Investigation and Analysis of Online Piano Improvisational Accompaniment Education: A Case Study of Universities in Guangzhou, Foshan, and Zhaoqing

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Abstract: The ability to provide impromptu piano accompaniment is a crucial skill that music teachers in primary and secondary schools must possess. Enhancing the accompaniment skills of music majors in colleges and universities is a focal point of the "new normal" compulsory courses. Drawing on data analysis and research from a questionnaire survey on impromptu accompaniment in some universities in the Guangdong-Hong Kong-Macao Greater Bay Area, this paper demonstrates that multidimensional, multi-channel, and diversified curriculum reform is essential for improving teaching effectiveness and achieving educational objectives. The paper also proposes suggestions and ideas for curriculum reform and the construction of an online impromptu accompaniment course learning platform for reference.

Keywords: Impromptu accompaniment; Universities; Questionnaire; Online courses

1. Research background

It has been more than 40 years since piano impromptu accompaniment was included in the music teaching curriculum of higher education in 1980. With the deepening of impromptu accompaniment teaching, numerous theoretical books and textbooks have emerged, and students have increasingly applied them in their work [1]. Nowadays, the piano impromptu accompaniment course has become one of the main courses in normal universities. The ability of impromptu accompaniment is closely related to piano playing skills, but often, the proficiency levels of the two are disconnected. In the 21st century, impromptu accompaniment courses face greater challenges. With the rapid proliferation of global information technology, various types of music can easily reach students through the Internet, smartphones, social media, and short videos. Improving impromptu piano accompaniment skills has become an urgent need for students, teachers, employers, and society at large [2]. The teaching of piano impromptu accompaniment should align with the current era, meet societal needs, and fulfill the requirements of college students, necessitating corresponding adjustments and reforms.

Amid unexpected events, all courses have shifted to online teaching, presenting both challenges and opportunities for impromptu accompaniment instruction. In the Ministry of Education's key points of work for 2021, there is a clear emphasis on "accelerating the modernization of education reform and promoting innovation and development in higher education." The report underscores the importance of "reform and innovation, deepening education and teaching reforms, and promoting sustained and high-quality development of the education system." Therefore, there is an urgent need to implement integrated online and offline teaching reforms, enhance teaching efficiency, and improve students' accompaniment skills [2]. However, several challenges persist in the process of exploring curriculum reform.

1.1. Analysis of the students' perspectives

(1) The enrollment of normal music majors in colleges and universities in Guangdong Province is increasing annually, implying that upon entering college, a significant portion of students are "novices" with no prior piano-playing experience. The two-year compulsory piano course only covers basic piano playing skills. Only a few diligent students can achieve proficiency above the level of "Czerny Piano Etude 849." Consequently, a lack of piano playing ability becomes a hindrance to learning impromptu accompaniment.

(2) Students do not allocate sufficient time to learn improvisational accompaniment. Piano impromptu accompaniment requires a blend of compositional theory, keyboard skills, acoustics, and piano performance. Different levels of performance ability yield varying degrees of accompaniment proficiency. Regardless of the performance level, dedicated practice is essential to complete the assignments in this course. Only through the harmonious coordination of "hand, eye, ear, and brain" can theoretical knowledge and practical application merge seamlessly, thereby avoiding the predicament of understanding in theory but faltering in practice [4,5]. However, where can students find the time? Presently, students are influenced by high-speed information technology and seek quick achievements. They aspire to enhance their impromptu accompaniment skills rapidly without investing ample time in gradual progress. Furthermore, the current curriculum structure in normal colleges and universities allocates minimal time to professional courses, leading to reduced practice time for piano improvisation accompaniment.

1.2. Analysis from the teaching level

(1) Since the introduction of impromptu piano accompaniment courses into normal colleges and universities nearly 40 years ago, the teaching focus of these courses has evolved to meet the demands of the times and social employment. Despite the abundance of impromptu accompaniment textbooks available, there is currently no standardized criterion for selecting such textbooks. Moreover, the teaching system lacks uniformity and perfection as instructors rely on their individual teaching experiences.

(2) The positioning of impromptu accompaniment lacks precision and is often overshadowed by piano playing proficiency. Impromptu accompanists must engage in seamless cooperation with singers, with the latter serving as the focal point while the former's role is to support and enhance the logical development of the singer's music.

(3) Regarding teacher selection, few colleges and universities employ full-time professional impromptu accompaniment instructors, with most positions filled by piano teachers. While piano performance and impromptu accompaniment may seem similar, their emphases differ significantly. This mismatch can exacerbate the aforementioned issues [6].

(4) There is a shortage of teaching equipment. Impromptu piano accompaniment classes require practical application of theoretical knowledge, and classroom exercises are crucial for rapid skill acquisition. However, many institutions have not adequately integrated digital pianos into impromptu accompaniment classes. Relying solely on traditional classroom setups, acoustic pianos, and PowerPoint presentations is insufficient for enhancing classroom teaching and improving teaching efficiency.

1.3. Analysis of the application of online learning software

(1) The absence or inadequacy of evaluation mechanisms for online courses also hampers their integration as supplementary tools in impromptu accompaniment teaching at colleges and universities. With the normal management of the COVID-19 epidemic, educational institutions have realized the importance of maintaining high teaching standards in online education and effectively bridging the gap between online and offline instruction, emphasizing the need for curriculum reform [7].

(2) Following the resumption of offline teaching, major educational apps have introduced various online impromptu accompaniment courses. Platforms such as "Yangyin Online," "China University MOOC," "Litchi Micro Course," "Xuelang," and "Douyin" have all offered impromptu accompaniment courses. Additionally, the Education Department of Guangdong Province has initiated programs promoting online impromptu accompaniment courses in recent years, albeit with limited adoption in provincial colleges and universities. The lack of standardized teaching content and progression results in a disparity among online courses, leaving the choice of materials largely to individual instructor preferences. This discrepancy in content and progression hinders the seamless integration of online and offline courses. The utilization and learning of impromptu accompaniment within software rely heavily on instructors' conscious awareness and students' independent learning abilities [8].

(3) The absence or inadequacy of evaluation mechanisms for online courses also impedes their effective use as supplementary tools in impromptu accompaniment teaching at colleges and universities.

2. Investigation and research on online teaching of piano impromptu accompaniment in universities in Guangzhou, Foshan, and Zhaoqing

2.1. Investigation of the current learning ability of normal music majors

2.1.1. Survey method

To assess the learning ability of normal music majors in colleges and universities, this survey employs various methods, including questionnaire surveys, interviews, data collection, and observation of select subjects.

The questionnaire is distributed to sophomores and juniors majoring in normal music in Guangzhou, Foshan, and Zhaoqing. It focuses on piano improvisational accompaniment learning and is typically administered during the student's junior year, although some institutions offer it in the sophomore year. Thus, students in these two stages are suitable participants. Due to logistical constraints and time limitations, the entire survey process was conducted online, and participation was voluntary. A total of 131 individuals took part in the survey, with 131 questionnaires collected. The questionnaire covers five main aspects: personal basic information, pre-course abilities, challenges encountered during learning, understanding, and engagement with online courses, and expectations regarding the effectiveness of piano impromptu accompaniment learning. The questionnaire's contents are detailed in the following table:

Contents of the questionnaire	Question number
Personal information	38
Study the basic competency survey for an improvisational accompaniment course	3, 5, 6, 7
Learn the problems encountered during the impromptu accompaniment class	10, 11, 15, 18, 23, 24, 25, 26
Understand the online improvisational accompaniment classes and learn the situation	29, 30, 31, 32, 33, 34, 35
Expectations for the effectiveness of improvisational accompaniment learning	1, 12, 14

The author conducted interviews with impromptu accompaniment teachers from various colleges and universities via telephone and WeChat. This survey aimed to assess music education students' learning abilities in impromptu piano accompaniment, identify prominent issues in the teaching process, propose potential solutions, and explore the utilization of online courses.

2.1.2. Specific analysis of the investigation content
2.1.2.1. Survey of students' abilities before taking the impromptu accompaniment course
Question 1: How familiar are you with keyboards? [Multiple choice]
A. Have a solid foundation and a certain level of playing - 33.59%
B. Learning time is not long, can play simple songs - 58.78%
C. Almost no contact with the keyboard, no basic - 7.63%

Question 2: Do you think you have enough basic music theory? [Multiple choice]
A. Yes - 71.76%
B. No - 28.24%

Question 3: Can you play scales proficiently? [Multiple choice]
A. Can be - 42.75%
B. Can't do - 57.25%

According to the data analysis, 7.63% of the students had not touched the keyboard before learning the impromptu accompaniment course and lacked basic playing skills. Additionally, 57.25% of the students were not proficient in playing various scales, and only 28.24% believed they had a basic understanding of music theory. Piano impromptu accompaniment requires proficiency in piano playing, harmony, musical form analysis, and other fundamental music theory skills, making it a crucial professional ability for students majoring in normal music. Therefore, students with weak foundations must be considered in teaching impromptu accompaniment courses, including selecting appropriate teaching materials and organizing teaching progress.

2.1.2.2. Difficulties encountered in the course of learning impromptu piano accompaniment
This questionnaire also includes several questions about the difficulties encountered in learning. Below are the specific questions and corresponding data:

Question 1: What is your biggest difficulty in learning to improvise accompaniment? [Multiple choice]
A. Difficulty in reading music - 15.27%

B. Difficulty in using harmonic texture - 58.78%

C. Unable to grasp the rhythm - 8.4%

D. Difficulty in coordinating both hands - 17.56%

Question 2: Do you find it difficult to take improvisational accompaniment classes in college?

A. Yes - 57.25%

B. No - 42.75%

From the data, it can be observed that 58.78% of students struggle with using harmonic texture in impromptu accompaniment learning, while 17.56% find it challenging to coordinate their hands. Additionally, 15.27% face difficulties in reading music, and 8.4% find it hard to grasp rhythm during learning. Overall, 57.25% of students perceive learning impromptu accompaniment as difficult. Based on the previous question's data, the difficulties encountered in the learning process can be attributed to two main factors: lack of theoretical knowledge and inadequate playing ability, leading to students feeling overwhelmed by the challenges of impromptu accompaniment learning.

There are differences between traditional theoretical courses and keyboard and acoustics courses. The former focuses on theoretical exercises, analyzing harmonic direction and solutions in musical scores. The latter involves repeatedly playing chord progressions on keyboard instruments and using sound to enhance learners' acoustic understanding of harmony. This helps them arrange accompaniments for melodies and develop a solid foundation in harmonic thinking for improvisation [9]. Currently, many colleges and universities prioritize traditional theoretical courses, emphasizing correctness in solving paper-based problems and written test scores. Consequently, students may lack awareness of harmony and sound, struggling to coordinate their hands, eyes, ears, and brain effectively while playing the piano.

2.1.2.3. Investigation of learning habits, involvement, preferences, and dislikes

Question 1: How much time are you willing to spend practicing impromptu accompaniment after class? [Multiple choice]

A. 1–2 hours - 46.56%

B. 3–4 hours and above - 12.21%

C. Practice when you think about it, not very deliberately - 41.22%

Question 2: Do you think you practice impromptu accompaniment efficiently? [Multiple choice]

A. Very high - 8.4%

B. Average - 91.6%

Question 3: Which way do you prefer to learn improvisational accompaniment? [Multiple choice]

A. Self-study with graphic and video materials - 8.4%

B. Class teachers concentrated on teaching knowledge and returned to class guidance - 15.27%

C. The teacher gave one-on-one instruction - 19.08%

D. All of the above - 57.25%

Question 4: What types of music pieces for homework after impromptu accompaniment class interest you the most? [Multiple choice]

A. Pop songs - 69.47%

B. Classical music - 16.03%

C. Children's songs - 14.5%

Question 5: What kind of music examples are you most interested in during class?

A. Patriotic songs - 4.58%

B. Children's songs - 2.29%

C. Pop songs - 37.4%

D. All of the above - 55.73%

From the above questionnaire survey with five questions, we observe that 46.56% of students from the three universities are willing to invest 1-2 hours daily in impromptu accompaniment classes, with only 12.21% able to dedicate more than 2 hours. However, merely 8.4% of students believe their learning efficiency is relatively high, indicating dissatisfaction among most students regarding their learning efficiency. Moreover, 69.47% of students prefer pop music accompaniment assignments, while 37.4% are interested in using music composition as a class example. In terms of preferred teaching styles, 8.4% opt for self-study, 19.08% prefer one-on-one teaching guidance, 15.27% prefer group classes with random homework assignments, and 57.25% prefer a blended teaching model with all three options.

Presently, pop music holds greater popularity and social functionality, making it more accessible to college students through various video websites and social media platforms. Analyzing the horizontal data comparison reveals a preference among students to master the skill of accompanying pop music through impromptu accompaniment courses, with a desire for all music arrangements taught in class to be pop music arrangements. This preference aims to enhance their learning interest and motivation [10]. Currently, only a few universities, such as the Music Education Department of Xinghai Conservatory of Music, offer improvisational accompaniment courses in the form of digital piano group lessons. However, most schools provide impromptu accompaniment courses in the traditional group lesson format, limiting students' practice opportunities and reducing their main participation. Consequently, their learning motivation naturally diminishes. The survey data indicates that more students prefer a practice-centric approach with teacher involvement, guidance, and participation throughout the arrangement and performance process.

2.2. Investigation on understanding and utilization of impromptu accompaniment courses on online platforms

The investigation of online courses on the network platform comprises two main parts. Firstly, it involves analyzing data generated from the questionnaire. Secondly, it entails exploring various online apps and impromptu accompaniment courses available on learning platforms to understand and learn to some extent. The following provides a detailed analysis of these two components.

2.2.1. Questionnaire analysis

Question 1: Do you like the present form of classes? [Multiple choice]

A. Yes - 51.15%

B. No - 12.98%

C. Generally - 35.88%

Question 2: Are you more familiar with the following online platforms for learning improvisational

accompaniment? [Multiple choice]

    A. Learn - 70.99%

    B. Central Voice Online - 33.59%

    C. Zhihu - 33.59%

    D. China University MOOC - 28.24%

Question 3: After-school development channels: [Multiple choice]

    A. TikTok - 40.46%

    B. WeChat public account - 5.34%

    C. Xiaohongshu - 9.16%

    D. Bilibili - 25.95%

    E. Other - 19.08%

Question 4: How often do you use online learning improvisational accompaniment platforms [Multiple choice]

    A. Once a day - 13.74%

    B. Once a week - 38.93%

    C. Once a month - 12.98%

    D. Never - 34.35%

Question 5: Do the teachers of the online improvisational accompaniment classes use teaching materials? [Multiple choice]

    A. Will use for teaching - 44.27%

    B. A small number of teachers will use - 35.88%

    C. They have not used any teaching materials, and only talk about teachers' own methods and ideas - 19.85%

Question 6: How many people around you have used online platforms to learn impromptu accompaniment? [Multiple choice]

    A. By yourself - 7.63%

    B. 1 to 10 people - 9.16%

    C. More than 10 people - 12.98%

    D. Unclear - 70.23%

Question 7: How much time do you spend learning improvisational accompaniment on online platforms? [Multiple choice]

    A. Under 40 minutes - 62.6%

    B. 1 hour - 27.48%

    C. 2 hours - 5.34%

    D. After 2 hours or more - 4.58%

Question 8: How is the impromptu accompaniment instruction used online graded for each lesson? [Multiple choice]

A. No score - 67.94%

B. Teachers graded online - 26.72%

C. Score by recording video - 5.34%

Question 9: After one stage of learning, will the online learning impromptu accompaniment platform distribute certificates? [Multiple choice]

A. Yes - 26.72%

B. No - 73.28%

From the above 9 questions, it is evident that in the highly developed network era and rapid exchange of information, traditional classroom modes no longer fully satisfy students' curiosity for knowledge. Most respondents in the survey engage in online impromptu accompaniment courses on learning platforms or explore major short videos and social platforms after class. However, there are still issues with the utilization of online tutorials. Only 44.27% of students believe that online teachers use textbooks for teaching, while 35.88% think only part of the content is supported by teaching materials. Additionally, 19.85% believe that online teaching content is solely based on teachers' methods and ideas. Regarding the evaluation of online courses, 67.94% of students feel there is no grading system, while 26.72% opt for instant online evaluation and 5.34% prefer post-class video recording for evaluation. In terms of time spent on online platforms, 62.6% of students study for less than 40 minutes per day, and 27.48% dedicate an hour to online study daily. The author suggests that there is a lack of systematic and continuous teaching materials in online courses, and the requirement for payment to access more structured courses may hinder effective learning.

2.2.2. Investigation of impromptu accompaniment courses on learning platforms

The author also examined online impromptu accompaniment courses on mainstream learning platforms, such as various courses available on the "Litchi Micro Lesson" app. These courses can be categorized into three types.

The first type is column courses, which are taught by instructors. These courses offer complete teaching content, clear syllabi, and are presented in a webcast format (with the option for replay). The advantage of live courses is the real-time interaction with students, allowing for immediate feedback and discussion on issues. However, they are limited to the live broadcast, and viewers cannot interact with the instructor when watching the recording.

The second type is thematic courses, primarily consisting of recorded videos, each addressing a specific topic concisely. These videos are friendly to students with some piano foundation, and their structured approach enables quicker practice initiation. However, these courses lack interactivity, preventing immediate communication and feedback when encountering problems. Additionally, without progression tracking or time requirements, and lacking an evaluation mechanism, they may not positively impact students' motivation.

The third type is real-time courses, accessible through the "Litchi Micro Lesson" platform with encrypted content requiring a password for access.

On the "University MOOC" learning platform, only Cai Changqing from Guangdong University of Foreign Studies and Xu Zhitong from the Central Conservatory of Music have offered impromptu accompaniment courses. Cai Changqing's course attracted 242 participants and offers downloadable text and video content, practical exercises, and reference materials. The course includes weekly assignments and uploads, with a clear evaluation mechanism and segmented online discussions. Xu Zhitong's course, "Let's Play -- Piano Impromptu Accompaniment," is currently unavailable, with 2,970 participants registered.

On the "Xuelang" learning app, nearly 100 impromptu accompaniment courses are available, covering various themes such as pop music accompaniment, children's song accompaniment, and adult piano improvisation. These courses, presented via video, lack an evaluation mechanism but feature a community question section. However, all courses require a fee ranging from Chinese Yuan ¥19.9 to ¥2000 for access. Notably, the most popular course, "Impromptu Accompaniment Teaching" by speaker Yan, offers 103 lessons with 1,227 students enrolled at ¥600, while the least expensive course, "Piano Impromptu Accompaniment Basic Introduction Course" by FE Piano Class, is priced at ¥18.8 with two participants. The app caters to those in need, primarily serving as a commercial venture.

2.3. Survey of expected learning outcomes

Understanding the learning objectives of the course is crucial for analyzing key points and difficulties in the course content and for effective study and analysis. Additionally, this survey investigated the knowledge and skills of impromptu accompaniment mastered after learning, completing a closed loop from before to after.

Question 1: Purpose of learning impromptu accompaniment
A. School music teaching - 74 students (56.49%)
B. Piano and vocal music teaching - 15 students (11.45%)
C. Playing and singing entertainment - 42 students (32.06%)

Question 2: What do you hope to learn from the course of improvisational accompaniment?
A. Universal accompaniment routine - 34.35%
B. Quick arrangement of various frame accompaniments - 53.44%
C. Various accompaniments with flourishes, colorful - 12.21%

Question 3: What level of improvisational accompaniment would you like to achieve?
A. Handy, skillful on everything - 46.56%
B. Can meet current and future basic personal needs - 51.15%
C. No requirement, it's okay not to learn - 2.29%

Question 4: Are you satisfied with your current level of improvisational accompaniment?
A. Very satisfied - 0.76%
B. Satisfied - 11.45%
C. Not satisfied, need to continue learning - 64.89%
D. Very dissatisfied, need to improve - 22.9%

In the survey on the purpose of learning impromptu accompaniment, 56.49% of students believe it's for future use in teaching at primary and secondary schools, while 32.06% view it as solely for entertainment purposes. Regarding learning expectations, 53.44% aim to quickly arrange various accompaniment frames, while 34.35% seek universal improvisational accompaniment routines. The majority of students (64.89%) are not satisfied with their current level of impromptu accompaniment and wish to continue learning.

After graduation, students majoring in normal music typically engage in music education in primary and secondary schools, where impromptu accompaniment skills are essential. The teaching goal of impromptu accompaniment is to train students to arrange and play impromptu accompaniment, meeting the demands of

future work [11,12]. However, half of the surveyed students lack clarity regarding the course's teaching goals, affecting their learning attitude, time allocation, and effectiveness.

2.4. Survey of content and course arrangement of piano impromptu accompaniment ability in colleges and universities

Upon consulting the teaching syllabi and objectives of various institutions, it's understood that after one academic year and two semesters of study, students are expected to proficiently use three or more playing textures to smoothly accompany songs using major triads, minor triads, dominant chords, and other elements.

Some institutions schedule piano impromptu accompaniment courses after students complete two years of compulsory piano courses, typically in their third year of college, conducted as collective class teaching units. This timing capitalizes on most students having mastered basic piano skills by then. Moreover, completion of courses in acoustics, solfeggio, song form analysis, or multi-voice writing provides a solid theoretical foundation for impromptu accompaniment study. However, in some institutions, impromptu accompaniment classes are offered in the second year, challenging students who have only completed one year of compulsory piano courses and are still refining their piano foundations.

Question 1: How do you think your current impromptu accompaniment classes have helped you?
A. Improved performance ability and diversified thinking - 36.64%
B. Ability to quickly accompany unfamiliar songs - 37.4%
C. Have not learned, see no current use - 25.95%

Nearly one-third of students who have taken impromptu accompaniment classes feel that the course's learning hasn't been immediately useful.

3. Research methods

(1) Questionnaire survey method: The questionnaire survey is a widely used method in social research. Through carefully designed questions, investigators can promptly gather feedback. Hence, this research project also employs a questionnaire-based method. The questionnaire was distributed to second to fourth-year students majoring in normal music at six colleges and universities in Guangzhou, Foshan, and Zhaoqing. It comprised 38 questions, with 37 being single-choice and one requiring open-ended responses. The Questionnaire Star in the WeChat mini-program facilitated the distribution and completion of the questionnaire, with 131 valid responses collected.

(2) Expert interview method: To gain a deeper understanding of the teaching process, content, facilities, and associated challenges of impromptu accompaniment courses in each institution, expert interviews were conducted. Interviews with experts from our institution were conducted in person while adhering to epidemic prevention and control measures, some interviews were conducted via WeChat and telephone. This method yielded detailed, accurate, and reliable data for the study.

(3) Literature review method: To present the research content and findings comprehensively and accurately, the author consulted a wide range of literature and thoroughly explored online software and learning platforms. Various types of literature materials were reviewed to understand the advantages of impromptu accompaniment course settings on online platforms and the core content of such courses.

(4) Mathematical statistics method: The collected questionnaire data and online course-related data underwent statistical processing and analysis.

4. Research conclusion

Based on the data analysis from this survey, it is imperative to reform and enhance the teaching quality of impromptu piano accompaniment courses and elevate students' piano accompaniment abilities through the following measures:

4.1. Improving the teaching syllabus

Piano impromptu accompaniment is a multidisciplinary subject that requires the integration of theoretical knowledge and practical experience from various fields. To excel in impromptu accompaniment courses, one must have a solid foundation in piano playing and possess knowledge of keyboard harmony theory.

(1) Adjusting the basic piano teaching syllabus: Piano lessons serve as the foundation for impromptu accompaniment classes, with the latter building upon the former. In addition to mastering basic playing skills and different piano styles, the syllabus will include enhanced instruction on chord progressions in various modes. Students will familiarize themselves with common chord progressions and texture changes while playing piano pieces. Harmonic and textural elements used in the pieces will be explained to facilitate practical application in impromptu accompaniment.

(2) Adjusting the acoustics syllabus: The existing acoustics curriculum will be integrated with keyboard instruction to enhance students' auditory awareness and harmonic understanding. Emphasis will shift from solely focusing on four-part harmonies to strengthening harmonic expression on the piano keyboard. Enriching harmonic thinking is crucial for establishing a solid chord framework in improvisational accompaniment.

(3) Adjusting the improvisational accompaniment syllabus: The curriculum will prioritize cultivating students' arranging skills and fostering a cooperative approach to accompaniment. Practical exercises and close engagement with pop music will be emphasized, with less emphasis on functional harmony thinking. Students with varying levels of piano proficiency will be grouped accordingly. High-quality online impromptu accompaniment courses will be integrated into daily teaching, with pre-class previews of videos and materials and post-class discussion and Q&A sessions for homework submission. Grading criteria will be established at the end of each semester in relevant areas to enhance student engagement, increase time investment in learning, and improve overall learning efficiency.

4.2. Building a high-quality online course environment for impromptu accompaniment

In the era of "5G, intelligence, high-speed, and information interaction," the internet pervades every corner of learning, work, and life. The rational application of network technology in education and teaching is the only path for educational reform and innovation.

(1) Correct positioning of online impromptu accompaniment courses: According to the American New Educational Encyclopedia, online courses are integrated with their own system and plans, communicated and displayed through the network. Activity dimension, content dimension, and target dimension constitute the connotation of online courses. Rich network resources are no longer confined by time, place, and space, with maximum human-computer interaction being the advantage of online courses. They provide infinite possibilities for establishing diversified teaching environments and modes. Given these advantages, online impromptu accompaniment classes serve as an effective supplement to offline courses.

(2) Proper planning of online impromptu accompaniment classes: In addition to clear teaching ideas and systematic teaching content, a high-quality online improvisational accompaniment course should include seven sections: learning content, online evaluation, homework upload, teacher-student

interaction, online notes, thematic forums, and resource search. The teaching progress of online courses should essentially mirror that of offline courses, with online courses being rationally used according to the teaching schedule. Let the online teaching platform play the most complementary role to offline courses.

(3) Designing online impromptu accompaniment courses: The design and development of online courses must focus on learners and their needs in learning knowledge content and activities. It should meet the learning needs of students at different levels and stimulate their interest in learning to maximize the advantages of online courses. This is embodied in several aspects:

(a) Teaching modular design: The content of impromptu accompaniment courses is based on five knowledge units of teaching and learning, with each unit comprising several knowledge modules. Each module should align with the teaching schedule and needs of offline teaching activities [13]. It should combine with the difficulties and key points in teaching that cannot be well realized in traditional teaching, presented in various media forms such as video, music examples, and audio. The multi-functional module design should clearly demonstrate the structure and function of the course [14].

(b) Multi-dimensional presentation of impromptu accompaniment teaching content: The enhancement of impromptu accompaniment ability results from the combination and improvement of multiple disciplines and abilities. Therefore, knowledge points of harmonics, keyboard and acoustics, music form analysis, piano performance, and other subjects should be integrated into the impromptu accompaniment course system. This integration encourages divergent thinking and fosters creativity in arranging accompaniment [15].

(c) Incorporating learning games to stimulate students' learning motivation: Gamification of online courses is common in children's learning software related to music, Chinese characters, English, etc. The learning content is combined with various types of games, conveying the content seemingly "unconsciously" through games. Designing impromptu accompaniment course content into online games with obstacles or tasks, and embedding teaching objectives into stimulating games, is an effective measure to encourage students' learning motivation and exploration spirit. These games provide a relaxed and enjoyable learning environment, stimulating interest and promoting independent learning and active exploration.

(d) Integrating online impromptu accompaniment teaching to enhance inter-school communication: With rich teaching resources and multiple teaching means, online courses are no longer limited by space, time, or region. Besides achieving interoperability and interaction between teachers and students, the construction of online teaching platforms should consider "human-computer interaction, everyone communication, and school-school collaboration." This approach maximizes the integration of teaching resources and content, enabling resource sharing, barrier-free inter-school teaching communication, practice observation, and experience sharing among teachers and students.

5. Characteristics and innovation

5.1. Originality of research content

Before this study, no investigation or research papers had been published on online piano improvisational accompaniment courses in universities in the Guangdong-Hong Kong-Macao Greater Bay Area. Therefore, this project is pioneering. By utilizing a large number of questionnaires and platform data, the study obtained the basic status and problems of online piano improvisational accompaniment education in Guangzhou, Foshan, and Zhaoqing. It also puts forward practical and feasible suggestions for building an online piano improvisational

accompaniment education alliance in universities.

5.2. Bold conception of the online improvisational accompaniment platform construction mode based on questionnaire data analysis

(1) The questionnaire design, distribution, and collection were completed within a relatively short period. Given the absence of prior investigations on piano impromptu accompaniment courses for normal music majors in colleges and universities in the Greater Bay Area, this project exhibits a certain level of originality.

(2) Based on the analysis and research of survey data and relevant materials, the author boldly proposes the idea and mode of constructing the improvisational accompaniment platform. This includes the "tree" teaching model of knowledge point divergence, the design of online teaching games, the embedding of online teaching games into the teaching content, and the construction of a multi-school "joint and linkage" impromptu accompaniment online teaching platform, all proposed for the first time.

5.3. Design of impromptu accompaniment teaching modules and multi-dimensional presentation of teaching modes

Modern teaching should acknowledge the power of technological innovation and enrich music teaching resources while meeting the needs of basic education. The Internet environment provides ample support for music teaching. Based on information technology and multimedia applications, the comprehensiveness of piano impromptu accompaniment teaching and the rational use of impromptu accompaniment teaching platforms meet the needs of integrating teaching advantages. This builds a communication bridge between teachers and students and stimulates students' internal drive for independent learning. Therefore, this project's multiple data analyses and research efforts have led to the design of multiple teaching modules and modes, including heuristic and inquisitive game teaching modes, enriching the online teaching platform's multi-dimensional teaching approach.

5.4. Development trend of piano impromptu accompaniment education realized by digital multimedia technology

The establishment of an interoperable and networked multimedia impromptu accompaniment teaching platform can enhance teaching quality and optimize and perfect piano impromptu accompaniment education. Digital technology support platforms facilitate the establishment of a systematic and comprehensive network impromptu accompaniment course, closely integrating theoretical knowledge with keyboard teaching to upgrade students' skills. Internet teaching enables personalized learning opportunities alongside group learning, improving students' personal knowledge reserves and professional skills. The construction of a complete improvisational accompaniment platform enhances teaching efficiency and quality, while traditional teaching supplemented by online teaching creates a conducive practice environment for students, facilitating continuous professional-level upgrades through mutual cooperation and assistance.

Disclosure statement

The authors declare no conflict of interest.

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