

Educational effects of e-learning using mobile videophone for students with physical impairments

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In this study, the authors evaluated educational effects of an e-learning system, based on a mobile videophone, for students with physical impairments. They analyzed video records of the behavior of a subject with severe physical impairments in two class sessions of e-learning and in two sessions of conventional visiting education. The ratio of positive to negative behavior in e-learning was higher than that in conventional visiting education. This result demonstrated the educational efficiency of the system.

Keywords mobile videophone; e-learning; students with physical impairments; special needs education

1. Introduction

We have conducted a pilot study of e-learning systems using mobile videophones for students with physical impairments, especially those who cannot attend school regularly because of those impairments. Our previous papers [1, 2] reported the first trial of the system for a student with severe physical impairments. Those studies showed that the student was able to attend the school curricula and engage in discussion with teachers and classmates through the system from home. Nevertheless, further analysis must evaluate the educational effectiveness of the system.

Some studies have shown the educational effects of e-learning systems for students with special needs [3, 4], but they have not compared those effects with other educational methods'. The present study is intended to evaluate educational effects of this e-learning system through comparison with those of conventional visiting education with a visiting teacher.

2. Methods

2.1 Subjects

The subject was a female student, aged 17, in the second grade of the advanced course at a school for the physically handicapped in Tokyo. She had muscle weakness and maintained a lateral recumbent position on a bed. An artificial respirator was required in her daily life. Therefore, she had difficulty in going out by herself and received a visiting education program, in which teachers visited her home to lecture.

This person had no intellectual disability and had mastered the school curricula for an age-appropriate grade level. In spite of muscle weakness, she was able to operate a mobile phone without assistive devices.

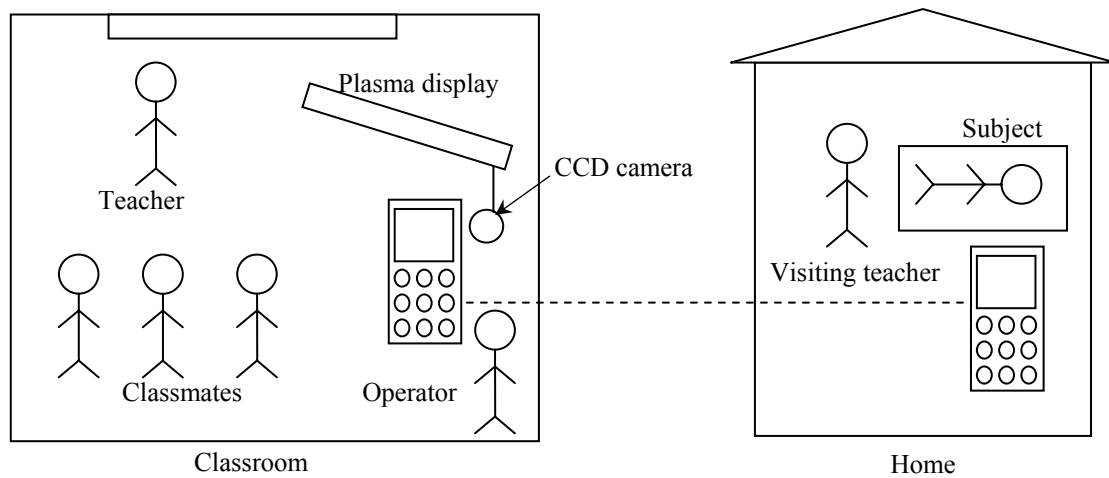
A class teacher, an in-class system operator, a visiting teacher, and 11 classmates also participated.

2.2 E-learning system

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1 The E-learning system was identical to that described in our previous paper [1, 2]. We placed a mobile
 2 videophone (FOMA P2102V; Matsushita Electric Industrial Co., Ltd. – “Panasonic” [5]) in the subject’s
 3 home. The classroom system was composed of a mobile videophone (Lookwalk P751V; Panasonic), a
 4 CCD camera, and a plasma display (Fig. 1).

5 The in-classroom operator handled the mobile videophone and CCD camera to present subject on the
 6 plasma display. Thereby, the teacher and classmates could view and communicate with the subject. At
 7 home, the subject communicated with the teacher and classmates using the phone. Thereby, she partici-
 8 pated in the class.



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30 **Fig. 1** E-learning system based on the mobile videophone.

31 32 33 2.3 Procedure

34 The system was used in the class for science education. We obtained video recordings of two class ses-
 35 sions using the system. Session times were 28.41 min. and 18.17 min. Recordings were made by a digital
 36 video camera located behind the subject.

37 For comparison with the subject’s situation for study, we recorded two class sessions for science edu-
 38 cation through conventional visiting education conducted by a visiting teacher without the e-learning
 39 system. Session times were 32.58 min. and 23.37 min.

40 41 42 2.4 Analysis

43 Video recordings in each session were imported to a personal computer (Apple Computer, Inc.: Macin-
 44 tosh PowerPC G4) with a movie software (Apple Computer, Inc.: iMovie 3.0.3). The PC and software
 45 were used to confirm the subject’s behaviors.

46 Behavior of the subject was classified as positive or negative. Positive occurrences were showing
 47 thoughtfulness, replying to classmates and teachers, writing educational material, and so on. Negative
 48 occurrences were neglect or lack of response even if teachers or classmates talked to and showed ques-
 49 tions and instructions to the subject.

Furthermore, positive behaviors were classified into five categories (Talking, Writing, Pointing, Gesture, and Other) for comparison with the different education method. If one behavior was related with two or more categories, we counted all of them.

3. Results and discussion

Table 1 shows the numbers of positive and negative behaviors and ratios of positive to negative in each session. More positive behaviors occurred in visiting education, whereas fewer negative behaviors occurred in e-learning. Table 2 shows further classification of positive behaviors. Behaviors in all categories were seen in visiting education, but not all in e-learning, in which "Talking" is about 80% of all behaviors.

In this manner, these results reflected the vast difference in the two educational methods. The student and visiting teacher communicate face-to-face in visiting education. It seems to be easy for the teacher to ask anything to the student to promote the session. However, sometimes the student seemed to feel monotony of learning and could not reply to the teacher's questions. We presume that this led to a greater number of negative behaviors.

However, the student communicated not only with a class teacher, but also with classmates in the e-learning system. Although expression methods were restricted, she was able to talk positively with others. Consequently, the ratio in e-learning was superior to that in conventional visiting education. This result demonstrated the educational efficiency of the system.

The subject spoke with others freely and positively using this system. Future studies will further analyze such effects and system application to other cases.

Table 1 Student behavior. (Numbers)

	Visiting Education		E-learning	
Positive	47	38	39	37
Negative	11	9	5	1
Ratio (Positive to Negative)	4.27	4.22	7.8	37

Table 2 Classification of positive behavior. (Numbers)

	Visiting Education		E-learning	
Talking	29	28	32	33
Writing	10	6	7	0
Pointing	8	1	0	0
Gesture	2	4	1	8
Other	3	1	0	0

4. Conclusion

This study evaluated the educational effect of this e-learning system, based on mobile videophone, for a student with severe physical impairment. It compared effects with those of conventional visiting education. The student's behavior in two class sessions in e-learning and in two sessions in conventional visiting education showed a higher ratio of positive to negative behavior with e-learning than with conventional visiting education. This result demonstrated the educational efficiency of the system.

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