A Study on the Agent-based Word-recognition Learning System for Pupils with Moderate Mental Retardation

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ABSTRACT

The purpose of this study is to explore the influence on the learning effectiveness for mental retardation students by using the Agent-based Word-recognition learning system. The system applied the teaching agent to increase learner’s motivation and used stimulus fading strategy to enhance the learning effectiveness. A multiple probes of single-subject design was adopted. A nine-year-old pupil with moderate mental retardation participated in the study. The experiment shows that the subject can identify the target words correctly without the presence of known pictorial cues. The learning system combining teaching agent and stimulus-fading strategy is efficient in teaching word recognition for pupils with moderate retardation.

Keywords

moderate retardation, teaching agent, stimulus fading strategy

1. Introduction

Web-based learning is the trend of Computer Assisted Learning (CAL). However, very few of them are especially designed for mentally retarded students. Despite the retarded pupils have lower ability and deficiencies in abstract thinking, remembrance and concentration. However, if the content of the system could be presented in concrete ways and combined with their experience, it should be able to improve their learning performance.

Previous research had shown the effectiveness by using stimulus fading strategies in word-recognition teaching. Nevertheless, many teachers do not incline to use them because it involves labor-consuming work for preparing materials. For the purpose of removing the barriers of what are mentioned above, using computerized learning system may be more effective and efficient.

The use of agents within computer mediated learning environments is currently an important issue of the development in CAL. Pedagogical agents must support individualized learning by its rich user interface, multimodal dialog, and proper guiding[1]. This study is to find out the effect on the learning efficiency of moderate mental-retarded pupil receiving a training session of agent-based learning system, which applies the stimulus fading strategy.

2. Method

2.1 System Design

We created the teaching agent by using Microsoft Agent to provide adaptive instruction and illustration. The system embedded IBM Via Voice to support Text-to-Speech Engine (TTS). The teaching agent plays several roles, including motivating, demonstrating, guiding, questioning, and testing. To evaluate learners’ learning outcomes, we use a database to collect the data that the user clicks.

2.2 Content

As shown in Figure 1, the system supports four phrases, including intriguing motivation, teaching activities, practicing and evaluation. The selection of the contents is based on the rules of functionality and practicability. Four functional Chinese words (towel[,], bucket[,], cloth[,], and scuffs[.]) were selected and served as target words. The system is integrated with the techniques of Agent, Text-to-Speech Engine (TTS) and some learning strategies (e.g., Multi-Hint Strategy, Situated Learning Strategy, and Read-aloud Strategy).

2.3 Stimulus Fading Strategy

Two types of stimulus fading strategies were shown as in Figure 2 and Figure 3. In terms of external stimulus-fading, a picture is presented separately in space from the word, and the picture is systematically and
gradually faded out.

Because of concentration ability deficiency, the literature is considered that pictorial cues could interfere with pupils’ attempts to deal with written words since they are likely to pay attentions to the picture instead of the words [2]. For the internal stimulus fading strategy, a picture is superimposed directly on the word and then the picture was systematically and gradually faded out. The learner could focus on the same point. The system adopted the internal stimulus-fading strategy.

3.1 Subject
A nine-year-old pupil with moderate mental retardation participated in the study. The subject was selected according to the following three criteria. First, it is on record that she was unable to recognize words taught in class. Secondly, she could follow her teacher’s directions. Thirdly, she could identify pictures of familiar items.

3.2 Procedure
3.2.1 Baseline
The subject’s familiarity with the target word was tested. The pupil was asked to point out the target words without cues. Each target word was assessed five times. During the baseline assessments, the researchers just recorded pupils’ responses and no feedback was given.

3.2.2 Instruction
The subject had a fifteen-minute learning session in the morning five times a week. The procedures included demonstration, practice, and evaluation. The subject could not enter to the next fading step until she reached the master criteria, 80% of correct responses for each word in three consecutive sessions. Then the instruction procedure was repeated during Step II (the pictures with 45% fade out) and Step III (the pictures with 75% fade out) and final step instruction (words only).

3.2.3 Maintenance
To examine whether the subject could recognize the targets words which have been taught, maintenance tests were administered after the instruction period. No instruction was delivered during the maintenance stage.

4. Results
Figure 4 presents the data that the correct responses of the four target words during the baseline, instruction, and maintenance sessions. The subject showed his reluctance to participate in some sessions, but this result implied that the subject could still shift his attention from the picture into the target word without much difficulty. The result also indicated that the subject could maintain his correct responses above the master level for each target word. In other words, the teaching agent learning system embedding stimulus-fading strategy was efficient in teaching word recognition to the pupil.

It is discovered that the system will equip the users with better learning effectiveness for the learning activities.

5. Conclusions
In this study we examined the effects of picture fading technique on agent-based learning system for pupil with moderate disabilities. The result of this study showed that the learning system can be an effective and efficient teaching tool for teaching pupils with moderate mental retardation.

Based on this study, major findings were:
1. For pupils with mental retardation, using stimulus fading strategies on word-recognition instruction can be an effective method.
2. The learning system embedded teaching agent can arouse learners’ motivation.
3. Fading strategy can be adopted to fade pictures and text, and to develop software packages with a view to reduce teachers’ pain when preparing teaching materials.

6. Reference