their own subjects according to their interests and preferences, which is a breakthrough change and a manifestation of personalized teaching. Nowadays, the teaching concept gradually changes from “teacher-centered” to “learner-centered”, and the central position of teaching also shifts from the teacher to the learner, and the purpose of teaching is to let learners internalize knowledge, master skills and form correct values, instead of training a learning machine that can only do problems. A personalized education environment provides learners with more opportunities to discover their own strengths and pursue further education in areas that suit their development.

Personalized education has always been a challenge, but the starting point for education must also depend on the learner, because the effectiveness of education is directly determined by the learner’s acceptance of the educational approach. Different learners learn in different ways, and one of the influencing factors is their learning

style. Learning style is a reflection of the overall attitude of the learner after the internalization of knowledge, i.e., the way information is input, the process of information processing, and the form of information output. Although learning styles have been shown to have no exact correlation with pedagogy and there is insufficient evidence that learning styles can be applied to general educational practice, there is still value in studying the role of learning styles in teaching and learning [1]. Because there is relatively little research on the effectiveness of research learning styles in educational applications, the potential role of learning styles has not been fully explored. Learning styles are not a basis for classifying students, let alone a framework for limiting their learning. On the contrary, knowing a student’s learning style can help teachers understand the student and also allow students to understand themselves and find their most appropriate learning style to adapt to different learning environments and accept different knowledge systems. However, based on the findings of existing research, there are still problems with applying the theory of learning styles to education and teaching. Learning styles may trap students in a unique learning mode and affect teachers’ tendency to guide students’ learning styles, which are not conducive to students’ diversity development. What we need to foster is for students to confront and embrace their own thinking processes, not to trap them in a uniform categorical space.

In addition, learning styles generally cannot be applied well in ordinary classroom scenarios because of the number of students, classroom time, and teacher energy. Unlike personalized teaching, personalized teaching models can help learners with different learning styles relate to the learning content in the most appropriate form to achieve the most optimal teaching effect. In this paper, we develop personalized teaching models according to different types of learning styles and demonstrate how to apply them in the IT course as an example, in order to provide a reference basis for subsequent research on the effectiveness of learning styles.

II. CONCEPT AND CLASSIFICATION OF LEARNING STYLES

Akbulut and Cardak [2] defined learning style as the integration of individual skills and preferences that influenced individual perceptions, highlighting the influence of perceptions on learning style, where

individual skills were developed on the basis of perceptions, so responses to perceptions affected behavioral preferences for individual skills. The definition of teaching style by Tan [3] was “Learning style is a consistent learning style and learning tendency of learners with personality characteristics.”, learning styles are formed under the influence of family’s educational history, social experience and social culture, and have obvious characteristics. Ji and Liu [4] pointed out that after defining the learning style, Cooper proposed that the learning mode is an individual’s preference and organization of knowledge, and is a part of the knowledge system process. Learning style mainly reflects the learner’s knowledge input, information processing, and information processing behavior in the process of knowledge output as well as personal tendency, which affects the way of reading information and its effect on the process of learning, and the perspective of processing information in the process of processing. It affects the way learners read information and how effectively they process it in the learning process.

Among the theories about the classification of learning styles, Kolb’s classification of learning styles is more commonly used at present. Kolb’s classification model originates from his idea of experiential learning, and it is in this idea that the circle of experiential learning arises, while David Cooper’s theory of experiential learning divides the knowledge process into four major dimensions, namely, Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE), and the four major dimensions constitute. The four dimensions form a cyclic knowledge process and are repeated over and over again [5]. Among them, CE emphasizes learning by personal experience, and generating stronger feelings about the people and things we know. The RO, on the other hand, emphasizes the use of visual and auditory perception to perceive, and before making any judgment, one has to carefully study the surrounding environment and events, and likes to analyze the problem with different viewpoints, and then to explore the meaning of the problem itself. The AC emphasizes the use of thinking to acquire knowledge, and will learn in a logical way, first fully familiar with the environment, and then carry out planned and strategic action. The AC concept emphasizes learning by doing, being conscious and patient in carrying things forward, enjoying the act of discovery, and taking action to change people and things around them.

In the process of circulation, CE and AC belong to the knowledge reception dimension, while RO and AE belong to the information processing dimension, and the combination of these two dimensions forms a basic structure about the four different cognitive styles.

Divergers, whose most important skills are concrete experience and reflective observation, are good at observing situations from multiple perspectives and are also good at divergent thinking, so they are more prominent in teaching activities that require large-scale thinking and creativity, such as “brainstorming” [6]. In

the classroom, these learners tend to enjoy group activities, listen to the opinions of others, and are open to receiving feedback from others. The typical question for learners with this learning style is “Why”.

Assimilators, whose primary learning skills are abstract generalization and reflective observation, are better at making large amounts of data simple and logical. Compared to divergent learners, assimilative learners are more sensitive to concepts and abstract theories. In the classroom, these learners enjoy reading and lecturing, are willing to explore and investigate physical models, and are eager to use their knowledge to think about problems and propose solutions. The typical question for this type of learner is “What”.

Convergers, the focus of this type of learner is on abstract concepts and active practice, and learners with this type of learning style are best at discovering real-world applications of scientific ideas and theories, finding solutions to problems, making decisions, and solving problems, so they are more likely to implement scientific and technical tasks and solve scientific and technical problems rather than or interpersonal questions, and these competencies are critical to pursuing expert and science and technology careers, among others. In the classroom, convergent learners are more willing to demonstrate new ideas through practice, imitation, test, and practice applications, etc. The classic question for this type of learner is “How”.

Accommodators, whose key competencies are concrete experience and active practice, are the learners who learn best through hands-on experience. They are willing to plan and to be involved in new and risky experiences. They act through intuitive, emotional behavior rather than logical thinking. Learners with a responsive learning style are used to obtaining data through human interaction when solving problems, rather than relying on their own skills to obtain data. In normal teaching situations, these learners are more willing to work with others on tasks, to set goals, to investigate, and to find different ways to achieve their plans, and their classic question is “What if”.

III. PERSONALIZED INSTRUCTIONAL MODEL DESIGN FOR FOUR TYPES OF LEARNING STYLES

The BOPPPS teaching model is an instructional framework designed based on Kolb’s empirical learning circle and contains six steps: Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, Summary/Closure [7]. The BOPPPS teaching model is based on constructivism and communicative approach and is known for its effective instructional design, which emphasizes student participation and feedback in the teaching process [8]. Based on the classification of learning styles, this paper will design corresponding teaching models for learners with four different types of learning styles. The design of the teaching model refers to the BOPPPS teaching model, and refines and enriches the content in the model on the basis of the original one.

Two points need to be clarified. First, the content of the teaching objectives set in the Objective stage of the

four teaching models is the same, that is, when teachers design the objectives, they should be clear about what they are teaching and what the students want to learn, and set the corresponding objectives according to the students' learning situation, comprehension and reception ability. What makes a difference is that the process and means of implementing the objectives are designed for different types of students, i.e., the Pre-assessment, Participatory Learning, and Summary phases that follow are designed for different types of learning styles. Second, the Post-assessment stages of the four teaching modes use the same evaluation dimensions and forms, including (1) knowledge mastery: single-choice, multiple-choice, and short-answer questions. The test of questions is used to understand the degree of learners' knowledge mastery so that the teaching contents can be adjusted in the subsequent teaching. (2) Application proficiency: scenario analysis, example application, etc., to develop students' ability to solve practical problems.

A. Personalized Teaching Model for Divergers

The characteristics of Divergers are that they are good at divergent thinking and like to ask "why". Based on the learning style and characteristics of learners, the teaching model is designed as follows.

- Bridge-in: Start with unfamiliar matters and ask surprising and challenging questions.
- Pre-assessment: Brainstorming is used to stimulate learners' imagination, through which the purpose of focusing the classroom is achieved.
- Participatory Learning: group discussion is used to motivate learners to participate, collect different ideas from group members, and deepen their understanding of the learning content.
- Summary: The teacher evaluates the group's learning results and develops students' critical thinking.

B. Personalized Teaching Model for Assimilators

Assimilators are characterized by good abstraction and logical thinking, and like to ask "what is". Based on the learners' learning styles and characteristics, the teaching model is designed as follows.

- Bridge-in: Guides learners to explore the questions in a step-by-step manner by asking questions related to the course.
- Pre-assessment: open-ended questions are used to stimulate learners' curiosity to explore [9].
- Participatory Learning: students are given sufficient time for independent thinking, and the teacher prompts at key points.
- Summary: Teachers give timely feedback to learners and collect feedback from students on their learning outcomes.

C. Personalized Teaching Model for Convergers

Convergers are characterized by being good at abstracting concepts and applying ideas, and like to ask "how". Based on the learning style and characteristics of the learners, the teaching model is designed as follows.

- Bridge-in: Use the abstracted and conceptualized problems from the textbook as an introduction.
- Pre-assessment: asking questions about real-world problems through classroom quizzes.
- Participatory Learning: provide simulated experiments to validate learners' new ideas with concrete operations [10].
- Summary: Encourage learners to conduct experiments to further strengthen the internalization of knowledge from the experimental process and results.

D. Personalized Teaching Model for Accommodators

Accommodators are characterized by their ability to learn from real-world experiences, to obtain information through interpersonal relationships, and to ask "What if...? What would happen?". Based on the learners' learning styles and characteristics, the teaching model is designed as follows.

- Bridge-in: Provide real-life scenarios and introduce the course with real problems.
- Pre-assessment: A formal exam is used to test the level of knowledge the learner already has.
- Participatory Learning: Uses scenario-based simulations to immerse the learner in the environment.
- Summary: Summarize what you have learned by asking new and inspiring questions.

IV. APPLICATION OF PERSONALIZED TEACHING MODELS FOR FOUR TYPES OF LEARNING STYLES

Taking the high school IT course "Processing and Handling of Picture Information" as an example [11], the Objective and Post-assessment stages of the four teaching modes are the same. First, in the Objective stage, learners should understand the use of pictures in their daily lives, know the common methods of acquiring pictures, and be able to use Photoshop software to select, move, and adjust the size of pictures and perform simple image compositions. Next is the post-assessment stage, where test questions are (single choice): What is the most important use of the Alpha channel: A. to save image color information B. to save the image in its unmodified state C. to store and create selection ranges D. to be a channel for paths; (short answer) What is the essential difference between bitmap images and vector graphics? (example operation) Compositing people and items together in the right position.

A. Instructional Design for Divergers

- Bridge-in: Provide a picture of snow falling in a tropical area and ask students why the scene is there.
- Pre-assessment: Organize a brainstorming session for students to think outside the box to imagine the reasons for this scenario to occur.
- Participatory Learning: The teacher will explain and demonstrate the knowledge of Photoshop software, and students will work in small groups to learn and operate.

- Summary: The teacher will comment on the group's work and summarize the effectiveness of the class.

B. Instructional Design for Assimilators

- Bridge-in: Provide a real picture taken and a manipulated picture and ask students what the difference is.
- Pre-assessment: The teacher asks what Photoshop software can do to pictures.
- Participatory Learning: The teacher introduces the basic functions of Photoshop software, leaving the rest of the time for students to think independently.
- Summary: The teacher collects the students' work and invites them to come up to the stage and present it.

C. Instructional Design for Convergers

- Bridge-in: The teacher asks questions about the relationship between the size of a picture and its pixels.
- Pre-assessment: Test question, how to shrink the image by adjusting the pixels when the image is too large.
- Participatory learning: After explaining the basics, the teacher lets students explore the relationship between pixel size variation and picture size on their own.
- Summary: The teacher summarizes the results of the students' exploration to deepen their impressions of what they have explored.

D. Instructional Design for Accommodators

- Bridge-in: The teacher prepares a flower and asks how the flower is made up, thus leading to the picture that is also made up of different elements.
- Pre-assessment: test questions, what layers are available in Photoshop software.
- Participatory Learning: After explaining the basics, the teacher guides students to incorporate elements of the classroom scene into the pictures.
- Summary: The teacher reviews the students' work and inspires them that they can combine elements of different scenes together to create.

V. CONCLUSION

Based on the analysis of learning styles, different teaching models were designed for students with four learning styles on the basis of the BOPPPS teaching model, and the high school IT course "Processing and Handling of Picture Information" was taken as an example. In these teaching designs, it can be seen that teachers use different questioning styles and contents, and the teaching methods adopted at each stage are also chosen according to the characteristics of learners with different learning styles. The teaching process is designed in such a way that learners are more engaged and motivated in the classroom, and that the effectiveness of the teaching is maximized. However, learning style is

only one aspect of learners' learning characteristics. If the teaching model is designed by integrating learners' learning characteristics, the personalized teaching model can be more perfect and can better reflect the concept of learner-centered teaching.

However, learning style is only one aspect of learners' learning characteristics, and learners' learning process is influenced by many factors, including learning environment, learning behavior, learning ability, learning emotion, and learning belief. First, the learning environment includes the internal and external environment. The internal environment is mainly the physiological state and sensory functions, while the external environment mainly includes the school environment, family environment, and social environment. The learning environment is the most basic, because the learning environment is not only the physical environment, but also the conceptual environment, with sufficient material and constantly updated ideas, in order to form a good learning environment. And learners can carry out effective learning activities only in a good learning environment. Second, learning behavior contains the physical and mental development of the learner, as well as the behavioral tendencies of the habitual. Third, learning ability is mainly the learner's intelligence level, learning strategies, and thinking ability. Fourth, learning emotion is mainly the learner's emotional experience while learning, which has a great correlation with whether the learner can sustain the learning activity. If learners have a good emotional experience while learning, then learners are more likely to continue learning. Fifth, learning beliefs are primarily internal to the learner. Learners' reasons for learning largely determine the efficiency of the learning process and the outcome of learning. Learners with strong internal motivation are more likely to stay motivated during the learning process and continue until the end of the learning. In the future, if the various influencing factors in the learner's learning process can be integrated into the design of personalized instruction, learners will be able to experience instructional activities that are more in line with their own development and make more accurate judgments for their future career planning and life planning.

Research on the effectiveness of learning styles should be further strengthened to lay a solid foundation for the proper use of learning styles as a theoretical system. Learning styles should not be completely discarded, but rather become an effective tool for teachers to understand the physical and mental development of their students and further promote the development of individualized instruction.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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