Introduction

Due to the rapid development of computer technology, the application of multimedia to teaching is widely accepted. Approaches for assisting literacy education through multimedia have been developed and promoted by researchers of Computer-Assisted Language Learning (CALL) (Ngu & Rethinasamy, 2006; Parette, Hourcade, Dinelli, & Boeckmann, 2009). In kindergarten classrooms, all types of computer equipment support young students to learn and help teachers to master various multimedia materials and programs to assist students' learning. Many studies indicate that rich multimedia elements, such as texts, pictures, audio, video, and animation, greatly improve the effectiveness of students' learning and enhance their interest (Vichuda, Ramamurthy, & Haseman, 2001). However, Sun and Cheng's (2007) study pointed out that large quantities of multimedia cannot guarantee the effective promotion of learning performance. According to their findings, only course contents with high uncertainty and equivocality can have such an effect. Ngu and Rethinasamy (2006) evaluated a CALL program for learning of English prepositions. Their results showed that the effectiveness of learning this program was even worse than that of the conventional group. They explored the possible reasons and found that the main one lies in the fact that there are some problems in the arrangement of media and course contents and such a CALL system overloaded learners with cognitive knowledge, thus, leading to poor learning outcomes. Therefore, for the design of multimedia teaching materials, it is necessary to consider how display design influences learners' attention and cognitive load (Austin, 2009). Thus, a very important issue arises, i.e., how to apply cognitive load theory to design teaching media that allow learners to achieve the best performance.

Although multimedia teaching equipment is now very popular in early childhood education, particularly through the integration of multimedia into children's language learning, research dealing with how to integrate multimedia into the literacy learning is still rare. In addition, studies of multimedia design for early childhood literacy learning are also rarely seen. In addition, as teachers are teaching Chinese characters, the problem of multimedia arrangements is very likely to appear, and this could lead to the reduction of learning effects (Ngu & Rethinasamy, 2006). Therefore, this study aims to explore how to arrange multimedia elements so as to reduce young children's load when learning

Chinese characters in order to allow children to achieve the best results in Chinese learning.

Chinese Character Learning

Learning Chinese characters is very different from learning other languages. Chinese characters were originally presented as drawings that resemble shapes of actual objects. According to their mode of formation, Chinese characters can be categorized into four forms of words: Pictographs, indicatives, ideographs, and semantic-phonetic compounds (Chen, Wang, Chen, & Chen, 2014). With its own complexity in meaning and formation, the Chinese word is presented in a graphical mode, and each has only a single word phonology, which greatly differs from the multi-syllable sounds of English words. For a non-native novice or a young native learner, to learn how to study and read Chinese characters aloud means that he/she needs to simply memorize the sound and meaning of a word, and by the time the learner accumulates enough words, he/she is eventually able to read and say Chinese. Lee, Shen, and Lee (2008) mentioned particularly that for novice learners, a well-designed multimedia teaching course can be an effective tool to learn Chinese characters. Therefore, this study aims to explore how teaching arrangements with multimedia elements may allow learners to get the best learning results.

Cognitive Load Theory

Many studies have noted that an effective multimedia teaching design has to consider the criterion of cognitive load theory. Furthermore, in the field of teaching design, cognitive load theory has been proven as a very important foundation theory (Gerjets, Scheiter, Opfermann, Hesse, & Eysink, 2009; Van Gog & Scheiter, 2010). The so-called cognitive load theory emerges from the research finding that when learners are engaged in the learning process, the effectiveness of human learning reaches certain limits, and learning effectiveness actually declines along with the increase of the learning amount or learning time.

Sweller, Ayres, and Kalyuga (2011) proposed that the learning process of the human brain resembles the information processing of a processor, and that by effectively arranging the information to correspond to human working memory we may achieve maximum operating performance. This is precisely the main purpose of cognitive load