

Smart Home Education and Teaching Effect of Multimedia Network Teaching Platform in Piano Music Education

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Abstract

Smart home contains all the living functions of the traditional home, and provides a more safe, comfortable and high-tech home space. With the development and popularization of multimedia technology, computer technology has been applied to music classroom, laboratory, music hall, almost all aspects of music teaching and research. In this paper, the author analyzes smart home education and multimedia network teaching platform in piano music education. Multimedia combined with different teaching characteristics, through the modern media as the carrier of the communication channels, then process the formation of vivid images or sounds of music. Along with the digital process of music classroom, computer music workstations, multimedia, distance learning, portable music systems, online interactive music creation, and other technologies are being popularized.

Keywords: *Smart home education, Piano education, Teaching effect, Multimedia network*

1. Introduction

At present, the Internet of things has become the focus of attention of researchers, which provides a good opportunity for the rapid development of the Internet of things an important application of smart home [1]. However, the current research about smart home is based on the functional requirements of a module or system, from the point of view of the system, more people need to participate in order to complete a specific function. At the same time, taking into account the home gateway is the core of the smart home system equipment, through it can get the useful information in the home environment and home environment for the operation and control of specific objects. Therefore, in order to make the smart home system to actively learn the behavior of the user, and to provide users with services [2-3]. Intelligent Home Furnishing contains all the functions of the traditional residential Home Furnishing, and provide more safe, comfortable, convenient, high grade, high family space, and will enhance the original static equipment for the "brain active" tools, provide Home Furnishing comprehensively, real-time information and internal active information exchange function for people, and optimize the user the way of life, reasonable arrangement of life and time to help people [4]. Although the internal mechanism of the home system is very complex, but are cleverly hidden, users only need to carry out a simple external operation, they can achieve a new concept of home life.

Since the beginning of 1990s, multimedia technology has flourished, its application has been in every corner of social life, is to give people the way of production, work, and even the way of life has brought great changes. Especially because of the characteristics of multimedia map, text, voice and even video activities, so can create more ideal teaching environment than the traditional music education, but also will have a profound impact on music education [5-6]. With the development of multimedia technology, the application of multimedia technology in education is becoming more and more popular. Multimedia computer assisted instruction is a new trend of educational development at

home and abroad, and it has become an effective way for the teaching of various subjects. In the United States, computer technology has been applied to music classrooms, laboratories, music halls, almost involved in all aspects of music teaching and research. For example: students in the acoustic record computer display, analysis of their songs in pitch, timbre and tremolo legato, the actual performance of these acoustic records produced in the student or recent singing lesson videos; watch the famous artist's performance in multimedia on the big screen; according to the computer and a sound system of rhythm sound clips practice improvisation; the use of automatic accompaniment program and interactive accompaniment and solo practice procedures; use the notation software record score and spectrum; music teaching basic skills of listening and practice using computer assisted instruction program [7-8]. College Music Majors (including music education) graduates must be able to skillfully use the computer in his work. Not only is a powerful tool for their learning, but also as the preparation of teaching materials and teaching tools.

2. Multimedia Development and Smart Home

2.1. Multimedia Development

In twentieth Century, a great invention has completely changed the world's perception of the world, the development of the new field of human production and life have a great impact, this is the birth of the computer. With the development and popularization of the computer, the production activities of human society gradually show its dependence degree. Since then, the application of computer has penetrated into all walks of life, and the computer to meet the enormous economic benefits brought about by people's production activities, but also constantly promote the computer application to a deeper level of development. With the continuous improvement of living standards, the pursuit of value of the computer and the application experience is also rising, which is a powerful driving force to drive the application of multimedia technology born. It can be said that as a medium between human and computer multimedia machine, make sense of thinking with the computer's logic calculation more closely together, the vivid illustrations, audio-visual effects and interactive features fully stimulate people's senses, more intuitive to show people in production activities reflect the behavior standard. The data more drippings sends. If the computer is one of the greatest inventions of mankind in the twentieth Century, so the application of multimedia is set in a bright pearl on computer technology, it not only makes the machine more closely, but also further promote the ties with the world.

A word can be said to the media in the information age is not what fresh words, through the understanding we can think of it as a transmission medium, but also can be said to be an intermediary, can also be understood as a carrier of information exchange connection. And the media from the literal meaning, it should be said that the concept of a variety of media or media. According to the data, there is no uniform standard and discussion about the definition of multimedia. I think, as an application of Multimedia Computing Technology in the application, we can understand this, it is the traditional information by computer software after processing into transmission data, then through computer hardware transmission electron carrier effect on human senses, then the competent people's awareness of embodied interaction process into computer operations. For example: the word processing software in our daily applications, audio and video playback software, look at newspapers and magazines, television, computer, projector, including process used in the field of medical facilities, auxiliary teaching and experimental analysis of can be said to be within the definition of multimedia.



Figure 1. Home Multimedia Devices

As an application in the field of computer technology, it is not only a unilateral information carrier or software applications, but contains the software and hardware processing and human-computer interaction, the exchange of the process of collection. From this concept, the meaning of multimedia contains the person's subjective initiative. Today, people are more closely linked with the computer, the computer application technology is becoming more and more attention to the development of human nature, which is like before you are watching the fashion show and now you are involved in the creation of fashion. As an expression of subjective consciousness, the leading role in the process of the use of computer multimedia is more and more strong. In fact, we will think of the mind by the multimedia hardware and software processing, we want to get the results we want through the multimedia technology showing the sensory audio and video, so as to achieve the goal of people's needs.

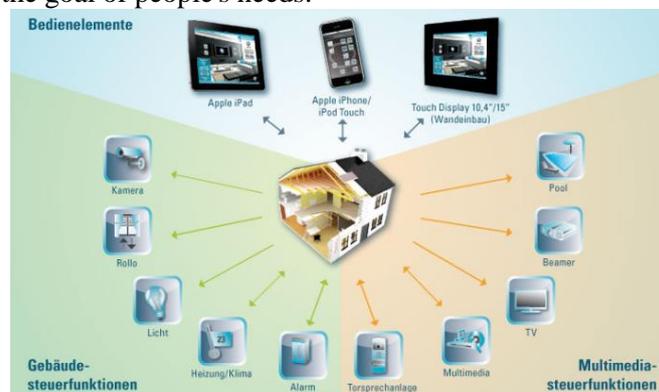


Figure 2. Home Multimedia

2.2. Smart Home

Home Furnishing intelligent information system is a residential platform, integrated automatic control technology, mobile communication technology and Internet technology, according to the needs of human life will be organically subsystem associated with Home Furnishing life such as information appliance system, lighting control system, curtain control system, environmental monitoring systems, security systems together. Intelligent Home Furnishing contains all the functions of the traditional residential Home Furnishing, and provide more safe, comfortable, convenient, high grade, high family space, and will enhance the original static equipment for the "brain active" tools, provide Home Furnishing comprehensively, real-time information and internal active information

exchange function for people, and optimize the user the way of life, reasonable arrangement of life and time to help people. Although the internal mechanism of the home system is very complex, but are cleverly hidden, users only need to carry out a simple external operation, they can achieve a new concept of home life.

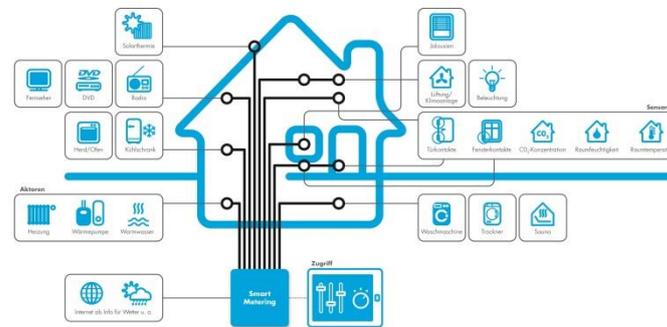


Figure 3. Smart Home

Real time multimedia transmission system has important application value, widely used in real-time monitoring system, video conferencing and other applications. However, with the development of mobile devices and enhance the ability of wireless communication technology, the traditional single network environment gradually become heterogeneous devices and networks constitute a pervasive computing environment. In recent years, with the development of hardware technology, and the requirements of the people in need to improve the accuracy of data acquisition, the wireless multimedia sensor network using cheap CMOS camera and microphone. Compared to the wireless sensor network and traditional wireless multimedia sensor network, multimedia information rich perceptual information amount of audio and video. To achieve fine-grained and precise detection of the environment. Because of these characteristics, the traditional WSN routing protocol cannot meet the demand of WMSN transmission. The author designs a routing algorithm which can meet the demand of WMSN by studying the ant colony algorithm. Ant colony optimization (ACO), the idea is the process of ant colony foraging ant system simulation in nature. So the state transition rule is called random proportional rule. It is located in the city of I ant K chose to move to the city of I. The probability at time t, the ants in the city I transfer probability the city of j:

$$P = \begin{cases} \frac{[\tau_{ij}(t)]^\alpha [\eta_{ij}]^\beta}{\sum_{n \in V} [\tau_{in}(t)]^\alpha [\eta_{in}]^\beta}, & j \in V \\ 0, & other \end{cases} \quad (1)$$

After the completion of the second cycle, the Formula (2) to update the pheromone concentration is on the path of the neighboring cities:

$$\begin{cases} \tau_{ij}(t + t_n) = (1 - \rho)\tau_{ij}(t) + \Delta\tau_{ij}(t) \\ \Delta\tau_{ij}(t) = \sum_{k=1}^m \Delta\tau_{ij}(t) \end{cases} \quad (2)$$

S from the source node to the destination node D through a number of paths to send packets to the destination node. Each node in accordance with the type (1) selects the next node j as the next hop:

$$\eta = K_1/E_j + K_2/t_j \quad (3)$$

In the process of data transmission, the energy consumed by the neighboring nodes is calculated at intervals of time:

$$E_j = n\Delta E \quad (4)$$

The probability of the data packet in the node is n:

$$\begin{cases} P(n) = P(0)(\lambda/t_\mu)^n \\ \sum_{n=0}^m P(n) = 1 \end{cases} \quad (5)$$

According to the Formula (5), can be solved:

$$\begin{cases} P(0) = 1 / \sum_{n=0}^m \rho^n \\ P(n) = \rho^n \frac{1 - \rho}{1 - \rho^{(m+1)}} \end{cases} \quad (6)$$

The desired function is obtained, and the average number of packets in the node j is obtained:

$$M = \frac{\sum_{n=0}^m nP(n)}{m+1} \quad (7)$$

Average waiting time is:

$$t_j = \frac{M}{\lambda} = \frac{\sum_{n=0}^m n\rho^n \frac{1 - \rho}{1 - \rho^{m+1}}}{(m+1)\lambda} \quad (8)$$

3. Modern Information Technology and Multimedia Teaching

3.1. Multimedia Teaching

The media will be combined with the characteristics of different teaching objects teaching goals and plans in the process of teaching, and through the combination of reasonable choice with the traditional teaching mode, and then by modern media as the transmission carrier, finally using the audio application of computer integration required to convey information processing form vivid images or sounds to students learning or teaching, teaching process is methodical, so as to achieve the best teaching effect, this is the multimedia teaching.

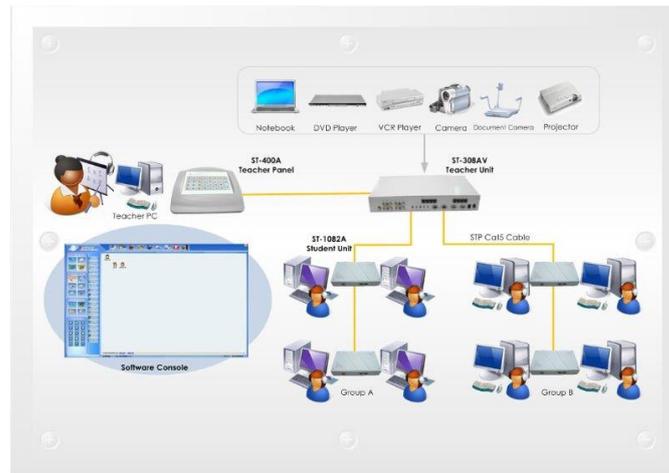


Figure 4. Multimedia Teaching

Characteristics of multimedia teaching:

1) **Diversity:** in the form of teaching, multimedia teaching combined with traditional teaching on the increase on a variety of elements, can make teaching more vivid and intuitive, it is totally different in the form of writing on the blackboard with a single teaching method. We use the multimedia teaching method in the study of learning situation, further processing procedures, the learning process of the dull as ditch water has become more vivid, which is conducive to the interaction between teachers and students, can active classroom atmosphere, thus the passive teaching learning for students to take the initiative to change, willing to learn.

2) **Integrate information:** through the use of multimedia processing technology, to be able to focus on all kinds of information to obtain, save and re combination of information. And multimedia education is the role of the multimedia education will be the integration of educational resources together, through the data processing as the image of the show, to increase the impression of learning. The integration of information is also reflected in the content from the new layout, we can make use of multimedia teaching in the old teaching content was improved and extended by modern means, to avoid the rigid repetition of content.

3) **Human computer interaction:** multimedia teaching has interactive features, the difference between the traditional teaching and the traditional information exchange is relatively simple, it is only a one-way passive transfer of information, which is passed to the students and teachers through the methods of teaching, and the students are often not in the classroom in a short period of time to learn the content timely feedback. The passive information dissemination mode leads to the decrease of the efficiency of learning, and multimedia teaching to solve this problem, it realizes the interaction between people and programs through the data operation, and can objectively test students in a timely manner through the data feedback learning, teachers adjust teaching content, the degree of difficulty, conducive to improving the quality of teaching it can be said, human-computer interaction is the largest multi-media features.

4) **Pertinence:** multimedia teaching is the reason that he has targeted, is that its main function is to serve the teaching, with the in-depth development of multimedia education, more and more technology to different characteristics, different levels of students' learning, which not only injected fresh vitality for teaching, also can pay more attention to the development of multimedia software and hardware and learning content matching, the remarkable characteristic is to embody the learning content.



Figure 5. Human-Computer Interaction

In the real-time multimedia transmission service oriented system, different node number of multimedia processing services previously deployed in the network. These services can be divided into functional and non functional service services. Services include subtitle embedding, tagging and encoding conversion is necessary to treat the source of information, meet the functional requirements of the users; non functional service including media compression, sampling, can reduce the amount of data transmission, thereby reducing the time delay of data transmission. Especially for mobile users with wireless access, these non functional services can effectively improve the reliability of user access to services, but its processing delay, and will reduce the quality of multimedia audio and video system. The function is: when the user receives the service request, the system starts from the data source, after a number of services and non reactive function The service processing node can construct a multimedia information processing transmission chain, and the multimedia information is transmitted to the terminal user with low delay and high reliability,

Algorithm 1: data quantity approximation algorithm.

1. Initialization: $index[i] \leftarrow 0$
2. $flag \leftarrow true$
3. While $flag == true$ do
4. $flag \leftarrow false$
5. for each $e(i,j) \in E$ do
6. if $index(j) \leq index(i)$ then
7. $index(j) \leftarrow index(i) + 1$
8. $flag \leftarrow true$
9. Endif
10. Endfor
11. End while
12. for each $index[i]$ do
13. $c \leftarrow 0, sum \leftarrow 0$
14. for each node $v \in SG$ do
15. If v has a service link to $index[i]$ then
16. $c \leftarrow c + 1, sum \leftarrow sum + m[v]$
17. End if
18. Endfor
19. $m[index[i]] = sum/c$
20. Endfor
21. return $m[0, N-1]$

Table 1. Statistical Analysis of the Questionnaire

category	expert	teacher	student
Total number	5	15	150
Total recovery	5	15	150
rate of recovery	100	100	100
Effective recovery	5	15	136
effective rate	100	100	90.67

3.2. Multimedia Music Teaching

With the rapid development of information technology, all aspects of traditional education have been challenged. From the beginning of the last century, the silent film, music, the beginning of education, modern teaching media has become an indispensable important tool for music teaching. This new teaching media carries a lot of audio-visual information, no doubt more attractive than the chalk ten blackboard. It not only expands the depth and breadth of the classroom teaching, but also makes the teaching more vivid and vivid. The feelings of the teaching process students' homes will be in the audio-visual data, without the need for teachers to the image of the language to describe. The traditional teacher's knowledge monopoly is broken by the unlimited resources on the Internet, the traditional teaching materials and its static, one-way way of infusion has been replaced by the interconnection and interaction of hypertext. At present, many countries in the world music educators on the development and utilization of information technology is active. The rapid process of digital music classrooms, computer music workstations, multimedia and large screen display technology, distance learning, portable music system, interactive personalized music learning software, online interactive music, playing and learning is popular. Information technology begins to realize the education idea which is difficult to be completed because of technical limitation, it will produce a full range of impact to the existing education, and indicates that the education reform which is launched by the information technology is rising.



Figure 6. Computer Assisted Piano Learning

The new generation of multimedia technology is in such a macro background came into being, it appears to play a revolutionary role in music teaching. It is worth noting that the computer music system is not to replace the traditional teaching equipment and means, but in the past on the basis of the advantages of means to develop a more powerful advantage of the new generation of teaching platform. As a modern teaching media, computer music system break through the limit of space and time in the traditional teaching method, the direct expression of a variety of things and phenomena, and can show the whole process of the movement and development of things in a short period of time, to enable students to obtain the most adequate perception and timely assessment of

their own learning in the textbooks. In the past the traditional teaching to the actual perception of content, through the audio and video equipment can be clearly displayed, so that students like the witness personally on the scene.

Modern students have grown up with this new music technology. Many of the music they listen to is made and played by electronic instruments. Many students have computers and keyboards, and some people are eager to learn electronic musical instruments. If the music education reform to meet the requirements of the development of students, it is necessary to the computer and the appropriate combination of today's music technology. In view of this, the full use of multimedia technology to assist teaching is not only the requirements of the times, but also the urgent requirements of the development of students themselves. The use of multimedia technology to provide a good platform for our music teaching, is also an urgent need for our music educators update teaching concepts, improve teaching methods, to explore together the modern music teaching mode.

3.3. Multimedia Music Teaching System

The hardware of multimedia music teaching system can be divided into the following types:

- **Multimedia computer:** The multimedia computer is the core equipment of multimedia music teaching system, it can handle text, graphics, images, sound, animation and movies and other media information, and these information can be converted into digital signals and edit and modify.

- **Video equipment:** including VCD, DVD, video recorders, projectors and video display units. The projector can also use large screen color TV, it can be displayed on the computer screen content is clear, the big picture, so that more people can see the display on the computer screen a variety of text and image information at the same time, the video presenter can put books, pictures, photos and real image information transmitted directly to the a projector or a large screen color TV display, may also need to highlight and enlarge the local image.

- **Audio equipment:** including power amplifiers and speakers, etc.. The power amplifier is used for receiving all the audio signals in the system and the power is amplified, and then transmitted to the sound box, and the sound is sent out. Speakers are used to receive a signal transmitted by the power amplifier, and the signal is reduced to sound playback.

- **Music equipment:** can be a special keyboard with MIDI interface, you can also use a professional electronic synthesizer. The built-in computer interface synthesizer can be directly connected to the computer, which combines music and audio playing keyboard as a whole, through the keyboard to play music directly to the computer input information, which can provide high quality audio, multi tone and multi voice polyphony.

There are many kinds of multimedia software, one of the most commonly used with PowerPoint, it is a multimedia production and presentation software, can add text, graphics, images and other similar slides in the presentation, but also will sound, animation and other multimedia elements into it, the use of PowerPoint tools can make the teaching slides, the content of the textbooks in the form of a slide show on the big screen display, can also be placed in the middle of the text or links images, sound and other media files, very suitable for making music courseware, which can make teaching more vivid and visual effects.

Sibelius is commonly used notation software, named after Finland musician Sibelius, is one of the composer, music teaching, this work set in a software. We can use this software to show clear examples of music for the students in the teaching, and the software can play music melody and are required to make the teaching of our audio, audio-visual capabilities, to facilitate student learning and practice. The relative cost of learning music and learning other subjects to many high schools for the piano room of preschool

education major students and music facilities are limited, it also gives the students to learn and practice some trouble. The multimedia teaching in music curriculum of preschool education major, can replace the real operation, research and development of music teaching software, and the real music equipment operation has reached the same effect, in a lot of music curriculum in the exercises, we can provide audio software help to students' exercises for students, this has greatly improved the use efficiency of the piano room, although the software in the texture and the piano is different, but the accuracy of audio software better, which greatly enhance the effectiveness of student exercises.



Figure 7. Sibelius Software

4. The Significance of Modern Multimedia Teaching

4.1. Multimedia Improves the Efficiency of Teaching

Classroom teaching is the key part of all teaching in the classroom teaching efficiency will directly affect the teaching quality and teaching effect, how to get the best teaching effect is constantly thinking of many teachers and explore in just a few minutes. Compared with other courses, music teaching has its own particularity and unique music, learn more is to rely on personal emotion understanding, which requires the music teaching form should be diversified, the traditional music of the single teaching form, teaching tools are confined to a piano, a recorder and others the process of teaching, lack of intuitive, it is difficult to create a good teaching atmosphere. For example, the harmony teaching, due to the lack of the necessary audio-visual class teachers, can only rely on the blackboard and chalk, for writing and analysis of the four part harmony can only be boring to explain, even if there is a piano as a teaching aid can only be a simple demonstration, and can not use the piano show rich harmony effect. For students, but also can only master some basic methods and regulations, and can not enjoy the real charm of harmony. The use of multimedia technology in teaching, and teaching with professional software, you can display various voices in the classroom, but also can hear the actual sound effects for each part or all of the voice sound effects, and this intuitive teaching, not only enable students to have a sound understanding of the theoretical and practical double sound and master moreover, it also greatly improve the teaching efficiency and the curriculum.

In the teaching of music appreciation teaching, using the traditional teaching mode is a tape recorder and tape storage is the analog record, the effect will be reduced with the increase of the use time of tape, resulting in many musical elements of music works is not easy to distinguish in the record; at the same time. Wear and aging recorder itself also affects the playback quality, often make us feel the same tape playback speed in different recorder will be different, this is because the recorder shaft belt caused by different speed different forms, it will affect our appreciation effect, moreover, in appreciation in the course of often to separate or listen to repeatedly listen for a certain period of time,

teachers should spend time in rewind, fast forward, rewind and other operation, there is a search for the specified point speed, choose to play the start point accurately. Using the advantages of multimedia computer and audio capabilities in these areas is very obvious, any music can select a random section of a film, audio files can be from any arbitrary selection of one minute one second, each player will not have the speed difference, and the computer can also according to the requirements of teachers quickly set up a paragraph of music, images in the play repeatedly.

4.2. Teaching Content is More Abundant

Learners' learning interest and learning results are directly related to the interest of the learners in the study of their hobbies, can be less dependent on the guidance of teachers, and can take the initiative to learn new topics, there is a new learning harvest. In particular, learning difficulties, students with learning interest can be persistent, until the purpose of learning to achieve. The traditional music teaching influenced by the teaching environment, teaching conditions, teaching methods are difficult to change, can be immutable and frozen, said a long time music teaching in a boring single state, which is not in conformity with the principle of the principle of freedom of emotional art education. The use of multimedia technology music teaching, with the help of sound, image, animation and other means to fully mobilize the enthusiasm of the students learning, and achieve better teaching results. Even some students feel that the curriculum theory of music theory, solfeggio as dull as ditch water, *etc.*, of course, the use of multimedia computers and related music teaching software, can make the teaching more vivid and interesting, let the students have the opportunity to learn music knowledge in different situations, can make the students in the learning process of reinforcement learning interest, so as to give full play to the initiative of students, to learn the true meaning of the construction of knowledge, improve teaching efficiency.

In addition, the use of multimedia technology for teaching can enrich the teaching content. Taking a course in music history as an example, the course is rather dull and boring for most students. The reason for this will give students the impression, but also due to our traditional teaching methods are single and echo what the books say the consequences of explanation. The use of multimedia technology in the teaching means, the sound, image, animation and other means to integrate the teaching content, not only can make the teaching content more abundant, but also can make the classroom atmosphere relaxed and active, the teaching effect can be greatly improved.

4.3. Improving Teaching Reform Ability

The application of multimedia technology in music teaching not only greatly improve the efficiency of teaching, enrich the teaching content, make the teaching process more interesting, but also to improve the overall quality of the music teachers are good. The application of multimedia technology in music teaching for our music teacher demonstrates a new educational concept and teaching mode, to master the multimedia technology faster and better, in addition to achieve the conversion of teachers' role as soon as possible, must also master the multimedia teaching to computer knowledge and skilled use of some domestic and foreign outstanding teaching software. Computer knowledge including the hardware structure of the computer skilled, familiar with the operation of a computer system (such as window2000, XP), proficient in computer music production skills and related hardware equipment (such as MIDI interface, audio, amplifier, mixer, synthesizer) *etc.*, Excellent music teaching software has many kinds, such as the sequencer software, music software *etc.*, Teachers can choose to learn and master the needs of their own professional needs or teaching courses, and have the choice of targeted use. In this way, teachers not only master the method of multimedia technology, but also can improve the quality of teachers.

Through the application of modern multimedia technology in music teaching learning and research, but also to promote teachers to actively participate in teaching reform, to further improve the ability of teachers to control the arts and science. Through the study, the teacher is more deeply felt the great impact of modern education and teaching mode to the traditional teaching methods, through their own learning and teaching practice, but also further appreciate the great changes of modern multimedia technology teaching, so as to promote our music teachers actively involved in research and exploration of the educational pattern and teaching method the new modern multimedia technology support, and strive to explore a set to adapt the concept of modern education teaching methods and teaching methods, and actively carry out theoretical research subject under the new mode, and improve the overall quality of art education.

5. Conclusions

The rapid development of modern multimedia technology and gradually applied in the field of music education, bring us a new education idea and education mode at the same time, will also put forward higher requirements for music educators. In twenty-first Century as a music teacher, we must be aware of the revolution of science and technology for classroom teaching and the impact brought by our own, which prompted us to improve their own quality and level of knowledge continuously through the aspects of learning, to adapt to the needs of the new era, in order to complete the task of education and teaching. Of course, the study on music teaching in multimedia environment is a complex system engineering, not only need to practice and summed up in the short term, we need a long-term learning and exploration; not only need the school teachers and students involved and learning, need more attention and support of the whole society. In this paper, the application of modern multimedia technology in music teaching and puts forward the planning of their own ideas, aim, also looking forward to more research and practice of music educators working in this area, so that our music education can be more broad and far-reaching development, in order to make our music teaching modernization.

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