THE DEVELOPMENT OF BLENDED TEACHING MODEL BASED ON METACOGNITION THEORY TO IMPROVE COLLEGE STUDENTS' AUTONOMOUS LEARNING ABILITY

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Thesis Title The Development of Blended Teaching Model Based on Metacognition Theory to Improve Students' Autonomous Learning Ability

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ABSTRACT

The purposes of the study were: 1) to investigate the current situation of students' autonomous learning, 2) to development a blended teaching model based on metacognition theory to improve students' autonomous learning ability, 3) to compare the effectiveness of the blended teaching model based on metacognition theory to improve students' autonomous learning ability before and after the implementation. The sample group for the survey on the current status of college students' autonomous learning ability was 400 students majoring in music from Neijiang Normal University, and for the teaching model implementation was 30 freshmen majoring in music from Neijiang Normal University, both adopted the principle of convenience sampling. Research instruments include: 1) questionnaire of autonomous learning ability of college students, 2) blended teaching model based on metacognition theory, course Lesson Plan, 3) questionnaire on autonomous learning ability of college students and autonomous learning ability of vocal music learning, 4) questionnaire of learning self-assessment of college students. The data analysis and research in this study used statistical methods such as mean, standard deviation, percentage, and dependent sample t-test.

The research results showed that the autonomous learning ability of college students majoring in music at Neijiang Normal University was at a moderate level. The "OKCPC" teaching model combined metacognition theory with blended teaching

included 5 steps: Objective setting, Knowledge acquisition, Cognitive monitoring, Personalized learning ,Cognitive assessment. By implementing the "OKCPC" blended teaching model in vocal basics and song singing courses, the students' autonomous learning ability in posttest was higher than pretest with the statistic significant at .01 level.

Keywords: Metacognition theory; Autonomous learning ability; "OKCPC" blended teaching model.

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Chen Yanru

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Chapter 1
Introduction

Rationale

In 2015, United Nations (UN, 2015) proposes strategies for Sustainable Development Goal 4 (SDG4) in the Education 2030 Framework for Action: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

In 2022, The State Council of The People's Republic of China stated that (SCPRC, 2022), China will promote the digitalization of education, build a learning society and a learning country with lifelong learning for all people.

It can be seen that both globally and in China, the importance of lifelong learning to the world, country, and society is greatly emphasized. Under the concept of lifelong learning, learning is no longer limited to a specific stage of life, but has become a continuous process that runs through a person's life. This also puts forward new concepts and requirements for education, that is, how education can cultivate talents with lifelong learning capabilities and sustainable development who can cope with future changes and challenges.

Ministry of Education of China (MOE, 2010) proposed in the "National Medium and Long-term Education Reform and Development Plan (2010-2020)" that, education should focus on ability in cultivating students. Optimize the knowledge structure, enrich social practice, and strengthen ability development. Efforts should be made to improve students' learning ability, practical ability, and innovation ability, educate students to learn knowledge and skills, learn to use their hands and brains, learn to survive, learn to behave and do things, and promote students to actively adapt to society and create a better future. In this outline, improving students' learning ability is clearly included in the development strategy of education, and its importance is self-evident.

Commissioned by the Ministry of Education, the Chinese Student Core Competencies Research Group (CCRG, 2016) spent three years researching and

released the "Overall Framework for Chinese Student Development Core Competencies" at Beijing Normal University in 2016. The framework includes 3 dimensions, 6 elements, and 18 basic points. Three dimensions, namely, cultural foundation, autonomous development and social participation. Among them, the dimension of autonomous development emphasizes that autonomy is a fundamental attribute of human beings as subjects, and that being able to manage one's own learning effectively is a key element of autonomous development. Through analysis, this study interprets “effectively managing one's own learning” in the framework as follows: 1) able to learn autonomously, mastering appropriate learning methods, and possessing the awareness and ability of lifelong learning; 2) able to self-monitor and reflect on the state and process of learning, and then adjusting the learning strategy; and 3) possessing informatization literacy and the ability of digital survival.

As can be seen from the relevant initiatives mentioned above, China attaches great importance to the cultivation of students' autonomous learning abilities in its top-level design of education reform and development planning, and has included autonomous learning as one of the core literacies for the development of Chinese students. Autonomous learning is the foundation for the realization of lifelong learning, and lifelong learners with autonomous learning ability will be able to cope with the changes and challenges of the current and future world (Chai, J.Y., 2016).

Cultivating the autonomous learning ability of college students is crucial to their cognitive development, adaptation to the educational environment and lifelong learning, and has far-reaching implications for their future career development and personal growth (Li, Y.C., 2022). Autonomous learning emphasizes students' self-determination, self-monitoring and self-evaluation, which not only helps students make independent choices in learning, but also prompts them to continuously monitor and evaluate the progress and quality of their learning (Pang, W.G., 2003). With the deep integration of information technology with education and teaching, and the digital development of educational resources, students need to manage their own learning paths using a variety of online tools and platforms, which requires them to have the ability to sift through information, make plans and self-motivate (Nguyen, T., 2020). This autonomy not only improves learning efficiency, but also enhances

students' ability to adapt to changing educational needs. In addition, autonomous learning ability is the basis of lifelong education, which equips students with the ability to continue learning and adapting to social and professional challenges in the future.

Metacognition theory originated in the 1970s, when metacognition and related concepts were first introduced by American psychologist Flawell John. He believed that metacognitive knowledge refers to an individual's knowledge of his or her own cognitive processes, outcomes, and related things, which involves an individual's real-time monitoring of his or her own cognitive processes and constantly regulating them in order to achieve a certain goal or task (Flavell, J.H., 1976). Metacognition includes three elements: metacognitive knowledge, metacognitive experience, and metacognitive monitoring. Among them, metacognitive monitoring is the core element, and the three elements interact with each other and work together to dynamically influence an individual's monitoring and regulation of his or her own cognitive activities. Once the metacognitive theory was proposed, it brought groundbreaking research progress to the educational community, and researchers generally agreed that metacognition has a positive impact on learning (Benton, C.W., 2014). In learning activities, the learner's perception of his or her learning process is the object of metacognitive monitoring (Zhang, T., 2018). When learners use metacognition, they begin to be aware of their thinking process, plan and begin to monitor their learning, and evaluate their progress and the results of their efforts. In the process of continuously practicing metacognitive knowledge, they acquire knowledge and skills, deepen their understanding of learning, achieve predetermined learning goals, gradually develop and enhance their autonomous learning ability, and lay the foundation for lifelong learning (Benton, 2014).

Blended teaching model is a new type of teaching model that is a deep integration of modern education concepts and information technology, closely combining traditional face-to-face teaching and online learning methods (He, K.K., 2014). In blended teaching, teachers are the designers and supporters of learning activities, emphasizing student-centeredness, valuing students' autonomous learning and personalized learning experience, and taking ability development as the core goal. In the context of China's active promotion of education digitization, the development

of Blended teaching has become an inevitable trend. Blended teaching integrates the advantages of online and traditional teaching, which can not only significantly improve the teaching effect, but also effectively cultivate students' autonomous learning ability (Zhang, Y.M., 2021). Through the combination of online and offline teaching model, teachers are able to provide customized teaching programs according to the individual needs of students, thus greatly satisfying the learning styles and interests of different students. At the same time, real-time teacher-student interaction and diversified evaluation methods further stimulate students' learning motivation and initiative. Most importantly, this teaching model breaks through the limitation of time and space so that students can learn anytime and anywhere, which greatly improves the flexibility and convenience of learning (Yen, J.C.et al., 2011). Therefore, the promotion and application of Blended teaching model is in line with the needs of the current educational development, and has a positive significance and role in cultivating talents who can cope with the future changes and challenges, and have the ability of lifelong learning and sustainable development.

In summary, cultivating college students' autonomous learning ability is crucial to their cognitive development, adaptation to the educational environment, and lifelong learning, and it also has a profound impact on their future career development and personal growth. Metacognition has a positive impact on autonomous learning and can help learners accomplish the whole process of metacognitive monitoring and regulation of their own learning cognitive activities. Blended teaching model is student-centered and values students' autonomous learning and personalized learning experience. Developing a Blended teaching model based on metacognition theory has a positive significance and effect on enhancing the autonomous learning ability of college students.

In this study, the music majors of Neijiang Normal University took the research group as the study group, developed a blended teaching model based on metacognition theory, and conducted a teaching experiment through the course of “Vocal Basics and Song Singing”, aiming to improve the autonomous learning ability of college students.

Research Question

1. What is the state of the autonomous learning ability of music major college students in Neijiang Normal University?

2. How to develop a blended teaching model based on metacognition theory to improve students' autonomous learning ability?

3. What is the effectiveness of implementing a blended teaching model based on metacognition theory on the improvement of students' autonomous learning ability before and after the implementation?

Objective(s)

1. To investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University.

2. To develop blended teaching model based on metacognition theory to improve students' autonomous learning ability.

3. To compare the effectiveness of the blended teaching model based on metacognition theory to improve students' autonomous learning ability before and after the implementation.

Research Hypothesis/Hypotheses

After the implementation of blended teaching model based on metacognition theory, students' autonomous learning ability is improved higher than before.

Scope of the Research

Population and the Sample Group of this study is divided into 2 parts：

Population:

1. The population for the survey study on the status quo of college students' autonomous learning ability is 2,000 college students of Neijiang Normal University.

2. The population of the experiment of the blended teaching mode based on metacognition theory is 250 freshmen students of the college of Music of Neijiang Normal University.

The Sample Group:

1. The sample group of the survey study on the status quo of college students' autonomous learning ability is 400 students in the School of Music of Neijiang Normal University, and the principle of convenience sampling is adopted.

2. The sample group of the experiment on the blended teaching mode based on metacognition is 30 freshmen students in the School of Music of Neijiang Normal University.

The Variables

Independent Variable:

Blended teaching model based on metacognition theory

Dependent Variable:

Autonomous learning ability of college students

Contents

Based on an in-depth analysis of the literature related to metacognition theory, autonomous learning ability and blended teaching mode, this paper proposes to develop a blended teaching mode based on metacognition theory, and take the course of “Vocal Basics and Song Singing” as a carrier to carry out a teaching experimental study to test the effect of blended teaching mode on students' autonomous learning ability.

The textbook is a series of textbooks for China's higher teacher training colleges and universities, Vocal Graded Course (Book 1) published by the Central Conservatory of Music Publishing House. The teaching content is selected from the most basic and important elements of vocal training. Based on the needs of this study, the course content is screened, reconstructed and integrated to form 4 units of thematic training. With the help of information technology platform, an online and offline blended teaching model is constructed.

The main content of this training consists of 4 units, totaling 16 class hours. Each unit adopts a blended teaching model, and the teaching process is divided into 5 steps.

Unit 1: Breathing in Singing. Understand the correct concepts of breathing and vocalization, establish the awareness of singing with breathing, train the students to control the breath and apply it in singing practice. 4 class hours.

Unit 2: Resonance in singing: to understand the correct concept of resonance in singing, to establish the consciousness of singing with resonance, to train students' resonance cavity (head cavity), and to utilize it in the singing practice of vocal exercises. 4 class hours.

Unit 3: Language in singing: to understand the common requirements of language in singing, to clarify the interrelationship between language and voice, language and emotion in singing, through the practice of reading lyrics aloud, focusing on the training of spitting, biting, rhyming and vocalization of language in singing. 4 class hours.

Unit 4: Song singing training I. Learning a Chinese art song, requiring correct pitch and rhythm, singing language standard, accurately grasping the style and characteristics of the song, and express them through singing. 4 class hours.

Time

2023.07-2024.07

Advantages

1. For students. Through the blended teaching model based on metacognition knowledge theory, students can better acquire knowledge and skills, deepen their understanding of learning, gain a more diverse and personalized learning experience, achieve predetermined learning goals, and gradually improve their autonomous learning ability.

2. For teachers. By development the blended teaching model based on metacognition theory, teachers can enrich their theoretical knowledge, enhance their sense of innovation, and improve their educational research ability. By implementing the blended teaching model based on metacognition theory, teachers can update their teaching concepts, improve their teaching level, and enhance their ability to apply information technology in teaching.

3. For school. Blended teaching model based on metacognition theory can be applied in a wider range of subject courses. By promoting and applying this teaching model, schools can enhance the autonomous learning ability of college students and improve the quality of teaching. School education will better serve the development of a learning society and cultivate talents with lifelong learning ability and sustainable development.

Definition of Terms

Autonomous learning ability

Autonomous learning ability is a learner's ability to take control of his or her own learning. It mainly includes the ability of learners to determine learning objectives, formulate learning plans, choose learning methods, monitor the learning process and evaluate learning results autonomously. Autonomous learning ability can be measured by the self-assessment questionnaire, constructed by the researcher.

Metacognition theory

Metacognition theory is an important theory in cognitive psychology. Metacognition theory focuses on an individual's knowledge of his or her own cognition, and believes that the use of metacognition can help an individual to strengthen the metacognitive monitoring and regulation of his or her own cognitive activities. Metacognition includes three components: metacognitive knowledge, metacognitive experience, and metacognitive monitoring. Metacognitive knowledge is the foundation, metacognitive experience is the mediator, and metacognitive monitoring is the core.

Blended teaching model

Blended teaching model is a new type of teaching model that is a deep integration of modern education concepts and information technology, closely combining traditional face-to-face teaching and online learning methods. In blended teaching, teachers are the designers and supporters of learning activities, emphasizing student-centeredness, valuing students' autonomous learning and personalized learning experience, and taking ability development as the core goal.

The blended teaching model based on metacognition theory

This is an innovative blended teaching model based on metacognition theory. This teaching model is student-centered and aims to improve students' autonomous learning ability. The development of the teaching model emphasizes that all learning activities are designed and implemented to fully incorporate the principles of metacognition theory, i.e., metacognitive monitoring and regulation of cognition. Specifically, under the guidance of the teacher, students use metacognitive monitoring for self-determination, self-monitoring and self-evaluation of the whole process of their own learning. This teaching model deeply integrates face-to-face teaching with online learning, and teachers and students can effectively interact in a diverse learning environment. Through the implementation of this teaching model, students will acquire knowledge and skills, deepen their understanding of learning, achieve predetermined learning goals, and gradually improve their autonomous learning ability.

Research Framework

This study sorted out and discussed relevant theories, such as metacognition by Flavell's(1979) theory (citing Dong,Q.1990) , blended teaching model by Sloan-C's (2003) theory (citing Allen, I.E.et al., 2003), autonomous learning ability by Holec, H's (1981) theory (citing Pang,W.G.,2010). Based on these theories and concepts, constructed the following research framework, as shown in Figure 1.1:

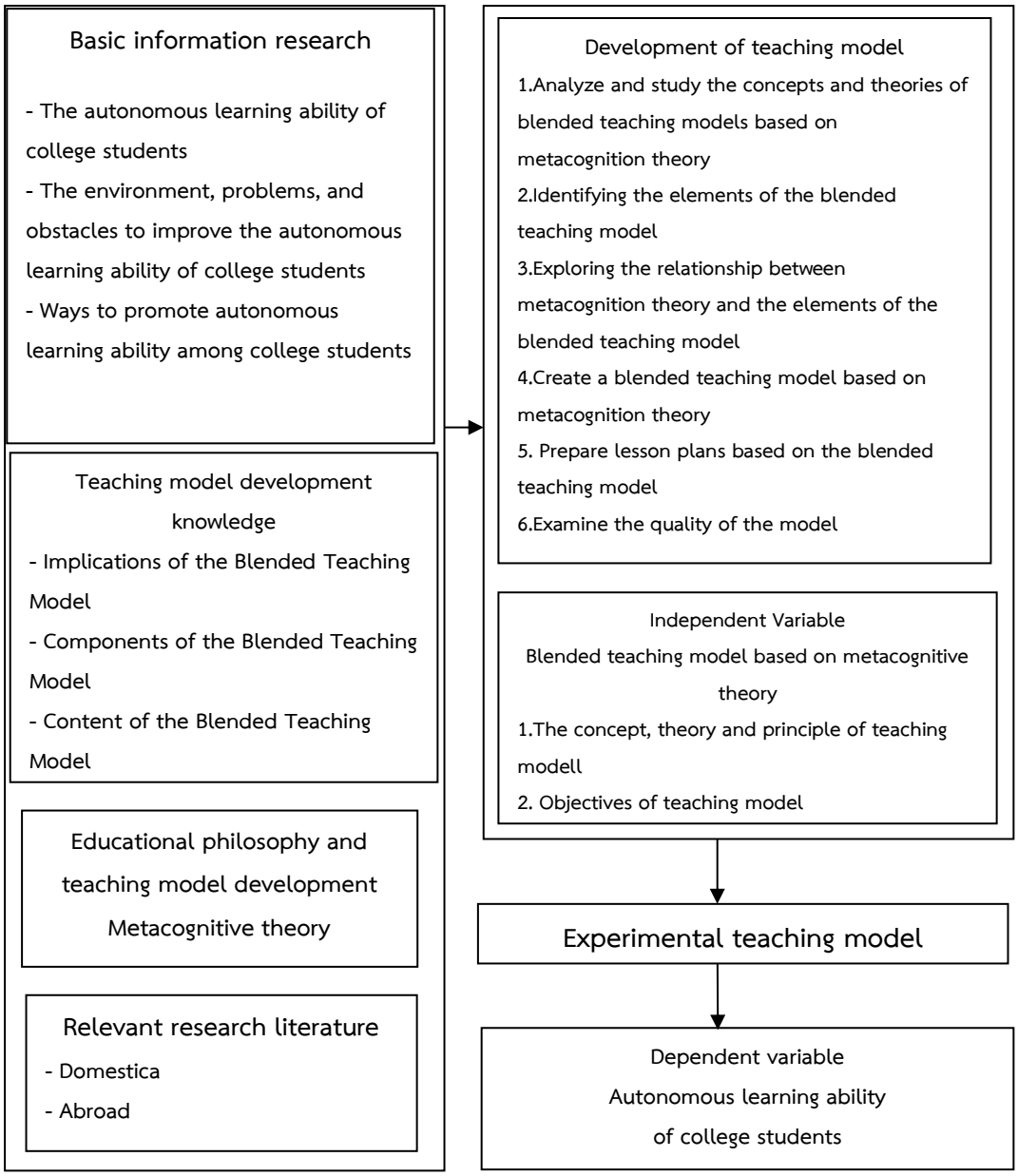


Figure 1.1 Research Framework

Chapter 2

Literature Review

The aim of this study was to develop a blended teaching model based on metacognitive theory to improve college students' autonomous learning ability. Therefore, the researcher searched and reviewed a large amount of literature on topics related to this study and conducted the literature review in four aspects.

These include the following:

1. Metacognition theory
2. Blended teaching model
3. Autonomous learning ability
4. Related research

Metacognition theory

The development and evolution of metacognition theory

Although the term "metacognition" was officially named in the 1970s, before that, some concepts closely related to metacognition had been studied in the fields of psychology and education. Piaget, J. (1976) proposed that "Reflection" is an individual's perception of his or her own mental state, which is very important to the development of intelligence. He emphasized that in order to make individual cognition expressible and available for conscious use, cognition needs to be further processed and expanded. When Brown, A.L. (1987) reviewed the origin of metacognition, he mentioned that as early as the beginning of the 20th century, in the field of reading and writing research, the term "Processes Metacognitive" was produced, which is highly related to metacognition.

Flavell, J.H. (1976) first proposed the term "metacognition" and defined metacognition. Since then, relevant scholars in the fields of cognitive psychology and educational psychology have conducted extensive and in-depth research on metacognition, promoting the continued development and evolution of metacognition theory. See the table 2.1 below for details:

Table 2.1 Definition and Components of metacognition

Researcher	Definition	Components
Flavell. J.H (1976)	An individual's knowledge about his own cognitive process and results or other related matters. In order to complete specific goals or tasks, the individual actively monitors and continuously adjusts the cognitive process based on the cognitive object.	Cognition of cognition Cognitive regulation
Flavell, J.H (1979)	Knowledge or cognitive activity that reflects or modulates any aspect of cognitive activity.	Metacognitive knowledge Metacognitive experience
Brown, A.L (1987)	Metacognition refers to the knowledge about cognitive activities and the control of cognitive systems possessed by cognitive subjects.	Cognitive knowledge Cognitive regulation
O'Neil, Jr (1996)	Metacognition is the conscious and regular self-examination and strategic selection of whether personal goals are achieved.	State metacognition Trait metacognition
Dong, Q. (1990)	Awareness of cognition, the self-regulation and self-awareness of cognitive processes performed by individuals when participating in cognitive activities.	Metacognitive knowledge Metacognitive experience Metacognitive monitoring
Wang, L. (2000)	Individuals' cognitive regulation of current cognitive activities.	Metacognitive knowledge Metacognitive experience Metacognitive skills
Martinez, M.E (2006)	For monitoring and controlling thinking, the "toolbox" is an appropriate metaphor for metacognition.	Metacognitive-memory Metacomprehension

Flavell has defined metacognition twice. For the first time, he defined metacognition as knowledge about cognition and the regulation of cognitive activities (Flavell, J.H., 1976). The second time, he made a more precise statement of the definition of metacognition, that is, knowledge or cognitive activities that reflect or regulate any aspect of cognitive activities (Flavell, J.H., 1979). Although the two definitions are expressed differently, the essence is the same. According to Flavell's point of view, we can understand metacognition from two aspects: 1) Metacognition is a static cognitive knowledge system that reflects an individual's understanding of cognitive activities and their influencing factors. 2) Metacognition is also a dynamic cognitive regulation process, involving individuals' real-time adjustments to current cognitive activities (PP, N., 2008). Flavell's views have a profound influence on the development of metacognition theory and are still widely accepted and cited today (Zhang, T., 2018).

Brown, A.L (1987) defined metacognition as the knowledge about cognitive activities and the control of cognitive systems possessed by cognitive subjects. O'Neil, Jr.et al (1996) believes that metacognition is the conscious and regular self-examination and strategic selection of whether personal goals are achieved. In his research, the elements of metacognition are divided into: 1) State metacognition, including short-term states, including self-perception, cognitive and emotional strategies, planning, self-examination and monitoring. 2) Trait metacognition, which is a relatively stable personal characteristic variable. Martinez, M.E. (2006) likens metacognition to a "toolbox", which is the monitoring and control of thinking.

Research on metacognition in China began in the 1980s. Dong, Q. (1990) defined metacognition as, cognition of cognition, self-regulation and self-awareness of cognitive processes performed by individuals while participating in cognitive activities. Unlike other scholars, he divided the elements of metacognition into three parts, namely metacognitive knowledge, metacognitive experience, and metacognitive monitoring. In this regard, he explains that in actual cognitive activities, metacognitive experience and metacognitive monitoring are inextricably linked, and it is only for the convenience of theoretical analysis that they are artificially distinguished (Dong, Q., 1994). His views have a profound impact on Chinese research in the field of metacognition.

Wang,L.et al (2000) defined metacognition as an individual's cognitive regulation of current cognitive activities and also supported Dong, Q.'s view of dividing metacognition into three elements. The difference is that she believes that the three elements include metacognitive knowledge, metacognitive experience, and metacognitive skills, while metacognitive skills include planning, monitoring, and assessment.

Analyzing the above points, we can see that different scholars have different definitions of metacognition, but they still have something in common: 1) Metacognition takes cognition as the cognitive object (Moshman, D., 2018). 2) No matter how the definition evolves, the components are relatively fixed, that is, knowledge about cognition and monitoring of cognition (Norman, E.et al., 2019). 2) With the development and evolution of metacognition theory, in relevant definitions, more and more There is more emphasis on dynamic metacognition, that is, the process of monitoring and regulating cognition (Moshman, 2018).

This study defines metacognition as the cognition of cognition, that is, the individual's monitoring and regulation of current cognitive activities. In the study, the Chinese scholar Dong, Q.'s triad of metacognition, namely metacognitive knowledge, metacognitive experience, and metacognitive monitoring, is adopted. The following is a literature review of the components of metacognition and their interrelationships.

The components and interrelationships of metacognition

The main components of metacognition include, metacognitive knowledge, metacognitive experience, and metacognitive monitoring.

Flavell, J.H. (1979) defined metacognitive knowledge as an individual's understanding of the various cognitive tasks, goals, actions, and experiences of himself and others as cognitive subjects. He classified metacognitive knowledge into three categories: person, task, and strategy, and argued that this knowledge helps individuals to better monitor and regulate their cognitive processes, and helps them to select, evaluate, revise, or abandon cognitive tasks and strategies.

Schraw.G. (2001) divides metacognitive knowledge into: 1) Declarative knowledge, which is knowledge about something. 2) Procedural knowledge is knowledge about how to do something. 3) Conditional knowledge refers to knowing “when”, “why” and “under what circumstances” to apply strategies.

Wang, L (2000) defined metacognitive experience as an individual's awareness and understanding of the situation related to cognitive activities. It is believed that the content of metacognitive experience varies at different stages of cognitive activity: 1) at the beginning of cognitive activity, it is mainly about the difficulty, familiarity and grasp of the task; 2) at the middle of cognitive activity, it is mainly about the progress of the task, and the experience when facing obstacles; 3) at the later stage of cognitive activity, it is mainly about the achievement of the goal, and the effect of cognitive activity and the personal gain.

Metacognitive experience influences the completion of cognitive tasks (Norman, E.et al., 2019). Positive metacognitive experience stimulates individuals' cognitive enthusiasm and mobilizes their cognitive potential, thus increasing the speed and effectiveness of cognitive processing.

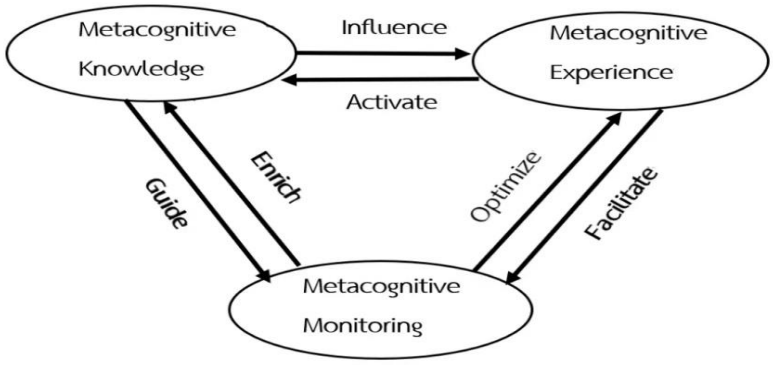
Dong, Q (1990, 1994.1995) defined metacognitive monitoring as the process by which an individual, in the course of performing cognitive activities, is actively monitor their cognitive activities and regulate them accordingly in order to achieve the predetermined goals. Specifically, it includes 1) making a plan. Before the cognitive activity starts, make plans, select strategies, and predict the effectiveness according to the specific goals, etc. 2) Actual control. Real-time monitoring during the cognitive activities to identify deficiencies and adjust and optimize the cognitive strategies through the feedback and evaluation mechanism.3) Examining the results. Evaluate the results of cognitive activities according to the cognitive goals and judge the degree of goal achievement.4) Remedial measures. According to the checking results, take corresponding remedial measures.

According to Li, S.P (2018), individuals perceive cognitive activities and monitor these cognitive activities based on their existing knowledge and experience to guide and regulate the cognitive process and test whether the cognitive goals are achieved or not, which is metacognitive monitoring. In his study, he emphasized that metacognitive monitoring plays a role in planning, monitoring and evaluating cognition.

The three components are defined in this study as follows: 1) Metacognitive knowledge is knowledge about cognition, i.e., an individual's knowledge about his or her own or another person's cognitive activities, processes, outcomes, influencing factors, etc. 2) Metacognitive experience, the cognitive or affective experience that

accompanies cognitive activities. 3) Metacognitive monitoring, the individual's active and autonomous monitoring and regulating of his or her own cognitive activities in their entire process.

On the basis of clarifying the definition, it is very necessary for this study to further clarify how each element plays a monitoring and regulatory role in the process of individual cognitive activities, as well as the interrelationship between them. Provide theoretical basis for the design and implementation of teaching models. By analyzing the relevant literature, this study concluded that the interrelationships among the three elements of metacognitive knowledge, metacognitive experience, and metacognitive monitoring are shown in the figure 2.1 below:



Figures 2.1 Relationship structure diagram of three elements of metacognition

In actual cognitive activities, the relationship between the three elements of metacognitive knowledge, metacognitive experience and metacognitive monitoring is dynamic, and they interact with each other and jointly influence the individual's monitoring and regulation of his or her own cognitive activities. In this dynamic metacognitive structure:

1) Metacognitive knowledge is the foundation. Influence on metacognitive experience, learners will have different cognitive experiences and emotions based on their understanding of their own cognition, tasks and strategies. Guide the conduct of metacognitive monitoring. Without relevant metacognitive knowledge, metacognitive monitoring will be very blind (Pintrich, P.R., 2000., 2002)

2) Metacognitive experience is the bridge. It plays a mediating and bridging role between static metacognitive knowledge and dynamic metacognitive monitoring (Pimvichai, J. et al., 2019). Metacognitive experience can activate relevant metacognitive knowledge and connect it with current cognitive activities, thus guiding metacognitive monitoring. At the same time, metacognitive experience will directly facilitate the opening of metacognitive monitoring.

3) Metacognitive monitoring is the core. The core element of metacognition is the monitoring of cognitive activities, and its essence is to reasonably plan, organize, and adjust current cognitive activities (Jia, X. et al., 2019). Metacognitive monitoring can enrich metacognitive knowledge and optimize metacognitive experience.

The relevance of metacognition to autonomous learning

Metacognition is closely related to autonomous learning, both in the process of autonomous learning and in the "outcome" of autonomous learning ability (Butler & Winne, 1995, Alderman, M.K., 2013, Guo, H., 2012).

In the field of educational psychology, researchers mainly focus on the influencing factors and metacognitive monitoring and regulating process of metacognition on the cognitive activities of autonomous learning, which is conducive to revealing the psychological mechanisms of autonomous learners, so as to deeply understand the essential characteristics of autonomous learning (Zhou, T.M., 2010, Haiying, S., 2016).

McCombs (1989) divides autonomous learning into two core cognitive processes: general cognitive processes and metacognitive processes. General cognitive processes, i.e. the basic ways of processing external information. The metacognitive process, which involves planning, monitoring, and evaluating these cognitive activities, is a more advanced thinking process concerned with how to manage and optimize the cognitive activity itself. According to McCombs, autonomous learning consists of three phases: 1) goal setting 2) planning and strategy selection 3) behavioral execution and evaluation. These three stages show a cycle from preparation to execution to feedback, and each stage requires metacognitive intervention to optimize the learning process.

Pang, W.G (2003) believes that the level of metacognitive development is one of the key factors affecting autonomous learning ability. The monitoring and regulating process of metacognition on autonomous learning cognitive activities is

mainly reflected in: 1) The planning process of learning, including goal setting, strategy selection and time planning. 2) The self-monitoring and regulation process of learning. 3) The self-evaluation process of learning 4) The will control process of learning.

Kong, B.J (2015) emphasized the important role of metacognition in learners' effective selection and application of cognitive strategies in autonomous learning, arguing that metacognition not only enhances the selectivity and adaptability of learning strategies, but also regulates and Feedback mechanisms improve the effectiveness of policy application. Specifically, it includes: 1) Mediating role. Metacognition plays a mediating role between different psychological and cognitive components and cognitive learning strategies, allowing learners to adjust their learning strategies according to these factors, thereby achieving more effectively learning target. 2) Strategy selection and adjustment. The three components of metacognition affect learners' strategy selection. This includes identifying which learning strategies are suitable for specific learning goals and conditions, and how to flexibly adjust these strategies based on feedback during the learning process. 3) The quality and quantity of cognitive learning strategies. Learners with higher metacognitive abilities are more effective and adaptable when selecting and applying cognitive learning strategies.

In the field of educational research, researchers pay more attention to the application of metacognitive theory in educational practice, and verify the correlation between metacognition and the cultivation or improvement of students' autonomous learning ability through educational experimental research.

Guo, H (2012) used an educational experimental study to train non-English majors in metacognitive strategies, and the results of the training showed that such metacognitive strategies can help students to control and evaluate their own learning process autonomously, thus improving their autonomous learning ability in English listening learning. The study also suggests to continue exploring the possibility of applying the metacognitive strategy in other disciplines and different teaching and learning environments to further validate its effectiveness in improving students' autonomous learning ability.

Chen, S.P. (2021) implemented a series of teaching strategies based on metacognitive theory, such as self-planning, metacognitive monitoring, and

assessment, in a teaching experiment. Through the use of metacognitive strategies, students can master the knowledge of the physics subject more effectively and improve their autonomous learning ability at the same time. This study not only confirms the value of the application of metacognitive theory in educational practice, but also provides a concrete method and basis for how to improve students' autonomous learning ability more effectively.

Wang, J.C (2021) verified through an empirical study that not only is there a significant positive correlation between metacognitive strategies and autonomous learning ability, but also that both of these have a direct positive effect on learning effectiveness (especially language learning achievement). This study emphasizes that more attention should be paid to fostering the use of metacognitive strategies and the development of students' autonomous learning ability in educational practices. In this way, educators can more effectively support students' learning and continuous development.

This study concludes that there is a significant correlation between metacognition and autonomous learning, and that the development of a Blended teaching model based on metacognition theory and the implementation of teaching based on the subject curriculum can cultivate or enhance students' autonomous learning ability.

The following is a literature review of the blended teaching model.

Blended Teaching Model

Definition and evolution of teaching model

American scholars Joyce, B.R et al (1986), in their book Teaching Model, define teaching model as a pattern or plan, which can be taken up with a view to shape a curriculum or course to select appropriate instructional material and to guide the teacher's action. They believe that teaching model are a bridge between teaching theory and teaching practice, which are both derived from the summarization of teaching practice and can in turn guide teaching practice.

Gunter, M.A et al (1995) have proposed a definition of teaching model, which they argue can be viewed as a design blueprint or foundational model that encompasses the core instructional aspects necessary to achieve desired instructional outcomes. In the process of teaching implementation, the established

teaching process and learning model should be strictly followed. Each teaching model is carefully designed to achieve specific educational goals.

Behar-Horenstein, et al (2005) argue models of teaching provide well-developed ways of teaching that guide the development of learning experiences and the identification of structures that support learning.

According to the Chinese scholar Ye, L (1991), teaching model is a theorized operational style that integrates teaching content, teaching objectives, teaching tasks, teaching processes, and organizational forms, and serves as a bridge linking learning, teaching, and related academic fields.

Entering the 21st century, with the increasing globalization and rapid development of information technology, education is facing more challenges, and the definition of teaching model is evolving.

According to Scott, C.L (2015), the teaching model is a framework adapted to the needs of the 21st century learner with a focus on personalization, engagement, collaboration, and project and problem-solving based learning approaches. The 21st century teaching model involves not only the transfer of knowledge, but also focuses on how learners can develop critical thinking, communicating, innovating, and problem-solving skills through interactive, collaborative, and hands-on activities .

Research by Deans for Impact (DFI, 2015) argues that teaching model should support the construction of knowledge frameworks, promote deeper understanding, and deepen learning through feedback and revision. This model emphasizes the application of scientific research to design learning activities and assessment strategies that meet students' individual needs and promote active learning and competency development.

In Mynbayeva et al.'s (2018) study, 21st century teaching models are defined as a set of educational frameworks integrating innovative pedagogical approaches and environments that adapt to the needs of learners in the digital age and address contemporary challenges. This definition emphasizes shifts in educational content, pedagogical methods, learning technologies, and the evolution of educator and learner roles.

In China, Pei, D.N (2015) believes that, modern teaching model should be characterized by innovation, subjectivity, practice, cooperation and reflection. She emphasizes the innovation and development of teaching models, and believes that

teaching models need to be constantly updated and improved to meet the needs of the times and the changes of students. At the same time, she also put forward the concept of "subjective teaching", emphasizing that teaching should respect students' subjective status and individual differences, and focus on cultivating students' autonomous learning ability and innovative spirit.

This study argues that a teaching model is a comprehensive instructional design framework that combines educational philosophies, pedagogical approaches, learning activities, and assessment strategies. 21st century teaching model is one in which the teacher is not only the transmitter of knowledge, but also the designer, guide, and collaborator in the learning process, and the student is the main subject of learning, actively engaging in and constructing his or her own learning experience. Such a teaching model is designed to promote active learning, deeper understanding and the development of integrated skills.

Definition and evolution of blended teaching

Globally, blended teaching arose in the 1990s. In the 21st century, blended teaching has been widely emphasized in the education sector and actively promoted in educational practice. Under the framework of "Internet+Education", blended teaching has been widely developed in China, and it has become a key factor and an important trend in promoting changes in university education. At present, educational researchers, teaching practitioners, as well as governmental and educational institutions generally recognize Blended teaching as one of the mainstream forms of education in the future (Guo, Z.H.,et al., 2023, Li, F.Q.,2016, Sun,L.N.,2022).

By analyzing the related literature, this study takes the technology application and teaching concept as the main line of analysis, and divides blended teaching from a transitional teaching method to gradually becoming an independent and mature teaching model into the following three stages of development, and the definition of blended teaching gradually develops and evolves along with these stages of development:

Table 2.2 The evolution of blended teaching

Developmental stage	Technical Application	Representative Views	Teaching Philosophy	Representative Views
Technology Exploration Stages	Combination of online and face-to-face instruction	Blended teaching is a combination of face-to-face and online instruction (Sloan-C, 2003)	Between online and face-to-face, transitional teaching methods	Emphasizing the central role of information technology in teaching and learning (Jones, N., 2006)
Technology Integration Stage	Clarify online ratios	Only instruction where 30% to 79% of the content is delivered online can be characterized as Blended teaching (Sloan-C, 2007)	Deep integration of information technology with the curriculum	Creating an information-based teaching environment, realizing new teaching and learning styles, and changing traditional teaching structures. (He, K.K., 2004)
Technology Blending Stage	Application of new-generation information technology	Blended teaching is a teaching and learning situation based on the combination of mobile	Student-centered	Blending teaching and tutoring styles in a "student-centered" learning environment. blending of

Table 2.2 (Continued)

Developmental stage	Technical Application	Representative Views	Teaching Philosophy	Representative Views
		communicatio-n devices, web-based learning environments and classroom discussions (Wasoh. F, 2016)		teaching and tutoring styles in a "student-centered" learning environment. (Goodyear, 2015)

1. Technological exploration stage (1990s-early 21st century).

Educators are beginning to experiment and explore the possibility of combining traditional instruction with emerging online learning resources. The most representative definition is that of the Sloan Consortium (Sloan-C) in the United States: Blended teaching is a combination of face-to-face and online instruction (Allen,I.E.et al., 2003). Blended teaching is mainly understood as a new way of teaching and learning, focusing on emphasizing the application of information technology in teaching and learning.

Jones,N (2006) categorized five levels based on the extent and manner in which information technology is used in teaching and learning: face-to-face-only, basic IT applications, IT-assisted, IT-led, and online-only. Blended teaching is understood as a combination of traditional teaching and online, emphasizing the central role of information technology in teaching and learning, and the amount of information technology application becomes the criterion for dividing the levels.

At this stage of development, scholars and practitioners mostly see the definition of Blended teaching as, a transitional stage between purely face-to-face teaching and purely online teaching, a combination of the two based on information technology.

2. Technological integration phase (Early 21st century-).

After entering the 21st century, the definition of blended teaching gradually became clearer as research and practice continued to deepen. The educational community began to try to make a clearer delineation of the proportion of online and face-to-face teaching, so as to clearly distinguish it from pure face-to-face teaching or pure online teaching, thus establishing the existence of Blended teaching as an independent teaching model, rather than just a transitional teaching method.

Sloan-C updated their definition of blended teaching, stating that "only instruction in which between 30% and 79% of the content is delivered online" can be considered Blended Teaching (Allen, I.E.et al., 2007). On this basis, Means,B.,et al(2013) further clarified this percentage by stating that "only more than 25% of the content included in the assessment is delivered online" can be considered blended teaching .

At the level of teaching philosophy, significant progress has also been made in understanding and defining blended teaching at this stage. Scholars have begun to examine and define blended teaching from the perspective of teaching strategies and methods, especially focusing on instructional design in a blended learning environment that combines online and face-to-face instruction. Therefore, at this stage, the definition of blended teaching focuses more on "interaction" and how the blended learning environment affects the interaction and how the instructional design is adapted accordingly. Among them, Bliuc,A.M.,et al (2007) definition is quite representative: blended learning represents a new way of learning, which integrates face-to-face live interaction with online interaction, thus realizing comprehensive and multi-dimensional interactions between students and students, students and teachers, and students and resources .

At this stage of development, blended teaching research has also begun to emerge in China. According to Prof. He,K.K (2004), blended teaching is not only a mixture of technical aspects, but also a deep integration of information technology and curriculum. "Integration" contains three basic attributes: creating an informationized teaching environment, realizing new teaching and learning methods, and changing the traditional teaching structure. Among them, changing the traditional

teaching structure is especially crucial to the effectiveness of Blended teaching (HE,K.K., 2014).

Yen,J.C et al (2011) called blended teaching “a fundamental change and redesign of the teaching model” and proposed three characteristics of blended teaching: 1) a gradual shift from teacher-centeredness to student-centeredness; 2) enhanced interaction between students and students, students and teachers, students and content, and students and external resources; (3) the adoption of an evaluation mechanism that combines formative and summative evaluation.

At this stage of development, blended teaching began to take shape as an innovative and independent teaching model. The key elements of the definition of blended teaching in this period are: firstly, a clear online ratio, secondly, "integration" and "interaction", and thirdly, a gradual shift in the teaching philosophy from teacher-centered to student-centered.

3. Technology Blending Stage (Age of Digital Transformation)

With the development of new-generation information technologies such as cloud computing, big data and new media, the development of the global Internet has entered an era of digital transformation. The development of the Internet has greatly facilitated personalization, popularization and interactivity in the field of education, resulting in more flexible learning styles and richer and more accessible educational resources, as well as enhanced global collaboration and exchange in education.

An important sign that blended teaching has entered the technology blending stage is the incorporation of mobile technology applications into blended teaching. Blended teaching has evolved from "a mixture of online and face-to-face teaching" to "a teaching situation based on mobile communication devices, web-based learning environments and classroom discussions" (Wasoh.F, 2016).

In terms of the development of conceptualizations of teaching and learning, Blended teaching during this period was reconceptualized as a new "learning experience" (Crawford & Jenkins, 2016; Shohel et al., 2021; Henseruk et al., 2023). The understanding of blended teaching has fallen to the student perspective, which has begun to focus on the changes that blended learning brings to students, and the

support for student learning (Dang,M.Y, et al., 2019; Sahni,J., 2019; Qiu, N,et al.,2022). A growing number of scholars are pointing out that blended teaching is not simply a mix of technologies, but rather the creation of a truly highly engaging and personalized learning experience for students. This phase of the blended teaching concept emphasizes a focus on "student-centeredness" (Lee,D, et al., 2021; Capone,R., 2022; Yang,H, et al., 2023; Chao,Z, et al., 2023).

An attempt to define blended teaching in this period, borrowing from Goodyear: blended is not just a mix of face-to-face and online teaching, but a mix of teaching and tutoring styles in a 'student-centered' learning environment (Goodyear, V.& Dudley, D., 2015).

In China, the concept of "Internet+" has been put forward from the perspective of national development strategy.In July 2015, the State Council of the People's Republic of China (State Council of the PRC, 2015) issued the Guiding Opinions on Actively Promoting the Action of "Internet+". Among them, there are guiding opinions on encouraging schools to use digital educational resources and educational service platforms, and gradually explore new models of networked education.

Simply put, "Internet +" is "Internet + all traditional industries", a combination of the Internet and other traditional industries. Specifically in the field of education, it is "Internet+Education" mode. Over the past decade, "Internet+Education" has brought about far-reaching changes and impacts on Chinese education, and has also greatly promoted the vigorous development of Blended teaching in China.

According to Li, D (2017), "Internet + Education" is the deep integration of new generation information technology with educational elements, teaching concepts, and teaching links, and the effective change of the teaching model has brought about the desired teaching effect.

The essence of blended teaching under the framework of "Internet+Education" is to create a truly highly participatory and personalized learning experience for students. The nature and connotation of learning has changed, and students not only need common and standardized knowledge, but also pursue the self-construction and generation of personalized and creative knowledge (Feng, X.et al., 2019).

In the Technology Blending Stage of development, blended teaching is becoming more mature and perfect as an independent teaching model. The keys to the definition of blended teaching in this period are: first, the deep integration of new-generation information technology; second, student-centeredness;third, the emphasis on autonomous learning, ability development and personalized learning experiences.

These are the three stages of blended teaching development summarized in this study based on the analyzed literature. It can be seen that the definition of blended teaching has evolved gradually with different stages of development.

This study tries to define it as follows by summarizing the views of previous researchers: blended teaching is a new teaching model that deeply integrates modern educational theory and information technology. In blended teaching, teachers are the designers and supporters of learning activities, emphasizing student-centeredness, paying attention to students' independent learning and personalized learning experience, and taking ability development as the core goal.

Components of a Blended Teaching Model

Joyce.B.R.,et al (1986) suggested that a teaching model consists of five elements: 1) Focus: this is the center of the teaching model and includes both instructional objectives and environmental aspects. 2) Syntax: organizes the sequence of steps in a complete instructional process, and different models may contain different phases. 3) Social System: describes the relationship between the teacher and the students and the roles each plays in the instructional activity. 4) Principles of Reaction: guides the way the teacher responds to student activities and ensures appropriateness for the chosen teaching model. 5) Support System: describes the additional support needed by the teacher to successfully apply the teaching model, which may include facilities in the classroom, human resources, etc. In addition, there are two types of effects that are usually associated with a teaching model: 1) Instructional Effect: a direct effect, which is the instructional goals and outcomes that the teacher intends to achieve. 2) Nurturant Effect: an indirect effect, which is a by-product or windfall of the instructional activity. They argue that teaching models are not fixed pedagogical formulas because each learner's situation must be taken into account when implementing a teaching model.

According to some researchers, the components of a teaching model include:

1) Principles: core beliefs that guide the direction of teaching and learning. 2) Objectives: specific goals of teaching and learning that specify the outcomes that students are expected to achieve during the learning process, which encompass knowledge, skills, and attitudes. 3) Learning process: methods and strategies for implementing teaching and learning. 4) Outcomes: assessment, feedback, and optimization (Bereiter, C.,et al, 2006).

According to Wang,Q (2016): a complete teaching model usually includes the following five components :

1) Theoretical foundation: refers to the teaching and learning theory or educational thought on which the teaching model is based. The theoretical basis includes teaching and learning theory and educational thought, which is the basis for the formation of the teaching model and reflects the ideological core of the entire teaching model.

2) Teaching objectives: each teaching model is designed for a specific goal, and the teaching objectives are oriented to the content of the teaching model and reflect the value of the teaching model.

3) Teaching program: refers to the logical steps of teaching activities and the specific operation method of each step, it is flexible and changeable in the actual teaching process, teachers can refer to these procedures to implement the specific teaching process.

4) Realization conditions: In order to give full play to the effect of the teaching model, teachers optimize the combination of various teaching conditions (such as learners, content, methods, resources, etc.), which can be regarded as the selection of teaching means and strategies.

5) Evaluation: Each teaching model has different evaluation standards and methods due to different objectives, procedures and conditions. Evaluation not only examines the fulfillment of teaching objectives, but also tests the effectiveness of the teaching model.

This study synthesizes the above views and concludes that the constituent elements of Blended teaching model include six aspects: Principle, Objectives,

Learning process, Results, Teaching resources, and Evaluation, which are the elements that should be in line with the general requirements of the 21st Century teaching model and should Fully reflect the deep integration of information technology. Specifically:

Based on the above points of view, this study believes that the components of the blended teaching model include six aspects: Principle, Objectives, Learning process, Results, Teaching resources, and Evaluation. These elements must not only meet the overall requirements of the 21st century teaching model, but also fully reflect information technology. deep integration. Specifically: 1) Principles: the basis and guidelines of the blended teaching model, "student-centered"; 2) Objectives: Design a blended teaching model with goal orientation; 3) Learning process: The implementation of teaching activities, involving teaching strategies, methods and interactive methods, emphasizing flexibility and diverse learning experiences; 4) Results: Result-oriented with the cultivation of students' abilities; 5) Teaching resources: Utilize diversified teaching resources and make full use of digital teaching resources and information technology platforms on the basis of traditional teaching resources; 6) Evaluation: Throughout the entire teaching and learning process, it has the characteristics of diversity, continuity, comprehensiveness, personalization, and instant feedback.

Design, implementation, and evaluation of a blended teaching model

Design of a blended teaching model

The core concept of the blended teaching model is to redesign the course content in order to create an active and collaborative learning environment for students to stimulate their learning initiative and to motivate them to actively construct their personal knowledge system (Islam,M.K.,et al., 2022). Porter, W.W.,et al (2014) after an in-depth study of 11 colleges and universities in the United States, systematically summarized the main components of blended teaching design. the main components of blended teaching design, which are the three modules of teaching planning, teaching organization and teaching guarantee. In the teaching planning stage, teachers need to develop a comprehensive plan for blended teaching; in the teaching organization stage, the core task of teachers is to design and

organize diversified teaching activities; and in the teaching safeguard link, teachers need to provide the necessary backup support to ensure the smooth implementation of blended teaching . In addition, Barnum,C.,et al (2002) further refined the blended teaching process by proposing a "four-stage" model: firstly, online transmission of relevant learning resources, secondly, face-to-face lectures, then targeted solutions to difficult learning problems, and finally, collaborative learning expansion.

Based on the four-stage model, Eagleton,S (2017) proposed a more detailed seven-stage model. He subdivided blended teaching design into seven consecutive phases: front-end analysis, resource design, resource development, course implementation, course execution, course evaluation, and summary review. In the front-end analysis stage, teachers need to analyze the characteristics of the target audience and the content of the teaching materials; in the resource design and development stage, it is crucial to design effective teaching processes and methods, and to prepare corresponding teaching tools and resources; in the course implementation and execution stage, teachers need to carry out the teaching activities and record the students' learning; and in the final stage of course evaluation and review, teachers need to evaluate the effectiveness of the teaching and reflect on and generalize the improvements that can be made. reflect and generalize the teaching methods that can be improved .

In China, the research of Feng,X.Y., et al (2021) concluded that the key to the design concept of blended teaching model lies in three shifts: from teaching design to learning design, from knowledge transfer to competence cultivation, and from front-end design to whole-process design. Three key words: core goal design, learning experience design, and learning scaffold design. It is further proposed that the design of Blended teaching model is divided into three periods: 1) early course: teachers should focus on creating a sense of social presence and teaching presence, creating a good and positive learning atmosphere, making students feel a sense of belonging and letting them understand the course, trusting the teacher, and stimulating students' motivation to learn. 2) mid-course, the teacher guides students to learn effectively, promotes individual and group construction, and stimulates students'.

3) In the latter part of the course, teachers need to design learning activities to create a sense of cognitive immediacy, drive students' self-development with the explicit goal of comprehensive presentations, and effectively improve students' problem-solving skills and self-reflection and evaluation skills.

Implementation of the blended teaching model

This study concluded that the implementation of the blended teaching model consists of two parts: pre-implementation preparation as well as implementation strategies.

Preparation for the implementation of blended teaching involves three dimensions: students, teachers, and institutions, and this preparation is specifically divided into two dimensions: attitudes and competencies:

Student-level readiness. Attitudinally, relevant studies show that students, especially adult learners, mostly have an open and positive attitude towards blended learning (Osgerby,J.,2013). Competency readiness includes the ability to apply information technology, time management skills, maturity and responsibility, etc. (Cheon, J. et al., 2012).

Teacher-level preparation. Feng, X. Y., et al (2021) investigated the current status of teacher readiness in 25 provinces and autonomous regions in China. The findings showed that attitudinally, teachers recognized the effectiveness of Blended teaching. In terms of competence, the readiness of general competence to implement education and teaching, such as teaching philosophy, collaborative ability, and self-development ability, is high, while the readiness of specialized knowledge and competence to implement Blended teaching is low.

Institutional preparedness. Graham, C.R.,et al (2013) categorized educational institutions' readiness for blended teaching into three levels of development: awareness/inquiry, adoption/initial implementation, and mature development. Specifically, the institutional level should address blended teaching by providing support for information technology, faculty, ongoing investment, and senior administrator and faculty training (Poon, J., 2013).

Implementation strategies for the blended teaching model. Currently, the most authoritative research findings on implementation strategies for the blended

teaching model are the practice strategies developed from the Community of Inquiry (CoI) model proposed by Garrison,D.R., et al (2001). The three key elements of blended teaching in the CoI model are: social proximity, pedagogical proximity, and cognitive proximity, and effective learning only occurs when all three types of proximity are at a high level. Later, Cleveland-Innes, one of the founders of the model, added a fourth element to the model: emotional presence (Cleveland-Innes, M. ,et al., 2012).

Using the CoI model as a theoretical foundation, Vaughan, N.,etal (2015) concluded that the core strategy for blended teaching implementation is to "consciously integrate real-time and non-real-time learning activities" to build meaningful connections in the learning process. They proposed three different phases of implementation, with strategies for each phase including: before synchronous learning, designing meaningful learning activities to serve as triggering events. During the synchronous learning process, the focus is on "listening to and dialoguing with students". After synchronous learning, activity-centered, targeted post-lesson exercises are designed for students .

Evaluation of blended teaching model

Only based on the evaluation data can we objectively and truthfully reflect the effectiveness of the Blended teaching model and realize the continuous improvement of the Blended teaching model (Zhao, P., et al., 2019). Garrison,D.R., et al (2010) based on the Community of Inquiry model (CoI), designed a out a Blended teaching evaluation framework to form evaluation indicators. Currently, the questionnaire method or content analysis method is mainly used to analyze the application of the framework in evaluating Blended teaching. The questionnaire method is to let students fill in the questionnaire after teaching; the content analysis method is to analyze the text of communication and discussion content in the process of Blended teaching.

The evaluation of Blended teaching includes: evaluation of teaching model, evaluation of teaching effectiveness, evaluation of satisfaction (teachers, students), and evaluation of influencing factors (Wang,J. et al., 2019., Liang, J. et al., 2021., Zhang,L., 2022., Zhang, Q.et al., 2023).

The evaluation of this study is mainly about the applicability, consistency, and effectiveness of the blended teaching model: 1) Invite three experts (see Appendix A for the list of experts and the invitation letter of the experts) to evaluate the applicability of the teaching model through the Item Objective Consistency (IOC). 2) Compare the changes in the autonomous learning ability of college students before and after the implementation of the teaching model by comparing the situation to evaluate the effectiveness of the blended teaching model based on metacognitive theory. The evaluation tools mainly include scale, index of goal congruence (IOC), etc. to collect data, and the evaluation methods include process evaluation and result evaluation.

Synthesizing the above views, this study develops the design, implementation and evaluation of blended teaching model in the light of its own research objectives. The development of a blended teaching model based on metacognitive theory aims to enhance the autonomous learning ability of college students. Next, a literature review on autonomous learning ability is conducted.

Autonomous learning ability

Definition and evolution of autonomous learning

There is no uniform definition of autonomous learning. The main reason why different researchers disagree on the definition of autonomous learning is because of their different theoretical stances and the research perspectives they focus on. By collecting, organizing, and analyzing relevant literature, this study classifies the definition of autonomous learning from research perspectives into three categories: ability, process, and principle, and tries to show the development and evolution of research related to the definition of autonomous learning. The details are shown in the following table:

Table 2.3 Evolution of autonomous learning definitions

Researcher	Definition	Research Perspectives
Holec,H (1981)	The ability to take control of their own learning. Learners can independently decide their learning goals, content, pace and methods of learning, and have Self-monitoring ability and self-assessment.	Ability
Zimmerman ,B.J.(1990)	A systematic self-regulation process that emphasizes the use of metacognitive, motivational and behavioral strategies, as well as the use of self-monitoring and feedback loops to adjust learning methods and clarify when and how to use specific learning strategies.	Process
Little,D. (1996,2000)	The process of learner self-determination and self-regulation, the process of applying what has been learned, the integration of transcendence, critical thinking, self-determination, and independent action abilities.	Process Ability
Pintrich,P.R. (2000)	Active constructive process in which students set learning goals and monitor, regulate, and control cognition, motivation, and behavior, emphasizing the mediating role of autonomous learning in the student's individuality, environment, and achievement.	Process
Pang,W.G. (2010)	The process or ability of an individual to consciously set learning goals, develop a learning plan, select learning methods, monitor the learning process, and evaluate the results of learning.	Process Ability
Chen, Y. (2016)	A learning principle that emphasizes the learner's initiative and independence in the learning process (regulation, reflection, assessment, improvement).	Principle Process

Holec,H (1981) definition of autonomous learning has proved remarkably robust and remains the most widely cited definition in the field. He sees autonomous learning as the ability to take control of one's own learning, and the definition emphasizes the core characteristics of an autonomous learner, including planning learning, selecting materials, monitoring learning progress, and conducting self-assessment.

Holec,H (2007) also emphasizes that while autonomous learning implies a certain amount of freedom for the learner, this is not the same as a complete lack of restrictions. On the contrary, learners need to exercise their autonomy within a certain framework. In addition, autonomous learning ability is not innate but can be developed through learning and training, and teachers play an important role in promoting autonomous learning ability. Autonomous learning requires not only the support of the external environment, but also the active participation and mental preparation of the learners themselves.

Zimmerman (Zimmerman,B.J., 1989, 1990) provides a systematic summary of the definition of autonomous learning: 1) Emphasizes the use of self-regulation strategies in metacognition, motivation, and behavior. 2) Emphasizes that autonomous learning is a self-directed feedback loop process, and believes that autonomous learners are able to monitor the effectiveness of their own learning methods or strategies and to repeatedly adjust their learning activities in response to this feedback. 3) Emphasizes that autonomous learners know when and how to use a particular learning strategy and respond appropriately. (3) Emphasize that autonomous learning learners know when and how to use a particular learning strategy and respond appropriately.

According to Little, D (1996), autonomous learning is the process of learners' self-determination and self-regulation in applying what they have learned, including a blend of transcendence, critical thinking, Self-determination abilities, and independent action. In a follow-up study, Little, D (2000) further suggested that the definition of autonomous learning should emphasize the psychology of the learner, placing psychological factors at the heart of autonomous learning, including the learner's psychological readiness, motivation, and their attitudes towards learning, among others.

According to Pintrich, P.R (2000), autonomous learning is an active, constructive learning process in which students first define learning goals for themselves, and then monitor, regulate, and control cognitions, motivations, and behaviors that are guided and constrained by the goals and the characteristics of the situation. Autonomous learning activities mediate individual, environmental and overall student achievement.

According to Pang (Pang,W.G., 2010), autonomous learning generally refers to the process or ability of an individual to consciously determine learning goals, make learning plans, choose learning methods, monitor the learning process, and evaluate the learning results. Pang advocates defining autonomous learning in both horizontal and vertical dimensions (Pang,W.G., 2003):

1) The horizontal dimension refers to the comprehensive definition of autonomous learning in terms of all aspects or dimensions of learning. If learners can consciously make choices and control all aspects of learning, their learning is fully autonomous. 2) The vertical dimension refers to the interpretation of the essence of autonomous learning from the whole process of learning. If the learner is able to set learning goals, make learning plans and make specific preparations for learning before the learning activity, to make self-monitoring, self-feedback and self-adjustment of the learning progress and learning methods during the learning activity, and to carry out self-checking, self-summarizing, self-assessment and self-remediation of the learning results after the learning activity, then his learning is autonomous learning.

According to Chen,Y.Q (2016), autonomous learning is a learning principle, and the definition about autonomous learning should emphasize the learner's initiative and independence in the learning process, which specifically includes regulation, reflection, assessment, and improvement.

Comprehensively analyzing the above viewpoints, autonomous learning is a process, and autonomous learning ability is the ability to control one's own learning. Autonomous learning ability mainly includes the ability of learners to independently determine learning goals, formulate learning plans, choose learning methods, monitor the learning process, and evaluate learning results. Based on the research questions and research objectives of this study, we will mainly focus on the research on autonomous learning ability.

Influences on autonomous learning ability

The previous studies related to the definition of autonomous learning show that autonomous learning can be seen as both a process and an ability. As a learning process, autonomous learning requires both internal necessary conditions and external supportive conditions. As an ability, autonomous learning is the result of long-term interaction between the learner and the external environment, and is a relatively stable learning characteristic of individuals in different contexts. Therefore, most scholars agree that the influencing factors of autonomous learning come both from within the individual and from the external environment.

Ridley,J (2000) states that the influences on autonomous learning ability include: 1) attitude, the learner takes responsibility for his or her own learning, is willing to face challenges, is willing to change, and is willing to learn. 2) character, including motivation to learn, to accomplish learning goals independently, to carry out learning activities, and to demonstrate learning outcomes. 3) skill, to design a learning plan, to carry out learning activities, and to manage the learning practices .

The study of Hussein,A.K., et al (2012) pointed out that the internal factors affecting autonomous learning ability include motivation, self-confidence, self-discipline, and study habits, of which motivation is the most critical internal factor affecting autonomous learning ability. External factors include: environmental support, technological tools, educational system, socialization and cultural atmosphere.

According to Pang,W.G (2001, 2003, 2010), internal factors affecting autonomous learning include 1) self-efficacy, the individual's self-confidence in his or her abilities. 2) attribution, the causal explanations that individuals make for their successes and failures. 3) goal setting, which guides the individual's learning process. 4) acquisition of cognitive strategies, the individual's methods of processing external information. 5) Level of metacognitive development, the individual's level of awareness of his or her own cognitive activities. 6) Level of volitional control, maintaining the continuity of autonomous learning. 7) Gender roles, there are certain gender differences in autonomous learning. External factors affecting autonomous learning include: 1) school education, teaching model, teaching method of teaching

materials, educational technology, classroom management style, learning community, etc. 2) family factors, which have an impact on motivation and ability of autonomous learning. 3) cultural factors, which have an impact on the characteristics of autonomous learning. 4) the level of autonomy, which has an impact on the ability of autonomous learning. 5) the level of metacognitive development, the level of individual's cognitive activity. 6) the level of volitional control, which maintains the continuity of autonomous learning. 7) gender roles, which have some gender differences in autonomous learning.

Entering the “Internet+”era, with the in-depth integration of information technology and education and teaching, bringing about the upgrading of educational concepts and the innovation of educational models, and the teaching methods and means are more personalized and diversified, the factors affecting the autonomous learning ability include: 1) externally, the development of educational technology will inevitably produce a series of impacts on the teaching model, teaching materials pedagogy and the way of classroom management, etc (Roy, A., 2019). In addition, the level of information technology application, the development and utilization of network resources have also become new external factors affecting autonomous learning ability (Ni, E., 2020). 2) Internally, the main effects on the learners themselves are to increase the opportunities for learners to express themselves, the confidence,heart of learning, to improve classroom participation or homework completion rate, to mobilize students' motivation to learn, and to improve students' ability to learn continuously (Dang, T. T., 2010)

This study argues that the influencing factors of autonomous learning ability include internal and external. As autonomous learning is characterized by subjectivity, autonomy and independence, some factors from within the learner and related to the psychological mechanism are the most crucial to the autonomous learning ability. Therefore, taking metacognitive monitoring as the theoretical basis, research on the psychological mechanism of learners' monitoring and regulating the process of autonomous learning is more conducive to capturing the essence of autonomous learning ability.

Acquisition, development, and evaluation of autonomous learning ability

Access, from the learner's perspective. Cultivation, from an educator’s perspective.

According to Sheerin, S (2014), learners should have the following competencies: 1) the ability to formulate and, if necessary, adjust learning objectives; 2) the ability to judge whether learning materials and learning activities are in line with the learning objectives; 3) the ability to select learning materials and learning content; 4) the ability to select or self-design the way learning activities are carried out and execute them; 5) the ability to negotiate with teachers or other learners Ability to negotiate with teachers or other learners; 6) Ability to monitor the implementation of learning activities; 7) Ability to adjust attitudes, motivation and other affective factors; 8) Ability to evaluate learning outcomes.

Pang.W.G (2003) summarized three ways of acquiring autonomous learning ability: 1) targeted instructional guidance; 2) learners acquire some autonomous learning strategies by observing and imitating the learning of others; 3) learning experiments designed and implemented by learners themselves.

However, Zimmerman,B.J (2008) pointed out that obtaining autonomous learning ability through personal learning experiments and observation of other learners is a tedious and inefficient task. The effect is much less effective than direct, targeted instruction. In order to better cultivate students' autonomous learning ability, teaching should be regarded as a main training method.

From the educator's perspective, cultivating autonomous learners is the fundamental goal of education (Pei. D.N., 2015). Cultivating or improving students' autonomous learning ability can be achieved by updating educational concepts, developing teaching models, innovating teaching methods, and enriching teaching strategies (Mynbayeva, et al., 2018).

Lai, B.G (2008) suggested that the development of students' autonomous learning ability includes improving the ability to utilize resources, motivation to learn, mastery of information strategies, and enhancement of self-discipline. In addition, since the development of students' autonomous learning ability is the best way to create sufficient motivation for the learning process, it can also be improved by

building motivation for learning, designing a learning plan, and checking self-mastery of knowledge content and learning performance.

Nguyen, T. (2020) is more specific. He constructs an O20 (Online/Offline) Chinese as a foreign language teaching model suitable for Vietnamese universities to enhance students' autonomous learning ability, and explores the design of learning environment, learning activities and learning evaluation suitable for the O20 model. Combined with case studies, he verifies the effectiveness of the O20 teaching model in promoting learners' autonomous learning ability. He suggests that in the "Internet+" era, the importance of autonomous learning ability has been emphasized, and that innovative teaching model is a must for the development of education and teaching.

Based on the hypothesis that blended teaching model can effectively improve students' autonomous learning ability, this study develops a blended teaching model based on metacognitive theory, and verifies the effectiveness of the blended teaching model based on metacognitive theory in promoting students' autonomous learning ability by comparing the before and after implementation of the teaching model.

Evaluation of autonomous learning ability.

Knowles, M.S (1975) was one of the first scholars to propose dimensions for assessing autonomous learning ability. He believed that students' autonomous learning ability could be assessed in six dimensions: learner responsibility, attitude to learning, motivation to learn, selection of learning strategies, management of time and resources, monitoring and evaluation.

Crowther,J (2004) classified the assessment of autonomous learning ability into eight dimensions such as desire to learn, responsibility for learning, information processing ability, a wide range of learning strategies, problem solving, critical thinking, self-regulation ability, social skills, etc. Liu,T (2005) believed that an autonomous learner should have various abilities such as learning management ability, learning technology ability, learning selection ability, learning construction ability, learning regulation ability and learning evaluation ability. Another researcher, HU, J.H (2011) believes that they should be evaluated in seven dimensions, such as motivation, confidence, content of the objectives, knowledge of learning strategies, planning, assessment, and monitoring ability.

Sun,J.L., et al (2021) analyzed the current status and trend of international research on the evaluation of autonomous learning ability, and classified the assessment tools of autonomous learning ability commonly adopted internationally into three categories: personal report survey tools, structured interview survey tools and teacher judgment tools. The adopted evaluation methods of autonomous learning ability mainly include observation method, survey method and learning analysis method.

This study evaluates the learners' autonomous learning ability in the three dimensions of Self-determination ability, Self-monitoring ability, and Self-evaluation ability by combining the three aspects of metacognitive planning, monitoring, and evaluation of the learning process.

Related Research

In this study, a Blended teaching model based on metacognition theory was developed for the music majors of Neijiang Normal College as a research group, and the teaching experiment was conducted in the course of “Vocal Basics and Song Singing”, aiming to improve the autonomous learning ability of college students. The following is a literature review of metacognition in music learning and the development and application of Blended teaching model in vocal music course.

Metacognition in music learning

In 1989, at the Music Educators National Conference (MENC) in the United States, Pogonowski,L (1989) proposed that metacognition is a dimension of musical thinking, and that music learners can take control of their own learning process through metacognitive skills for greater success. Boardman,E (2002) further proposed that metacognition is the basic thinking type of music learning and plays a vital role in music learning. Hanna,W (2007) reviewed and revised Bloom's taxonomy, he listed metacognition as the main type of knowledge and proposed the importance of metacognition to music education. He believes that the ability to express music skillfully requires a high degree of self-cognition, and the development of metacognitive knowledge can help music learners understand their musical talents more comprehensively and make progress in music learning.

Benton, C.W (2014) defines metacognition in music learning in terms of “thinking about thinking” and argues that metacognition is a beneficial pedagogical tool in music teaching. She proposes three metacognition-based activities in music learning: 1) reflective writing. Students engage in reflective writing based on teacher prompts and guidance. 2) Self-assessment. Students identify their strengths and weaknesses as well as assess their musical development. 3) Thinking out loud. Students can express their thinking process and share learning strategies with a partner in a music learning task. She believes that the teacher's influence in the music learning process is mainly to enable students to develop self-awareness, self-determination (goal setting, planning, and strategy use), self-assessment, and other learning skills, and to gradually develop autonomous learning ability, and then to become lifelong music learners.

Concina,E (2019) argues that metacognitive knowledge and skills are critical for musicians in their academic and professional careers, enabling them to organize, monitor, evaluate, and revise practice plans based on specific performance goals. It also has broader educational implications. The teaching strategies he suggests include: 1) Reflecting on practice and performance: Through journal entries, seminars, or feedback sessions, teachers encourage students to reflect deeply after musical practice and performance to assess what went well or needs improvement. 2) Self-assessment: Students learn how to assess their own musical performance and learning progress, identifying strengths and weaknesses in order to better plan for future learning directions. 3) Clarifying goals Setting: Teachers guide students to set specific and achievable learning goals to help them practice purposefully and challenge themselves while avoiding excessive difficulty. 4) Introduction and application of learning strategies: Teachers introduce and guide students to apply effective learning strategies and techniques, such as segmented practice and slow playback, in order to enhance students' comprehension and memorization of musical material.

In China, Ma,D (2003) was the first to focus on the important role of metacognition in music learning. He argued that the role of metacognition is usually neglected in traditional music education, and that the introduction of metacognition

can help students monitor and regulate their learning process more effectively and obtain better learning outcomes. He proposed seven metacognition-based music learning strategies: 1) Music learning diary. By recording what they learn on a daily basis and the difficulties they encounter, students are prompted to reflect on and optimize their learning process. 2) Increase awareness of cognitive processes. Teachers and students share the thinking process of problem solving to enhance students' cognitive awareness and self-regulation. 3) Instructing students to engage in self-questioning. Students are encouraged to continually ask themselves questions in order to develop self-monitoring and critical thinking skills. 4) Summarize learning material. Test and deepen students' understanding of the material by summarizing and outlining points. 5) Assessing comprehension. Allow students to assess their own understanding to ensure an accurate grasp of the content. 6) Focus on factors related to learning effectiveness: Make students aware of the key factors affecting learning effectiveness, and help develop effective learning strategies. 7) Reflect on learning: Through a series of reflective steps, help students identify and solve learning problems and optimize their learning methods.

Zhang,S.H (2014) study used a teaching experiment to implement a teaching model based on metacognitive theory in the vocal music courses, and compared the effectiveness of students' vocal music learning through the pre-test and post-test of the implementation of the teaching model. The results of the experiment showed that the application of metacognitive theory can significantly improve the quality of vocal music teaching and students' learning effectiveness.

This study argues that in music learning, metacognition can help learners plan, monitor, and evaluate their learning process, enhance their autonomous learning ability, and improve the effectiveness of music learning.

Development and application of Blended teaching model in vocal music courses

Vocal course is a professional compulsory course offered by music majors, and the traditional teaching model of vocal course mainly adopts the face-to-face teaching method of teachers and students. Through literature search, it is found that in recent years the research related to the development and application of Blended

teaching model in the vocal music course has increased year by year. This also reflects that under the background of the era of digital development of education, the deep integration of information technology and curriculum teaching is an inevitable trend of education and teaching development.

Tang, H. M.,et al (2021) developed a new teaching model for use in university vocal music classes, and proposed some specific teaching strategies: 1) Choose an appropriate online teaching platform to ensure sound quality and video quality. 2) Prepare necessary teaching aids for better demonstration and correction. 3) Creating a quiet teaching environment is a prerequisite for ensuring good teaching results. 4) Use high-quality video resources to assist teaching and provide examples of professional standards for students' independent learning. 5) Conduct teacher-student interaction and post-class summary through the online platform to ensure the interactivity of teaching and the timeliness of feedback. This study believes that the use of blended teaching models in vocal music courses can enhance teaching interaction, stimulate students' learning motivation, help teachers improve their information technology application capabilities, and comprehensively improve teaching quality.

Wang,H.T (2022) took the vocal music curriculum reform in the music education major as the research object, and developed a blended teaching model based on improving students' core competencies. Specifically, it includes: 1) Online teaching, which provides video courses on vocal music theory and techniques through an online platform to facilitate students' independent learning. 2) Offline practice, focusing on face-to-face practical teaching and personalized vocal guidance. 3) Flipped classroom: Encourage students to study online, while offline classes focus on practice, discussion and problem analysis to enhance learning interest. 4) Technical assistance: Use technical tools for course management and learning monitoring to ensure real-time feedback. 5) Course content: Redesign the course content based on the future career needs of college students majoring in music education (primary and secondary school music teachers).

Wu,W.J (2024) proposed the following implementation strategies for the application of blended teaching models in vocal music classes: 1) Micro-video

assisted teaching. Teachers use micro-videos to demonstrate vocal techniques and work analysis, stimulate students' creativity, and provide personalized feedback. 2) Combine online learning with offline evaluation. Combining online theoretical learning with offline practical exercises to ensure that students can apply knowledge in practice. 3) Offline targeted tutoring: Use video teaching to expand non-classroom learning, and offline classes focus on solving specific problems in students' learning. 4) Optimize the assessment and evaluation mechanism. Integrate online and offline performance to comprehensively evaluate students' learning effectiveness through comprehensive data and actual performance. Wu believes that these strategies jointly promote the personalization and flexibility of teaching, strengthen students' active learning and creativity, and effectively improve students' core literacy and comprehensive artistic abilities.

By analyzing and organizing the literature, the relevant research on blended teaching model in vocal music courses currently has the following deficiencies: 1) the development of the teaching model lacks a theoretical basis. 2) the main focus is on the enhancement of students' vocal skills, which has not risen to the cultivation of competence. 3) there is a lack of empirical research, which does not adequately validate the effectiveness of the Blended teaching model in the vocal music courses. Remedying these deficiencies became the motivation for the conduct of this study, as well as the significance and innovation of this study.

This study develops a blended teaching model based on metacognitive theory, aiming to improve college students' autonomous learning ability.

Chapter 3
Research Methodology

This study adopts a research and development (R&D) approach. The objectives of the study were: 1) to investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University, 2) to develop blended teaching model based on metacognitive theory to improve students' autonomous learning ability, 3) to compare the effectiveness of the blended teaching model based on metacognitive theory to improve students' autonomous learning ability before and after the implementation.

The research process is divided into three steps: The first step is to investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University, the second step is to develop blended teaching model based on metacognition theory, the third step is the experimentation and improvement of teaching model.

The detailed content of this chapter is introduced as follows:

Step 1: To investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University

The Population / The Sample Group

The Population

The population for the survey study on the status quo of college students' autonomous learning ability is 2,000 college students of Neijiang Normal University.

The Sample Group

In this study, the sampling principle of convenience sampling was used to confirm that the sample group was college students from the College of Music of Neijiang Normal University. According to Krejcie & Morgan's (1970), 400 college students were selected as respondents.

Research Tools

Questionnaires

1. Documentary review/Research report review

2. Questionnaire of autonomous learning ability of college students. The questionnaire consists of two parts:

The first part is common data of the respondent, consists of gender, age, and grade level.

The second part is autonomous learning ability scale. It is based on the College Students' Autonomous Learning Scale compiled by Pintrich, P.R., et al (1990) and Zhu, Z.D., et al (2005) and revised according to the studies of Wang, X.S (2019) and Li,L.Y., et al (2023), which is divided into three dimensions of autonomous decision-making ability, self-monitoring ability, and self-evaluation ability, with a total of 15 questions, using a 5-point Likert scale ranging from strongly disagree (1 point) to strongly agree (5 points), with higher scores indicating greater autonomous learning ability.

(Appendix C for Research Instruments: Autonomous Learning Ability Scale)

The development process of research tools

1. Review concepts, theories, research papers and research frameworks related to autonomous learning ability of college students.

2. Based on the information obtained from the review, a questionnaire on the autonomous learning ability of college students was drafted. The questionnaire consists of two parts:

Personal background information, which is mainly designed to understand the basic situation of the research subjects, mainly including gender, age and grade.

College Students' Autonomous Learning Ability Scale, which aims to measure the status of college students' autonomous learning ability. The scale consists of three dimensions: self-monitoring ability, self-evaluation ability, and self-determination ability, and adopts a 5-point Likert scale, with higher scores indicating stronger autonomous learning ability. The scale was developed for Chinese college

students, has good reliability, and can effectively measure the status of autonomous learning ability of college students. The scale is scored as follows:

Scale 5 means students can follow this sentence/question as much as possible.

Scale 4 means students can follow this sentence/question very much.

Scale 3 means students can moderately follow this sentence/question.

Scale 2 means Students are less able to follow this sentence/question.

Scale 1 means students can follow this sentence/question the least.

3. To present the draft of questionnaire to the advisors for checking correctness and completion.

4. To have content validity by three experts (including curriculum and teaching experts, educational expert, and psychologists) against the following criteria Item-Objective Congruence (IOC).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = The contents are not Guangxi Province related to the topics

The acceptable items must have the IOC values not less than 0.5. The questionnaire was then revised according to the experts' comments and suggestions. The questionnaire was pre-tested and finally the reliability and validity of the questionnaire was analyzed using statistical software to develop a questionnaire suitable for this study. In this study the result of the assessment of the consistency of the questionnaire the expert received an IOC equal to 0.67-1.00 for every item, (the acceptable value is between 0.50-1.00) which was considered that the assessment form was content-consistent. In this study, the autonomous learning ability Scale has a Cronbach's coefficient reliability value (α) at 0.88, the cumulative explained variance is 56.12 percentage.

Data Collection

1. An invitation letter is obtained from the Graduate School and sent to Neijiang Normal University to allow the researcher to conduct the survey activity. The

investigator will clarify the purpose to respondent and distribute the consultation questionnaire.

2. According to the final revised questionnaire on college students' autonomous learning ability, a questionnaire survey was conducted on 400 college students, and the recovered data were analyzed in terms of mean, standard deviation, and content, and the idea of developing a blended teaching model to enhance college students' autonomous learning ability was finally summarized.

Questionnaires were collected, checked, coded, filed, and then analyzed.

Data Analysis

The data of autonomous learning ability of college students in Neijiang Normal University were analyzed to identify frequency, percentage, mean and standard deviation. Researchers have proposed a hierarchical classification of data analysis results to facilitate mutual understanding when providing the following information.

The criteria for interpreting the mean scores are as follows:

Mean Score 4.51 - 5.00 means students can practice at “the highest level”.

Mean Score 3.51 - 4.50 means students can practice at a “high level”.

Mean score 2.51 - 3.50 means students can practice at a “medium/moderate level”.

Mean Score 1.51 - 2.50 means students can practice at a “low level”.

Mean Score 1.00 - 1.50 means students can perform at “the lowest level”.

Step 2: To develop blended teaching model based on metacognition theory

Development of teaching model: Based on the theory of metacognition, the development of blended teaching model to improve college students' autonomous learning ability. It is mainly carried out in the following five steps:

1. Clarify the components of the blended teaching model

1) Research and analyze theories related to metacognition theory, blended teaching model, and autonomous learning ability.

2) Exploring the relationship between metacognition theory, blended teaching model, and autonomous learning ability.

2. Clarify the goals and principles of the blended teaching model

1) The development of a blended teaching model based on metacognition theory aims to enhance the autonomous learning ability of college students, with the specific goal of cultivating students' autonomous learning ability, including autonomous self-determination ability, self-monitoring ability and self-evaluation ability.

2) The design of a blended teaching model based on metacognition theory to enhance the autonomous learning ability of college students has four main design principles: clear objectives, metacognition cultivation, personalized teaching resources, and building a feedback mechanism.

3. Create a blended teaching model and develop guidelines for the teaching and learning process

1) Create a blended teaching model based on metacognition theory based on the theories, objectives and principles explored in the above steps and present it in a diagram.

2) Develop a process guide for the teaching model and detail the content and requirements of each element of the teaching model.

4. Checking the feasibility of teaching model and teaching process guidelines

The feasibility of the teaching model and teaching process guidelines will be assessed primarily by placing relevant documents, such as the teaching model and teaching process guidelines, available for expert review, editing, and recommendations. The details are as follows:

The Experts

Three professional scholars included curriculum and instruction expert pedagogical expert. This course evaluation consists of three experts (Appendix A for list of specialists and letters of specialists' invitation for IOC verification), who will evaluate the applicability of the teaching model.

Research Tools

Questionnaire.

Checklist on the quality of teaching model/ Questionnaire.

The tool used for data collection is the evaluation of teaching model compliance using the index of objective consistency (IOC) as the consideration standard.

The development process of research tools

1. Studied the pedagogical model and development process of the checklist/questionnaire.

2. Drafted the checklist/questionnaire.

3. Validated/checked the structural validity of the teaching model quality checklist/questionnaire by professional scholars consisting of three experts from Thailand and revised the teaching model quality checklist/questionnaire based on the recommendations.

At the end of each section, there is a space for experts to write suggestions that can help improve.

Data Collection

Invitation letters are obtained from the Graduate School and sent to professional bodies to allow the researcher to conduct the survey activities. Clarify the purpose to the interviewee by the investigator and distribute the consultation questionnaire. Details are as follows.

Pre-survey preparation: Preparation of consultation questionnaire and note-taking equipment.

Consultation request. During the consultation request process, the investigator first informs the purpose of the survey and after the interviewee agrees to the survey, the survey consultation questionnaire is given to the interviewee.

Organize the questionnaire data. Based on the data collected, the respondents' opinions and suggestions on what constitutes a "blended teaching model based on metacognition theory" were understood and the final teaching model was determined.

Data Analysis

Conformity Assessment Use the index of consistency as a criterion for consideration (Index of Objective Consistency = IOC) with the following criteria:

Rating is +1 there is an opinion that “Corresponds to the teaching model outline elements.”

Rating is 0 there is an opinion that “Not sure it corresponds to the teaching model outline elements.”

Rating is -1 there is an opinion that “Inconsistent with the teaching model outline elements.”

The result of the assessment of the consistency of the teaching model outline components the expert received an IOC equal to 1.00 for every item, (the acceptable value is between 0.50-1.00) which was considered that the assessment form was content-consistent.

5. Improve and document the teaching model.

Taking into account and improving the information obtained from expert revisions and recommendations, in order to obtain a complete teaching model and document the teaching model.

Step 3: The experimentation and improvement of teaching model

The Population / The Sample Group

The Population

250 freshmen students of the College of Music of Neijiang Normal University.

The Sample Group

30 students from a class at the College of Music, Neijiang Normal University, were selected through cluster random sampling."

Research Tools

Instruments

1. Lesson plan according to the teaching model.

2. Assessment form for validity of lesson plan according to the teaching model.

3. Assessment form for validity of autonomous learning ability and learning self-assessment scale of college students.

The development process of the Research Tools

1. The process of developing a lesson plan based on the teaching model.

1) Study the concept and development process of lesson plans.

2) Elements of the lesson plan identified: Concept, Content, Objectives, Teaching/Learning process, Teaching tools, Evaluation.

3) Studied the details of the teaching model. In this study, 16 class hours in 4 units were mainly selected for experimental study.

4) Drafted lesson plans based on the teaching model. The specific content consists of Unit 1: Breathing in Singing, Unit 2: Resonance in singing, Unit 3: language in singing, and Unit 4: Song singing training, and each unit has 5 steps within it: Step 1 Objective setting, Step 2 Knowledge acquisition, Step 3 Cognitive monitoring, Step 4 Personalized learning, Step 5 Cognitive assessment.

5) Advisers validated the details of the teaching model

6) Modify the details of the teaching model according to the suggestions

7) Validation of the details of the teaching model by 3 professional scholars.

8) Modification of the teaching model based on the recommendations of three professional scholars.

2. The development process of assessment form for validity of lesson plan according to the teaching model.

1) Studied about concept and development process of assessment form for validity of lesson plan

2) Drafted assessment form for validity of lesson plan the level of consideration is as follows:

Rating is +1 there is an opinion that "Corresponds to the lesson plan topics."

Rating is 0 there is an opinion that "Not sure it corresponds to the lesson plan topics."

Rating is -1 there is an opinion that "Inconsistent with the lesson plan topics."

At the end of each section, there is a space for experts to write suggestions that can help improve. The test consistency index of congruency is 1.00, which is from the second part in the Appendix C.

3) Verified assessment form for validity of lesson plan by advisers

4) Modified the assessment form for validity of lesson plan according to suggestion

3. The development process of assessment form for validity of autonomous learning ability and Learning self-assessment scale of college students.

The autonomous learning ability scale for college students was revised from the questionnaire used in Step 1 of this study. It has been divided into two parts: autonomous learning ability and autonomous learning ability in vocal basics and song singing course. The results of the experts' assessment of the consistency of the components of the autonomous learning ability scale mostly align with the criteria, except for item 10 (IOC=0.33, not within the acceptable range), "Even if I am not interested in a particular unit of the course, I will try to find a way to learn it." This item was revised based on expert opinion. The modified item 10 now reads:" Although some unit of the course is not interesting, I can learn about it happily". The revised autonomous learning ability scale has a Cronbach's alpha coefficient reliability value (α) of 0.90.

The development process of the validity of the self-assessment scale for college students' learning.

1) Research on the concept and development process of the validity assessment form of the learning self-assessment scale for college students. The learning self- assessment scale was adapted from Barnard, L., et al.'s (2009), and was based on a 5-point Likert scale with 9 question items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with 1-3 for objective setting evaluation, 4-6 for task strategies evaluation, and 7-9 for Self-evaluation. The scale is scored as follows:

Scale 5 means students can follow this sentence/question as much as possible.

Scale 4 means students can follow this sentence/question very much.

Scale 3 means students can moderately follow this sentence/question.

Scale 2 means Students are less able to follow this sentence/question.

Scale 1 means students can follow this sentence/question the least.

2) Drafting the assessment form for validity of learning self-assessment scale for college students:

Rating +1 refers to the expertise are sure that the contents are related to the topics

Rating 0 refers to the expertise are not sure that the contents are related to the topics

Rating -1 refers to the expertise are Sure that the contents are not related to the topics

At the end of each section, there is a space for experts to write suggestions that can help improve.

The result of the assessment of the consistency of the learning self-assessment scale components the expert received an IOC equal to 0.67-1.00 for every item, (the acceptable value is between 0.50-1.00) which was considered that the assessment form was content-consistent. In this study, the learning self-assessment scale has a cronbach's coefficient reliability value (α) at 0.76, the cumulative explained variance is 67.27 percentage.

Experimental design

This research is experimental research. One Group Pretest – Posttest Design was used with the following experimental design:

Table 3.1 Experimental design

Group	Pretest	Experimental	Posttest
R	O1	x	O2

The meaning of symbols used in experimental design.

R means random sampling

X means experimental

O1 means Pretest Observation

O2 means Posttest Observation

Experimental and improvement process

1. 30 university students were tested on their autonomous learning ability

2. 30 students from the School of Music of Neijiang Normal University were taught in 4 units, each unit is 4 hours, total of 16 hours according to the teaching model.

3. After each lesson, students assessed their Learning effect by using the learning self-assessment scale.

4. 30 university students were tested on their autonomous learning ability at the end of the total course.

5. Analyze the data and improve the teaching model based on the recommendations.

Data collection

In this phase of the study, the researcher followed the following procedure to collect data.

The researcher applied for authorization from the university where the survey was conducted to conduct a pilot study with 30 college students from the College of Music at Neijiang Normal University.

The investigator explained to the students the content of the Vocal Basis music and Song Singing course in the blended teaching model based on the metacognition theory, emphasizing the principles of voluntary participation, confidentiality of information, and anonymity.

The investigator analyzed and processed the data based on theories and methods related to teaching and learning pilot study.

Data Analysis

This study is divided into two parts: a Qualitative research Methodology and a Quantitative research Methods.

Qualitative research Methodology:

Qualitative data were analyzed through content analysis.

Quantitative research Methods:

1. To analysis on the study of autonomous learning ability stud of college students, the data was described by mean and standard deviation.

The criteria for interpreting the mean scores are as follows:

Mean Score 4.51 - 5.00 means students have autonomous learning ability at “the highest level”.

Mean Score 3.51 - 4.50 means students have autonomous learning ability at “high level”.

Mean score 2.51 - 3.50 means students have autonomous learning ability at “moderate level”.

Mean Score 1.51 - 2.50 means students have autonomous learning ability at “low level”.

Mean Score 1.00 - 1.50 means students have autonomous learning ability at “the lowest level”.

2. To compare the differences between the pretest and post-test college students' autonomous learning ability, the data was described by mean, standard deviation, t-test for dependent sample, degrees of freedom.

3. To understand the self-assessment of learning effect of college students in the blended teaching model, the data are described by mean and standard deviation.

Chapter 4
Results of Analysis

This study adopts a research and development (R&D) approach. The objectives of the study were: 1) to investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University, 2) to develop blended teaching model based on metacognition theory to improve students' autonomous learning ability, 3) to compare the effectiveness of the blended teaching model based on metacognition theory to improve students' autonomous learning ability before and after the implementation.

The analysis of research results is divided into three steps:

Result of Part 1: To investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University.

Result of Part 2: To develop a blended teaching model based on metacognition theory.

Result of Part 3: To experimental and improvement of blended teaching model.

The details are as follows.

Symbol and abbreviations

f	represents frequency
%	represents percentage
$\bar{X}$	represents for average value
S.D.	represents for Standard deviation
df	represents the degree of freedom
t	represents for t-test for dependent sample test
Sig.	represents for significance

Results of Data Analysis

This study used statistical software such as to apply statistical tests for general data analysis of the respondents, presenting basic data, current status of autonomous learning ability, testing of teaching experiments, and satisfaction statistics of the respondents in terms of mean ($\bar{X}$), standard deviation (S.D.), percentage (%), t-test (t), and Sig. (<0.01**) were presented to present the basic data of the respondents, the current status of autonomous learning ability, the test of the teaching experiment, and Learning effect statistics.

Result of Part 1: To investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University

1.1 Present study participants data

400 college students at Neijiang Normal University, Sichuan, participated in a survey on autonomous learning ability.

Table 4.1 Frequency and percentage of common data of the respondent in overall

(n=400)

Common data of the respondent	Frequency(f)	Percentage(%)
Gender		
1.Male	77	19.25
2.Female	323	80.75
Total	**400**	**100.00**
Age		
1.18	82	20.50
2.19	174	43.50
3. 20 and above	134	36.00
Total	**400**	**100.00**
Grade		
1. first year	245	61.25
2. sophomore	142	35.50
3. junior	11	2.75
4.senior	2	0.50
Total	**400**	**100.00**

From Table 4.1, it is found that the respondents college students in terms of gender, the highest proportion of the number of female students totaled 323 people accounted for 80.75 percentage. In terms of age, 19-year-old students 174 people accounted for 43.50 percentage of the highest proportion. In Grade, first year students 245 people accounted for 61.25 percentage proportion is the highest.

1.2 Respondents autonomous learning ability level

The researcher proposed a hierarchical classification of data analysis results to facilitate mutual understanding when presenting the following information. Autonomous learning ability consists of three dimensions as illustrated in Tables 4.2.

Table 4.2 Autonomous learning ability data

(n=400)

Autonomous learning ability	$\bar{X}$	S.D.	Level	Ranking
1. Self-determination ability	3.63	0.63	high	1
2. Self-monitoring ability	3.45	0.72	moderate	2
3. Self-evaluation ability	3.42	0.70	moderate	3
Total	**3.50**	**0.69**	**moderate**	

From Table 4.2, The autonomous learning ability of college students in Neijiang Normal University, is at a moderate level ($\bar{X}$=3.50, S.D.=0.69). From the composition of autonomous learning ability, students scored best at “Self-determination ability” ($\bar{X}$=3.63, S.D.=0.63), followed by “Self-monitoring ability” ($\bar{X}$=3.45, S.D.=0.72), and lastly, “Self-evaluation ability” ($\bar{X}$=3.42, S.D.=0.70).

1.3 Respondents autonomous learning ability level in aspect of self-determination ability

The researcher proposed a hierarchical classification of data analysis results in order to understand each other when providing the following information. There are autonomous learning ability level in aspect of self-determination ability measurement presentation as table 4.3.

Table 4.3 Mean and standard deviation of data analysis on autonomous learning ability level in aspect of self-determination ability

Self-determination ability	$\bar{X}$	S.D.	Level	Ranking
Students can choose the next focus based on their learning goals.	3.66	0.60	high	2
Students can adjust their learning plan based on the completion of learning tasks.	3.64	0.60	high	3
Students can adopt appropriate learning methods based on their learning content.	3.63	0.58	high	4
Students will consciously seek suitable learning partners.	3.52	0.70	high	5
If student encounter a question that they cannot answer, they will actively seek help from others through the Internet.	3.72	0.63	high	1
Total	**3.63**	**0.63**	**high**	

From Table 4.3, the autonomous learning ability of college students in Neijiang Normal University in aspect of self-determination ability, is at a high level ($\bar{X}$=3.63, S.D.=0.63).

From the composition of self-determination ability, “If Students student encounter a question that they cannot answer, they will actively seek help from others through the Internet” showed the highest rank ($\bar{X}$=3.72, S.D.=0.63). Followed by “Students can choose the next focus based on their learning goals” ($\bar{X}$=3.66, S.D.=0.60). While in “Students will consciously seek suitable learning partners” showed the lowest rank. ($\bar{X}$=3.52, S.D.=0.70).

1.4 Respondents autonomous learning ability level in aspect of self-monitoring ability

The researcher proposed a hierarchical classification of data analysis results in order to understand each other when providing the following information. There are

autonomous learning ability level in aspect of self-monitoring ability measurement presentation as table 4.4.

Table 4.4 Mean and standard deviation of data analysis on autonomous learning ability level in aspect of self-monitoring ability

Self-monitoring ability	$\bar{X}$	S.D.	Level	Ranking
1. Students regularly check their learning progress to ensure that they are completing their learning tasks within the specified timeframe.	3.50	0.65	moderate	2
2. Students able to manage their study time to avoid procrastination or over-study.	3.24	0.76	moderate	5
3. Students actively monitor their attention and concentration during they study to maintain efficient learning.	3.35	0.72	moderate	4
4. Students confident that they will be able to successfully complete college through their studies.	3.79	0.66	high	1
5. Students will try to learn the content of their courses even if it does not interest them.	3.38	0.69	moderate	3
Total	**3.45**	**0.72**	**moderate**	

From Table 4.3, the autonomous learning ability of college students in Neijiang Normal University in aspect of self-monitoring ability, is at a moderate level ($\bar{X}$=3.45, S.D.=0.72).

From the composition of self-monitoring ability, “Students confident that they will be able to successfully complete college through their studies” showed the highest rank ($\bar{X}$=3.79, S.D.=0.66). Followed by “Students regularly check their learning

progress to ensure that they are completing their learning tasks within the specified timeframe" ($\bar{X}$=3.50, S.D.=0.65). While in "Students able to manage their study time to avoid procrastination or over-study" showed the lowest rank ($\bar{X}$=3.24, S.D.=0.76).

1.5 Respondents autonomous learning ability level in aspect of self-evaluation ability.

The researcher proposed a hierarchical classification of data analysis results in order to understand each other when providing the following information. There are autonomous learning ability level self-evaluation ability measurement presentation as table 4.5.

Table 4.5 Mean and standard deviation of data analysis on autonomous learning ability level self-evaluation ability

Self-evaluation ability	$\bar{X}$	S.D.	Level	Ranking
1. Students confident in their ability to learn.	3.39	0.76	moderate	3
2. Students will conduct self-evaluation after completing their learning tasks.	3.31	0.71	moderate	4
3. Students will summarize their learning at the end of each chapter to consolidate their learning and make up for any deficiencies.	3.19	0.73	moderate	5
4. Students able to accept feedback and suggestions from others and improve their learning methods and performance accordingly.	3.67	0.58	high	1
5. Students will compare their own performance with that of other students in different learning tasks to assess their learning outcomes and progress.	3.53	0.63	high	2
Total	**3.42**	**0.70**	**moderate**	

From Table 4.5, the autonomous learning ability of college students in Neijiang Normal University in aspect of Self-evaluation ability, is at a moderate level ($\overline{X}$=3.42, S.D.=0.70).

From the composition of self-evaluation ability, “Students able to accept feedback and suggestions from others and improve their learning methods and performance accordingly” showed the highest rank ($\overline{X}$=3.67, S.D.=0.58). Followed by “Students will compare their own performance with that of other students in different learning tasks to assess their learning outcomes and progress” ($\overline{X}$=3.53, S.D.=0.63). While in “Students will summarize their learning at the end of each chapter to consolidate their learning and make up for any deficiencies” showed the lowest rank ($\overline{X}$=3.19, S.D.=0.73).

Result of Part 2: To develop blended teaching model based on metacognition theory to improve students' autonomous learning ability

Through the theoretical research on metacognition theory, blended teaching mode and autonomous learning ability, as well as the investigation of the current situation of college students' autonomous learning ability, considered and constructed a blended teaching model based on metacognitive theory. The specific content of this teaching model is as follows:

Principle

Autonomous learning is a kind of active, positive, and self-conscious learning behavior, which can effectively execute the objectives of learning, monitor the progress of learning, and adjust when necessary, and is an important way for college students to realize self-development. Metacognition is the subject's self-awareness, self-monitoring, and self-regulation of its cognitive activities, i.e., the cognition of cognition. It is emphasized that the enhancement of college students' autonomous learning ability cannot be separated from the interaction of individual metacognitive knowledge, metacognitive experience, and metacognitive monitoring.

By integrating traditional offline teaching, online learning and practical applications, a blended teaching model based on metacognition theory can be constructed to cultivate students' metacognitive level in a more comprehensive way,

so that they not only master the knowledge, but also manage and adjust their own learning process in a more autonomous way. Such a teaching model helps to adapt to different students' learning styles and improve their learning effectiveness and autonomous learning ability.

Blended teaching model based on metacognition theory to improve college students' autonomous learning ability has established principles that guide teaching and learning activities as follows:

1. The blended teaching model based on metacognition theory to improve college students' autonomous learning ability is a model for organizing teaching and learning under metacognition theory, which has 2 important principles: 1) choosing what is appropriate for oneself 2) selecting a method for planning, supervision, and self-assessment of learning.

2. Making students understand autonomous learning and improve their autonomous learning ability requires students to determine clear learning objectives and learning content.

3. Teaching and learning activities focus on having students plan their learning, monitor their learning progress, and evaluate the results of learning by guiding students to plan, break down tasks, reflect, and combine with case studies and other strategies to improve students' autonomous learning ability.

4. The blended teaching model based on metacognition theory, emphasizing the use of a variety of teaching media, such as online media, offline media, and various learning platforms for learning and practicing a variety of tasks to meet according to the learning styles, interests, and levels of different students Including encouraging students to choose learning resources according to their own situations in order to enhance the learning experience and stimulate interest and motivation in learning on their own.

5. The blended teaching model based on metacognition theory requires the creation of mechanisms to guide students in reflecting on their learning process and reflecting on what they have learned. Including creating a feedback channel so that students can access the feedback information provided by teachers in a timely manner, allowing them to think and adjust their learning strategies.

Objectives

The blended teaching model based on metacognition theory aims to improve the autonomous learning ability of college students with the following specific objectives: to develop students' autonomous learning ability, including self-determination ability, self-monitoring ability and self-evaluation ability.

Teaching/ Learning process

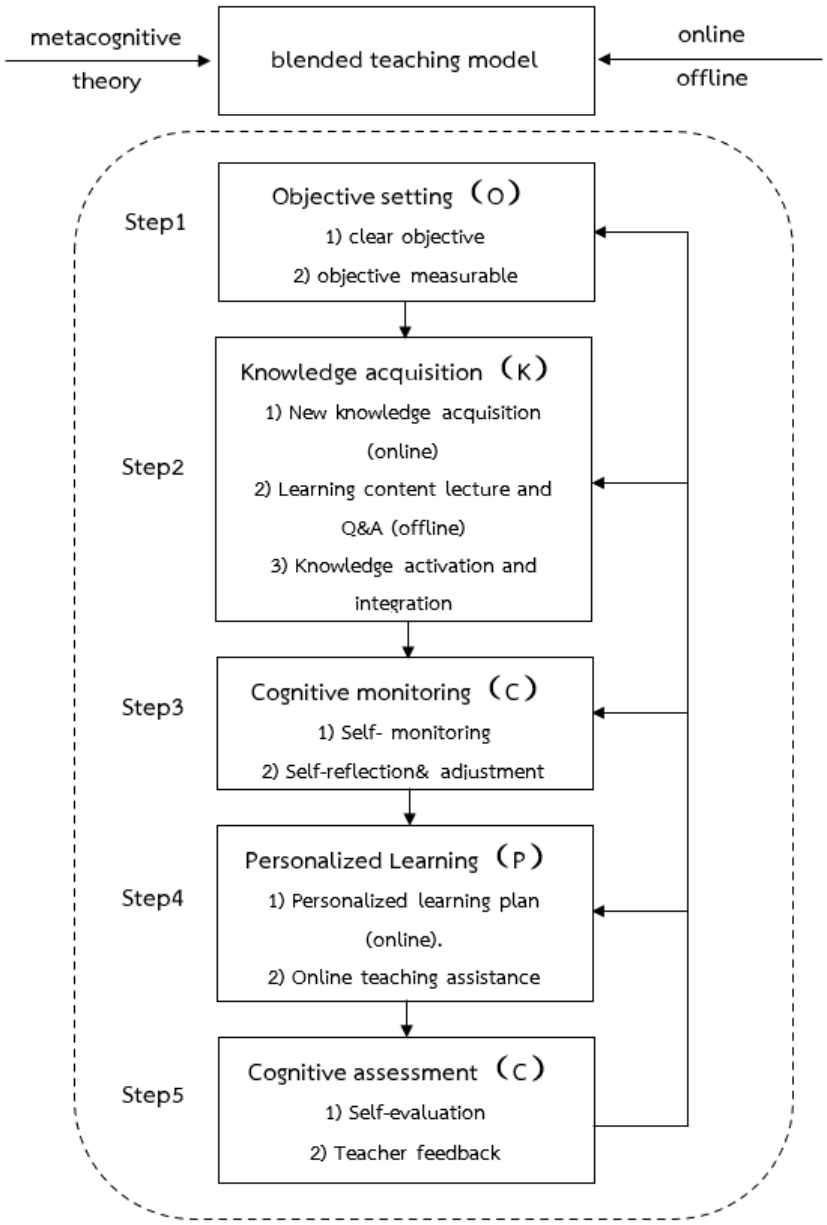


Figure 4.1 The "OKCPC" Blended Teaching Model Based on Metacognition Theory to improve students' autonomous learning ability

Step 1 Objective setting (O). This stage is the pre-course learning stage, in which teachers use the online platform to release the learning objectives of the relevant chapters and related learning resources to help students set clear learning objectives. Objective setting involves monitoring and adjusting students' own cognitive processes and learning objectives, and clear objective setting can prompt students to be able to organize their learning activities in a more directional way, make more effective use of learning resources, and maintain their motivation in the learning process. Objective setting helps to develop students' self-determination ability and metacognitive level, enabling them to reflect on their learning process and adjust their learning strategies autonomously for continuous improvement. In this model, objective setting includes the following 3 aspects:

1) Clear objectives: objectives should be set clearly and specifically, and should also be set according to students' learning needs, interests, etc. They can be categorized into curriculum objectives, Process objectives, and autonomous objectives. Lesson objectives are the comprehensive objectives that are expected to be achieved at the end of each lesson. Process objectives are those directly related to the learning process. Autonomous objectives are the objectives set by students according to their own situation and from a practical point of view, which express their expectations of the effect of learning to achieve.

2) Objective measurable: the objective should be realistic and feasible, not overly idealized, while the objective should be measurable and assessable.

3) Self-determination: students are autonomous in choosing appropriate learning methods and content based on formulated learning objectives.

Step 2 Knowledge Acquisition (K). Knowledge acquisition is the process by which students acquire new knowledge through instructional activities and learning resources. This can include classroom instruction in the classroom, reading textbooks, participating in discussions, watching educational videos, and utilizing online learning resources. Knowledge acquisition is more than just receiving information; it involves understanding, interpreting, and integrating information to form meaningful cognitive structures of course knowledge. In this model, knowledge acquisition includes the following 3 aspects:

1) New knowledge acquisition (online): students actively acquire new knowledge from the online learning resource platform.

2) Learning content lectures and Q&A (offline): offline lecture time is utilized for in-depth explanations of important concepts, case studies, and practical applications.

3) Knowledge activation and integration: help students review their existing knowledge and experience, connect newly learned knowledge with prior knowledge, and promote deeper learning.

Step 3 Cognitive Monitoring (C). Cognitive monitoring helps students better understand their learning process, identify problems in learning, adjust learning strategies in time, and improve learning outcomes. It is also closely related to the cultivation of autonomous learning ability and metacognitive level. By developing the ability of cognitive monitoring, students can learn more autonomously and purposefully, better adapt to the requirements of different learning tasks, and make learning objectives easier to achieve. This stage emphasizes students' active and conscious monitoring of their cognitive states and learning strategies during the learning and problem-solving process. In this model, cognitive monitoring includes the following 2 aspects:

1) Self-assessment. Online learning logs or learning task tracking forms are provided to help students dynamically assess their learning progress and record their learning experiences.

2) Self-reflection. Through the content recorded in the self-monitoring tool, students self-reflect on the learning process, analyze the problems and difficulties in learning, and adjust and improvements accordingly.

Step 4 Personalized learning (P). The main purpose is to maximize tailored teaching, meet students' learning needs, improve learning motivation, develop students' autonomous learning ability and metacognitive level, and promote students' individual development and optimization of the learning process. In this model, personalized learning includes the following 2 aspects:

1) Personalized learning plan (online). Helping students choose appropriate learning resources and develop personalized learning plans that suit them according to their needs, interests and learning pace.

2) Online teaching assistance. Provide online tutoring to help students solve their learning problems according to individual differences.

Step 5 Cognitive Assessment (C). Mainly adopts various forms of assessment methods, such as tests, homework, group discussions, self-assessment, to help students assess and measure their cognitive abilities, learning process strategies and the level of understanding of what they have learned, so that they can have a clearer understanding of their learning status, develop their metacognitive level and improve their learning results. In this model, cognitive assessment includes the following 2 aspects:

1) self- evaluation. Students are asked to summarize the learning process in a variety of ways and to complete a Learning self-evaluation scale to assess whether they have met their pre-determined objectives and to reflect on plans for improvement.

2) Teacher feedback. Teachers provide students with summaries and feedback, guiding them to reflect on their learning experiences throughout the lesson.

Teaching resources

Offline and online resources: audio, video, pictures, Online audio and video resources, online platforms.

Evaluation

Through the "OKCPC" blended teaching based on metacognition theory, learners can learn the content of related topics in a deeper and more meaningful way, and improve their autonomous learning ability, including:

1) Students can effectively improve their self-determination ability

2) Students can effectively improve self-monitoring ability

3) Students can effectively improve their self-evaluation ability

Evaluation methods: Process assessment methodology and summary assessment methodology by using Autonomous learning ability scale and learning self-assessment scale.

Evaluation criteria:

1) The purpose of the Learning self-assessment scale is to enable students to take control of their Learning effect at the end of each course and to help them improve their awareness and control of cognitive processes during the learning process. The questionnaire was adapted from Barnard et al.'s (2009) Online Learning Effectiveness Scale (OLES) and was based on a 5-point Likert scale with 9 question items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with 1-3 for Objective Setting Evaluation, 4-6 for Task Strategies Evaluation, and 7-9 for Self-evaluation.

2) The purpose of the Autonomous learning ability scale was to measure the level of students' Autonomous learning ability before and after the experiment in order to understand the changes in students' Autonomous learning ability. The Autonomous Learning Scale developed (Li, Cheng, and Liu, 2023) was cited, using a Likert 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree) with 15 question items, 1-5 for self-determination, 6-10 for self-monitoring, and 11-15 for self-evaluation.

The result of the assessment of the consistency of the “OKCPC” blended teaching model outline components the expert received an IOC equal to 1.00 for every item, (the acceptable value is between 0.50-1.00) which was considered that the assessment form was content-consistent.

Result of Part 3: The experimental and improvement of blended teaching model

This part using tables and descriptions as well as mean, standard deviation, and explanation to present the analytical results serving objective 3, as well as the ranking of all projects.

The comparison of students' autonomous learning ability before and after the implementation of blended teaching model

In the first semester of 2024, 30 freshman students from Neijiang Normal University participated in the “Vocal Basics and Song Singing” course teaching experiment of “OKCPC” Blended Teaching Model based on metacognition theory to improve college students' autonomous learning ability.

Table 4.6 Data analysis of respondents in pre-post “OKCPC” Blended Teaching Model experiment

Item	Pretest		Level	Ranking	Pretest		Level	Ranking
	$\overline{X}$	S.D.			$\overline{X}$	S.D.		
1.Autonomous learning ability								
1.1 Self-determination ability	3.62	0.71	high	1	4.02	0.66	high	3
1.2 Self-monitoring ability	3.37	0.82	moderate	3	4.03	0.67	high	2
1.3 Self-evaluation ability	3.55	0.75	high	2	4.10	0.67	high	1
Total	**3.52**	**0.77**	**high**		**4.05**	**0.67**	**high**	
2.Autonomous learning ability in Vocal Basics and Song Singing course								
2.1 self-determination ability	3.55	0.85	high	2	4.15	0.63	high	1
2.2 self-monitoring ability	3.50	0.93	high	3	4.12	0.65	high	3
2.3 self-evaluation ability	3.55	0.83	high	1	4.13	0.68	high	2
Total	**3.54**	**0.87**	**high**		**4.13**	**0.65**	**high**	

From Table 4.6, Contains two parts of data.

The first part is a comparison of students' autonomous learning ability pre-post the implementation of “OKCPC” blended teaching model. The self-monitoring ability in autonomous learning ability changed from “moderate” to “high” level before and after the implementation of the teaching model, the other abilities were at the same “high” level. After analyzing various aspects, it was found that the mean value of 1.1 self-determination ability in the pre-test was the highest ($\overline{X}$=3.62, S.D.=0.71), and the mean value of 1.3 self-evaluation ability in the post-test was the highest ($\overline{X}$=4.10, S.D.=0.67).

The second part is a comparison of students' autonomous learning ability in the “Vocal Basics and Song Singing” course pre-post the implementation of the "OKCPC" blended teaching model. The level of each dimension of autonomous learning ability remained at “high” before and after the implementation of the blended teaching model, but in the post-test, the scores of each dimension increased. After analyzing various aspects, it was found that the mean value of 2.1 self-evaluation ability in the pre-test was the highest ($\overline{X}$=3.55, S.D.=0.83), and the mean value of 2.1 self-determination ability in the post-test was the highest ($\overline{X}$=4.15, S.D.=0.63).

Learning self-assessment of students in each unit

In order to help students better monitor the learning process, adjust learning strategies, and evaluate learning outcomes, during the implementation of blended teaching model based on metacognitive theory, used the "Learning self-assessment scale" at the end of each unit of study to allow students to conduct self- assessment.

The following data are the results of a survey on Learning self-assessment among the 30 freshman students who participated in the experimental study. The data consists of three dimensions: objective setting evaluation, task strategies evaluation, self-evaluation.

Table 4.7 Students’ learning self-assessment data

(n=30)

Unit	1. Objective Setting Evaluation		Level	2. Task Strategies Evaluation		Level	3. Self-evaluation		Level	Total		Level
1	3.51	0.64	high	3.56	0.78	high	3.63	0.67	high	3.57	0.70	high
2	3.53	0.56	high	3.59	0.73	high	3.54	0.60	high	3.55	0.63	high
3	3.78	0.61	high	3.91	0.61	high	3.92	0.63	high	3.87	0.62	high
4	4.05	0.70	high	4.09	0.69	high	4.14	0.68	high	4.10	0.69	high
Total	**3.72**	**0.67**	**high**	**3.79**	**0.74**	**high**	**3.81**	**0.69**	**high**	**3.78**	**0.70**	**high**

From Table 4.7, The overall Learning self-assessment of the course for the students who participated in the experiment of the blended learning model vocal music class reached high level ($\overline{X}$=3.78, S.D.=0.70). Learning effect analysis of students

in each unit shows that with the learning of the unit, students' scores in the Objective Setting Evaluation, Task Strategies Evaluation, Self-evaluation dimensions are on the rise, and the scores of the unit4 of each dimension are higher than the other three units ($\overline{X}$=4.05, S.D.=0.70, $\overline{X}$=4.09, S.D.=0.69, $\overline{X}$=4.14, S.D.=0.68).

The comparison on autonomous learning ability and autonomous learning ability in vocal basics and song singing course of college students before and after using "OKCPC" Blended Teaching Model experiment implementation

Table 4.8 The comparison on autonomous learning ability of college students Pre-test and Post test with using "OKCPC" Blended Teaching Model

	Pretest (30)		Posttest (30)		df	t	Sig.
	$\overline{X}$	S.D.	$\overline{X}$	S.D.			
1. Autonomous learning ability	52.73	5.61	60.76	5.64	29	10.89**	0.00
2. Autonomous learning ability in vocal basics and song singing course	53.03	8.18	61.96	6.21	29	7.10**	0.00

**Statistically significant at the level. 01

From Table 4.8, according to the dependent sample t-test, the difference of college students' autonomous learning ability before and after the implementation of the "OKCPC" blended teaching model was statistically significant (t=10.89). The difference of college students' autonomous learning ability in vocal basics and song singing course before and after the implementation of "OKCPC" was also statistically significant (t=7.10).

It can be seen that after the implementation of the teaching model, the autonomous learning ability of college students showed a significant upward trend, which proves that the "OKCPC" blended teaching model can effectively improve the autonomous learning ability of college students.

Chapter 5
Conclusion Discussion and Recommendations

The objective of this Research is to: 1) to investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University, 2) to develop blended teaching model based on metacognitive theory to improve students' autonomous learning ability, 3) to compare the effectiveness of the blended teaching model based on metacognitive theory to improve students' autonomous learning ability before and after the implementation. The subjects of the study were 400 college students from Neijiang Normal University and 30 freshmen from the College of Music of Neijiang Normal University. The research tools were autonomous learning ability scale and Learning effect scale. The study was conducted through statistical software such, using statistical tests for general data analysis of the respondents in terms of mean, standard deviation, percentage , t-test for dependent sample were used to analyze the data of the results of the study, which are summarized below: conclusion , discussion, and recommendations.

Conclusion

This study summarizes the following conclusions based on the purpose of the study, research hypotheses, experimental research, data analysis and so on:

Results analysis of students' autonomous learning ability in Neijiang Normal University

It was found that the level of autonomous learning ability of college students is at a moderate level. According to the dimension scores, it can be seen that self-determination ability is the only dimension which is at high level with the highest rank, followed by self-monitoring ability, and finally self-evaluation ability.

Results analysis of development "OKCPC" blended teaching model

In order to improve college students' autonomous learning ability, this study based on metacognition theory, proposes a "OKCPC" blended teaching model. The "OKCPC" teaching model includes 5 steps: step 1, Objective setting (O), includes clear

objective, objective measurable and self-determination. Step 2, Knowledge acquisition(K), includes new knowledge acquisition, learning content lecture and Q&A, knowledge activation and integration. step 3, Cognitive monitoring(C), includes self-monitoring and self-reflection. step 4, Personalized learning(P), includes personalized learning plan and teaching assistance. Step 5, Cognitive assessment(C), includes self-evaluation and teacher feedback. The "OKCPC" blended teaching model successfully passed the index of objective coherence (IOC) tested conducted by three experts in related fields, the experts gave each item score of 1.00 (the acceptable value is between 0.50-1.00).

Results analysis of the "OKCPC" blended teaching model to improve college students' autonomous learning ability

To design the“Vocal Basics and Song Singing” course based on the “OKCPC” blended teaching model. The course consists of 4 units, each unit has 4 hours, a total of 16 hours. The lesson plan for this course successfully passed the objective consistency index (IOC) test conducted by three experts in the field, the experts gave each item score of 1.00 (the acceptable value is between 0.50-1.00).

Based on the "OKCPC" blended teaching model, a teaching experiment was carried out through the "Vocal Basics and Song Singing" course with 30 freshmen from Neijiang Normal University as the sample group. After a planned implementation of 16 hours teaching experiment, it can be observed that students have significantly improved their autonomous learning ability. The data show that the pre-test score of the autonomous learning ability of the 30 students who participated in the teaching experiment was 52.73, and after the implementation of the teaching experiment, the post-test score was 60.76. The pre-test score of students' autonomous learning ability in vocal learning was 53.03, and after the implementation of the teaching experiment, the post-test score was 61.96. After dependent sample t-test found that there was a significant difference in the pre-test and post-test scores of college students' autonomous learning ability, and there was also a significant difference in autonomous learning ability in vocal learning. This fully proves that the "OKCPC" blended teaching model based on metacognitive theory has obvious advantages and effects to improve college students' autonomous learning ability.

Discussion

Discussion on the survey data of college students' autonomous learning ability

From the current survey on the autonomous learning ability of music students at Neijiang Normal University, we found that the overall performance of college students' autonomous learning ability is "moderate" level. This is consistent with the findings of Dai, X (2020) and Xu, C., et al (2021) regarding college students' autonomous learning ability. The overall situation of analyzing college students' autonomous learning ability is “moderate” due to :1) Students' insufficient intrinsic motivation to learn, lack of time management and monitoring ability, as well as lack of effective reflection and self-assessment strategies . 2) Teachers focus more on the transfer of knowledge and skills than on the development of students' autonomous learning ability, resulting in students' lack of active learning . In teaching, there is still more use of the traditional teaching model, which lacks interaction and motivation, resulting in low student participation and inability to stimulate students' interest in autonomous learning. 3) The school's learning support system (curriculum design, resource construction, evaluation system, etc.), does not sufficiently support students' cultivation of their autonomous learning ability .

In addition, the findings of this study differed from those of Li,D.et al (2021), in which college students were found to have overall better autonomous learning ability. The reasons for this may be :1) The different orientations of the schools surveyed. Li Dan et al. investigated a key university in China, while Neijiang Normal College is a local general undergraduate college, the origin and structure of the students are relatively different. 2) The professional background of the survey respondents is different. The respondents of this study were college students majoring in music, while the respondents of Li Dan et al. were mainly college students majoring in science and engineering, and there are significant differences in the autonomous learning ability of students from different majors (Liu, L., & Tian, D., 2020). Therefore, it is important to design a targeted teaching model to improve the autonomous learning ability of college students majoring in music.

From the analysis of the three dimensions of autonomous learning ability, it can be seen that college students have the best Self-determination ability, followed by Self-monitoring ability and finally Self-evaluation ability. Reason analysis:

1) Self-determination ability is related to the learner's cognitive development level (Li,S.P.,et al., 2017, Rochma, A.F., 2023). The cognitive development level of college students has enabled them to have independent thinking, planning and decision-making abilities, and they have a clearer understanding of their own interests and goals in learning, which helps them make decisions more confidently during the learning process.

2) Self-monitoring ability requires continuous feedback and self-correction during the learning process (Liu, Y. P.,et al., 2023, Sun,L.N., 2022). The freedom and diversity of university life may make college students lack continuous self-monitoring when facing learning tasks.

3) Self-evaluation ability depends not only on individual cognitive ability, but also on the development of metacognitive knowledge and skills (Mahlberg, J., 2015, Wang,H.J.,et al., 2023). Therefore, strengthening the training of college students' metacognitive knowledge and skills is very necessary to improve their self-evaluation ability.

Discussion of the " OKCPC " blended teaching model

This study first systematically sorted out the relevant concepts and theories such as metacognitive theory, blended teaching model, and autonomous learning ability. On this basis, it innovatively combined metacognitive theory with teaching model and developed the "OKCPC" blended teaching model based on metacognitive theory, aiming to improve college students' autonomous learning ability. "OKCPC" covers the aspects necessary for a complete teaching model: Principles, Objectives, Teaching /Learning process, Teaching resources, and Evaluation. "OKCPC" blended teaching model including 5 steps: Objective setting, Knowledge Acquisition, Cognitive Monitoring, Personalized Learning, and Cognitive Assessment.

Through the construction of the "OKCPC" blended learning model, traditional offline teaching, online learning and practical application are combined to help students understand autonomous learning and clarify learning goals and content.

Then, by guiding students to develop learning plans, decompose tasks, reflect and other strategies, students' metacognitive level is more comprehensively cultivated, so that they can not only master knowledge, but also manage and adjust their learning process more independently. This teaching model helps to adapt to the learning styles of different students and improve students' autonomous learning ability and learning effect. "OKCPC" blended learning model was fully recognized by the experts for its advanced design concept, clear operation steps and good teaching effect, the three experts unanimously passed the IOC consistency test.

The "OKCPC" model emphasizes the importance of blended teaching in improving students' autonomous learning ability. This is in line with Bosch,C.& Laubscher, D. (2022) and Ma,X.,et al (2020) studys, which concluded that blended course design plays an important role in enhancing students' self-directed learning, and that students' autonomy and engagement can be effectively supported through the use of authentic tasks and motivational components in a blended learning environment. Meanwhile, the "OKCPC" teaching model mainly guides students to learn metacognitive theories and utilize metacognitive strategies in the Blended teaching model. Developing metacognitive awareness and teaching strategies can improve the effectiveness of the learning process, which in turn enhances their autonomous learning ability, which is consistent with the research of Susantini,E., et al (2021).

Discussion on the effectiveness of "OKCPC" blended teaching model by comparing the data before and after the teaching experiment

After the implementation of the "OKCPC" teaching model, the autonomous learning ability of the 30 students who participated in the teaching experiment was significantly improved, which fully proved the effectiveness of the "OKCPC" teaching model to improve students' autonomous learning ability. The "OKCPC" teaching model starts by setting clear learning objectives for the course and the students. This helps students to be more focused by clarifying where they are going with their learning and the specific outcomes they expect to achieve. Research has shown that specific and challenging goals can significantly increase student motivation and learning effectiveness (Orzechowska & Polok, 2019). The development of students'

metacognitive activities can help them better manage their learning (Zimmerman,B.J., 2008). The "OKCPC" teaching model supports students to develop metacognitive skills through various steps such as planning, monitoring, and adjusting learning activities. The development of metacognitive skills helps students to better understand and manage their learning process, which leads to increased learning autonomy and effectiveness.

The investigation of the students' learning outcomes revealed that the overall learning outcomes of the students' self-assessment reached the "High" level. The reason for this is mainly due to the fact that the "OKCPC" teaching model blends online and offline learning methods. This blended learning strategy enables students to utilize online resources for independent learning while deepening their understanding through communication and collaboration in a face-to-face environment. This approach not only increases the flexibility of learning, but also adapts to the learning styles and needs of different students. Relevant studies have found that Blended teaching model can enhance students' learning effectiveness and satisfaction, especially excelling in increasing student engagement and interaction (Feng,X.Y.,et al., 2019, Sahni,J., 2019). Moreover, timely instructor feedback and self-assessment can significantly enhance students' learning effectiveness. Effective feedback mechanisms can help students identify and reinforce their learning strategies and motivate them to progress in their learning (Nguyen,T., 2020, Wen,L., 2022).

During the teaching process, the teacher used the Observation Method to record the learning behavior of all students. Completed the 4 unit of "Vocal Basics and Song Singing" course, students have improved their breathing, resonance, language and singing. This is consistent with the conclusions drawn by Zhang, S.H (2014) in a teaching experiment based on metacognitive theory in vocal basics course. Specifically, they have mastered the correct breathing techniques and enhanced the stability and staying power of the breath. In resonance, the students showed a more rounded and penetrating voice, and the expression of the voice was richer. The use of language is more accurate and more focused on understanding and practicing the lyrics. They can integrate breathing, resonance, language, and

other techniques and use them in the practical training of song singing. Moreover, they can better grasp the style and characteristics of the song, singing with a certain degree of infectiousness.

In the "OKCPC" teaching model, students' independent learning is integrated into every teaching step. Specifically, students can set up their own learning objectives for each unit under the guidance of the teacher. In the process of learning, students can conduct self-monitoring against the learning objectives, find out the deficiencies in vocal learning, and make self-reflection and adjustment in time; students can make the Vocal Practice Plan of each unit under the guidance of the teacher.

Recommendations

The findings of this study bring dual recommendations: applicability of the results and future research.

1. Applicability of the model

In addition to music subject, the "OKCPC" teaching model is equally applicable to other arts and humanities subjects. When considering adopting this teaching model, educational environment and teaching objectives are consistent with the features and benefits of the model to maximize its effectiveness.

2. Suggestions for teachers

In order to better apply the "OKCPC" teaching model, teachers should be prepared, which includes preparation in attitude and ability. Attitudinal preparation includes showing an open and positive attitude towards this teaching model, fully recognizing the concept of "Student-centered" education, and paying attention to whether students can have a better learning experience. Preparation in terms of ability includes, in addition to subject teaching ability, knowledge of interdisciplinary pedagogy, psychology and other related disciplines, as well as a certain degree of research on metacognitive theory. In addition, a certain degree of information technology ability is also required.

3. Recommendations for educational institutions

Although the educational experiment of this study has proved that the "OKCPC" teaching model is effective in cultivating and improving college students' autonomous learning ability. However, as an innovative teaching model, the preparation and support required for educational institutions to carry out this teaching model also brings new problems and challenges, including infrastructure, technical preparation, staffing, resource construction, teacher reserve, etc. The suggestions for educational institutions include making good preparations and support in terms of infrastructure, information technology, resource building, and staffing, as well as actively supporting the development of teachers and strengthening teacher training, especially teacher training related to the "OKCPC" teaching model.

Future Research

1. Further assessment of the effectiveness of the "OKCPC" teaching model. In order to further evaluate the effectiveness of the "OKCPC" teaching model, we need to expand the scope of the study. Due to the limitations of manpower, resources, and time, the current study only used four teaching units, and the sample was limited to 30 first-year music majors, and the duration of the study was only 16 hours, which limits the generalizability of the results. Future research should cover more majors, grades, and university types to accurately evaluate the effectiveness of the "OKCPC" teaching model and further explore the implementation effect and continuous improvement of this teaching model.

2. Enriching research methods to improve the credibility of the "OKCPC" teaching model. Enriching the research methodology can improve the credibility of the study by adding quantitative research tools and subjective qualitative research. In this study, the "OKCPC" teaching model was implemented to assess the changes in students' autonomous learning ability through pre-test and post-test. In the future, it is recommended to add quantitative questionnaire data, as well as qualitative research tools such as teaching reflection and student interviews, teaching reflection, student interviews, etc., to make the research results more accurate and credible.

3. Research on teacher training to improve the support system for the "OKCPC" teaching model. By conducting in-depth research on the training and support needed by teachers when adopting the "OKCPC" teaching model, we can investigate their training needs, study different types of teacher training methods, and analyze the impact of such training on the implementation of the model. This will help to further improve the support system of the "OKCPC" teaching model.

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

1. Associate Professor Dr. Praneet Muangnual	Faculty of Education, Bansomdejchaopraya Rajabhat University
2. Associate Professor Dr. Jittawisut Wimutthipanya	Faculty of Education, Bansomdejchaopraya Rajabhat University
3. Assistant Professor Dr. Tanaput Chancharoen	Graduate College, Bansomdejchaopraya Rajabhat University

Appendix B

Official Letter

Ref. No. MHESI 0643.14/ 350

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for research tool validation

Dear Assoc. Prof. Dr. Praneet Muangnual

Attachment Validation sheets

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul, and Assoc. Prof. Dr. Wichian Intarasompun, Assoc. Prof. Dr. Areewan Iamsa-ard as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, the pretest-posttest, questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Ref. No. MHESI 0643.14/351

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for research tool validation

Dear Assoc. Prof. Dr. Jittawisut Wimutthipanya

Attachment Validation sheets

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul, and Assoc. Prof. Dr. Wichian Intarasompun, Assoc. Prof. Dr. Areewan Iamsa-ard as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

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Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Ref. No. MHESI 0643.14/352

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for research tool validation

Dear Asst. Prof. Dr. Tanaput Chancharoen

Attachment Validation sheets

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul, and Assoc. Prof. Dr. Wichian Intarasompun, Assoc. Prof. Dr. Areewan Iamsa-ard as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

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Graduate School
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Ref. No. MHESI 0643.14/353

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for evaluation of instructional model
Dear Assoc. Prof. Dr. Praneet Muangnual
Attachment 1. The developed Teaching Model
2. The appropriateness evaluation form

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Program at Bansomdej ChaoprayaRajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul as major advisor and Assoc. Prof. Dr.Wichian Intarasompun, Assoc. Prof. Dr.Wichian Intarasompun as co-advisors, the Teaching Model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed Teaching Model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said Teaching Model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Ref. No. MHESI 0643.14/ 354

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

5 March 2024

Subject Request for evaluation of Integrated Curriculum
Dear Assoc. Prof. Dr. Jittawisut Wimutthipanya
Attachment 1. The developed Teaching Model
2. The appropriateness evaluation form

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Program at Bansomdej ChaoprayaRajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul as major advisor and Assoc. Prof. Dr.Wichian Intarasompun, Assoc. Prof. Dr.Wichian Intarasompun as co-advisors, the Teaching Model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed Teaching Model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said Teaching Model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Ref. No. MHESI 0643.14/ 354

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for evaluation of Integrated Curriculum

Dear Asst. Prof. Dr. Tanaput Chancharoen

Attachment 1. The developed Teaching Model
2. The appropriateness evaluation form

Regarding the thesis entitled "The Development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Program at Bansomdej ChaoprayaRajabhat University code number 6373103117, Thailand under the supervision of Prof. Dr. Wirot Watananimitgul as major advisor and Assoc. Prof. Dr.Wichian Intarasompun, Assoc. Prof. Dr.Wichian Intarasompun as co-advisors, the Teaching Model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed Teaching Model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said Teaching Model before its implementation.

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Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Ref. No. MHESI 0643.14/ 355

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

1 March 2024

Subject Request for permission to implement experiment

Dear President of Neijiang Normal University

Regarding the thesis entitled "The development of blended teaching model based on metacognition theory to improve college students' autonomous learning ability" of Ms. Chen Yanru, a Ph.D. student majoring in Curriculum and Instruction Program at Bansomdej ChaoprayaRajabhat University code number 6373103117 Thailand under the supervision of

Major Advisor : Prof. Dr. Wirot Watananimitgul
Co-advisor : Assoc. Prof. Dr.Wichian Intarasompun
Co-advisor : Assoc. Prof. Dr. Areewan Iamsa-ard

The researcher needs to implement an experiment in compliance with approved methodology and collect data in terms of questionnaire from 30 first-year college students majoring in music education of College of Music, Neijiang Normal University during the 1st semester of academic year 2024. Hence, I'm formally requesting permission to implement the experiment and access the aforementioned data.

The researcher plans to use this data for her thesis completion and further necessary publication as required by the Ph.D. course.

I am grateful for your consideration of my request. I pledge to adhere to any stipulations you deem fit. You may reach me at the phone number or email address provided below in case of any related questions. I look forward to your response.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel. +66 0204737000 Ext. 1814

Appendix C

Research Instrument

Autonomous Learning Ability Scale

Dear Student:

I am a current Ph.D student at Bansomdejchaopraya Rajabhat University and I would like to thank you for taking the time to answer this questionnaire! The main purpose of this scale is to investigate the current status of autonomous learning ability of college students. This questionnaire is anonymous, and your answers will only be used for academic research purposes.

Thank you for your active support!

Graduate School

Bansomdejchaopraya Rajabhat University

Personal background information:

1. Your gender: ○Male ○ Female
2. Your age: __ years old
3. Your grade: _____

No	Item	Degree
1	I can choose the next focus based on my learning goals.	1 2 3 4 5
2	I can adjust my learning plan based on the completion of learning tasks.	1 2 3 4 5
3	I can adopt appropriate learning methods based on my learning content.	1 2 3 4 5
4	I will consciously seek suitable learning partners.	1 2 3 4 5
5	If I encounter a question that I cannot answer, I will actively seek help from others through the Internet.	1 2 3 4 5
6	I regularly check my learning progress to ensure that I am completing my learning tasks within the specified timeframe.	1 2 3 4 5
7	I am able to manage my study time to avoid procrastination or over-study.	1 2 3 4 5
8	I actively monitor my attention and concentration during my studies to maintain efficient learning.	1 2 3 4 5
9	I am confident that I will be able to successfully complete college through my studies.	1 2 3 4 5
10	I will try to learn the content of my courses even if it does not interest me.	1 2 3 4 5
11	I am confident in my ability to learn.	1 2 3 4 5
12	I will conduct self-evaluation after completing my learning tasks.	1 2 3 4 5
13	I will summarize my learning at the end of each chapter to consolidate my learning and make up for any deficiencies.	1 2 3 4 5
14	I am able to accept feedback and suggestions from others and improve my learning methods and performance accordingly.	1 2 3 4 5
15	I will compare my own performance with that of other students in different learning tasks to assess my learning outcomes and progress.	1 2 3 4 5

A Blended teaching model based on metacognitive theory to improve college students' autonomous learning ability

1. Principle

Autonomous learning is a kind of active, positive, and self-conscious learning behavior, which can effectively execute the Objectives of learning, monitor the progress of learning, and adjust when necessary, and is an important way for college students to realize self-development. Metacognition is the subject's self-awareness, self-monitoring, and self-regulation of its cognitive activities, i.e., the cognition of cognition. It is emphasized that the enhancement of college students' autonomous learning ability cannot be separated from the interaction of individual metacognitive knowledge, metacognitive experience, and metacognitive monitoring.

By integrating traditional offline teaching, online learning and practical applications, a hybrid teaching model based on metacognition theory can be constructed to cultivate students' metacognitive level in a more comprehensive way, so that they not only master the knowledge, but also manage and adjust their own learning process in a more autonomous way. Such a teaching model helps to adapt to different students' learning styles and improve their learning effectiveness and autonomous learning ability.

Blended teaching model based on metacognitive theory to improve college students' autonomous learning ability has established principles that guide teaching and learning activities as follows:

1. The Blended teaching model based on metacognitive theory to improve college students' autonomous learning ability is a model for organizing teaching and learning under metacognitive theory, which has 2 important principles: 1) choosing what is appropriate for oneself 2) Selecting a method for planning, supervision, and self-assessment of learning.

2. Making students understand autonomous learning and improve their autonomous learning ability requires students to determine clear learning objectives and learning content.

3. Teaching and learning activities focus on having students plan their learning, monitor their learning progress, and evaluate the results of learning by guiding students to plan, break down tasks, reflect, and combine with case studies and other strategies to improve students' autonomous learning ability.

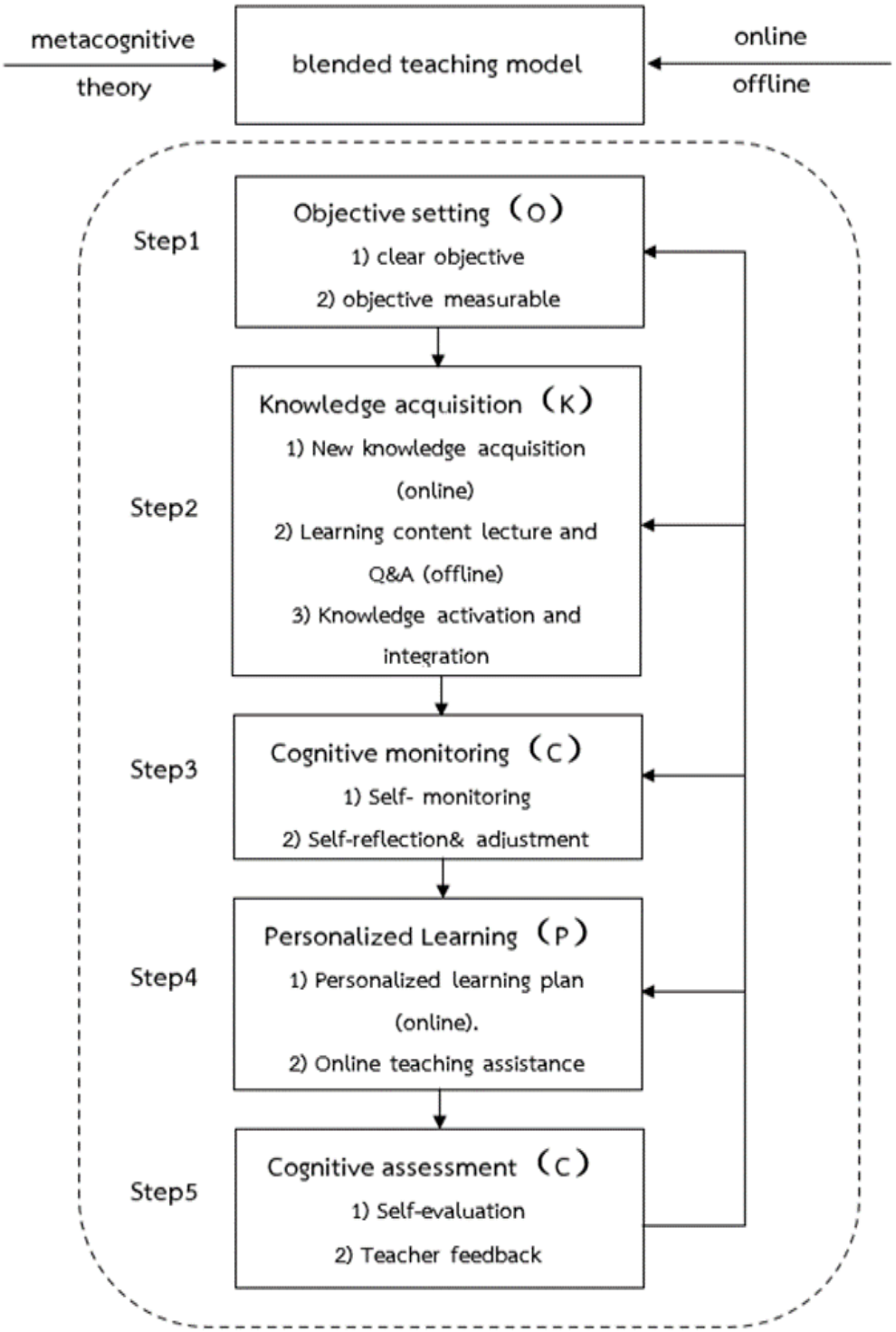
4. The Blended teaching model based on metacognitive theory, emphasizing the use of a variety of teaching media, such as online media, offline media, and various learning platforms for learning and practicing a variety of tasks to meet according to the learning styles, interests, and levels of different students Including encouraging students to choose learning resources according to their own situations in order to enhance the learning experience and stimulate interest and motivation in learning on their own.

5.The Blended teaching model based on metacognitive theory requires the creation of mechanisms to guide students in reflecting on their learning process and reflecting on what they have learned. Including creating a feedback channel so that students can access the feedback information provided by teachers in a timely manner, allowing them to think and adjust their learning strategies.

2. Objectives

The Blended teaching model based on metacognitive theory aims to improve the autonomous learning ability of college students with the following specific objectives: to develop students' autonomous learning ability, including self-determination ability, self-monitoring ability and self-evaluation ability.

3. Learning process



“OKCPC” Blended Teaching Model Based on Metacognitive Theory

Step 1 Objective setting. This stage is the pre-course learning stage, in which teachers use the online platform to release the learning Objectives of the relevant chapters and related learning resources to help students set clear learning Objectives. Objective setting involves monitoring and adjusting students' own cognitive processes and learning objectives, and clear Objective setting can prompt students to be able to organize their learning activities in a more directional way, make more effective use of learning resources, and maintain their motivation in the learning process. Objective setting helps to develop students' self-determination ability and metacognitive level, enabling them to reflect on their learning process and adjust their learning strategies autonomously for continuous improvement. In this model, Objective setting includes the following 3 aspects:

1) Clear Objectives: Objectives should be set clearly and specifically, and should also be set according to students' learning needs, interests, etc. They can be categorized into Curriculum Objectives, Process Objectives, and Autonomous Objectives. Lesson Objectives are the comprehensive Objectives that are expected to be achieved at the end of each lesson. Process Objectives are those directly related to the learning process. Autonomous Objectives are the objectives set by students according to their own situation and from a practical point of view, which express their expectations of the effect of learning to achieve.

2) Objective measurable: the Objective should be realistic and feasible, not overly idealized, while the Objective should be measurable and assessable.

3) Self-determination: Students are autonomous in choosing appropriate learning methods and content based on formulated Learning Objectives.

Step 2 Knowledge Acquisition. Knowledge acquisition is the process by which students acquire new knowledge through instructional activities and learning resources. This can include classroom instruction in the classroom, reading textbooks, participating in discussions, watching educational videos, and utilizing online learning resources. Knowledge acquisition is more than just receiving information; it involves understanding, interpreting, and integrating information to form meaningful cognitive structures of course knowledge. In this model, knowledge acquisition includes the following 3 aspects.

1) New knowledge acquisition (online): students actively acquire new knowledge from the online learning resource platform.

2) Learning content lectures and Q&A (offline): offline lecture time is utilized for in-depth explanations of important concepts, case studies, and practical applications.

3) Knowledge activation and integration: help students review their existing knowledge and experience, connect newly learned knowledge with prior knowledge, and promote deeper learning.

Step 3 Cognitive Monitoring. Cognitive monitoring helps students better understand their learning process, identify problems in learning, adjust learning strategies in time, and improve learning outcomes. It is also closely related to the cultivation of autonomous learning ability and metacognitive level. By developing the ability of cognitive monitoring, students can learn more autonomously and purposefully, better adapt to the requirements of different learning tasks, and make learning Objectives easier to achieve. This stage emphasizes students' active and conscious monitoring of their cognitive states and learning strategies during the learning and problem-solving process. In this model, cognitive monitoring includes the following 2 aspects.

1) Self-monitoring tools. Online learning logs or learning task tracking forms are provided to help students dynamically assess their learning progress and record their learning experiences.

2) Self-reflection and adjustment. Through the content recorded in the self-monitoring tool, students self-reflect on the learning process, analyze the problems and difficulties in learning, and adjust and improvements accordingly.

Step 4 Personalized learning. The main purpose is to maximize tailored teaching, meet students' learning needs, improve learning motivation, develop students' autonomous learning ability and metacognitive level, and promote students' individual development and optimization of the learning process. In this model, personalized learning includes the following 2 aspects.

1) Personalized learning plan (online). Helping students choose appropriate learning resources and develop personalized learning plans that suit them according to their needs, interests and learning pace.

2) Online teaching assistance. Provide online tutoring to help students solve their learning problems according to individual differences.

Step 5 Cognitive Assessment. Mainly adopts various forms of assessment methods, such as tests, homework, group discussions, self-assessment, etc., to help students assess and measure their cognitive abilities, learning process strategies and the level of understanding of what they have learned, so that they can have a clearer understanding of their learning status, develop their metacognitive level and improve their learning results. In this model, cognitive assessment includes the following 2 aspects.

1) Self- evaluation. Students are asked to summarize the learning process in a variety of ways and to complete a Learning self-evaluation scale to assess whether they have met their pre-determined Objectives and to reflect on plans for improvement..

2) Teacher feedback. Teachers provide students with summaries and feedback, guiding them to reflect on their learning experiences throughout the lesson.

4. Results

Through blended teaching based on metacognitive theory, learners can learn the content of related topics in a deeper and more meaningful way, and improve their autonomous learning ability, including:

1) Students can effectively improve their self-determination ability

2) Students can effectively improve self-monitoring ability

3) Students can effectively improve their self-evaluation ability

5. Teaching resources

Multimedia resources: presentations, online videos, catechism, flipped classroom platform, etc.

Classroom activities: group discussion, group sharing, group reporting, etc.

6. Evaluation

Evaluation methods: Process assessment methodology and summary assessment methodology

1) Process assessment methodology: Learning self-evaluation scale

2) summary assessment methodology: Autonomous learning ability scale

Evaluation criteria:

1) The purpose of the Learning self-evaluation scale is to enable students to take control of their Learning effect at the end of each course and to help them improve their awareness and control of cognitive processes during the learning process. The questionnaire was adapted from Barnard et al.'s (2009) Online Learning Effectiveness Scale (OLES) and was based on a 5-point Likert scale with 9 question items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with 1-3 for Objective Setting Evaluation, 4-6 for Task Strategies Evaluation, and 7-9 for Self-evaluation.

2) The purpose of the Autonomous learning ability scale was to measure the level of students' Autonomous learning ability before and after the experiment in order to understand the changes in students' Autonomous learning ability. The Autonomous Learning Scale developed (Li, Cheng, and Liu , 2023) was cited, using a Likert 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree) with 15 question items, 1-5 for self-determination, 6-10 for self-monitoring, and 11-15 for self-evaluation.

Lesson Plan

Curriculum Title: Vocal Basics and Song Singing

Textbook: "Vocal Grading Tutorial" (Volume 1), Central Conservatory of Music Press, 2022

Teaching Object: First-year student at the Conservatory of Music of Neijiang Normal University

Teaching Objectives: Improve students' autonomous learning ability through the implementation of "Vocal Basics and Song Singing" courses with blended teaching model.

Teaching Tools: Piano (or electric piano), multimedia, computer, mobile phone, etc.

Course Time: 16 class hours

Lesson Plan:

Lesson Plan 1

Unit1: Breathing in Singing **Time:** 4 class hours

Teaching Objective: Understand the correct concepts of breathing and vocalization, establish the awareness of singing with breathing, train students' ability to control breath and apply it in singing practice.

Content: 1) Theoretical knowledge about breathing in singing.

2) Breathing skills training in singing.

3) Learning two vocal exercises about breathing in singing.

Teaching Media: Piano (or electric piano), multimedia, computer, mobile phone, etc.

Teaching /Learning Process:

Step 1 Objective setting (Online)

Teachers arrange the teaching content of this unit and set teaching goals on the online platform.

Guide students to set clear and measurable learning objectives:

1)Be able to clearly define what breathing in singing is.

2)Be able to understand the impact of correct breathing on song singing.

3)Be able to use breathing correctly in subsequent singing exercises.

Step 2 Knowledge acquisition

New knowledge acquisition:

1) Pre-class preview (online): Before class, students watch relevant videos and pictures sent by the teacher through the online platform, learn breathing-related knowledge in singing, and preview the vocal exercises released by the teacher on the platform in advance.

Requirements: Take deep breaths from the chest and abdomen together, relax the face and lips, achieve the ability to breathe freely, and sing softly in a high position.

When students practice, they should start from their most comfortable natural vocal range and gradually increase the level according to the semitone relationship, and act according to their ability.

2) In-class discussion (offline): Students are divided into three groups in class to discuss and share their situation in the preview, focusing on sharing their thinking process during the preview. Through sharing and demonstrations between groups, students can further understand the application of breathing in singing.

Learning content lecture and Q&A (offline):

The teacher checks the students' singing performance of the vocal exercises, explains and corrects errors. The teacher responds to questions raised by students in group discussions and analyses, again emphasizing the key elements of correct breathing and the importance of correct breathing in singing.

Knowledge activation and integration:

Teach the common issues of breathing in singing, find the breathing state and techniques when singing from some instinctive living habits of people, and guide students to easily find the breathing state and methods when singing.

Step 3 Cognitive monitoring

Self-monitoring:

1) Students record their own topic learning during class (offline), including taking class notes and class recordings

2) After class, students play back their classroom recordings and compare them with their class notes to check and discover the strengths and weaknesses in their

singing. Then record the video (or audio) of singing the vocal practice song and upload it to the platform.

Self-reflection and adjustment:

1) The teacher guides students to conduct self-reflection against the learning goals set in step 1. Think about whether the learning objectives have been achieved, reflect on existing deficiencies and make timely adjustments.

2) Teachers provide an online feedback mechanism to guide students on how to better self-reflect and adjust.

Step 4 Personalized learning

Practice plan:

Vocal music learning has both commonalities and individual characteristics. Each student may encounter different problems in practicing alone. Based on the offline classroom and online learning experience of this unit, students make a vocal practice plan for the week and upload it to the teacher. The content mainly includes goals, time management and practice strategies.

Online teaching coaching:

1) The teacher provides a vocal practice plan template and explains the elements of developing a personalized practice plan.

Vocal Practice Plan (Unit 1)	
Name:	Date:
Practice goals:	
Practice pieces:	
practice time:	
Practice strategy:	

2) Teachers provide individual tutoring and make suggestions for the vocal learning plan uploaded by each student.

Step 5 Cognitive assessment

Self-Assessment: Students self-evaluate their Learning situation in the course after class.

1) The teacher provides cognitive assessment tools (Learning Self-Evaluation Scale) and explains the filling rules.

2) Students use the scale to self- evaluation the Learning situation of this unit.

Teacher feedback: Teachers provide online feedback on students' self-assessment, highlighting successes and providing suggestions for improvement to prepare for the next unit of study.

Through the first unit, students will establish a correct understanding of breathing in singing, laying the foundation for in-depth learning in subsequent units.

Evaluation

Process evaluation

1. After the end of each teaching plan, students conduct self- assessment on their own learning, " Learning Self-Evaluation Scale".

2. For evaluation in lesson plan, teacher should use "Observation Method" and record "student behavior" that occurs in each step of teaching in lesson plan. The recording behavior consists of 2 parts: 1) the part that is knowledge, understanding, attitude, and musical skills. 2) the part that is students' autonomous learning. The ability for recording is to be recorded in an essay writing style.

Lesson Plan 2

Unit2: Resonance in singing **Time :**4 class hours

Teaching Objiective: Understand the correct concept of singing resonance, establish awareness of singing with resonance, focus on training students' resonance cavity (head cavity), and use it in singing exercises of vocal exercises.

Content: 1) Theoretical knowledge about resonance in singing.

2) Resonance skills training in singing.

3) Learning two vocal exercises about resonance in singing.

Teaching Media: Piano (or electric piano), multimedia, computer, mobile phone, etc.

Teaching /Learning Process:

Step 1 Objective setting (Online)

Teachers arrange the teaching content of this unit and set teaching goals on the online platform.

Guide students to set clear and measurable learning objectives:

1)Be able to clearly define what resonance in singing is.

2)Be able to correctly understand the relationship between resonance and song singing.

3)Be able to use (head cavity) resonance correctly in subsequent singing exercises.

Step 2 Knowledge acquisition

New knowledge acquisition:

1) Pre-class preview (online): Before class, students watch relevant videos and pictures sent by the teacher through the online platform, learn knowledge about resonance in singing, and Preview 2 vocal exercises released by teachers on the platform in advance.

Requirements for Vocal Practice 1:

Breathing is elastic, singing with skipping notes, and the voice has a grainy feel.

Open the cavity, raise the smile muscles, expose the upper teeth, find the resonance of the head cavity, and maintain a high-position singing state.

Requirements for Vocal Practice 2:

Breathe continuously, keep space in your mouth, and close your lips lightly.

Feel the sound moving forward and upward, experience the vibration between the eyebrows, and find the resonance in the head cavity.

When practicing the above two exercises, students can start from their most comfortable natural vocal range, gradually increase the level according to the semitone relationship, and do according to their ability.

2) In-class discussion (offline): Students were divided into three groups in class to discuss and share their experiences during the preview, focusing on sharing their

thinking process during the preview. Through sharing and presentation between groups, students can further understand the relationship between resonance and singing.

Learning content lecture and Q&A (offline):

Teacher checks the students' singing performance of the vocal practice songs, explains and corrects the mistakes. The teacher answered the questions raised by the students in the group discussion and analysis, and once again emphasized the key elements of achieving good resonance in singing, as well as the mutual relationship and importance of resonance and singing.

Knowledge activation and integration:

Teach the common issues of resonance in singing, look for the resonance state and skills when singing from some instinctive living habits of people, guide students to integrate the content of the first unit with the learning content of this unit, and find the state and skills of using resonance when singing. method.

Step 3 Cognitive monitoring

Self-monitoring:

1) Students record their own topic learning during class (offline), including taking class notes and class recordings

2) After class, students play back their classroom recordings and compare them with their class notes to check and discover the strengths and weaknesses in their singing. Then record the video (or audio) of singing the vocal practice song and upload it to the platform.

Self-reflection and adjustment:

1) Teacher guides students to conduct self-reflection against the learning goals set in step 1. Think about whether the learning objectives have been achieved, reflect on existing deficiencies and make timely adjustments.

2) Teachers provide an online feedback mechanism to guide students on how to better self-reflect and adjust.

Step 4 Personalized learning

Practice plan:

Vocal music learning has both commonalities and individual characteristics. Each student may encounter different problems in practicing alone. Based on the

offline classroom and online learning experience of this unit, students make a vocal practice plan for the week and upload it to the teacher. The content mainly includes goals, time management and practice strategies.

Online teaching coaching:

1) The teacher provides a vocal practice plan template and explains the elements of developing a personalized practice plan.

Vocal Practice Plan (Unit 2)	
Name:	Date:
Practice goals:	
Practice pieces:	
practice time:	
Practice strategy:	

2) Teachers provide individual tutoring and make suggestions for the vocal learning plan uploaded by each student.

Step 5 Cognitive assessment

Self-evaluation: Students self-evaluate their learning situation in the course after class.

1) The teacher provides cognitive assessment tools (Learning Self-Evaluation Scale) and explains the filling rules.

2) Students use the scale to self- evaluation the Learning situation of this unit.

Teacher feedback: Teachers provide online feedback on students' self-evaluations, highlighting successes and providing suggestions for improvement to prepare for the next unit of study.

Through the second unit, students will establish a correct understanding of resonance in singing, laying the foundation for in-depth study in subsequent units.

Evaluation

Process evaluation

1. After the end of each teaching plan, students conduct self- assessment on their own learning, " Learning Self-Evaluation Scale".

2. For evaluation in lesson plan, teacher should use "Observation Method" and record "student behavior" that occurs in each step of teaching in lesson plan. The recording behavior consists of 2 parts: 1) the part that is knowledge, understanding, attitude, and musical skills. 2) the part that is students' autonomous learning. The ability for recording is to be recorded in an essay writing style.

Lesson Plan 3

Unit3: Language in singing **Time :**4 class hours

Teaching Objiective: Understand the common requirements for language in singing, clarify the relationship between language and sound, language and emotion in singing, and focus on training the articulation, articulation, rhyme and vocalization of language in singing through the practice of reading lyrics.

Content: 1) Theoretical knowledge about language in singing.

2) language skills training in singing ,

3) Learning two exercises about language in singing.

Teaching Media: Piano (or electric piano), multimedia, computer, mobile phone, etc.

Teaching /Learning Process:

Step 1 Objective setting (Online)

Teachers arrange the teaching content of this unit and set teaching goals on the online platform.

1)Teaching content: Language training in singing

2)Teaching objectives: Understand the common requirements for language in singing, clarify the relationship between language and sound, language and emotion in singing, and focus on training the articulation, rhyme and vocalization of language in singing through the practice of reading lyrics.

Guide students to set clear and measurable learning objectives:

1) Be able to clearly understand the common requirements for language in singing.

2) Be able to correctly understand the relationship between language and sound, language and emotion in song singing.

3) Be able to read the lyrics emotionally in standard Mandarin in subsequent language exercises.

Step 2 Knowledge acquisition

New knowledge acquisition:

1) Pre-class preview (online): Before class, students watch relevant videos and pictures sent by the teacher through the online platform, learn language-related knowledge in singing, and preview the lyrics of the Chinese song "Farewell" released by the teacher on the platform in advance. .

Requirements: Be familiar with the lyrics and recite them emotionally in standard Mandarin.

Students mark words they find difficult to pronounce.

2) In-class discussion (offline): Students are divided into three groups in class to discuss and share their situation in the preview, focusing on sharing their thinking process during the preview. Through sharing and presentation between groups, students can further understand the relationship between language and sound, and the relationship between language and emotion in singing.

Learning content teaching and Q&A (offline):

The teacher checks the students' practice of the lyrics of the Chinese song "Farewell", explains and corrects errors. The teacher answered the questions raised by students in group discussion and analysis, and once again emphasized the importance of language in singing, especially the importance of language in the emotional expression of songs.

Knowledge activation and integration:

Guide students to integrate the content of the first and second units with the learning content of this unit. The three major elements of breathing, resonance, and language are indispensable in song singing.

Step 3 Cognitive monitoring

Self-monitoring:

1) Students record their own topic learning during class (offline), including taking class notes and class recordings.

2) Students play back their classroom recordings after class, compare them with their class notes, and check and discover their strengths and weaknesses in practice. Then record a video (or audio) of reading the lyrics and upload it to the platform.

Self-reflection and adjustment:

1) The teacher guides students to conduct self-reflection against the learning goals set in step 1. Think about whether the learning objectives have been achieved, reflect on existing deficiencies and make timely adjustments.

2) Teachers provide an online feedback mechanism to guide students on how to better self-reflect and adjust.

Step 4 Personalized learning

Practice plan:

Vocal music learning has both commonalities and individual characteristics. Each student may encounter different problems in practicing alone. Based on the offline classroom and online learning experience of this unit, students make a vocal practice plan for the week and upload it to the teacher. The content mainly includes goals, time management and practice strategies.

Online teaching coaching:

1) The teacher provides a vocal practice plan template and explains the elements of developing a personalized practice plan.

Vocal Practice Plan (Unit 3)	
Name:	Date:
Practice goals:	
Practice pieces:	
practice time:	
Practice strategy:	

2) Teachers provide individual tutoring and make suggestions for the vocal learning plan uploaded by each student.

Step 5 Cognitive assessment

Self-evaluation: Students self-evaluate their learning situation in the course after class.

1) The teacher provides cognitive assessment tools (Learning Self-Evaluation Scale) and explains the filling rules.

2) Students use the scale to self- evaluation the Learning situation of this unit.

Teacher feedback: Teachers provide online feedback on students' self-evaluations, highlighting successes and providing suggestions for improvement to prepare for the next unit of study.

Through the third unit, students will establish a correct understanding of the language in singing, laying the foundation for in-depth study in subsequent units.

Evaluation

Process evaluation

1. After the end of each teaching plan, students conduct self- assessment on their own learning, " Learning Self-Evaluation Scale".

2. For evaluation in lesson plan, teacher should use "Observation Method" and record "student behavior" that occurs in each step of teaching in lesson plan. The recording behavior consists of 2 parts: 1) the part that is knowledge, understanding,

attitude, and musical skills. 2) the part that is students' autonomous learning. The ability for recording is to be recorded in an essay writing style.

Lesson Plan 4

Unit4: Song singing training **Time :**4 class hours

Teaching Objiective: Correct intonation and rhythm, standard singing language, accurately grasp the style and characteristics of songs, and express them through song singing.

Content: 1) Chinese Art Songs "A Flower In The Haze.

2) Background of the song, stylistic features, singing characteristics.

3) Song Singing Practical Training.

Teaching Media: Piano (or electric piano), multimedia, computer, mobile phone, etc.

Teaching /Learning Process:

Step 1 Objective setting (Online)

Teachers arrange the teaching content of this unit and set teaching goals on the online platform.

1) Teaching content: Song "A Flower In The Haze "

2) Teaching objectives: correct intonation and rhythm, standard singing language, accurately grasp the style and characteristics of songs, and express them through song singing.

Guide students to set clear and measurable learning objectives:

1) Be able to achieve correct pitch, correct rhythm and standard singing language in singing.

2) Be able to grasp the style and characteristics of the song more accurately.

3) Be able to sing songs completely, and basically achieve both vocals and emotions.

Step 2 Knowledge acquisition

New knowledge acquisition:

1) Preview before class (online): Before class, students watch the song singing video sent by the teacher in advance through the online platform, learn the song " A

Flower In The Haze " in the "Vocal Music Grading Tutorial" (Volume 1), and preview this song in advance Sheet music and lyrics of the song.

Require:Be familiar with the music score and mark out the important and difficult points on the music score.

Be familiar with the lyrics and recite them emotionally in standard Mandarin.

Follow the accompaniment and start learning to sing songs.

2) In-class discussion (offline): Students are divided into three groups in class to discuss and share their situation in the preview, focusing on sharing their thinking process during the preview. Through sharing and presentation between groups, students became more familiar with the lyrics and melody of the song, and further mastered the key and difficult knowledge encountered during the online preview process.

Learning content teaching and Q&A (offline):

The teacher checks the students' practice of the song " A Flower In The Haze ", explains and corrects errors. The teacher answers the questions raised by students in group discussion and analysis, and further analyzes and explains the style and characteristics of the song as well as common issues that need to be paid attention to when singing. Correct the intonation and rhythm problems existing in students' singing.

Knowledge activation and integration:

Guide students to integrate the learning content of the first, second, and third units, and comprehensively use breathing, resonance, and language in song singing training.

Step 3 Cognitive monitoring

Self-monitoring:

1) Students record their own topic learning during class (offline), including taking class notes and class recordings.

2) Students play back their classroom recordings after class, compare them with their class notes, and check and discover their strengths and weaknesses in practice. Then record a video (or audio) of reading the lyrics and upload it to the platform.

Self-reflection and adjustment:

1) The teacher guides students to conduct self-reflection against the learning goals set in step 1. Think about whether the learning objectives have been achieved, reflect on existing deficiencies and make timely adjustments.

2) Teachers provide an online feedback mechanism to guide students on how to better self-reflect and adjust.

Step 4 Personalized learning

Practice plan:

Vocal music learning has both commonalities and individual characteristics. Each student may encounter different problems in practicing alone. Based on the offline classroom and online learning experience of this unit, students make a vocal practice plan for the week and upload it to the teacher. The content mainly includes goals, time management and practice strategies.

Online teaching coaching:

1) The teacher provides a vocal practice plan template and explains the elements of developing a personalized practice plan.

Vocal Practice Plan (Unit 4)	
Name:	Date:
Practice goals:	
Practice pieces:	
practice time:	
Practice strategy:	

2) Teachers provide individual tutoring and make suggestions for the vocal learning plan uploaded by each student.

Step 5 Cognitive assessment

Self-evaluation: Students self-evaluate their learning situation in the course after class.

1) The teacher provides cognitive assessment tools (Learning Self-Evaluation Scale) and explains the filling rules.

2) Students use the scale to self- evaluation the Learning situation of this unit.

Teacher feedback: Teachers provide online feedback on students' self-evaluations, highlighting successes and providing suggestions for improvement to prepare for the future studies of Vocal Music.

Through the fourth unit, students integrate breathing, resonance, and language and apply them comprehensively to song singing training. And through repeated practice, we can deepen our understanding of the song style and strengthen our singing performance.

Laying the foundation for the future studies of Vocal Music.

Evaluation

Process evaluation

1. After the end of each teaching plan, students conduct self- assessment on their own learning, " Learning Self-Evaluation Scale".

2. For evaluation in lesson plan, teacher should use "Observation Method" and record "student behavior" that occurs in each step of teaching in lesson plan. The recording behavior consists of 2 parts: 1) the part that is knowledge, understanding, attitude, and musical skills. 2) the part that is students' autonomous learning. The ability for recording is to be recorded in an essay writing style.

Outcome evaluation

At the end of all courses, organize students to fill out the " Autonomous Learning Ability Scale for College Students " .

Autonomous learning ability scale for college students
(pre-test and post-test)

Dear Student:

This questionnaire in order to investigate the changes in the level of Autonomous learning ability of college students before and after the Curriculum. The results of the study will guide and improve the teaching arrangement and learning management of this Curriculum. Your responses will not have any impact on you,the researchers will only fully analyze and extract the results of the study.

Thank you for your active support!

Graduate School
Bansomdejchaopraya Rajabhat University

No	Item	Degree
1	I can choose what to focus on next according to the unit learning objectives of the course.	1 2 3 4 5
2	I can make timely adjustments to my next learning plan based on the learning tasks I have completed in the course.	1 2 3 4 5
3	I can adopt appropriate learning methods according to the learning content of each unit.	1 2 3 4 5
4	I will consciously seek out appropriate classmates to study with.	1 2 3 4 5
5	I will take the initiative to seek help from others through the Internet for questions that I cannot answer by myself.	1 2 3 4 5
6	I will regularly check my study progress to ensure that I complete my study tasks within the specified time.	1 2 3 4 5
7	I will manage my study time effectively to avoid procrastination or over-study.	1 2 3 4 5
8	I will proactively monitor my attention and concentration during my online and offline study sessions to maintain efficient learning.	1 2 3 4 5
9	I am confident that I will be able to successfully pass the course I am studying.	1 2 3 4 5
10	Although some unit of the course is not interesting, I can learn about it happily.	1 2 3 4 5
11	I am confident about my learning in this course.	1 2 3 4 5
12	I will self-evaluate after completing each unit of study.	1 2 3 4 5
13	I will summarize my learning at the end of each unit to consolidate my learning and make up for any deficiencies.	1 2 3 4 5
14	I am able to accept feedback and suggestions from my	1 2 3 4 5

No	Item	Degree
	teacher or classmates and improve my learning methods and performance in this course accordingly.	
15	I will compare my performance with that of my classmates in the classroom to assess my learning outcomes.	1 2 3 4 5
16	I am able to make decisions independently when it comes to choosing vocal practice strategies.	1 2 3 4 5
17	When learning new songs, I prefer to try them independently rather than relying entirely on my teacher's guidance.	1 2 3 4 5
18	I am able to organize my vocal practice time efficiently and not only rely on my teacher's advice.	1 2 3 4 5
19	When I encounter difficulties in learning, I will first try to solve them by myself instead of immediately asking my teacher for help.	1 2 3 4 5
20	When learning vocal technique, I prefer to choose the practice method that suits me.	1 2 3 4 5
21	I am able to accurately assess the quality of my voice during vocal practice.	1 2 3 4 5
22	I will record my practice sessions, including vocal progress, to better understand my development.	1 2 3 4 5
23	I am able to monitor and adjust myself during practice, rather than relying solely on my teacher's guidance.	1 2 3 4 5
24	I will prepare myself before singing a song, including self-monitoring of my voice and performance.	1 2 3 4 5
25	I will be aware of the health of my voice and take steps to protect it.	1 2 3 4 5
26	I am able to independently assess my own progress in vocal technique.	1 2 3 4 5
27	I carefully consider the comments and suggestions of	1 2 3 4 5

No	Item	Degree
	others in the learning process rather than blindly accepting them.	
28	I regularly evaluate my learning Objectives and make adjustments as needed.	1 2 3 4 5
29	When mistakes occur, I view them as learning opportunities rather than getting frustrated.	1 2 3 4 5
30	I am able to independently evaluate my performance of song singing and summarize lessons learned.	1 2 3 4 5

Learning self-assessment scale

Dear Student:

This questionnaire is part of this study and is used for self-assessment after the learning task of each unit is completed. Your responses will not have any impact on you,the researchers will only fully analyze and extract the results of the study.

Thank you for your active support!

Graduate School
Bansomdejchaopraya Rajabhat University

No	Item	Degree
1	In this lesson, I have set standards for the learning task to be achieved.	1 2 3 4 5
2	In this lesson, I set high standards for my own learning performance.	1 2 3 4 5
3	In this lesson, I set objectives to help me manage my study time.	1 2 3 4 5
4	In this lesson, I will take careful notes.	1 2 3 4 5
5	I will prepare questions to ask before the lesson.	1 2 3 4 5
6	I will try to solve problems other than those assigned in the Curriculum to familiarize myself with the content taught in the Curriculum.	1 2 3 4 5
7	I will summarize the learning outcomes of the Curriculum to review my understanding of the content.	1 2 3 4 5
8	I will ask myself many questions about the Curriculum content during the course of the lesson.	1 2 3 4 5
9	In the course of the Curriculum, I will discuss with my classmates to see how well I am doing.	1 2 3 4 5

Appendix D

The Results of the Quality Analysis of Research Instruments

Index of Item-Objective Congruence(IOC) of Autonomous Learning Ability Scale for Statistical Table

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Self-determination	I can choose the next focus based on my learning goals.	1	1	1	1	Valid
	I can adjust my learning plan based on the completion of learning tasks.	1	1	1	1	Valid
	I can adopt appropriate learning methods based on my learning content.	1	1	1	1	Valid
	I will consciously seek suitable learning partners.	1	1	1	1	Valid
	If I encounter a question that I cannot answer, I will actively seek help from others through the Internet.	0	1	1	0.67	Valid
Self-monitoring	I regularly check my learning progress to ensure that I am completing my learning tasks within the specified timeframe.	1	1	1	1	Valid
	I am able to manage my study time to avoid procrastination or over-study.	1	1	1	1	Valid
	I actively monitor my attention and concentration during my studies to maintain efficient learning.	1	1	0	0.67	Valid

Dimensions	Question	Experts			$\overline{X}$	Validity
		No1	No2	No3		
	I am confident that I will be able to successfully complete college through my studies.	1	1	1	1	Valid
	I will try to learn the content of my courses even if it does not interest me.	1	1	1	1	Valid
Self-evaluation	I am confident in my ability to learn.	1	1	1	1	Valid
	I will conduct self-evaluation after completing my learning tasks.	1	1	1	1	Valid
	I will summarize my learning at the end of each chapter to consolidate my learning and make up for any deficiencies.	1	1	1	1	Valid
	I am able to accept feedback and suggestions from others and improve my learning methods and performance accordingly.	1	1	0	0.67	Valid
	I will compare my own performance with that of other students in different learning tasks to assess my learning outcomes and progress.	1	1	1	1	Valid

Index of Item-Objective Congruence(IOC) of “OKCPC” Blended Teaching Model Statistical Table

Level 1 indicators	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Step 1 Objective Setting(O)	Clear objectives	1	1	1	1	Valid
	Objective measurable	1	1	1	1	Valid
	Self-determination ability	1	1	1	1	Valid
Step 2 Knowledge Acquisition(K)	New knowledge acquisition(online)	1	1	1	1	Valid
	Learning content lectures and Q&A (offline)	1	1	1	1	Valid
	Knowledge activation integration	1	1	0	0.66	Valid
Step 3 Cognitive Monitoring(C)	Self-monitoring tools	1	1	1	1	Valid
	Self-reflection adjustment	1	1	0	0.66	Valid
Step 4 Personalized Learning(P)	Personalized learning plan (online)	1	1	1	1	Valid
	Online teaching assistance	1	1	1	1	Valid
Step 5 Cognitive Assessment(C)	Self-assessment	1	1	1	1	Valid
	Teacher feedback	1	1	1	1	Valid

Index of Item-Objective Congruence(IOC) of Lesson Plan

Statistical table

Level 1 indicators	Question	Experts			$\bar{x}$	Validity
		No1	No2	No3		
Lesson Plan 1 Breathing in Singing	Step 1 Objective setting	1	1	1	1	Valid
	Step 2 Knowledge acquisition	1	1	1	1	Valid
	Step 3 Cognitive monitoring	1	1	1	1	Valid
	Step 4 Personalized learning	1	1	1	1	Valid
	Step 5 Cognitive assessment	1	1	1	1	Valid
Lesson Plan 2 Resonance in Singing	Step 1 Objective setting	1	1	1	1	Valid
	Step 2 Knowledge acquisition	1	1	1	1	Valid
	Step 3 Cognitive monitoring	1	1	1	1	Valid
	Step 4 Personalized learning	1	1	1	1	Valid
	Step 5 Cognitive assessment	1	1	1	1	Valid
Lesson Plan 3 language in Singing	Step 1 Objective setting	1	1	1	1	Valid
	Step 2 Knowledge acquisition	1	1	1	1	Valid
	Step 3 Cognitive monitoring	1	1	1	1	Valid
	Step 4 Personalized learning	1	1	1	1	Valid

Level 1 indicators	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
	Step 5 Cognitive assessment	1	1	1	1	Valid
Lesson Plan 4 Song Singing Training	Step 1 Objective setting	1	1	1	1	Valid
	Step 2 Knowledge acquisition	1	1	1	1	Valid
	Step 3 Cognitive monitoring	1	1	1	1	Valid
	Step 4 Personalized learning	1	1	1	1	Valid
	Step 5 Cognitive assessment	1	1	1	1	Valid

Index of Item-Objective Congruence(IOC) of College Students' Autonomous Learning Ability Scale for Statistical Table

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Self-determination	I can choose what to focus on next according to the unit learning objectives of the course.	1	1	1	1	Valid
	I can make timely adjustments to my next learning plan based on the learning tasks I have completed in the course.	1	1	1	1	Valid
	I can adopt appropriate learning methods according to the learning content of each unit.	1	1	1	1	Valid
	I will consciously seek out appropriate classmates to study with.	1	1	1	1	Valid
	I will take the initiative to seek help from others through the Internet for questions that I cannot answer by myself.	1	1	1	1	Valid
	I will regularly check my study progress to ensure that I complete my study tasks within the specified time.	1	1	1	1	Valid

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Self-monitoring	I will manage my study time effectively to avoid procrastination or over-study.	1	1	1	1	Valid
	I will proactively monitor my attention and concentration during my online and offline study sessions to maintain efficient learning.	1	1	0	0.67	Valid
	I am confident that I will be able to successfully pass the course I am studying.	1	1	1	1	Valid
	Even if I am not interested in a particular unit of the course, I will try to find a way to learn it.	-1	1	1	0.33	Revision
Self-evaluation	I am confident about my learning in this course.	1	1	1	1	Valid
	I will self-evaluate after completing each unit of study.	1	1	1	1	Valid
	I will summarize my learning at the end of each unit to consolidate my learning and make up for any deficiencies.	1	1	0	0.67	Valid
	I am able to accept feedback and suggestions	1	1	1	1	Valid

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
	from my teacher or classmates and improve my learning methods and performance in this course accordingly.					
	I will compare my performance with that of my classmates in the classroom to assess my learning outcomes.	1	1	1	1	Valid
Self-determination	I am able to make decisions independently when it comes to choosing vocal practice strategies.	0	1	1	0.67	Valid
	When learning new songs, I prefer to try them independently rather than relying entirely on my teacher's guidance.	1	1	1	1	Valid
	I am able to organize my vocal practice time efficiently and not only rely on my teacher's advice.	1	1	1	1	Valid
	When I encounter difficulties in learning, I will first try to solve them by myself instead of immediately asking my teacher for help.	1	1	1	1	Valid

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
	When learning vocal technique, I prefer to choose the practice method that suits me.	1	1	1	1	Valid
Self-monitoring	I am able to accurately assess the quality of my voice during vocal practice.	1	1	1	1	Valid
	I will record my practice sessions, including vocal progress, to better understand my development.	1	1	1	1	Valid
	I am able to monitor and adjust myself during practice, rather than relying solely on my teacher's guidance.	1	1	1	1	Valid
	I will prepare myself before singing a song, including self-monitoring of my voice and performance.	1	1	1	1	Valid
	I will be aware of the health of my voice and take steps to protect it.	1	1	1	1	Valid
	I am able to independently assess my own progress in vocal technique.	1	1	1	1	Valid
	I carefully consider the comments and suggestions	1	1	1	1	Valid

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Self-evaluation	of others in the learning process rather than blindly accepting them.					
	I regularly evaluate my learning Objectives and make adjustments as needed.	1	1	0	0.67	Valid
	When mistakes occur, I view them as learning opportunities rather than getting frustrated.	1	1	1	1	Valid
	I am able to independently evaluate my performance of song singing and summarize lessons learned.	1	1	1	1	Valid

Index of Item-Objective Congruence(IOC) of Learning Self-assessment Scale for Statistical Table

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
Objective Setting Evaluation	In this lesson, I have set standards for the learning task to be achieved.	1	1	1	1	Valid
	In this lesson, I set high standards for my own learning performance.	1	1	1	1	Valid
	In this lesson, I set objectives to help me manage my study time.	1	1	1	1	Valid
Task Strategies Evaluation	In this lesson, I will take careful notes.	1	1	1	1	Valid
	I will prepare questions to ask before the lesson.	1	1	1	1	Valid
	I will try to solve problems other than those assigned in the curriculum to familiarize myself with the content taught in the curriculum.	1	1	1	1	Valid
Self-evaluation	I will summarize the learning outcomes of the curriculum to review my understanding of the content.	1	1	1	1	Valid
	I will ask myself many questions about the	1	1	1	1	Valid

Dimensions	Question	Experts			$\bar{X}$	Validity
		No1	No2	No3		
	Curriculum content during the course of the lesson.					
	In the course of the Curriculum, I will discuss with my classmates to see how well I am doing.	1	1	1	1	Valid

Reliability analysis of research tools

Variable	Cronbach's α	Dimension	Cronbach's α
Autonomous Learning Ability	0.97	self-determination ability	0.95
		self-monitoring ability	0.93
		self-evaluation ability	0.96
Learning Self-assessment	0.76	Objective Setting Evaluation	0.75
		Task Strategies Evaluation	0.73
		Self-evaluation	0.64
Autonomous learning ability scale for college students (pre-test and post-test)	0.90	self-determination ability	0.81
		self-monitoring ability	0.66
		self-evaluation ability	0.76

Factor analysis of Autonomous Learning Ability Scale

Variable	item number	Factor loading	Squared Factor Loading	
			Eig	EV
Self-determination ability	1	0.84	4.99	33.24%
	2	0.79		
	3	0.88		
	4	0.58		
	5	0.71		
Self-monitoring ability	6	0.60	4.83	32.22%
	7	0.54		
	8	0.61		
	9	0.42		
	10	0.48		
Self-evaluation ability	11	0.74	2.54	16.92%
	12	0.77		
	13	0.71		
	14	0.91		
	15	0.90		
KMO: 0.91				
Total Explained Variance: 82.38%				

Factor analysis of Learning Self-assessment Scale

Variable	item number	Factor loading	Squared Factor Loading	
			Eig	EV
Objective Setting Evaluation	1	0.74	2.19	24.29%
	2	0.79		
	3	0.83		
Task Strategies Evaluation	4	0.77	2.07	23.05%
	5	0.56		
	6	0.82		
Self-evaluation	7	0.81	1.79	19.92%
	8	0.85		
	9	0.76		
KMO: 0.57				
Total Explained Variance: 67.27%				

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mrs.Yanru Chen

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 3rd October 2020

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

Journal of Roi Kaensarn Academi
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Date : August 3, 2024

Acceptance Letter

Dear Author (S) : Chen Yanru, Wirot Watananimitgul, Wichian Intarasompun and Areewan Iamsa-ard

Paper ID : 670895

PaperTitle : The development of Blended Teaching Model Based on Metacognition Theory to Improve College Students' Autonomous Learning Ability

This is to enlighten you that above manuscript reviewed and appraised by the review committee member of Journal of Roi Kaensarn Academi by 3 assessors and it is accepted for the purpose of publication in Journal of Roi Kaensarn Academi at Group 1 of Thai journal citation Index Centre (TCI) with ISSN 2697-5033 (Online) Volume 9 Issue 8 August 2024 that will be available at https://so02.tci-thaijo.org/index.php/JRKSA/index

Sincerely

Teedanai Kapko

Dr.Teedanai Kapko

Editor Journal of Roi Kaensarn Academi

Full paper : https://so02.tci-thaijo.org/index.php/JRKSA/index

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