

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

Chen Yanru, Wirot Watananimitgul,
Wichian Intarasompun and Areewan Iamsa-ard
Bansomdejchaopraya Rajabhat University, Thailand
Corresponding Author, Email: wichian.in@bsru.ac.th

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 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 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 autonomous learning ability scale, learning self-assessment scale, blended teaching model based on metacognitive theory and lesson plan . 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 metacognitive 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.

Introduction

Autonomous learning ability is a learner's ability to take control of his or her own learning(Pang,W.G.,2003:2-7)). 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(Chen,Y.Q.,2016:56-60. He,J.S.,2009:81-83). In the top-level design of education reform and development planning, China attaches great importance to the cultivation of students' learning ability and lists autonomous learning as one of the core qualities for the development of Chinese students(CCRG,2016:1-3).

Metacognitive theory is an important theory in cognitive psychology, first proposed by psychologist Flavell John(1976:231-236).Metacognitive 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(Moshman,D.,2018: 599-606.Wang, L. and Guo, D. J., 2000: 458-463).

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.,2014:58-62). 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(Feng, X.Y.et al.,2020:25-32;

This study believes that cultivating college students' autonomous learning ability is crucial for their cognitive development, adaptation to the educational environment, and lifelong learning, and also has a far-reaching impact on future career development and personal growth. Metacognition has a positive impact on autonomous learning and can help learners monitor and regulate the entire process of their own learning and cognitive activities. The blended teaching model is student-centered and attaches importance to students' autonomous learning and personalized learning experience. Developing a blended teaching model based on metacognitive theory has positive significance and role in improving college students' autonomous learning ability.

Research Objectives

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

Research Methodology

The methodology of this research was research and development (R&D), The research process is divided into three steps:

Step1, Investigate the current situation of autonomous learning ability of music major students in Neijiang Normal University.

- 1) Developing a questionnaire on college students' autonomous learning ability.
- 2) Using the principle of convenience sampling, a questionnaire on the current status of autonomous learning ability was distributed to 400 college students from the School of Music of Neijiang Normal University.

3) Questionnaire survey data was collected to analyze the current status of college students' autonomous learning ability, providing the basis for development a blended teaching model based on metacognitive theory.

Step2, Development a blended teaching model based on metacognition theory.

- 1) Clarify the components of the blended teaching model, clarify the goals and principles of the blended teaching model

2) Create a blended teaching model and develop guidelines for the teaching and learning process

3) Drafted lesson plans based on the teaching model.

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

5) Improve and document the teaching model.

Step3, Experimentation and improvement of teaching model.

1. Design teaching experiments based on the revised teaching model and research tools.

2. The experimental design was adopted to apply the blended teaching model based on metacognitive theory to the vocal basics and song singing courses, and a teaching experiment was carried out.

3. Through the cluster random sampling method, 30 freshmen majoring in music from Neijiang Normal University were selected to carry out the teaching experiment.

4. The dependent sample t-test was used to analyze the experimental data before and after the teaching experiment, the research results were obtained based on the analysis.

5. Further revise and improve the teaching model based on the research results.

Research Scope

1. Population and sample

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

1.1 Population

1) The population of the survey on the current status of college students' autonomous learning ability is college students of Neijiang Normal University.

2) The population of the blended teaching model experiment based on metacognition theory is freshmen students from the School of Music of Neijiang Normal University.

1.2 Sample Group

1) The sample group for the investigation and study on the current status of college students' autonomous learning ability is 400 students from the School of Music of Neijiang Normal University, and the principle of convenient sampling is adopted.

2) The sample group of the experiment on the blended teaching mode based on metacognition theory is 30 freshmen students in the School of Music of Neijiang Normal University, the principle of convenience sampling is adopted.

2. Independent Variable and dependent variable

Independent Variable:

Blended teaching model based on metacognitive theory

Dependent Variable:

Autonomous learning ability of college students

3. Research instruments

The following research instruments were used in this study, all questionnaires are scored based on the test taker's scores: mean score 4.51 - 5.00 means "the highest level", mean score 3.51 - 4.50 means "high level", mean score 2.51 - 3.50 ,means "moderate level", mean Score 1.51 - 2.50 means "low level", mean score 1.00 - 1.50 means "lowest level".

3.1 Questionnaire of autonomous learning ability

This questionnaire is used in the first step of the survey on the current status of college students' autonomous learning ability, with a total of 15 questions. Which is divided into three dimensions of autonomous decision-making ability, self-monitoring ability, and self-evaluation ability, 5 questions for each dimension. 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, the Cronbach's coefficient reliability value (α) at 0.97.

3.2 The blended teaching model based on metacognition theory . This study 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. Which includes 5 steps: objective setting, knowledge acquisition, cognitive monitoring, personalized learning, and Cognitive Assessment. Based on this blended teaching model, lesson plans were developed for a course on vocal basics and song singing. The lesson plan consists of 4 units: breathing in singing, resonance in singing, language in singing, song singing training, each unit has 4 hours, total 16 hours.

Then, three professional scholars, including curriculum and teaching experts, pedagogy experts, and psychology experts, were invited to evaluate the objectives, principles, and teaching process guidelines of the teaching model through the Index of Objective Coherence (IOC) to determine the effectiveness of the blended teaching model. The result of the assessment of the consistency of the 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.

3.3 Questionnaire of college students' autonomous learning ability

This questionnaire was used in the third step of this study, it was modified based on the autonomous learning ability scale used in step 1 and added items related to vocal learning, with a total of 30 questions, 1-5, 16-20 for self-determination, 6-8, 21-25 for self-monitoring, and 9-12, 26-30 for self-evaluation. Which aimed to investigate the changes in the level of college students' autonomous learning ability before and after the implementation of the blended teaching model based on metacognitive theory in the

vocal basics and song singing courses, as well as the changes in students' autonomous learning ability in vocal learning.

This scale 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, the Cronbach's coefficient reliability value (α) at 0.90.

3.4 Learning self-assessment questionnaire

This questionnaire was used in step 3 of this study. 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 self-assessment scale includes 3 dimensions, with 1-3 for objective setting evaluation, 4-6 for task strategies evaluation, and 7-9 for self-evaluation, a total of 9 questions. This scale 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, the cronbach's coefficient reliability value (α) at 0.76.

4. Data collection and analysis

This study collected data and analysis it according to the following steps:

1) A web-based questionnaire on the survey of autonomous learning ability was distributed to college students at Neijiang Normal University in Sichuan using the principle of convenience sampling. The introduction to filling out the questionnaire detailed the principles of voluntary completion, confidentiality of information, and anonymity. The actual number of valid questionnaires in this survey was 400. Subsequently, the recovered valid questionnaires were coded and statistically analyzed, and the results were expressed and analyzed in terms of mean (\bar{x}), standard deviation (SD.) and percentage (%).

2) A experimental design was adopted to apply the blended teaching model based on metacognitive theory to the vocal basics and song singing courses, and a teaching experiment was carried out. Before the experiment, the questionnaire on college students' autonomous learning ability was distributed and collected from 30 freshmen. Then, 16 hours of vocal basics and song singing courses were taught. After all the courses were completed, the questionnaire on college students' autonomous learning ability was distributed and collected again. Mean (\bar{x}), standard deviation (S.D.), t-test (t), degree of freedom (df) and significance (sig) ,were used to observe the changes of autonomous learning ability level before and after the experiment, and to analyze the effect of the blended teaching model . As shown in Table 1:

Table 1: Experimental design (pre-test and post-test) :

Group	Pre-test	Implementation courses	Post-test
R	O1	X	O2

The meaning of symbols used in experimental design:

R stands for random sampling

X represents the implementation course

O1 indicates pre-test

O2 indicates post-test

3) Data collection for process evaluation. After completing each unit of the vocal basics and song singing course, the self-assessment scale was distributed to 30 freshmen to examine their self-assessment of the learning status and learning effect of each unit.

The results were expressed and analyzed in terms of mean (\bar{x}) and standard deviation (SD.).

Research Findings

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 self-assessment of learning effect . The research findings as follow:

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

400 students majoring in music at Neijiang Normal University participated in a survey on the current status of college students' autonomous learning ability. 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 :

Table 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 Table1, 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).

2. Development a blended teaching model based on metacognition theory

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, aims to improve college students' autonomous learning ability. The blended teaching model includes five steps, as shown in Figure1:

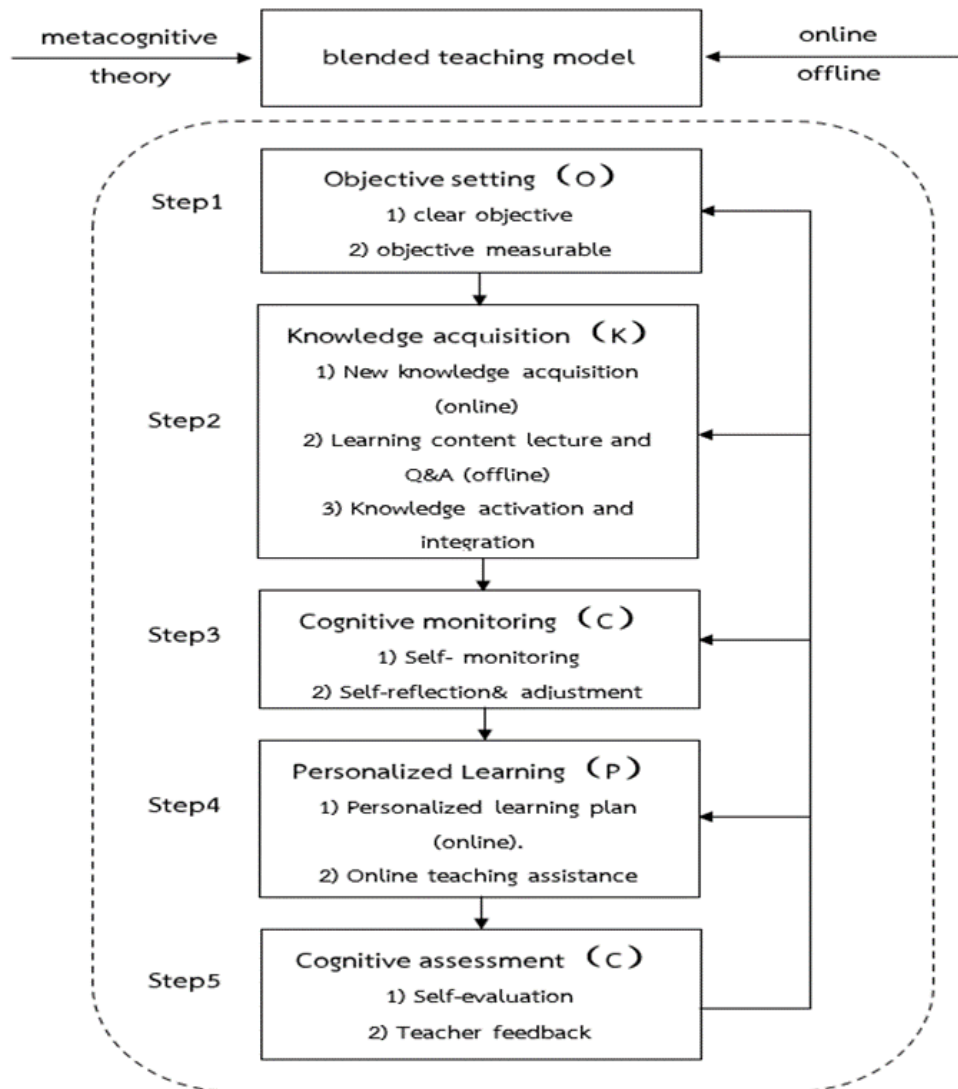


Figure 1.The “OKCPC” blended teaching model based on metacognitive theory

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.

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).

3. Comparison of college students' autonomous learning ability before and after the implementation of "OKCPC" 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.

First, 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. Then, using independent sample t-test, the differences in college students' autonomous learning ability before and after the implementation of the "OKCPC" blended teaching model were analyzed.

Table 3. Data analysis of respondents in pre-post "OKCPC" Blended Teaching Model experiment

Item	Pretest		Level	Ranking	Posttest		Level	Ranking
	\bar{x}	S.D.			\bar{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	

(n=30)

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 2, 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(=3.62, S.D.=0.71), and the mean value of 1.3 self-evaluation ability in the post-test was the highest(=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(=3.55, S.D.=0.83), and the mean value of 2.1 self-determination ability in the post-test was the highest(=4.15, S.D.=0.63).

Table 4. T-test of autonomous learning ability of college students Pre-test and Post test with using "OKCPC" Blended Teaching Model

	Pretest (30)		Posttest (30)		df	t	Sig.
	\bar{x}	S.D.	\bar{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 3, 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.

Learning self-assessment in each unit. In order to help students better monitor the learning process, adjust learning strategies, and evaluate learning outcomes, during the implementation of the "OKCPC" blended teaching model, used the "Learning self-assessment scale" at the end of each unit of study to allow students to conduct self-assessment. The data analysis results are as follows:

Table 4. learning self-assessment data

Unit	1. Objective Setting Evaluation		Level	2. Task Strategies Evaluation		Level	3. Self-evaluation		Level	Total		Level
	\bar{x}	S.D.		\bar{x}	S.D.		\bar{x}	S.D.		\bar{x}	S.D.	
	1	3.51	0.64	high	3.56	0.78	high	3.63	0.67	high	3.57	0.70
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, 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 Good level (\bar{x} =3.78, S.D.=0.70). Learning self-assessment 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 (\bar{x} =4.05, S.D.=0.70, \bar{x} =4.09, S.D.=0.69, \bar{x} =4.14, S.D.=0.68). This shows that students generally believe that through the vocal basics and song singing courses of the "OKCPC" blended teaching model, they have achieved good learning results in vocal learning and improved their autonomous learning ability.

Discussion

This study will discuss the conclusions according to the order of research purposes , includes the following three parts:

1. 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 Xu, C. et al.,(2021:66-70), 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., (2021:111-117), 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, D. 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. There are significant differences in the autonomous learning ability of students from different majors (Liu, L. et al., 2020:22-25). 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, X. P. et al., 2017:41-47). 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. and Fang, L., 2023:138-144). 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 (Wang, H. J. et al., 2023:22-29). Therefore, strengthening the training of college students' metacognitive knowledge and skills is very necessary to improve their self-evaluation ability.

2. 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.and Laubscher,D.(2022:17-34) study, 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. This result consisted the appropriate similar results as the study of Meng, C. et al. (2023:160-163) Zhonghua.et al. (2023; 382-383)Zimin , and Z., et al (2023: 335-336).

3.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 and Polok, 2019:1-11). The development of students' metacognitive activities can help them better manage their learning. 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.,2019:19-26). 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.,2020:69-75; Peihao, X. et al, 2023: 140-143)

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. (2014:186-188) 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

1. Theoretical Recommendation

Deeply integrate metacognitive theory with educational theory, and continuously improve and perfect the blended teaching model. Future research should expand the assessment of the "OKCPC" model across various majors, grades, and university types to generalize findings. Employ both quantitative and qualitative methods, such as teaching reflections and student interviews, to comprehensiveness of the research.

2. Policy Recommendations

Policy Recommendations for Educational institutions:

1) Infrastructure and technical support: increase investment in infrastructure, develop more abundant online teaching platforms and course teaching resources, support the implementation of the "OKCPC" blended teaching model, and ensure the provision of resources and technical support for students and teachers.

2) Teacher development and training: implement continuous professional development programs that focus on interdisciplinary pedagogy, psychology, metacognitive theory, and technology. Research on teachers' training needs and effective training methods should be prioritized to support the "OKCPC" blended teaching model.

3) Resource Allocation and Staffing: Allocate sufficient resources and ensure proper staffing to support the "OKCPC" blended teaching model. Regularly evaluate and adapt policies to meet the evolving needs of students and educators.

3. Practical Recommendations

For effective application of the "OKCPC" blended teaching model, practical recommendations include:

1) Preparation: Develop a positive attitude towards the model, fully embracing the student-centered approach. Enhance subject teaching abilities and acquire interdisciplinary knowledge in pedagogy, psychology, and metacognitive theory, along with technological skills.

2) Student-Centered Approach: Focus on creating a supportive and interactive learning environment that encourages self-regulation and reflective thinking. Provide continuous and constructive feedback to students.

3) Continuous Improvement: Regularly assess and refine teaching practices based on feedback and research findings. Expand the scope of study to diverse educational contexts to accurately evaluate the model's effectiveness and explore opportunities for continuous improvement.

Reference

- Bosch, C., & Laubscher, D. J. (2022). Promoting self-directed learning as learning presence through cooperative blended learning. *International Journal of Learning, Teaching and Educational Research*, (09), 17-34.
- Chen, Y. Q. (2016). Thoughts on several issues concerning autonomous learning in primary and secondary school students. *Educational Science Research*, (10), 56-60. doi:CNKI:SUN:JYKY.0.2016-10-014.
- Feng, X. Y. et al. (2019). Blended learning in the era of "Internet+": Learning theories and pedagogical foundations. *China Distance Education*, (07), 19-26, 92-93. doi:10.13541/j.cnki.chinade.2019-07-004.
- Feng, X. Y., Cao, J. T., & Huang, L. Y. (2020). Methods and strategies for blended learning design in the "Internet+" era. *China Distance Education*, (08), 25-32+ 54+77. doi:10.13541/j.cnki.chinade.2020.08.004.
- He, J. S. (2009). The connotation, composition, and dynamic analysis of students' autonomous learning ability. *Educational Review*, (02), 81-83. doi:CNKI:SUN:JYPL.0.2009-02-027.
- He, K. K. (2014). How to implement "depth fusion" of information technology and education. *Curriculum. Teaching. Materialand. Method*, (02), 58-62+67. doi:10.19877/j.cnki.kejcf.2014.02.012.
- Intarasompun, W., Muangnual, P., and Puchatree, N. (2022). Active Learning Management and Using E-Portfolio as Authentic Assessment for Teacher Students. *Journal of Yanasangvorn Research Institute Mahamakut Buddhist University*, 13 (2), 108-118. Retrieved from <https://so04.tci-thaijo.org/index.php/yri/article/view/262856>
- Li, D., & Wang, Y. (2021). Assessment and analysis of college students' extracurricular self-directed learning abilities: A case study of Beihang University. *Journal of Beihang University (Social Sciences Edition)*, (05), 111-117.
- Li, S. P., Zhao, W., Liu, H. X., Liu, D. L., & Liu, F. J. (2017). Data representation metacognition: A study on online self-directed learning behavior based on learning analytics. *E-Learning Research*, (03), 41-47. <https://doi.org/10.13811/j.cnki.eer.2017.03.007>
- Liu, L. et al. (2020). Analysis of the current status of college students' self-directed learning ability: A case study of an industry-based university. *China Educational Technology Equipment*, (16), 22-25. doi:CNKI:SUN:ZJJB.0.2020-16-008.

- Liu, Y. P., & Fang, L. (2023). A study on the relationship between self-monitoring ability in higher mathematics and academic performance in mathematics: A case study of Tonghua Normal University. *Journal of Tonghua Normal University*, (12), 138-144. <https://doi.org/10.13877/j.cnki.cn22-1284.2023.12.023>
- Meng, C., Intarasompun, W., Watananimitgul, W., & Iamsa-ard, A. (2023). The Development of Issue-centered Teaching Model based on Radical Constructivism Theory to Improve Students' Critical Thinking Ability. *Journal of Roi Kaensarn Academi*, 8 (11), 156–170. Retrieved from <https://so02.tci-thaijo.org/index.php/JRKSA/article/view/266117>
- Moshman, D. (2018). Metacognitive theories revisited. *Educational Psychology Review*, (30), 599-606.
- Nguyen, T. (2020). Research on O2O teaching model of Chinese as a foreign language (TCFL) for improving autonomous learning ability [Doctoral dissertation, *East China Normal University*]. *China National Knowledge Infrastructure*. doi:10.27149/d.cnki.ghdsu.2020.001964.
- Orzechowska, P., & Polok, K. (2019). Goal-setting as a motivational factor helping FL learners in gaining their levels of FL proficiency. *Open Access Library Journal*, 6 (3), 1-11.
- Pang, W.G. (2003). *Autonomous learning: Principles and strategies for learning and teaching*. Shanghai, China: East China Normal University Press.
- Peihao, X., Intarasompun, W., Watananimitgul, W., & Iamsa-ard, A. (2023). The Development of Life Values Integrated Curriculum to Enhance Mental Health for Freshmen Students. *Journal of Roi Kaensarn Academi*, 8 (11), 131–146. Retrieved from <https://so02.tci-thaijo.org/index.php/JRKSA/article/view/266122>
- Wang, H. J., Lu, X. Y., Ma, G. Q., & Liao, X. L. (2023). Research on the Effect of Metacognitive Ability on Online Learning Behaviors. *Digital Education*, (05), 22-29. <https://doi.org/CNKI:SUN:SEJY.0.2023-05-004>
- Wang, L., & Guo, D. J. (2000). The nature and elements of metacognition. *Acta Psychologica Sinica*, 32 (04), 458-463. doi:CNKI:SUN:XLXB.0.2000-04-015.
- Xu, C., Wang, X., Sheng, W., & Mou, Y. (2021). Analysis of the current status of online self-directed learning among college students and strategies for cultivating self-directed learning abilities. *Journal of Suzhou University*, 2021(11), 66-70. <https://doi.org/CNKI:SUN:SZSY.0.2021-11-015>.
- Zhang, S.H. (2014). Vocal pedagogy in higher education guided by metacognitive theory. *Music Composition*, (11), 186-188. doi:CNKI:SUN:YYCZ.0.2014-11-048.
- Zhonghua, G., Intarasompun, W., Watananimitgul, W., & Iamsa-ard, A. (2023). The Development of Blended Teaching model Based on Deep Learning Theory to Enhance college students' critical thinking. *Journal of Roi Kaensarn Academi*, 8 (11), 381–394. Retrieved from <https://so02.tci-thaijo.org/index.php/JRKSA/article/view/266121>
- Zimin, Z., Watannanimtgul, W., Intarasompun, W., & Iamsa-ard, A. (2023). The Development of Instructional Model According to Immersive Learning in Virtual Reality Environment to Enhance Tour Guide Students' Oral Communication Ability. *Journal of Roi Kaensarn Academi*, 8 (12), 324–338. Retrieved from <https://so02.tci-thaijo.org/index.php/JRKSA/article/view/266491>