

Evaluating a Classroom Design with Web-Based Learning for the Japanese Manual Alphabet System

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Abstract: In this paper, we present the results of both classroom lessons and Web-based learning for Japanese manual alphabets (YUBIMOJI) to ordinary elementary school children. So far, we have developed an easy-to-use edutainment system: Practice! YUBIMOJI AIUEO (PYA). The objectives of PYA are to promote basic expressions of Kana characters (AIUEO) of Japanese manual alphabets, and to give the experience of communication with deaf people to ordinary children at elementary school age. In our previous work, we have shown that PYA is an effective educational material to increase the awareness of school children concerning the universal design. Extending the results, we develop a new framework for a classroom design. For the purpose, we have improved PYA to PYA-WEB. In this paper, we have carried out series of intensive experiments at classrooms of Sumiyoshi Elementary School and Web-learning (7 or 8 years old; 59 subjects). The results are summarized as follows: 1) The greediness for learning at starting point is important to motivate learning and practice in order to let the students feel accomplished; 2) PYA-WEB is effective to increase the capability of YUBIMOJI reading; 3) PYA-WEB users with the higher motivation keep the learning effect the longer and they get a YUBIMOJI skill the more, in proportion to the access time; and 4) After the children mastered YUBIMOJI, the communication lessons with deaf people are successful. These results have suggested that PYA-WEB has encouraged children's self learning and enhanced the communication skill. The YUBIMOJI lessons with the proposed classroom design and PYA-WEB would be useful to construct a barrier-free society.

Keywords: children, educational-materials, classroom, web-based-learning, YUBIMOJI

1 Introduction

Educational materials supported by computer systems should be used to acquire both knowledge about the topics and good morals about the real world. In order to develop a barrier-free society, it is important for elementary school children to learn about the disability through Japanese sign language. Learning manual alphabets or KANAs (YUBIMOJI) also should lead to making a barrier-free concept to ordinary children.

Although the rapid development of computer technologies, until recently, the research on studying computer supports for sign languages or manual alphabets has not been a popular topic. Most of the current support systems focus on the highly motivated users, therefore, they have a lot of sophisticated functions [3, 4].

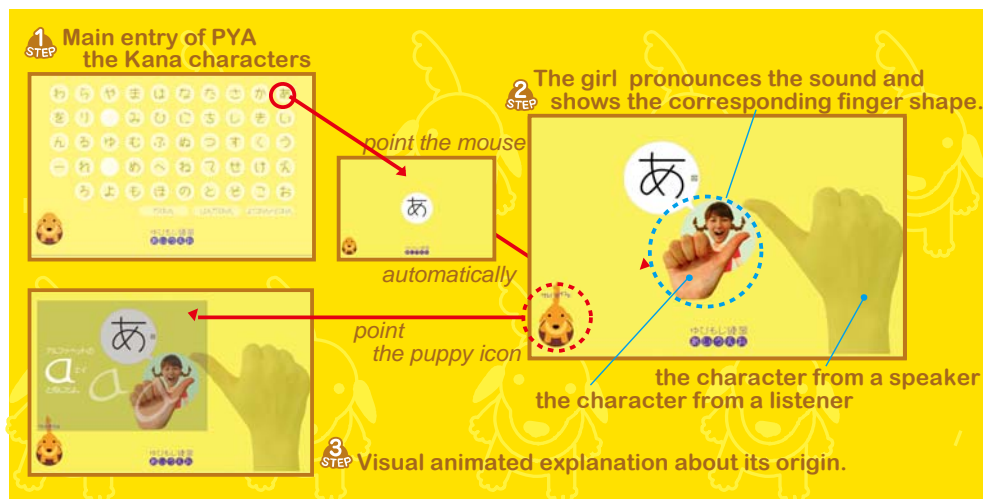


Fig. 1. How PYA Works. User is only required to point the display icons with a mouse or finger touch.

To envision an easy-to-use graphical interface for ordinary beginner children, we have developed the learning system: Practice! Yubimoji AIUEO (PYA) [1]. PYA is an attractive edutainment system, and we have convinced that PYA is effective from pedagogical and computer human interaction points of view [2].

Extending our previous work, we improved the functions of PYA to PYA-WEB so that children could learn YUBIMOJI at their home, and we have developed a new framework for a classroom design. In this paper, we present the results of both classroom lessons and Web-based learning for YUBIMOJI to ordinary elementary school children.

2 Brief Explanation of PYA and its Principles

PYA on a personal computer with a web browser has an easy-to-use and look-and-feel visual interface. Figure 1 depicts the interface and how it works. PYA has following five principles: 1) Visual expressions, which recognize a character from both a listener and speaker, correspondently; 2) Figures of the Kana-character, finger shape with appropriate movements, mouth shape, and the sound of the character pronunciation, at the same time; 3) Photograph expressions of the fingers and face which is important visual information; 4) Dynamic expressions of the finger character with a motion; and 5) Visual animated explanations about the Kana-character's origin. Based on the above principles, even very young children are able to use PYA without any manual descriptions nor help messages.

3 Classroom Design with Self Learning using PYA-WEB

We design a research program for the school children at the second grade of the Sumiyoshi Elementary School in Kobe City in 2006-2007. Our classroom lesson program consists of the following items. Figure 2 displays some of the pictures at the practice.

- A Classroom lesson about moral education (12-th Jun. 2006 ; 45min)

One of our objectives is to let children think by themselves how to communicate with deaf people. In the lecture, we emphasize that: 1) Children discuss about the situations that they could not relate to any other persons; and 2) A teacher gives a lecture, which explains the communication difficulties with deaf people and their differences with ordinary people; and 3) It is important to understand the sign language system and basic YUBIMOJI.



Fig. 2. Snapshots of lesson (from left to right: Introduction PYA /PYA lessons /Communication practice)

- Introduction of PYA (12-th. Jul. 2006 ; 45min)
Children learn the deaf situation by experiencing deaf-simulations. A teacher talks that it is important for deaf people to watch mouse shapes, and that we should watch our faces each other when we talk to deaf people. A teacher talks about similar phonologic phrases that we hardly distinguish the phrases by only watching mouse shapes. After the lecture, children are expected to understand the importance of YUBIMOJI using PYA.
- PYA lessons by a PC (12-th. Jul. 2006 ; 45min)
Children learn how to use PYA system freely. The goal of this lesson is that children are gradually familiar with the operations by themselves. A teacher gives suggestions about the direction of the shapes and two sides of the fingers shapes of YUBIMOJI in order to let them learn PYA at home.
- Self learning homework (12-th. Jul. 2006 ; 45min – 18-th Jan. 2007)
We have prepared user IDs and Passwords of PYA-WEB for children. We recommend that children learn YUBIMOJI freely at home. We gather access data of them to analyze the effectiveness of PYA-WEB learning.
- Communication practice (22-nd. Jan. 2007)
We invite our university students with hearing impaired as special lecturers for the children. In this lesson, children communicate with them using gaming interactions for self-introductions and friend-introductions. The goal is to let children have experience on various kinds of communication styles of face to face and/or writing with deaf people.

4 Experimental Results and Discussions

4.1 Experimental Set- Ups at Elementary School

The 116 school children of 3 classes with 7 or 8 years old at the second grade of the elementary school were selected as the subjects of the experiments. The children participated in the experiments three times (after the oral lecture, the PYA lesson by a PC, and the communication lesson). The experiments consisted of the three kinds of performance test: the paper examinations (15characters), video examinations (42characters), and the questionnaire surveys of the subjective evaluation. We selected the subjects, who used PYA-WEB and participated in all tests. Finally, we got 59 subjects data for the analysis (class A; 30 subjects, class B; 29 subjects).

In this section, we present the experimental results which utilized PYA and PYA-WEB from the scores of paper tests and video tests, subjective evaluations, and the access time using PYA-WEB. The analysis focuses on the following viewpoints: 1) Comparisons between classes; 2) Correlations about self-learning effects and access time of PYA-WEB; and 3) Differences of learning effects between the paper-tests and the video-tests.

Table 1 the subjective evaluation about the greediness for learning at the starting point.

Class (number of subjects / %)	Not want to learn (h, l)	want to learn (low)	want to learn (high)
A (30, 100%)	0 (0%)	7 (23.3%)	23 (76.7%)
B (29, 100%)	0 (0%)	1 (3.4%)	28 (96.6%)

Table 2 the subjective evaluation about the understanding of communication practice.

Class (number of subjects / %)	not understand (low)	understand (low)	understand (high)
A (30, 100%)	4 (13.3%)	11 (36.7%)	15 (50.0%)
B (29, 100%)	2 (6.9%)	6 (20.7%)	21 (72.4%)

4.2 Comparison Between Classes

The average of access time is 114.1 minutes, the average of number of access is 5.7 times and the access time per one try is 21.2 minutes. Transitions of the percentage of correct answers of paper tests and video tests are 40 %, 80 % and 90 %. Each classroom lesson is managed by different teachers. We compare the class A and B. There are no differences between class A and B at the above viewpoints. Compared with the statistics, however, the subjective evaluations about the greediness for learning at the starting point and the understanding of communication practice show differences between class A and B ($p < .05$) The results are summarized in Tables 1 and 2.

4.3 Correlation about the Self-Learning Effects and the Access Time of PYA-WEB

We investigate whether the effects of learning are correlated with the self-learning, or not. The subjects who have over 400 minutes and 15 times of access are omitted because they are considered to be outside of normal data. Finally we got 47 subjects for the analysis (class A; 24, class B; 23). The effects of learning are highly correlated with the access time, the case of class B with highly motivated and successful in the communication practice ($r = 0.6$) (show Fig.3). However, we find no correlation between learning effect and access time in the case of class A.

4.4 Differences of Learning Effects between the Paper-Tests and the Video-Tests

We have evaluated the learning effects by the score of the paper-tests and the video-tests. Both scores are increasing step by step. However, there are significant differences about the learning effects of the paper-tests and video-tests. We have analyzed the phenomena by ANOVA (Two-way repeated measures analysis of variances). The progress time and the kinds of tests has the interaction ($p < .05$). The score of video-test has a remarkable effect between the first time and the second time. It means that PYA-WEB is effective for the improvement in the capability of YUBIMOJI reading.

4.5 Discussion

These results have suggested that "greediness for learning" is the point for the effectiveness of learning. In order to get the effectiveness of PYA-WEB correctly, we have to give the children the high greediness for learning. The PYA-WEB allows the short time increase of children's capability of YUBIMOJI readings, which is useful in communication with the deaf. This suggests that the high motivations will reach to the effective learning in proportion with their efforts, and that they feel a sense of accomplishment. From the viewpoints of classroom design, we should pay attention to "greediness for learning at starting point".

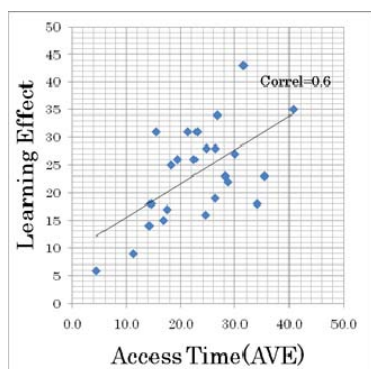


Fig.3. Correlation about the self-learning effects and the access time

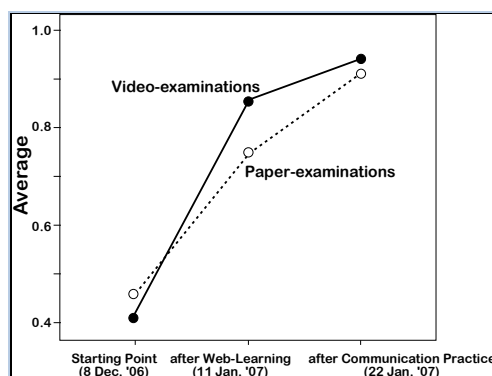


Fig.4. Significant differences about the learning effect

5 Concluding Remarks

This paper has described the series of classroom experiments to develop the educational methods of PYA-WEB: a web edutainment system for Japanese manual alphabet learning for school children. PYA was designed to be used in both a classroom lecture and home work, thus, we have implemented PYA as a client-server system on the web. We have demonstrated the effectiveness of PYA-WEB and classroom design based on the subjective evaluations and the access time. The conclusions are 1) The greediness for learning at starting point is important for children to motivate the learning and practice; they have succeeded in reaching the sense of accomplishment; 2) The PYA-WEB is effective to improve the capability of YUBIMOJI reading; 3) The PYA-WEB users with higher motivation keep up the more learning effect, and they have skilled with YUBIMOJI characters in proportion with the access time; and 4) After the school children mastered the more YUBIMOJI characters, the communication lessons with deaf people are the more successful. The YUBIMOJI lessons with suitable classroom design and PYA-WEB are useful to develop our future barrier-free society.

The future work related with the research is to develop a new system, in which school children learn Japanese manual alphabets using PYA on a network and communicate with their friends or deaf people using manual alphabets. We have developed PYA-CAM which processes both picture or image information. In the next step, we will develop PYA-NetCAM.

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