An Evaluation of Presentation Methods in Multimedia Applications Designed to Help Teachers of Special Education Choose Appropriate Software Programs

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Abstract: The purpose of the present study was to discover a more effective presentation method for making multimedia applications designed to help special education teachers choose appropriate software programs. Two easy-to-evaluate software programs and two different presentation methods such as 1) text + still image, and 2) text + movie + captions were used. Subjects were 22 teachers of special education who had either developed software programs themselves, or had used software programs in their teaching. Each subject scored the two software programs under two conditions. The amount of time required to view the presentations, install the software program, and to complete evaluation form of it, as well as the evaluation scores and comments made on the programs were analysed. It was found that in terms of time taken, Condition 1 was less than Condition 2 ($t=3.21$, $p<.01$), in net scoring time ($t=2.58$, $p<.05$), and there was no significant difference between the scores of two conditions. In terms of time efficiency, findings indicate that text + still image was more efficient than text + movie + caption. However, these findings are limited to restricted conditions of easy-to-evaluate software programs and the subjects were all computer literate. Despite this, most software programs now used in special education are simple to use and the overall level of computer literacy amongst teachers has been increasing. It is hoped that the results of the present study will help enhance the use of computers in special education.

Key Words: Multimedia, presentation methods, evaluation study, DHTML, SAMI, special education

Choosing suitable software programs is a time-consuming task for teachers of special education and is forced to use trial and error to find a program suitable for the needs of the children they teach.

In 1997 Munetaka and Takuma developed and evaluated an HTML (Hypertext Mark-up Language) module introducing 74 educational software programs with movies and text to teachers, but they had not examined the effects of method of presentation. In recent years, media technology has made rapid advances with the emerging technologies. At the present time, Synchronised Accessible Media Interchange Format (SAMI) is available which enables users to use text/audio data synchronised with video, and Dynamic HTML, or DHTML, an extension version of HTML enabling either the executing of user programs on web pages, or the addition of multimedia functions to the page. Using SAMI, a format developed by Microsoft Corporation in 1998, various independently developed media such as movies, still images, sound, and text data can be presented in synchrony. At present, although SAMI runs only Microsoft’s Media Player 5.0 or later versions, it can be used on a Web page implemented by DHTML so the user can integrate various media, including text, movies, audio narrations, and open captions. Microsoft Corporation suggests that this technology can be effective for the disabled, for example, the adding of explanatory narration to ordinary video programs for people who are blind and representing open captions on the screen of ordinary video programs. In Japan, Takemura (1999) developed a multimedia software program with on-screen captions using SAMI technology for the learning of mathematics at a school for the deaf.

It is suggested that adding text data to visual information is effective, not only for the learning of children with hearing loss, but also it can be useful in a variety of ways for non-disabled children. For example, non-disabled children can use this technology to

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1 Part of this research paper was presented to the 6th Joint Conference on Educational Technology. The paper was delivered under the title of ‘A Comparison of Two Multimedia Applications Aimed at Helping Teachers of Special education in Selecting Software Programs.’
2 The name of the department was changed to ‘Educational and Information Technology’ in April 1, 2001. This paper was originally published in Japanese in February of 2001.
3 There e is another similar specification to SAMI called SMIL (Synchronised Multimedia Integration Language), composed by W3C (World Wide Web Consortium). This has been operated in RealPlayer of RealNetworks Inc. as the software program for delivering and playing movie files on the Internet.
4 DHTML is used for either executing user programs on a web page or adding some multimedia functions to the page. It was proposed jointly by Microsoft Corporation and the World Wide Web Consortium and utilized on Internet Explore.
augment or render more precise information access in settings such as noisy environments, or if the information is difficult to access in the auditory mode.

While on the one hand, these new technologies are expected to be used in application programs for teacher education, on the other, they require a large number of data files as well as human resources to develop. For the development and effective dissemination of multimedia applications aimed at helping teachers of special education with selecting suitable software programs, there is an urgent need to identify the practicality of multimedia applications using these new technologies.

**Purpose**

The purpose of the present study was to discover a more effective presentation method aimed at helping teachers of special education choose appropriate software programs. Specifically, the purpose was to develop two introductory programs based on different presentation methods, viz. text + movie + narrations + open captions and text + still images, and to experimentally test the effectiveness of these programs with teachers of special education.

**Method**

**Subjects**

The subjects were teachers of special education who had either developed software programs themselves, or had used software programs in their teaching. The subjects were mainly selected for a list of teachers who had completed Educational Technology in-service training courses at the National Institute of Special Education and had Windows 95 or 98 with Internet access installed in their computers at school or home. 34 teachers were invited to participate in the study, but only 22 responded (male = 20, female = 2). One subject was aged 20 to 29, 14 were aged 30 to 39, and seven were aged 40 to 49. 12 worked in schools for the intellectually disabled, six in schools for the physically disabled, two in schools for the health impaired, three worked for education of children with emotional disturbance, one in a school for the visually disabled, one in a special class in an ordinary school, a school counselor, and one teacher teaching disabled children in general. 14 subjects had training in the teaching of the intellectually disabled, four in the field of physical disability, three in health impairment, two in emotional disturbance, two in visual disability, and one in multiple disabilities. In terms of computer literacy of subjects, nearly 60% (n = 13) responded that, `I can make software programs by myself, ` and rest of all (n = 9) responded, `I have no problems in using commercially available software, ` and a nil response for, `I need someone who could help me with using computers.`

**Materials**

All subjects were mailed, 1) a letter inviting them to participate in the study, 2) an outline of how the study would be conducted, 3) a sample completed evaluation form, 4) two evaluation forms (one for each program), and 5) a CD-ROM containing introductory programs made using DHTML and HTML, movies, text data, and two software programs.

a) The software programs to be evaluated were Software Program 1, *What colour is this part?* and Software Program 2, *The same colour*. Both programs were newly written with the expectation that they could be evaluated in a short period of time. They were interactive and contained voice data about colors and were focussed on use in special education.

b) The introductory programs were based on different presentation methods. Two types of multimedia applications introducing software programs were developed. The first contained text, movie clip(s) with narration and caption for the narration (movie) by means of DHTML (Dynamic HTML) and SAMI, The second program written in HTML contained text and still imagery (still image), and are described below.

i) **Still image** program written in HTML: An introductory program contained text or explanation, and the still image was developed using HTML. (see Figure 1) **Still image** shows a computer screen that runs one of the learning programs, text data provides information about goals, characteristics, how to use, equipment required and the authors names. Text data prepared for software data programs 1 and 2 (see Tables 1 and 2), and **Still image** shows a start screen. And were written in HTML so that they could be used by any browser software on the Internet.

ii) **Movie** program written in DHTML and SAMI: An introductory program using DHTML and SAMI and containing text or explanation, movies, narration, and open captions was the developed. (see Figure 2) Although the movie screen was similar to the still program, the introduction to the movie started by clicking mouse on the picture. There were two movie files each of 72 seconds duration for Software Program 1 and 69 seconds for Software Program 2.
Program 2. In addition, the introduction program for Software program 1 contained a 19-second movie segment about the actual use of the program. The introductory programs were written in DHTML so the Internet Explorer 4.0 or later versions were required.

Movie and narrations were prepared using RTE-2800, a real time MPEG encoder unit produced by SONY. The narrations were typed to text format and changed to SAMI format using OTEGARU SAMI, a SAMI file generator program. (Takemura, 1998) This allowed users to choose text colour and display timing. In the present study, different colours were used for different speakers so that it was easier to distinguish who is talking then. DHTML-page designer of Visual Basic 6.0 was used to create DHML files.

c) The evaluation instrument consisted of four sections (see Table 3), namely, 1) time taken to score (related items I-1, I-2, I-3), 2) Face sheet (related items II-1 to II-7), 3) evaluation items (related items III-1 & III-11), and 4) comments.

A previous study by Takuma, Narita, Nakamura and Munetaka (1995) establishing levels of computer literacy of subjects was used as the basis for the form. The level, ‘I have never used computers,’ however, was deleted from the inventory. The number of criteria for scoring software programs (e.g. III-1 to III-6, and III-10 was based on the research literature (see Gakujo -ken, 1992). The objective statements by subjects (viz. items III-7 to III-9, and III-11 were used because it was believed that these items reflected the actual decision making processes used by teachers in selecting software programs. The objective of the comments section was to not only obtaining evaluation data, but to develop or revise the programs in the future.

Procedure

Each subject was asked to separately evaluate two software programs after examining the introductory program of either the still image version, or the movie version. Each subject was asked to complete the evaluation form after finishing using the learning software. Subjects were randomly divided into two Table 1. Text data prepared for software program 1: ”What color is this part?”

| Purpose: | To learn the names of colors using favourite pictures or photos. |
| Description: | Display a favorite picture, or photo on the screen, verbalize the name of the color as you locate it with the mouse. Three pictures are prepared in default setting and by clicking outside the picture area and the picture are alternated. By clicking on the file menu you can select any picture on the computer. |
| How to use: | Simply move the cursor on the screen. The computer will verbalize any color you choose. If you click outside the picture area, the picture/photo will change, and if you click on the file menu, you can choose any picture on the computer (a teacher can help you do this, if required). |
| Results(trial): | A child used the mouse and listened to the computerized vocalizations and enjoyed it very much. Using a digital camera, photos were taken of the child’s favourite fruit and people with whom she was familiar. |
| Equipments: | Microsoft Windows, PC with sound card, speakers. Visual Basic ver. 6.0 (for programming language). |
| Developer: | MUNEKATA Tetsuya & OOMAKI Mariko |
| Contact Address: | NISE, 5-1-1, Nobi, Yokosuka. Phone :+81(468)48-4121 |
Table 2. Text data prepared for software program 2: “Same Color”

| Purpose: | To learn names of colors and develop eye-hand coordination through the activity that filling tree squares on the screen in the same color. |
| Description: | Designed to motivate the learners. For example, the color of a square on the screen changing randomly and teacher’s voice read aloud the name of the color repeatedly. Background color of the screen set in black so that the squares are highlighted. |
| How to use: | Simply touch or click on your mouse at one of the three squares on the screen. Do it until all the three boxes became the same color. If you touch the start button located upper left side of the screen, you can start the program again (A teacher can help doing this part, if needed.). |
| Results(trial): | A child touched the panel and listen to the voices and enjoyed seeing changing colors on the screen. He liked the voice “Good job! Very good!” as a knowledge of results very much and said “I did it! I did it!” with satisfaction, further more, he said “Yes!” replying to computer’s voice “Let’s do it again!”. |
| Equipments: | Microsoft Windows, PC with sound card, touch panel, and speakers. Visual Basic ver. 6.0 (for programming language). |
| Developer: | original MS-DOS program made by UOZUMI Takashi and revised windows version made by MUNEKATA Tetsuya |
| Contact Address: | NISE, 5-1-1, Nobi, Yokosuka. Phone:+81(468) 48-4121 |
groups, Group A and Group B, to experimentally evaluate the two learning software programs using two different presentation methods.

On the one hand, each subject in Group A was required to evaluate Software Program 2 by using the movie format and Software Program 1 in still image. On the other hand, each member of Group B was required to evaluate Software Program 1 by using the movie format and Software Program 2 in still image.

Although it was felt desirable to conduct each evaluation task in the same setting (e.g. an equipment room, etc.), because it was impractical to gather all 22 subjects together in the same location, all required materials were forwarded to subjects by mail to complete in their own time. Statistical tests used in this study were based on Iwahara (1965) and the computer program EXCEL by Microsoft.

Results

Subjects were randomly assigned to two groups, Group A and Group B. There was no significant difference between groups on level of computer literacy \( n_1 = 11, n_2 = 11, T_1 = 132, U_1 = 55 \), and on age level \( n_1 = 11, n_2 = 11, T_1 = 117.5, U_1 = 69.5 \). The sex ratio of the groups was the same.

Scoring time

There were two parts to analysis of scoring time, 1) net scoring time, and 2) overall scoring time. Net scoring time was defined as the time required to evaluate the software program under the run setting. Before the evaluation, each subject viewed either text + movie + captions, or text + still image applications. The overall scoring time was viewing time plus net scoring time.

Net scoring time \( (M = 649, SD = 547) \) for text + still image, and for text + movie + captions \( (M = 794, SD = 668) \). Net scoring time of text + still image was less than net scoring time of text + movie + captions \( t = 2.58, .1 < p < .05 \). The actual difference ranged from –300 seconds to +900 seconds \( (M = 145, SD = 263) \). Overall the scoring time of text + still image was less than text + movie + captions \( t = 3.21, p < .01 \).

Scores

Each subject was asked to complete a Likert scale for each of the first 10 items followed by scoring the software program from 0 to 100 points. Software Programs 1 and 2 were analyzed separately between two conditions, text + movie + captions, and text + still image. There was no significant difference between two items in Software Program 2; viz. ` Needed operation for the learner was appropriate? ` \( (n_1 = 11, n_2 = 11, T_1 = 153, U_1 = 34, p < 0.1) \), and ` Please make rating the software program 0 to 100. ` \( (n_1 = 11, n_2 = 11, T_1 = 153.5, U_1 = 33.5, p < 0.1) \). There were also no significant differences between the two conditions on the total of 22 items of the scale. Differences between the scored data under the two presentation methods are listed in Table 4.

Comments

` It was easy to understand,` ` It was nice to see a learning example,` ` The example may help me with knowing how to use the software program in the classroom,` ` It might be a good hint for the user,` and ` It was good because it was colourful and simple to use by clicking the mouse,` for the movie version.

` It was simple to read,` ` too simple compared with another one (movie version),` ` It will be better if you can put movies of the actual scene or use targeted children,` ` It will be better if you can put an explanation of the programs directly on to the image,` ` You need to put arrows if you want to explain something,` ` There are not very many people to read the text carefully, and impact and fun should be added` for the still image version.

There are comments common to the two programs as follows. ` There are some difficulties in understanding terms if the user is a novice, either in the use of computers or in special education,` ` Hints for instructions are needed,` ` It would be better if you put in many more example lessons,` ` You should describe the needs of the targeted children more clearly,` ` Descriptions of needed equipment require additional information,` ` Please inform available graphic formats for the program,` ` You should add game-like features to the introductory program itself,` ` Titles should be more visible,` and ` Please add information about the location of servers for graphic data. ` Even though subjects were asked to comment on only the introductory programs, eight subjects commented on the learning programs.

In summary, there were more positive comments about the movie version compared with the still image version. However there is no indication that this result is reflected in the scores of the programs.

Discussion

This study examined the differences between two presentation methods, movie and still image, implemented by multimedia applications aimed at helping teachers of special education choose appropriate software programs. In terms of time efficiency and needed scoring time, the maxim is `the
Table 3. Evaluation Form

<table>
<thead>
<tr>
<th>Name of Software Program: “Same Color Ver. 1.0A”</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 Starting time for introduction part { } : { } : Completing time { } : { }</td>
</tr>
<tr>
<td>-2 Starting time for installation { } : { } ; Completing time { } : { }</td>
</tr>
<tr>
<td>-3 Starting time for learning part { } : { } ; Completing time { } : { }</td>
</tr>
</tbody>
</table>

| -1 Male { } | Female { } |
| -2 Age level 20-29 { } : 30-39 { } : 40-49 { } : 50-59 { } : 60-69 { } |
| -3 Disability field of your school { } |
| -4 Disability field of your profession { } |

| -5 { } | I can make software programs by myself. |
| -6 { } | I have no problems in using commercially available software. |
| -7 { } | I need someone to help me with using computers. |

- 1. Do you understand the purpose/goal of the software?
Yes, very well | No, nearly not at all

- 2. Do you understand the special features of the software?
No, nearly not at all | Yes, very well

- 3. Do you understand how to use the software?
No, nearly not at all | Yes, very well

- 4. Are the operations need to use this software appropriate for your learners?
Yes, indeed | No, not at all

- 5 Is it easy to understand the graphic representation/audio representation?
Yes, indeed | No, not at all

- 6. Is the feedback given to the learners effective?
Strongly agree | Strongly disagree

- 7. Do you think the software is effective for learning?
Yes, indeed | No, not at all

- 8. Do you wish to use the software programs in your classroom?
No, not at all | Yes, indeed

- 9. Would you recommend this software to your colleagues?
Yes, very much | No, never.

- 10. Is it easy for you to install the software?
It was very difficult | It was very easy

- 11 Please score the effectiveness of this program on a scale of 100 points. It’s |

Finally, please write your comments on the introduction program.

Positive points of the introduction program:

Needed improvements:

Thank you very much for your cooperation.
shorter the better, if only there was no significant difference in scores between the conditions. As seen in the comments, the movie was the preferred option of some subjects. However, these positive reactions towards multimedia applications did not influence the scoring of the software programs itself.

As the movie contained a 91 second segment in Software Program 1 and a 69 second segment in Software Program 2, the duration of viewing time for this type was, as would be expected, longer than that of the still image. The still image had a slight advantage (viz. 69 sec. and 91 sec.). Raw data indicated that the time difference between movie and still image was 142 seconds in mean value. This is still longer than 91 seconds. However, from the statistical point of view, for overall scoring time, there was no significant difference between them using data as follows. Movie: overall scoring time plus amount of time of movie clips of its counter presentation. Even so, the net scoring time of the still image was significantly less than that of the movie. There could be some possible answer for it, such as effects of some kinds of emotion related issues, redundant activities or cognitive process, and recalling or comparing process of the movie viewed just before. Further research studies are needed for this part.

For overall, because of the fact that still image was more effective in time efficiency and there were no significant differences in scores between the conditions, it can be assumed that the still image was more efficient than the movie.

Table 4. Differences between the scored data under the two presentation methods

<table>
<thead>
<tr>
<th>Items</th>
<th>Software program 1: “What color is this part?”</th>
<th>Software program 2: “Same Color”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“still image” [Mdn (quartile)]</td>
<td>“movie” [Mdn (quartile)]</td>
</tr>
<tr>
<td>□-1 Do you understand the purpose/goal of the software?</td>
<td>6[6, 7]</td>
<td>6[6, 7]</td>
</tr>
<tr>
<td>□-2 Do you understand special features of the software?</td>
<td>6[6, 6.75]</td>
<td>6[6, 7]</td>
</tr>
<tr>
<td>□-3 Do you understand how to use the software?</td>
<td>6[5, 6]</td>
<td>6[5, 7]</td>
</tr>
<tr>
<td>□-4 Are the operations need to use this software appropriate for your learners?</td>
<td>6[5.75, 6]</td>
<td>5[3.5, 6]</td>
</tr>
<tr>
<td>□-5 Is it easy to understand the graphic representation/ audio representation?</td>
<td>5[4, 6]</td>
<td>3[2.5, 6]</td>
</tr>
<tr>
<td>□-6 Is the feedback given to the learners effective?</td>
<td>5[3.25, 5.5]</td>
<td>4[3, 5.5]</td>
</tr>
<tr>
<td>□-7 Do you think the software is effective for the learning?</td>
<td>6[4.5, 6.5]</td>
<td>5[3.5, 6]</td>
</tr>
<tr>
<td>□-8 Do you wish to use the software programs in your classroom?</td>
<td>6[5.5, 7]</td>
<td>5[3, 6.5]</td>
</tr>
<tr>
<td>□-9 Would you recommend this software to your colleagues?</td>
<td>5[4.5, 7]</td>
<td>5[3, 6.5]</td>
</tr>
<tr>
<td>□-10 Is it easy for you to install the software?</td>
<td>6[5, 6]</td>
<td>5[4, 6.5]</td>
</tr>
<tr>
<td>□-11 Please score the effectiveness of this program on a scale of 100 points.</td>
<td>80[73, 85]</td>
<td>60[55, 80]</td>
</tr>
</tbody>
</table>
Conclusion

The presentation method using text + still image is better than text + movie + narration only if we take account of the limited conditions such as easy-to-evaluate software assessed by computer literate teachers, and so on. In special education, on the other hand, most software programs are simple and the computer literacy of teachers is on the rise. The results of the present study, therefore, should have an impact on increasing the use of computers in this field. According to Monbusho(2000), 59.9% of all special schools were connected to the Internet, but it has been planed by government that before 2005 this proportion will have risen to 100%. While expectations are high at present, the use of movies on the Internet still has limitations. Based on the findings of the present study, it is still reasonable to use still images in preference to movies over the Internet. It is hoped that these results can be used as practical criteria for the development of programs similar to those presented here.

Future Research Issues

Arising from the results of this study there are several issues that require further investigation. First, why the net scoring time of the still image was significantly shorter than the movie, and second, is it still appropriate to use still image for evaluating more complex software programs? Third, is movie format still ineffective for novices (in computer use) teachers?

Acknowledgement

The participation of all teachers in this study is gratefully acknowledged.

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