Teaching Innovation of Mind Mapping Applied in Project-Based Learning: Taking Psychology Courses for Normal University Students as an Example

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Abstract: This article explores the integration of mind maps into project-based learning within psychology courses for teacher trainees. It emphasizes the constructive nature of project-based learning, which involves students in a cycle from problem identification to solution presentation, enhancing critical thinking and teamwork. Mind maps, as visual thinking tools, are highlighted for their ability to organize information and stimulate creative thinking. The article identifies current teaching issues, such as rigid designs and monotonous methods, and argues for the feasibility of mind maps to address these by organizing knowledge and enhancing inquiry and collaborative skills. The methods for introducing mind maps include their use in pre- class and post-class activities, group project assignments, and presentations. These strategies aim to make knowledge more vivid and progressive, ultimately empowering students to take a leading role in their learning. The article concludes that the application of mind maps in project-based learning can optimize teaching designs, reform methods, and improve student engagement and academic performance.

Keywords: Project-Based Learning; Mind Maps; Student-Centered Approach; Collaborative Skills; Teaching Innovation

1. Introduction
In April 2022, the "Compulsory Education Curriculum Plan and Curriculum Standards" was released, emphasizing the need to focus on cultivating students' core competencies and highlighting project-based learning. Project-based learning (PBL) has become a key term in curriculum reform and an important path to deepen classroom reform and improve the quality of education. Project-based learning, which originated from John Dewey's concept of "learning by doing" in the early 20th century[1], is based on social constructivism and aims to cultivate learners' abilities to solve real-world problems.

2. Core Concepts

2.1 Project-based Learning and Its Characteristics
Project-based learning is a constructive teaching method. Teachers project students' learning tasks and guide students to ask questions based on real situations. They then use relevant knowledge and information to conduct research, design, and practical operations to ultimately solve problems and display and share project results. From this connotation, it can be seen that "project" as the carrier of learning refers to the complete activity from problem formulation to design and production, and finally to the display of results. Stoller & Myers (2019) condensed the steps of project-based learning into five steps, specifically including: preparation stage (teachers and students jointly determine the topic), data collection (completed by students), data processing (producing results), result presentation, and reflection (joint reflection by students and teachers)[1].Research shows that project-based learning can improve students' critical thinking, communication, mutual respect, teamwork, and interpersonal skills, and increase students' interest in the course.

Project-based learning requires a student-centered approach and must be conducted in groups under the guidance of teachers, who act as facilitators or mentors. The real issues mainly arise during the learning process. Encountered problems are used as a tool to acquire the necessary knowledge and problem-solving skills,

ultimately solving the problem, and new knowledge needs to be obtained through self-directed learning. In summary, the focus of project-based learning is on students learning by analyzing and solving representative problems.

2.2 Mind Mapping and Its Characteristics

Mind maps, also known as mind map or brain maps, were proposed by British educator and psychologist Tony Buzan in the 1960s[2]. He believed that mind maps combine the left brain's logical, textual, numerical, and abstract reasoning abilities with the right brain's abilities in imagery, spatial awareness, and color[3]. By placing the main topic at the center and radiating key information outwards, this technique uses a combination of text and images to present the relationships between various levels of topics in a hierarchical diagram that shows subordination and relevance. It establishes memory links between topic keywords and images, colors, and so on, much like a thinking tool of the neural network. As a visual thinking tool, it transforms monotonous information into a richly colored and highly organized schema, allowing thoughts to break free from the confines of neat but cumbersome text[4], and instead represent the internal connections between things in a more concrete and vivid manner.

The characteristics of mind maps are mainly manifested as follows: First, they have a large information capacity. Compared with rigid words, mind maps are more attractive. Research shows that applying visual aids in learning can increase learning efficiency by 400%. Second, the key points are prominent and the levels are distinct. The theme is displayed as the focus on the central graphic, and the main keywords of the theme radiate from the center to the surroundings as branches and are refined layer by layer[5]. The theme and branches are interconnected with distinct relationships, which is more helpful for people to remember clearly. Third, it diverges thinking and has an obvious personal style. Different from the rigidity of words, the content or theme presented by mind maps is more vivid and easier to develop students' imagination, enabling everyone to consider problems from different angles and entry points as much as possible, and then showing cognition with obvious student individuality.

"A thousand words are not as good as a picture." Mind maps can form colorful brain cognition of originally abstract, boring, and chaotic things in an image-specific, intuitive, and multi-dimensional divergent way, thus facilitating students' understanding and mastery.

3. Current Teaching Issues in Psychology Courses for Teacher Trainees

3.1 Rigid Teaching Design and Subpar Teaching Quality

As a comprehensive subject that covers basic psychology, developmental psychology, and learning psychology, the psychology course for teacher trainees requires teachers to accurately grasp the textbook knowledge and form their own teaching ideas to better complete classroom teaching. A single teaching template is not conducive to highlighting the key and difficult points of the teaching content, nor is it conducive to the formation of individual teaching ideas. This reduces the innovation and enthusiasm of teachers in teaching, leading to a decline in teaching quality.

3.2 Monotonous Teaching Methods and Lack of Student Interest

Although the psychology course for teacher trainees is a required course, the class schedule is tight. Under the traditional teaching method where "the teacher is the main and the student is the auxiliary," in order to complete the heavy teaching tasks, teachers tend to focus on a single knowledge delivery, neglecting the exchange and interaction between teachers and students, as well as among students. This approach does not ensure teaching quality, and it also affects students' interest and enthusiasm for psychology courses.

4. Feasibility Assessment of Applying Mind Maps in Project-Based Learning in Psychology Classrooms

4.1. Assessment of the Application of Mind Maps in the Study of Psychological Knowledge

4.1.1 The application of mind maps helps to organize key and difficult points of knowledge.

The psychology course for teacher trainees is a

required core professional course with a large amount of content and a wide range of topics. Students, lacking a background in psychology, often find the knowledge to be vast and scattered, making it difficult to grasp the key points and frequently falling into the dilemma of remembering and forgetting. By creating mind maps, the rich and fragmented knowledge points in students' minds about memory can be systematically processed. The key points and easily confused knowledge points in each chapter of the textbook can be categorized using a method that combines text and images, and placed into a framework that is logical and organized. By establishing memory connections between the key points of each chapter and images, colors, etc., students can better search their knowledge base, and even specify which book and page a certain piece of knowledge comes from. When it is necessary to delve into and consolidate learning, students can quickly access this knowledge link[5]. With such knowledge reserves and a knowledge link system constructed with mind maps, when students encounter questions like the following in practical teaching, they can easily organize their thoughts and solve problems smoothly.

4.1.2 Using mind maps is beneficial for constructing knowledge frameworks

In psychology classroom teaching, teachers guide students to summarize teaching content and understand the deeper structure of the material from different perspectives using mind map patterns. This makes the learning process a self-exploration journey for students. During this process, students' opinions continuously collide, gradually leading to the emergence of new insights and a deeper understanding of new knowledge, constructing a knowledge map. By building a knowledge system and forming their own learning methods, teachers guide students to integrate new and old knowledge into a knowledge network according to certain logical sequences and cognitive patterns. This helps to expand students' thinking, stimulate their inspiration, and enable students to form unique understandings. Invisibly, it enhances students' mastery and comprehension of knowledge, achieving the purpose of teaching[5].

4.2. Assessment of the Application of Mind Maps in Project-Based Learning

4.2.1 Enhancing Students' Inquiry Skills

In teaching activities, there is a vast amount of knowledge in psychology, which often leaves many students feeling overwhelmed. Students primarily learn by memorizing professional terminology to grasp key points, without forming a relevant chain of knowledge in their minds, let alone exploring the connections between psychological knowledge points and their underlying patterns. Traditional teaching mainly employs logical and linear models, seldom teaching students how to learn and how to solve problems. Based on this, in psychology teaching, it is essential to organically combine systematic psychological theories with students' rich life experiences to cultivate their inquiry skills. Psychology is a discipline of inquiry, and its learning process is inseparable from simulated situational experiences, which can enhance students' hands-on and critical thinking abilities and deepen their memory of knowledge. Through project-based learning, leveraging the advantages of mind maps, students can be trained in memory comprehension and problem-solving skills, deepening their understanding of the concepts they learn, thereby better improving their autonomous learning abilities and fostering their cooperative awareness and practical skills.

4.2.2 Cultivating Students' Collaborative and Communicative

Skills In psychology classroom teaching, if teachers dominate the lecture and flood the classroom with information, students may feel bored, tired, and distracted. Teachers can establish learning groups and guide students to collaborate in creating mind maps, encouraging them to discuss and analyze which theme should be the center for their mind map. During group cooperation, students express their individual opinions and eventually synthesize a specific theme. After exploring and finding answers through cooperative discussion, students use mind maps to present and explain their findings. This teaching process fully integrates the guidance of teachers with the cooperative and communicative exploration of students, which not only enhances students' collaborative learning abilities but also helps to cultivate their autonomous inquiry skills.

5. Methods and Main Features of

Introducing Mind Maps into the Classroom

5.1 Introducing Mind Maps into the Classroom

Based on the content of textbook chapters, use software such as XMind or Edraw to create diagrams. In addition to classroom explanations, mind maps are mainly used for pre-class content outlines and post-class review summaries.

5.2 Establishing Unit Project-Based

Assignment Themes From the perspective of project-based learning, analyze the learning objectives holistically and establish themes for unit project-based assignments. The psychology course for teacher trainees can be divided into eleven chapters, each with independent content, thus allowing for eleven unit project-based assignments. At the same time, establish learning groups, with each group collaborating to complete a unit theme assignment. Teachers will assign teaching tasks or problems based on the course content, and each team member should collaborate according to the teaching tasks assigned by the teacher.

5.3 Displaying Group Achievements

Create authentic situations and design tasks driven by these situations to encourage students to integrate unit knowledge for analyzing and solving problems, achieving the transfer and application of knowledge. Before each class, the corresponding team is required to prepare a PPT and explanation for the chapter content they are responsible for. After the mind map is created, it is submitted to the teacher for review, and then returned to the students for further revision.

5.4 Review and Reflection

Once the mind map is completed and the group has presented it to the class, the teacher will review the students' explanations to fill in any gaps and summarize the key points. After class, the group responsible for the presentation is also required to reflect on, distill, and summarize the key content of the lesson using the strategies of mind mapping. Students then publish the revised mind map to all classmates as a review material for after-class study.

5.5 Student Feedback

The appropriate application of mind maps in the psychology courses for teacher trainees is beneficial for teachers to optimize teaching designs and reform teaching methods, and it also helps students to innovate their classroom notes and improve the quality of review. In the practical application of mind map teaching, students have reported better memory effects, increased teaching satisfaction, and improvements in both their evaluations and semester grades.

6 Advantages of Teaching Innovation in Project-Based Learning with the Application of Mind Maps

6.1 Optimizing Teaching Design to Make Knowledge "Vivid and Vivid"

Incorporating mind maps has a significant effect on improving teaching design[6]. Teachers can use diagrams to present teaching content in a three-dimensional way, highlighting key and difficult points with different colors and line thicknesses. This not only showcases the teacher's unique inspiration and creativity but also helps to form their own teaching ideas, thus ensuring that teaching content and methods are not confined to textbooks and templates. The completed mind maps have both the teacher's personal characteristics and reflect the features of psychology and its various chapters, which greatly assist teachers in organizing their teaching ideas, optimizing teaching designs, and grasping the content of their lessons.

6.2 Reforming Teaching Methods to Make Teaching "Progressive and Layered"

Introducing mind maps as a new teaching method into the classroom allows students to construct an organic context system from scattered knowledge points, forming a good cognitive structure[7]. On one hand, it focuses students' main efforts on key thematic knowledge points and clarifies their thinking. On the other hand, teachers no longer need to teach strictly from the textbook but can guide students' learning through mind maps. Initially, mind maps can be presented in the form of PPT animations, gradually revealing the main themes, sub-themes, and detailed points of the chapters, going deeper layer by layer. This helps students to visualize their learning content, make their thinking process visible,

and integrate scattered knowledge points, which is conducive to stimulating learners' motivation, assisting them in understanding the content, and improving the efficiency of teaching and learning.

6.3 Project-Based Learning

Empowering Students to "Take the Lead" Cultivating students' ability to create mind maps and organizing them to systematically summarize and categorize knowledge points of varying difficulty according to their understanding of the teaching content allows students to draw mind maps with their own characteristics[8]. Project-based learning can enhance teacher-student interaction and student-student interaction during the teaching process. Collaborative construction of mind maps by teachers and students brings freshness and vitality to the classroom, allowing students to truly take an active part in teaching, "taking the lead" and becoming the main body in the classroom. After completion, presentations are made by learning groups, evaluations are formed, and then collective reflection takes place, gradually improving the process.

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