Design and Implementation of Solfeggio and Ear Training Learning Assistant System Based on Computer Cat Technology

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Abstract. With the rapid development of Internet, many new technologies emerge in endlessly. Digital technology is one of them. Now digital technology is very popular in many fields. Now many music scholars are trying to apply this technology to music education. This kind of auxiliary teaching method is more and more popular, and is a kind of development trend at present. Solfeggio is one of the important courses in higher music teaching, and it is also a very basic course in music teaching. Digitizing the teaching of Solfeggio and ear training course is also a topic of research for many music majors in Colleges and universities. This paper discusses and analyzes the effect of CAT technology on Solfeggio and ear training teaching. This paper analyzes and compares the effect of CAT technology in Solfeggio and ear training learning aid system and the difference between the original traditional teaching through Two Conservatories of music. The results show that in the process of Solfeggio and ear training, more than 60% of the students are satisfied with the cat technology learning aid system, while they are satisfied with the traditional learning aid system. The proportion of students should not exceed 50%.

Keywords: Cat Technology, Solfeggio and Ear Training, Auxiliary System, Database

1. Introduction
In the process of network technology and digital technology constantly update and tend to mature, more and more people's life and work are inseparable from the computer, many people learn through the network technology, people get more and more knowledge resources through the network [1]. In teaching, many people use network technology to assist teaching, and now digital technology is also a very popular auxiliary means [2]. In the field of music, teaching methods are also constantly improving with the times and science and technology. Now digital music teaching has gradually replaced the traditional teaching methods, and the previous music teaching methods have been gradually replaced, and new music teaching methods have begun to appear. Compared with the traditional way, digital technology can fully show the rhythm of many styles of music, such as rock, tango and jazz. It is the goal of Art Majors in many art colleges and higher vocational colleges to strive for digitalization of Solfeggio and ear training teaching. Many experts and scholars in this field try to combine CAT technology with Solfeggio and ear training technology, and digitize Solfeggio and...
ear training software system under CAT technology can combine a variety of computer digital technologies, so as to form a new media information exchange method. Solfeggio learners can customize their own personalized training mode through this technology, so as to find their own learning methods, and at the same time, can also be tested in time, so as to achieve a more ideal learning effect, and this can also make learning interactive and personalized get further integration [3-4].

Science and technology are constantly developing and changing with each passing day. Wang Jinfeng believes that in many professional text translation, CAT technology is more and more used for translation, and CAT technology is becoming more and more important in today's scientific translation. The storage function of CAT technology is very powerful, which is not the advantage of manual translation. CAT technology can save the time of searching information in translation, because compared with manual translation, it has a fast search function and greatly improves the search efficiency [5]. In recent years, computer-aided translation technology has received great attention in the translation industry, and its development speed and achievements are also very remarkable. Translators can improve the efficiency and quality of translation by using CAT technology, and at the same time, they can complete many difficult translation tasks in the translation industry [6]. With the rapid development of information technology, people rely more and more on machine translation to communicate with transnational personnel, so as to overcome the language barriers. Yang Zhao LAN and Yang Jin believe that cat technology has brought far-reaching influence on traditional translation methods, and this influence is very positive and positive. Many translators choose CAT technology to assist in translation, which is a common phenomenon in the translation industry. CAT technology is also the first choice for people to translate [7]. CAT technology can be said to bring a great change and brand-new face to the traditional translation methods [8].

CAT technology has also had a great impact on the teaching methods of Solfeggio and ear training. In the past, the music style was monotonous, the audio equipment was single and the content of music materials was limited. However, the use of CAT technology can obviously improve this phenomenon and increase the scope and effectiveness of solfeggio music teaching. The combination of CAT technology and solfeggio and ear training technology can improve the music teaching mode and improve the original teaching mode. Moreover, this not only brings a new teaching method, but also makes the music theory from abstract to concrete, which makes the solfeggio learners not only feel the new teaching experience, but also makes the Solfeggio teaching more complete. In this way, the teaching of Solfeggio and ear training under CAT technology not only brings good experience to students, but also brings better teaching methods to teachers, which improves the quality of class and teaching efficiency. Therefore, to sum up, CAT technology in solfeggio teaching is very good application effect and broad prospects for development [9-10].

2. Method

2.1. CAT Technology

Cat is called computer aided translation in Chinese. CAT technology is different from the previous auxiliary translation software, it is not all automatically completed by the translation software, it is interactive with people, its translation process is the participation of staff. Compared with the traditional translation software, it has faster working efficiency and better translation quality. The whole working process is easy and efficient, and can achieve twice the result with half the effort. CAT technology can improve the efficiency of the whole translation work, and can make the translation process automatic. CAT technology actually includes a lot of content, and its working principle is from simplification step by step to a more difficult level. Translation memory technology is the core content of CAT technology, and language database is also one of the key reasons for the powerful storage function of CAT technology. Translation memory mainly depends on language database. The system will automatically provide users with better and closer to the daily logic of the translation
method in the memory, it will also help users to discard repetitive and useless text, to avoid low-level errors in the translation process.

2.2. Solfeggio and Ear Training
Solfeggio is one of the most basic subject contents in the learning process of music major. Teachers in music schools generally regard it as the training of reading skills. When students learn relevant subject knowledge, they will carry out active thinking activities under the guidance of the teacher, and connect with music reading. Students can actively mobilize the various senses and abilities of the body to read music, such as vision Hearing and association. Solfeggio is a very important basic music course every year. Through solfeggio, a large number of music materials, including music melody fragments and various theme music fragments, are used to accumulate their own music materials and abilities step by step through daily training, so as to cultivate their own musical hearing, enhance their music memory and cultivate correct intonation, so as to help them My own sense of rhythm. In the process of Solfeggio and ear training, students are generally required by teachers to carry out hearing training, solfeggio training and students’ dictation ability training. This can help students better use the auditory ability to grasp the sense of rhythm in the actual music activities.

2.3. Audio Digitization
In our real life, the sound of nature is very complex and diverse. In terms of the language we have learned in physics, sound waves are diverse and vary greatly. The waveform of sound must be converted into digital form before it can be stored in the computer. The method used in this process is PCM coding, which is the common pulse code modulation code in professional terms. PCM can convert sound by sampling, quantizing and coding. Each time in different time intervals, the samples are continuously sampled in the analog audio, and then the samples are corresponding to the time points. Finally, the samples are sorted out and connected one by one, so as to obtain the sound waves we want. Although the sampling time is not continuous, but the time range is within a certain limit, and this period of time can still be expressed as continuous. It is a very common way to express the sound intensity with numbers, which is usually expressed in binary numbers, but there are also restrictions on the representation, that is, the binary system is also limited. PCM is a kind of digital audio signal in essence, and this kind of signal is not compressed. Although its storage capacity is OK, it also has the disadvantage of too large storage volume. However, compared with other methods, its stored sound quality will be better.

2.4. Algorithms Involved in the Analysis of Experimental Data Results
Sound is a very important factor in musicology. The physical characteristic of acoustic characteristics is sound. There are four elements of sound. The first is the timbre we often say; the second is pitch, length and intensity. Pitch is an important evaluation function in music teaching. In the process of evaluating the effect of Solfeggio and ear training, we usually adopt several music evaluation methods, among which the pitch extraction method is one of them, and the most important one is the short-term autocorrelation function method. Therefore, we not only used the correlation formula in statistics, but also used the short-term autocorrelation function method in the analysis of experimental results. The following are three related formulas:

\[ R_m() = [(sn + m(n))][sn + m(t + m(t))] \]  

\[ SD(\bar{X}) = \frac{SD(X)}{\sqrt{n}} \]  

\[ DX = \sum_{i=1}^{n} (x_i - EX)^2 \cdot pi \]
3. **Experiment**

We can know from the content of the previous article that the combination of CAT technology and solfeggio learning aid system will bring positive and positive impact on the students' Solfeggio learning mode in art colleges and universities, and bring many benefits to teachers and students, even the whole music education industry. In order to know scientifically and objectively the effect of applying CAT technology to Solfeggio and ear training learning assistant system, we can first make a reasonable plan, then select the appropriate experimental objects, through the experiment, collect the data observed from the experiment, and finally carefully record and sort out the data, through analysis and summary, we can get the conclusion that we want to know. The results.

3.1. **Selection of Experimental Objects**

Taking two similar types of music colleges as examples, this paper analyzes their respective models of Solfeggio and ear training learning assistance system. CAT technology is adopted in Solfeggio and ear training teaching in school A, while traditional teaching mode is used in school B.

3.2. **Experimental Test Index**

In this experiment, we conducted a questionnaire survey on the students of two schools in the experiment by random interview, and compared and analyzed the results of the two groups of experimental data combined with the feedback.

3.3. **Processing of Experimental Data**

We can use the knowledge of probability theory in data processing. One of the key contents of probability theory is total probability. Total probability is to study how to calculate the event probability under complicated conditions from some simple events through the probability of these simple events. This method represents a kind of mathematical thinking of logical calculation, that is, it can transform the situation into a complex one. It's easy, it's hard to get the results you want. The formula is as follows:

\[
P(A) = P(A \mid B_1)P(B_1) + \ldots + P(A \mid B_n)P(B_n)\]

or:

\[
P(A) = P(AB_1) + P(AB_2) + \ldots + P(AB_n), \text{ (the relationship between } a \text{ and } B_n \text{ is cross)}
\]

Among them, \(B_1, B_2, B_3, B_n\) stands for events. They constitute a complete set of events, which are incompatible with each other. The sum is a complete set, and any \(p(B_1)\) is greater than 0.

4. **Result**

4.1. **Experimental Data Results**

In this experiment, we will analyze and compare the teaching results and quality of the two schools. The method adopted here is to mark the teaching situation of the two schools in a semester according to the relevant education and professional departments. The score is based on the percentage system. In this experiment, we recorded the results of four groups of experiments respectively. The final experimental results are shown in Table 1 and Figure 1.

**Table 1. Comparison of Variance Results between the Two Schools**

|                | Experiment 1 | Experiment 2 | Experiment 3 | Experiment 4 |
|----------------|--------------|--------------|--------------|--------------|
| Experiment group | 87           | 80           | 85           | 91           |
| Control group   | 70           | 75           | 67           | 76           |
From Table 1 and Figure 1, we can see the teaching situation of the two schools. We can see that the teaching performance of school A adopting the auxiliary mode of Solfeggio and ear training combined with CAT technology is significantly higher than that of School B adopting the traditional teaching mode. Therefore, we can know that CAT technology has brought a lot of benefits to the teaching mode of Solfeggio and ear training in art colleges. It makes the learning system of Solfeggio more optimized, but also greatly improves the efficiency and quality of teaching. It also shows that it is advisable to apply CAT technology to the Solfeggio and ear training assisted learning system in music and art colleges, which is worthy of investment and research, and is conducive to the innovation and realization of the system.

4.2. Students' Satisfaction with the Two Teaching Modes
In the questionnaire survey, we conducted statistics on the satisfaction of students in school A which applied CAT technology and school B applied traditional teaching mode in Solfeggio and ear training teaching. The results are shown in Table 2 and Figure 2.

**Table 2.** How satisfied are the Students of the Two Schools with the Two Teaching Models

|                      | Very satisfied | Quite satisfied | Dissatisfied | Unclear |
|----------------------|----------------|-----------------|--------------|---------|
| **Experiment group** | 37%            | 30%             | 16%          | 17%     |
| **Control group**    | 23%            | 25%             | 30%          | 22%     |

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From Table 2 and Figure 2, we can see the satisfaction of the students in the two schools in the Solfeggio and ear training learning aid system based on CAT technology and traditional methods. Among them, 37% of the students in the experimental group are very satisfied, 30% of the students are satisfied, 16% of the students are not satisfied, and 17% of the students are not clear. In the control group, 23% of the students were very satisfied, 25% were satisfied, 30% were not satisfied, and 22% were not clear. This shows that compared with the traditional music teaching mode, students prefer the experience brought by the Solfeggio and ear training teaching mode combined with CAT technology. Under the teaching mode of combining CAT technology with music teaching in art colleges, its efficiency and teaching quality are greatly improved. At the same time, students' interest in learning and teachers' efficiency in class are greatly improved, and students' awareness of physical education is also improved. Therefore, the auxiliary system of Solfeggio and ear training based on CAT technology is welcomed by teachers and students in music teaching, and it also promotes the innovation and development of music teaching mode, and the development prospect of this area is also very broad.

5. Conclusion
In a word, the combination of CAT technology and solfeggio has advantages over the traditional teaching methods, and digitizing the teaching of Solfeggio and ear training is also the research goal of many relevant experts and scholars. I believe that in the near future, this goal can be achieved, and the combination of CAT technology and solfeggio learning aid system is very perfect. The teaching of Solfeggio and ear training has brought a lot of benefits, such as providing high-quality and more efficient working methods, promoting the upgrading and optimization of Solfeggio and ear training learning auxiliary system, as well as making the system design more perfect. We expect CAT technology to bring us more surprises in the future.

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