Making Multimedia an Integral part of Curricular Innovation

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Abstract

This article argues that, in order to make effective use of multimedia technology to aid our teaching and learning of Chinese as a foreign language, we should not only think of the advantages, but also bear in mind the limitations of multimedia technology. We need to consider what pedagogical problems a particular multimedia program can help solve and how it contributes to successful learning and teaching of Chinese as a foreign language. After a discussion of two principles for guiding our integration of multimedia technology we provide some specific examples of our multimedia material development and distance learning projects to illustrate how we attempt to make multimedia an integral part of a successful Chinese language program. We also raised more research questions such as what coping strategies and techniques should be employed in order to create the optimal instructional environment in which technology is an integral part of a successful foreign language curriculum.

1. Introduction

Multimedia technology has gained more and more attention across all levels of education and the teaching and learning of foreign languages have also been profoundly affected. In the teaching of Chinese as a foreign language Cheng (1973, 1977) was one of the first attempts at integrating computer technology into the language programs. In recent years great progress has been advanced. According to Yao (1996) the first commercially available software for learning Chinese was developed by Kim Smith of the Brigham Young University in 1981. It was designed to help the learning of Chinese characters. Since then many more computer-assisted language learning materials have become available. Yao (1996) provided the most comprehensive list of the computer-assisted Chinese learning software that had been developed in the previous two decades. More recent articles by Zhang (1998) and Xie (1999) also examined some of the available multimedia programs for Chinese language learning. In addition, Xie

(1999, 2000) dealt with the roles of Chinese word-processing, e-mail and Internet in Chinese language teaching and learning. As Yao (1996) correctly pointed out, most of the available multimedia materials are not designed for any particular textbooks and it is up to the teachers to think of ways to integrate them effectively to the curriculum of teaching Chinese as a foreign language. In order to make effective use of multimedia technology to aid our teaching and learning of Chinese as a foreign language, we have found the following principles important to consider. First we should not only think of the advantages, but also bear in mind the limitations of multimedia technology. Secondly, we need to make multimedia an integral part of our curriculum. The key word for successful integration of multimedia technology into our curriculum is problem-solving i.e. we need to consider what specific pedagogical problems can a particular authoring tool or application program help us solve? Most computer application programs or authoring tools are designed for many purposes and often contain more complex features that we need. If we start with a pedagogical problem we can focus our valuable time and effort at learning only those features that apply to our material development projects. We need to consider what pedagogical problems a particular multimedia program can help solve and how it contributes to the current practice to ensure successful learning and teaching of Chinese as a foreign language. In the next section of this paper we will discuss the two principles for guiding our integration of multimedia technology and the remaining part of the paper deals with some examples to make multimedia an integral part of a successful Chinese language program.

2. Two Guiding Principles

The first guiding principle for successful integration of multimedia into our language curriculum is that we need to be fully aware not only of the advantages but also the limitations of multimedia technology. There is no doubt that the current multimedia technology offers us great potentials for enhancing the process of teaching and learning of a foreign language (Bai 2000; Xie 2001). Xie (2001) argues convincingly for Chinese teachers to face the challenge of new technology and to become "e-generation's Chinese language teachers." He made specific useful suggestions in eight areas where teachers can develop their professional competence in using computer technology to improve their teaching effectiveness. We echo Xie's enthusiasm and do realize the advantages and potentials of technology in enhancing the process of teaching and learning of Chinese as a foreign language. However, we would also repeat our cautionary note that, without fully understanding its limitations, we may find ourselves disappointed as we try to integrate the multimedia technology into our instruction.

Multimedia technology can provide learners with multi-stimulus environment because of its capacity of delivering texts, graphics, audio or videos at the same time. Some recent teaching materials (Jin, Xu and Hargett, 2000; Bai, 2001, 2002) take advantage of the multimedia features to enhance pedagogical effectiveness and the multimedia features in these materials seem to be well received by students and teachers of Chinese as a foreign language. Another advantage of using computer technology is that computers never get tired with mechanical drills and, therefore they are very patient. We are all aware of the fact that repeated grammar practice is essential for students to acquire automaticity in the language. Students can come to the lab and practice at their own pace, at any time, in-group or individually. The computers are there to help students do the same thing repeatedly without getting bored. For instance, the Chinese Character tutorial from USC's website (www.usc.edu/dept/ealc/chinese/character/) is a very useful tool to help students learn to write Chinese characters. Harvard University's web site (www.courses.fas.harvard.edu/~pinyin/) for the practice of Chinese sounds and tones are well designed to help beginners to learn Chinese sounds and tones. Another important aspect of multimedia technology is its speed to deliver pop-up tutorials. If we are aware of the common problems that our students are likely to encounter we can build very good pop-up tutorials into the multimedia reading exercises through the use of hot links and students can get instant feedback when they practice their reading or listening.

We can easily go on with the list of advantages and potentials of computer technology, but we do need to note its limitations. Bai (2000) discussed five areas of limitations of the current multimedia technology: its low IQ, its lack of interactive capacity, its cost, its lack of capacity to meet individual needs and its limited capacity to analyze errors and miscues. We may also experience other difficulties. For instance, multimedia may not contribute much to the development of productive skills of speaking and writing although it has great potential for developing receptive skills of reading and listening. Another limitation can be the lack of recognition of academic validity; some deals may not consider multimedia material development as qualified scholarship. Without bearing in mind the above limitations we may not be able to make optimal use of multimedia technology in our Chinese language curriculum. The major limitation is that the IQ of computers is zero. Without the involvement of excellent language teachers or learners, the multimedia products will not contribute to better language learning. There are many multimedia products in the market that are not pedagogically sound. We need to be very careful in selecting multimedia courseware.

There is an urgent need of good reviews of the various products that show what multimedia courseware are available to help students to learn Chinese as a foreign language more effectively. The articles on Xie's website (www.csulb.edu/~txie/online.htm) are a good start and have provided us with useful information on various computer assisted learning materials. In addition to reviews of the computer assisted learning materials research studies such as those by Nagata (1997, 1999), Chun (1996) and Gettys, Imhof and Kautz (2001) would be very useful to empirically test the effectiveness of the various design techniques of multimedia materials. For instance, Gettys, Imhof and Kautz (2001) explored how two different on-line glossing formats affect students' reading comprehension and vocabulary retention. One of their findings was that "retention of lexical items is better aided by reading the text with dictionary-form equivalents of the L2 words than text with sentence-level translation equivalents."

The rapid-changing computer technology requires that its users constantly update their knowledge so that they can take full advantage of the technology. We have used a great deal of and are familiar with the conventional instructional mode, but we are not as experienced with the newer tool and the new computer-equipped environment of teaching and learning. We need to learn how to bring the potential of multimedia technology into full play and to develop new coping strategies and techniques to create an optimal instructional environment in which computer technology is an integral part of a successful language curriculum. In order to make best use of multimedia technology to aid our teaching of Chinese as a foreign language more effectively, we have to consider the above limitations although we know that multimedia has much to offer and it has enormous potential as a learning aid.

The second principle for successful integration of multimedia technology is that we adopt a problem-solving approach, i.e. we start by asking what specific pedagogical problems can a particular authoring tool or an application program help us solve? As we mentioned above, if we start with a pedagogical problem, we can focus our valuable time and effort at learning only those features that apply to our own purposes. The specific questions we ask within the problem-solving approach are as follows 1) Can we do better than what we are doing now if multimedia technology is integrated? What specific pedagogical problem can it help solve? There might be times when older technology is as good as and may be better than the more current multimedia technology. For instance, a regular audiocassette or videocassette might work better than sound or video clips on the

web because of the slow download of the latter. 2) If the answer is yes to the first question, then we ask the next questions. Do we have enough expertise and enough time and money and sufficient institutional support to ensure successful integration of the technology in mind? 3) How can we do it and where it fits into our curriculum? The answers to the above questions are important to consider before launching a multimedia project. The remaining part of this paper is a report on some of our initiatives to make multimedia technology an integral part of our Chinese language curriculum.

2. **Making Multimedia an Integral part of Curricular Innovation**

One of our first projects was the use of WinCalis to create simple sets of vocabulary, grammar and reading comprehension exercises. The instructional goal was to make the out-of-class assignments of a beginning Chinese course more effective and motivating and reinforce what students learn from the lecture and drill sessions. Students could sit at the computers and do the mechanical drills of grammar and vocabulary and etc. so that teachers could make use of the class time for helping them acquire more productive skills such as speaking and writing. The vocabulary exercises consisted of individual sentences of Chinese characters followed by true and false questions. Sound and interactive feedback was incorporated. As the students read and answer questions they can listen to what they read. If they answer the questions incorrectly they will get interactive feedback, which may be explanation on word usage, grammar or cultural knowledge. The reading comprehension exercises consisted of short reading passages written in Chinese characters followed by multiple-choice comprehension questions. Sound and interactive feedback were also incorporated. As the students read and answer questions they can listen to what they read at any time. If they answer the questions incorrectly they will get interactive feedback. WinCALIS, designed by Duke University, is a multilingual and multimedia authoring tool for teachers of foreign languages to create their own teaching materials. This authoring tool was easy to learn and it utilizes Unicode and incorporates all the possible foreign languages. The only part that we had difficulty using at that time was its video component. The multimedia exercises were well received by students and successfully integrated into the curriculum. However, after the college computers became upgraded from Windows 3.1 to NT, the multimedia materials stopped functioning appropriately because our version of the WinCalis was not compatible with the NT at that time. This is the kind of problems that often occur with less commonly taught languages because most of the software developers of Chinese language programs cannot catch up with the fast development of the computer industry.

Developing multimedia materials for courses of independent studies. As the number of advanced-level students increases there is a greater demand of upper-level courses that we cannot offer. Because of the problem of understaffing small programs such as Kenyon College cannot offer a full range of language classes. One of the solutions is to offer courses of independent studies; students study on their own with limited guidance from the Chinese instructor. To help make the teaching of independent studies courses easier and more effective we worked on the second multimedia project, using Authorware to create a multimedia tutor for the Chinese novel Jia. The novel was divided into 9 weekly units. For each unit we designed a set of tutorial materials that include 1) glossary of difficult words. 2) Explanation and illustrative sentences for the difficult grammatical structures and discourse devices. 3) Comprehension questions and interactive feedback. for instance, we have multiple-choice questions for the students to answer. If their answers are incorrect, a sensitive help window will pop up to help students by either providing them with direct teaching or referring them to certain pages for re-reading. If their answers are correct they will be given positive reinforcement and then they move on. We believe that students' understanding of assigned readings can be enhanced if we can provide them with multimedia tutorial materials rather than only assigning the linear conventional text form. Multimedia tutor materials include text, sound, graphics, and most importantly, interactive feedback. All these features contribute to more effective teaching and learning of advanced Chinese because they help provide a learning environment that is interactive, self-paced, information-rich and more motivational. The project was funded by an Andrew Mellon grant with local institutional support.

Developing supplementary video-clip material to provide our students with multiple opportunities to practice their language skills in meaningful contexts. In order to make the out-of-class assignments more motivating and effective we recently completed two sets of video materials (Web and CD versions). The first set, Video Clips of Survival Chinese, was designed for students of low intermediate level and the URL is www2.kenyon.edu/people/bai/vcsc.htm. It integrates the use of video clips, Chinese texts with pop up annotations, various types of listening comprehension exercises and suggestions for how the video clips be integrated with the training of other skills such as speaking and writing. The second set, entitled "Real People on Real Topics", consists of lessons of interviews of Chinese people of different age and gender on social and cultural issues. The questions for the interviews are from the exercise sections of the textbook, Beyond the Basics. Users of the textbook, when they discuss the questions of various chapters, can use "Real

People on Real Topics" to note how various Chinese people respond to the same issues in question and learn the needed vocabulary, sentence patterns and paragraph structures. "Real People on Real Topics" also integrates the use of video clips, Chinese texts with pop up annotations, various types of listening comprehension exercises and suggestions for how teachers can integrate the video clips into the curriculum of advanced Chinese. The URL of the web version is www2.kenyon.edu/depts/mll/chinese/bbvideo/bbvideo.htm. The feedback from users of both sets of materials has been positive. For instance, since September of 2001 we noticed 13074 hits on the web version of the Video Clips of Survival Chinese and more than 200 copies of the CD version were distributed free of charge to students and teachers around the world, who found the on-line web version too slow to download. In order to solve the problem of slow download several institutions such as Colgate, Yale University and Defense Language Institute downloaded the above multimedia materials onto their own local server.

Our experience shows that the authoring tools for developing multimedia course materials are becoming cheaper, more user-friendly and easier to learn. We used two authoring tools, the Makers from Middlebury College (free of charge) and Dreamweaver from Macromedia ($90), for developing the recent multimedia materials. The amount of time for learning the authoring tools is minimum, but much time is needed for developing high quality content and learning activities. In order to create effective learning activities and exercises it requires a great deal of time and talent. The two recent projects were conducted by a team of three faculty members of Chinese and one advanced student of Chinese. The reason for including a student in this project is two-fold: getting feed back about the effectiveness of the exercises from the students' perspective and having a native speaker of English to polish the English gloss and explanation of the content of the listening materials. The video-clip multimedia material projects were also funded by the Andrew Mellon grants administered by the OH-5 and the Denison-Kenyon Collaborative Projects.

Collaborating with other colleagues through the use of web-based distance learning instruction to help solve the problem of understaffing among smaller programs of Chinese studies. Kenyon College and Denison University are two small literal arts colleges in central Ohio of the United States and neither of them can offer a full year of advanced Chinese because of lack of staffing. However, there is more and more demand for taking advanced Chinese. When the two colleges received a Mellon grant from the Denison-Kenyon Collaborative Project to promote cross-campus collaboration we grasped the opportunity and one of our

initiatives was the design and implementation of distance learning courses by sharing resources and utilizing multimedia technology and the teleconferencing facilities that were established with the Mellon grant.

In order to develop the distance learning courses we attended several training workshops to learn about the newly established teleconferencing classrooms that were set up for enhancing learning through collaboration that uses modern information technology. More about the grant is available at the Mellon Program's web site, http://enhanced-learning.org/mellon. The remote teleconferencing classrooms meet many instructional needs with the following features:

- Tandberg Educator 5000 videoconferencing suites
- Easy-to-use touch screen control panel that can be moved from a speaker's podium to conference table
- Full room microphone coverage
- Two color monitors at the front of the classroom to view incoming and outgoing images
- One color monitor at the rear of the classroom for instructor's view
- Two video cameras capable of automatic tracking and independent control
- Dedicated video network connections between our two campuses
- Four dial-up telephone lines (ISDN) for video connections to facilities worldwide
- VCR and document cameras for display in room as well as video conference exchanges
- Networked microcomputer for projection and video conference exchanges
- Color projection system and screen for computer displays
- Flexible seating for 18, or conference table seating for 10
- Telephone for voice communications with other sites or for support

In addition to learning to use the features of the teleconferencing classrooms we also visited other foreign language programs or their web sites that offer distance-learning courses. We observed two types of distance learning courses. First, it is the web-based asynchronous design such as the advanced Asian language courses at University of Hawaii. They offer distance-learning courses in advanced Chinese via the World Wide Web. Students receive web-based, asynchronous instruction. Learning activities are a mix of on-line interaction

with and feedback from the instructors and the semester wraps up with a web-based language exchange with graduate students in Taiwan. The second format is the synchronous design through the use of interactive TV. For instance, Morgan County Community College in Colorado offers various courses through their interactive TV classrooms. The instructor teaches from the main campus and students from both the main campus and different remote sites attend the class at the same time. All of the students seem to feel comfortable participating in the class discussion.

Having examined both formats of distance learning course we attempted to combine the features of both the synchronous and asynchronous formats in the design of our distance-learning courses. One of the courses we offer via distance learning instruction is the Advanced Chinese, entitled Empower Reading by Reading about China, which integrates both the teleconferencing facility and web-based technology. It is designed for students to develop and refine their ability to understand, speak, read, and write Chinese. Each class consists of three integral components: 1) the pre-class reading and pair activities, 2) the during-class interactive TV lecture and practice and 3) the post-class activities for reinforcing and assessing learning outcome. To facilitate the smooth operation of the class activities and the communication among the instructor and the students, the instructor holds a brief "computer literacy" workshop at the beginning of the course. Students could learn the basic required skills within a one-and-half hour workshop.

The pre-class tasks. Before coming to each class the students will do the assigned readings from two textbooks, Beyond the Basics and Across the Straits, which deal with aspects of Chinese culture and society. Both conventional type of materials such as audio and videocassettes and newer types of materials such as CD and web materials are used in order to facilitate the learning process during the pre-class tasks. Students also need to read newspaper and other articles on the suggested web sites. On-line dictionaries, the Annotator (www-rohan.sdsu.edu/~chinese/annotate.html) and ITV office hours are also employed to facilitate learning during this phase of the course. The objective of this phase of the course is to help students get prepared for the class participation and for developing their competence of independent learning strategies. In order to make the out-of-class assignments more motivating and effective we also use the recently-completed video material of "Real People on Real Topics." It consists of lessons of interviews of Chinese people of different age and gender on social and cultural issues. The questions for the interviews are from the exercise sections of the textbook, Beyond the Basics. When they discuss the questions of various chapters

students can use the materials to note how various Chinese people respond to the same issues in question and learn the needed vocabulary, sentence patterns and paragraph structures.

The during-class interactive TV lecture and activities. This component of the class is devoted mostly to develop students' productive skills of speaking and writing and increase their knowledge about aspects of Chinese culture and society. The class is interactive and learner-centered. Students are encouraged to come to class with questions about the text. Having explained the content of the text we implement student-centered activities that engage students to talk to the teacher and each other about the cultural and social issues and practice their speaking skills. There are also writing tasks. For instance, the instructor may raise a question and, instead of oral discussion, ask students to write for 5 minutes in response to the question. After students finish writing the instructor may show students' writings through the document camera for students on both sites to view, which serve as points of departure for further oral discussion of the issues in question. Teleconferencing classroom facilities are essential components for distance learning and collaboration and require coping strategies that are different from the conventional instruction. For instance, the sitting arrangements, the background colors, the kind of projected image and lecture handouts all need careful advanced planning. Audio and video materials, materials on the web can all be utilized and integrated effectively in the teleconferencing classrooms.

The post-class tasks. The objective of the third component of the class is to help students reinforce what they learn and to assess learning outcome through the conventional paper-pencil exercises and the use of web-based threaded discussions, the section of the discussion board of the CourseInfo or Eres, reports and collaborated group projects. Their performance is assessed via regular homework and tests delivered and collected via e-mails, threaded discussion and etc. Technological requirements for effective implementation of this component include: 1. Successfully deliver and collect Chinese-character files that can be viewed by both the students and the instructor. 2. Use functions of the word processor such as color coding etc. that tracks changes of documents so that students can easily see which part of their writing has been corrected and needs attention. The Chinese program, Njstar, can track changes of documents by utilizing different colors, which is useful for tracking students' writing performances. The instructor seldom "corrects" students' errors, but points out the places that need fixing and helps students realize what went wrong and how they should be fixed. Red for grammar errors, purple for vocabulary, pink for others and blue for "slip of

keys". Re-submitting of their self-corrected version of their homework is highly encouraged. They can earn full score if they keep correcting their errors until the assignment is perfect. 3. Create instant feedback to students writing assignments. In addition to the regular class meetings and the pre and post class activities all the students meet two to three times during the semester so that they can know each other better and can have the opportunity of face-to-face interaction. Teaching assistants are also hired to help students practice speaking on individual basis through interactive TV.

In addition to the regular class meetings and the pre and post class activities the students meet three times during the semester so that they can know each other better and can have the opportunity of face-to-face interaction. There are also two half-hour individual sessions each week with the instructor's assistant. During these individual sessions, students are required to 1) discuss the class content, 2) complete the assigned task-based activities, 3) discuss the current events or topics of their own choice, and 4) get help about their assigned home-work or projects. The instructor is responsible for creating the tasks and speaking exercises for the teaching assistant to use with the students on both campuses. The instructor also travels to the remote site to teach a couple of times during the semester so that the students from the remote site can have the opportunity of interacting with the instructor personally for more effective communication and assessment, and most of all, for debugging the technical problems. Sometimes the Chinese viewing and word processing and other programs stop working ap-propriately.

The immediate benefit of our distance-learning project is that it helps broaden the curricular options at both Kenyon and Denison. We have conducted some in-formal surveys about the effectiveness of the distance-learning course; the reac-tions are mostly positive. To the question of "How do you like this distance-learning course in comparison to other language courses that you have taken?" the responses are "it is about the same", "It took some getting used to, but some-times communication was harder." One student from the remote site commented that "I did feel that it was at a disadvantage and hard to jump into discussion." Other students complain about the audio quality over the phone lines. In response to the latter comments we have installed better microphones that improve the audio clarity. Another question was "Did the use of technology make you spend more or less time with respect to your other language courses?" Most responses are "Didn't make much difference." A few students reported that they spent more time on this course because of the writing requirement. Students had been re

quired to surf the recommended web pages and write reports on what they had read and heard. If we help our students learn to take advantage of some of they web materials and then design task-based learning activities such as writing or group projects our students will be able to work to improve their linguistic competence, expand their knowledge about China and develop independent learning strategies. Another survey question was asked about the course web site, www2.kenyon.edu/depts/mll/chinese/bai/chns321/chinese321.html. All responses indicate that it was a useful part of the course. Another question was designed to ask for students' opinion on the use of Njstar software. One student responded, "Once I got used to it, it was very useful. It made turning assignments in very convenient." Two students expressed their concern that the use of computer word processor might have made their handwriting of characters rusty. To the question of "How did you like the color-coding system for correcting your homework?" almost all students responded positively with one student commenting that the use of multi-color is not necessary. Because the discussion board was not used very much we designed the question of " In your opinion, why was the discussion board (news/current events reports) not used often?" The explanations from the students are as follows: "[Chinese input] was very slow and I never had that much time to put into it." "Too much time translating because the translating web site was broken." "It was really tedious to read everyone's and try to respond." "It was hard to access and not very fun." Obviously we needed much work to improve the learning tasks so that students can become motivated and engaged more. When we asked "What did you find least valuable about the use of technology in this course?" The responses seemed to show that students were content with the different uses of computer technology in this course. The only negative response was that one student disliked the discussion board. To the question of "How did you like the individual sessions with Guo Laoshi (our teaching assistant)?" All the responses were extremely positive: "Great! It was a great chance to just chat in Chinese. Even though I never did my homework with her it helped me feel like I was keeping up with my conversation." "Great! I feel like the fluency of my speech improved because of that." "Very useful. It was good to speak Chinese one-on-one for a half hour twice a week." We also asked students for their feedback about sitting arrangements and etc. We found that students' responses were informative and useful for us to improve the quality of our distance-learning courses.

It is obvious that designing and implementing distance learning courses requires special expertise and, as we mentioned above, we are not very experienced yet with the new tools of multimedia technology and it takes time to learn to use the

tools more effectively. As Duke President Keohane (2000) puts it, "we need to approach distance education, as we should all exotic and complex new opportunities, with mindfulness and with our mission statements before us." As we implement our distance learning instruction we are still seeking effective techniques and to examine and validate our initiatives with regards to curricula innovations that enhance distance collaboration via technology.

3. Conclusion

We have argued that, in order to make effective use of multimedia technology to aid our teaching and learning of Chinese as a foreign language, we should not only think of the advantages, but also bear in mind the limitations of multimedia technology. We need to make multimedia an integral part of our curriculum and consider what pedagogical problems a particular multimedia program can help solve and how it contributes to successful learning and teaching of Chinese as a foreign language. Some specific examples have been reported to illustrate how we attempt to make multimedia an integral part of a successful Chinese language program.

Research (Pennington, 1996) has shown that multimedia technology promotes a better teaching and learning environment. In its recent Standards for Foreign Language Learning (American Council on the Teaching of Foreign Languages, 1996), ACTFL suggests: “Access to a variety of technologies ranging from computer-assisted instruction to interactive video, CD-ROM, the Internet, electronic mail, and the World Wide Web, will help students strengthen their linguistic skills. . .and learn about contemporary culture and everyday life in the target country. (p 31)” However, the new multimedia environment is also a challenge for both teachers and learners; we need to explore ways to make the most effective use of the new environment of teaching and learning. Some of the research questions include 1) what coping strategies and techniques should be employed in order to create the optimal instructional environment in which technology is an integral part of a successful foreign language curriculum? 2) How should we alter or refine the traditional curriculum in terms of the integration of multimedia and web-based technology? 3) How to design and write/select the course materials and some of the student-centered interactive exercises, put them on the web page, and then work out a scheme for grading and assessment? 4) How to help students use on-line learning tools such as annotators of Chinese or on-line dictionaries? 5) How to design and implement “discussion board” activities that encourage more students’ interaction? 6) How to make best use of the class time getting students from the distance engaged in interacting with

the faculty member and students from the other campus? 7) How teachers can take advantage of the tracking capacity of multimedia programs to identify students' individual needs and strengths? The findings from these research questions will be informative and significant for establishing an effective and efficient model of making the available multimedia technology an integral part of the teaching and learning of Chinese as a foreign language.

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