Vol. 19 No.2, April 2009 ISSN 0853 - 0920

WIDYA DHARMA
Jurnal Kependidikan

Diterbitkan oleh Lembaga Penelitian Universitas Sanata Dharma
Jln. Affandi, Mrican, Tromol Pos 29, Yogyakarta 55002
E-mail : Widya_dharma@staff.usd.ac.id

WIDYA DHARMA
JURNAL KEPENDIDIKAN

Widya Dharma adalah jurnal kependidikan yang diterbitkan oleh Lembaga Penelitian dan Pengabdian kepada Masyarakat Universitas Sanata Dharma, dua kali setahun: Oktober dan April. Jurnal ini memuat laporan penelitian dan pemikiran tentang kependidikan. Visi Jurnal ini adalah menjadikan kependidikan di Indonesia unggul lewat penelitian dan pemikiran yang mendalam. Misinya menyebarkan laporan penelitian dan pemikiran tentang kependidikan yang inovatif dan mendalam

Redaksi menerima naskah, baik yang berbahasa Indonesia, maupun yang berbahasa Inggris. Naskah harus ditulis sesuai dengan format yang berlaku di Jurnal Kependidikan Widya Dharma, dan yang dimuat tidak selalu mencerminkan pandangan Redaksi.

ALAMAT REDAKSI

FKIP, Universitas Sanata Dharma
Jln. Affandi, Tromol Pos 29, Mrican Yogyakarta 55002
Telepon: (0274) 513301, 515352, *Fax*. (0274) 562383
E-mail: widyadharma.fkip@gmail.com

WIDYA DHARMA
JURNAL KEPENDIDIKAN

Daftar Isi

DEVELOPING EFFECTIVE EDUCATIONAL MULTIMEDIA SOFTWARE FOR STUDENTS OF ELEMENTARY SCHOOL

Y. G. Harto Pramono
Dosen Pendidikan Bahasa Inggris,
Universitas Widya Mandala, Surabaya
Email : hartopram@hotmail.com

ABSTRACT

This paper describes an ongoing project to develop educational multimedia software for students of Elementary School. The aim of the development is to produce attractive and pedagogically effective multimedia software that can enhance Year 1 students' motivation in learning English and improve their English learning outcome. To produce such software, three different levels of multimedia concept (i.e., the technical level, semiotic level, and sensoric level) had been addressed. To gain an optimal product, a series of evaluations was conducted phase by phase. After each phase of the evaluations was done, the product was revised by addressing the results of the evaluation. In addition, a quasi-experimental study was conducted to see whether the software can promote the students' motivation in learning English and whether the software is effective to improve the students' learning outcome. The result of the study indicated that the motivation of the experimental group comprising 80 students increased significantly and based on the t-test their learning outcome also improved significantly compared to the control group. These results show that the developed multimedia software is pedagogically quite effective to support Year 1 students of elementary school learning English.

Keywords *: multimedia learning, English learning software, multimedia software*

INTRODUCTION

Students' achievement in learning English is apparently influenced by many factors, among others are the quality of the available English learning resources (including textbooks and English learning software), instructional methods and media used by teachers, and the students' learning motivation. In relation to the above-mentioned statement, as far as the writer is concerned, in the elementary school setting the number of existing English learning software is still limited and the quality also needs improving. Real effort should be done soon in order to improve this condition. Thus, a study was conducted as the writer's response toward this matter. Through the current study, one multimedia English learning software entitled "*Fun English Learning*" has been developed and this software is expected to be one of English learning resources which is interesting, pedagogically effective, user-friendly and which can motivate students of elementary school to learn English and improve their English competence.

Educational multimedia software in principle can play roles as: (a) an integral part of instruction for it is quite adaptive to the classroom teaching activities where teachers can share their tasks with the media in a flexible manner, and (b) as a complete learning system that can stand alone because the media can independently be a learning resource that directly interacts with the users (learners). In addition, if well designed, educational multimedia software can give benefits to learners, among others are: (a) it provides fun in English learning that can motivate students to learn – as an edutainment tool; (b) it supports interactive learning; (c) as it has capability to present texts, sound, colors, static images, realistic images, and animation, this learning resource is very interesting and effective as learning media that can present simulation of reality, provide pronunciation model that can be a good partner for less-qualified teachers; (d) it can make learning easy and improve learning qualities; (e) it can be used to present effective immediate feedback to students; (f) it supports learner-centered and independent learning; (g) it enables students to better familiarize with computers and get used to using them that become increasingly more important in the information society; and (h) another important benefit is the existence of this type of learning resource strongly supports the implementation of competence-based curriculum (*see* Depdiknas, 2003).

However, based on the writer's observation, not all educational multimedia software products in the market are able to give the above-mentioned promising benefits. Many multimedia software products in the market do not cover the local curriculum, as an integral part of the school curriculum. In addition, there are many multimedia software products that are merely business rather than

educational-oriented. More importantly, there are also many multimedia software products that are designed by addressing the technical aspect only, while sensoric and semiotic aspects, deliberately or not, are not given equal attention. As a matter of fact, the two aspects are equally important. There can big false investments of time and money be made in multimedia software, if only one level is taken into account instead of all the three levels, and these aspects require expertise of cognitive science, psychology, educational science, and semiotics (Schnotz, 2001).

In order that the above-mentioned benefits can be provided by the developed multimedia software, "*Fun English Learning*", the software was designed carefully through the development procedures that were based on software learning principles, learning psychology, characteristics of the course, curriculum, and educational background of the schools in Indonesia. This paper thus intends to describe the design features of the developed multimedia software. As educational multimedia software cannot be considered educational multimedia software until it has been validated to prove its validity empirically and its effectiveness as a learning resource (Burke, 1982), in this current study the developed multimedia software was validated through a series of evaluation and quasi-experimental study. Thus, the paper also reports on the results of a series of evaluation/try-out aimed to improve the quality of the developed multimedia software and the result of experimental research to see its effectiveness in enhancing the students' learning motivation and improving their learning achievement.

The multimedia English learning software developed in this study is hoped to give multiplying effects, among others are: (a) it will be one of many interesting choices among the available learning resources and (b) it can motivate students to learn and improve their learning achievement.

When is Multimedia Software Pedagogically Effective?

Adapting Schnotz's idea regarding levels of multimedia (Schnotz, 2001), multimedia concerns the combination of multiple technical devices (i.e. computers, electronic memories, information transfer networks, and display devices) in order to present information with multiple presentation formats (like texts, realistic pictures or graphs) through multiple sensoric modalities. Accordingly, the concept of multimedia software refers to three different levels: (a) first, a technical level that refers to the technical devices; these technical devices can be considered as the carriers of signs; (b) second, a semiotic level that refers to the forms or representation (i.e. texts, pictures, and graphs); these forms of representation can be considered as the types of signs; and (c) third, a sensoric level that refers to the sensoric modality of sign reception.

As Schnotz (2001) has pointed out there is a frequent misconception about multimedia software which is based on the ignorance of these different levels. People who believe that multimedia software is primarily information technology are not aware that they only address one level. However, the other two levels are equally important, and these levels require expertise of cognitive science, psychology, educational science, and semiotics.

Another frequent misconception about multimedia software that is also caused by the ignorance of the different levels of multimedia software is that the technical medium would have an impact on learning, no matter how the software is designed. In fact, like good books, which can be printed on good or on bad paper, multimedia software can convey good as well as bad instruction (Schnotz, 2001). What counts to make multimedia software effective is the interplay between the learner's cognitive system, the learning environment, and the design of multimedia software.

A further misconception is that rich multimedia environments will automatically result in large amounts of cognitive processing and thus create elaborated knowledge structures (Schnotz, 2001). According to Schnotz, the underlying idea is very simple: Provide a lot help, as this will help a lot. Consequently, the new media possibilities are sometimes employed as far as possible, including multiple forms of representation, different sensoric modalities, animation, videoclips, possibilities for interaction, and so forth. This can make learning even ineffective, because less can be more.

Considering the merits of the three levels of multimedia software (technical, semiotic, and sensoric levels), therefore, in designing and developing the intended multimedia software the writer addressed those principles. Accordingly, aspects related to those principles should be addressed during the process of developing multimedia software, i.e.: (a) multiple forms of representation, (b) animation, (c) multiple sensoric modalities, (d) non-linearity, and (e) interactivity. Each is elaborated below:

Multiple Forms of Representation

Multiple forms of representations means the combination of texts, realistic pictures, diagrams, or graphs. As Ainsworth (1999) has pointed out, multiple representation can support comprehension, because these representations constrain each other. Mayer (2001) points out that a well established research result concerning the use of multiple forms of representation is that text information is remembered better when it is illustrated by pictures. In using multiple forms of representation, these representations should be coherent and that the corresponding

information should be presented according to the principles of spatial and temporal contiguity. If pictures and text cannot be shown simultaneously, then it is better to present the picture before the corresponding text than vice versa (Kulhavy, R.W., Stock, W.A., & Caterino, L.C., 1994).

In general, multiple forms of representations make sense only if the requirements of integrative processing are not too high for the learner, and if the cognitive costs of coherence formation from multiple presentations do not exceed the benefits of such processing (Schnotz, 2001).

Animation

Animation is an important feature of multimedia software. Animations can serve some different purposes. They can be used to direct the learners' attention to important aspects of the content, (but also to unimportant animated decoration) (Schnotz, 2001). Animation can also serve motivational and attention gaining functions, but no extra learning effects can be attributed to the use of animation (Hannafin & Rieber, 1989). Animation can also be used to demonstrate procedures (Sponder & Hilgenfeld, 1994). Finally, animation can have a supplantation function, when a learner is enabled to perform a cognitive process with the help of animation, which he/she would not yet be able to perform without this support (Schnotz, Böckheler, & Grzondziel, 1999).

Although animations are not intrinsically superior to static pictures (see Lowe, 1999; Pramono, 2008), when they are congruent to the learning task, they can offer instructional benefits to the learners (Rieber, 1990). Animations should not be used, however, when learners possess sufficient prior knowledge and cognitive skills to perform mental simulation processes independently. Otherwise, these learners would unintentionally be hindered in their learning, because they are prevented from performing cognitive processes by a support, which they do not really need (Schnotz, 2001).

Multiple Sensoric Modalities

It has been known that humans know through their senses, obtaining and processing new information through their sensory perceptions (James & Galbraith, 1985). Learners have unique sensoric preferences for learning, which afford learners their most effective and efficient modalities for learning (Wislock, 1993). Helping learners learn by providing a multiple sensory approach that supports their sensoric preferences allows them to process more information and facilitates the development of their mental models engaging all of the learners' senses. Research has shown that learners may be able to process more information in working memory when it is presented in a well-designed multiple sensoric

modality (Sweller, 1999). However, providing multiple sensoric modalities may cause split attention and can also increase the cognitive load on the learner. Different sensoric modalities for the same text information may cause split-attention and interference between reading and listening comprehension (Mayer, 2001). So, it is recommended that multimedia software be designed in a way that can avoid split attention effect. According to Mayer, it can be done by distributing information across different modalities, not delivering the same text information through different sensoric modalities, and related verbal and pictorial information should be presented simultaneously according to Mayer's principle of temporal contiguity.

In addition, the use of sound and music might be useful in multimedia software for at least two purposes (Schnotz, 2001): (a) to present a specific setting, introduce a topic and activate prior knowledge and (b) for segmenting an instructional sequence, not during semantic processing of the learning material. It is not a good idea to present background music or sound during semantic processing of the learning material because this draws on capacity of working memory and reduces the cognitive resources for learning. However, based on a study conducted by Sedighian and Sedighian (cited in Shamir, Hercules, & Crowther, 2008), addition of background music was favored by more than 85% of sixth-graders solving tangram puzzles, and that the addition of the music did not interfere with their learning.

Non-linearity and Interactivity

Multimedia environments are usually organized as hypermedia and, therefore, provide a flexible access to a non-linear information space. Hypertexts suggest multiple perspectives which enhance elaborative processing and finally result in higher cognitive flexibility (Spiro, Feltovich, Jacobson & Coulson, 1991). Research into this indicated that learning with hypertexts resulted in better performance than traditional linear texts, but there are also many studies, which found that linear texts resulted in better performance than hypertexts.

Different from the traditional media, multimedia software allows interactivity. Interactivity is the major difference between traditional instruction and instruction delivered by multimedia software. In multimedia software interactivity can be actualized through not only intentional selection of information, but also manipulate and investigate a subject matter through active, self-directed exploratory learning (Schnotz, 2001). This can promote cognitive engagement and positively affect learning.

Research into the effect of interactivity on learning found relatively different findings: positive effects, negative effects, and no effects. Generally the

possibilities of interaction are frequently not used very much by the learners. In fact handling the technical medium requires cognitive resources, and the self-regulation of learning may overtax the individual meta-cognitive processes.

Active learning does not necessarily require lots of interaction with the learning system, and that behavioral activity does not always correspond to cognitive activity (Schnotz, 2001). A learner who interacts again and again with a decorative animated detail may be very active behaviorally, but probably not cognitively.

Handling the interactivity medium also requires some cognitive capacity; therefore, the degree of so-called non-linearity should be carefully adapted to the learning level and the meta-cognitive skills of the learner.

Cognitive Prerequisites

Finally, multimedia software can only be successful, if the learners possess the necessary learning prerequisites in terms of prior knowledge and cognitive skills in order to engage in active integrative processing, and if he/she is ready also to apply these skills.

Learners need strategies which can be referred to as multimedia competence. These strategies include the task-oriented selection of information, the sequencing of information, selection of adequate forms of representation, sensoric modalities and the integrative processing of this information.

METHOD

As mentioned previously, *"Fun English Learning"* software has been developed using Macromedia Flash MX. It is an interactive multimedia software to help Year 1 students of elementary school learn English in more fun and meaningful experiences. This software is intended to motivate students to learn English and enhance their learning achievement through self-learning by which they can practice their English with minimum help from their teachers.

The materials of this software cover the following themes: alphabet, number, color, time, family, and transportation. The activities are carefully designed to help children develop the four main skills for language acquisition – listening, reading, speaking and writing in an integrated way. The software has special features as follows:

- New theme-related words through listening and pronunciation practice
- Grammar concepts related to the theme of each lesson
- Practices on listening, speaking, reading and writing skills

- Creative activities with fun-filled interactive games, animated pictures and songs related to the themes

"Fun English Learning" software has been designed by addressing the three levels of multimedia concept (i.e., technical, semiotic and sensoric levels) and thus the product has its design features related to these three levels. Each level is described below.

With regard to the technical level, the developed multimedia software provides:

- Interactivity which allows the learner to select information, manipulate and investigate a subject theme through active, self-directed exploratory learning;
- A set of multiple ways to process information in a linear sequence, which allows the learner to make a choice. As this choice also requires some cognitive capacity, the degree of so-called non-linearity was carefully adapted to the learning level and the meta-cognitive skills of the learner.

In terms of semiotic level, the developed software provides *multiple forms of representation* as follows:

- Text information is illustrated by pictures in order that the text information is understood and remembered better.
- These representations are made coherent and the corresponding information are presented according to the principles of spatial and temporal contiguity. In other words, related verbal and pictorial information are presented simultaneously (Mayer's principle of temporal contiguity).
- If pictures and text cannot be shown simultaneously, then it is better to present the picture before the corresponding text than vice versa.
- Animations is also used in this developed software to direct the learners' attention to important aspects of the content, (but also to unimportant animated decoration).

Considering the principles of sensoric level, the developed software provides:

- Background music but not during semantic processing of the learning materials because this draws on capacity of working memory and reduces the cognitive resources for learning.
- Different modalities (the visual and auditive modalities) in order to provide the learners with the pronunciation model of the target words.

Multimedia software cannot be considered multimedia software until it has been validated. To validate multimedia software means to prove its validity empirically by conducting field-evaluation (Burke, 1982). In this study, to validate the developed multimedia software, a series of evaluation and quasi-experimental study were conducted.

Multimedia software was developed for Year I students of elementary school. After the software had been developed, it was validated through a series of evaluation (try-out). Also, quasi-experimental research was conducted to see the effectiveness of the software in motivating students to learn English and in improving students' learning achievement.

A series of evaluation (try-out) was conducted by involving subjects as follows: Firstly, experts evaluation which involved 4 expert of different areas (English, Education Psychology, Educational Technology, and Software Design) and the development tem (4 people) Through experts evaluation, concept clarification and product specification were established. In the next phases, try-out was conducted by involving the following subjects:

a) Individual evaluation involves: 3 English teachers and 4 Year 1 students of elementary school.

b) Group evaluation involves: 3 English teachers and 9 Year 1 students of elementary school.

c) Field try-out involves: 8 English teachers and 82 Year 1 students of elementary school.

Table 1 presents variables/aspects that are validated and the indicators, (adapted from www.aimia.com) on which the acceptability and suitability of each variable are based. The variables included in the validation also represent the characteristics of the developed multimedia software.

Table 1 Variables and Indicators

No.	Variables	Indicators
1	Fitness of the multimedia software for purpose	a. Does the software suit its audience (students)? b. Is it suited to the medium that's being used to deliver it? c. Does it achieve what it sets out to?

No.	Variables	Indicators
2	Suitability of learning content	a. Does the content have good structure? b. Does the content suit its audience? c. Are types of exercises appropriate? d. Is the feedback informative?
3	Audio-visual impact and aesthetics	a. Is the design clear and visually appealing? b. Does it have attention-gaining materials at the beginning of the software? c. Is it appropriate for the audience and the content it is supporting? d. Are the images/illustrations/animations relevant? e. Are text and images presented simultaneously? f. Is background music used appropriately? g. Is sound used appropriately?
4	Usability and Accessibility	a. Does the software have consistent navigation? b. Is it easy to navigate? c. Does it have consistent visual themes? d. Does it present information in clear and easily readable fashion? e. Are the instructions clear? f. Is text in appropriate fonts?

The instrument used for evaluating the product was a questionnaire developed by the writer. The questionnaire asked about the following aspects: (a) fitness of the multimedia software for purpose, (b) suitability of learning content, (c) audio-visual impact and aesthetics, and (d) usability and accessibility.

Response frequencies were determined for the closed format questions, while responses to the open format questions were analyzed according to emergent categories. The results of the analysis were used as the basis for product revision phase by phase.

The study employed quasi-experimental design which aims to see the effectiveness of the developed product in increasing students' motivation to learn English and in improving students' learning achievement. The quasi-experimental design used is matching-only pretest-posttest control design (see Fraenkel, J.R., & Wallen, 2007). The study was conducted for two months in elementary schools in Surabaya.

In this study, the following two hypotheses were formulated:

- The developed multimedia software can increase the motivation of Year 1 students of elementary school in learning English.
- The developed multimedia software can improve the achievement of Year 1 students of elementary school in learning English.

In line with the research objectives, the subject of the study was Year 1 students of elementary schools. Two equivalent elementary schools in Surabaya were selected. Two classes in each school were selected. One class was selected as the experimental group and the other class was as the control group. Each group consisted of 40 students.

The independent variable for the two hypotheses in this quasi-experimental research is the use of multimedia software for learning English by Year 1 students of elementary school. The dependent variable for the first hypothesis is students' motivation to learn English. It is rated on a five-point Likert scale (1=strongly disagree, to 5=strongly agree). The dependent variable for the second hypothesis is students' learning achievement that is indicated through posttest score.

Instruments used to measure the effectiveness of the developed multimedia software are: (a) questionnaire to measure students' motivation, and (b) posttest to measure students' learning achievement. The instruments were made by the researcher. Before the instruments were used, they were validated to see its validity and reliability.

The two selected classes in each school were assigned randomly as the experimental group and the other is as the control group. The experimental group was learning English through the developed multimedia software, whereas the control group was using printed-version counterpart of the equivalent materials. For two months the two groups were given the same materials, except the learning delivery methods that were different.

Data about the students' learning motivation were collected through the questionnaire administered to the subject before and after the implementation of the treatment. Data about the students' learning achievement were obtained through posttest.

Data of the dependent variable (learning motivation) measured through questionnaires and students' learning achievement measured through posttest were analyzed using T-test.

The developed multimedia software is considered effective and can give positive influence if:

a. The mean score of the experimental group is higher than the control group.

b. The difference between the mean score of the experimental group and that of the control group shows significance ($p<.05$).
c. The mean score of the experimental group reaches the minimum standard of achievement (70).

RESULTS AND DISCUSSION

Data that will be presented here include: (1) data of product evaluation (try-outs) and (2) data of the experimental research on the effectiveness of the product.

To validate the product, a series of evaluation had been carried out. The results of the evaluation are presented in the following sequence: (a) Evaluation Phase I: experts evaluation, (b) Evaluation Phase II: individual evaluation, (c) Evaluation Phase III: group evaluation, and (d) Evaluation Phase IV: field try-out.

Result of Evaluation Phase I (Experts Evaluation)

The developed multimedia software was at the beginning evaluated by 8 experts comprising 1 expert of English, 1 expert of educational psychology, 1 expert of instructional technology, 1 expert of software design, and the development team (4 people). Results of evaluation phase I can be examined in Table 2. Only the comments or suggestions are presented here. The comments and suggestions given by the experts were used as the basis for revising the developed software.

Tabel 2. Result of Evaluation Phase I (experts evaluation)

No.	Variables	Suggestions
1	Fitness of the CALL software for purpose	Some materials seem too difficult for the students living in villages. It is advisable to: a. have topic "Time" easier. b. have Exercises for topic "Family" easier.
2	Suitability of learning content	a. In topic "Alphabet", spelling exercise does not function well. Type of exercise needs redesigning. b. Exercise1 in topic "Time" needs to be made simpler.
3	Audio-visual impact and aesthetics	The position of certain animated pictures in topic "Number" is not in sequence.

4	Usability and Accessibility	a. Color of some fonts need to be contrasted with the background color. b. Some font types look distracting, and are difficult to read. They need to be changed with font types that are easy to read. c. Some font size need to be made bigger d. The position of icons should be consistent to avoid confusion.

Based on the suggestions given by the experts as presented in Table 2, the developed software was revised (as first revision). Thus, the revision covers things as follows:

a) The fitness of the multimedia software for purpose was criticized by the experts. Considering their comments, some materials were revised accordingly, i.e., topic "Time" was made easier and the exercises for topic "Family" was made simpler.

b) Suggestions given by the experts regarding the suitability of learning content were good. Therefore, revision was made accordingly, i.e.: type of spelling exercises was redesigned and exercise 1 in topic "Time" was made simpler.

c) In relation to audio-visual impact and aesthetics, the sequence of animated pictures in topic "Numbers" was fixed.

d) Concerning the usability and accessibility, revision was made as suggested by the experts, i.e.: the font color which did not match with the background color was changed in a way that the font color appears salient. The difficult-to-read font types that impeded the reading fluency were changed with clearer fonts. Font size that was too small was also fixed and made bigger. In addition, the position of icons were made consistent.

Results of Evaluation Phase II

After the revision was done based on the suggestions obtained through the evaluation phase 1, the product was evaluated again through the evaluation phase 2, i.e., individual evaluation that were done by 3 English teachers and 4 students. The goal was to identify and find out small errors (for instance, mistyping), unclear language and instruction for operating the software that might occur. Below is the result of the evaluation phase 2, as summarized in Table 3.

Table 3. Result of Evaluation Phase II (individual evaluation)

No.	Components	Errors found
1	Instructions for the exercises	One written instruction is not the same with the sound found in topic "Number".
2	Spelling	Misspelling in the word *giraffe.*
3	Grammar	Missing "s" in the word *cat.*
4	Icon (button)	The position of button "check" is not consistent. This may confuse the users.
5	Instructions for operating the software	One instruction in topic "Time" is too long so that it can confuse the users.
6	Quality of voice	Some pronunciation for numbers is not clear in topic "Numbers" i.e.: 16 and 17, sounds like 60 and 70.

Inputs and suggestions obtained through evaluation phase 2 as presented in Table 3 are logical and so revision was made based on those suggestions. For example, the inconsistency of icon position may confuse students; therefore, icons were repositioned.

Result of Evaluation Phase III

After the second revision had been made based on the suggestions obtained through evaluation phase 2, the developed software was then evaluated again through evaluation phase 3, i.e., group evaluation comprising 3 English teachers and 9 students. The goal was to identify shortcomings that might have occurred after the second revision was made. The result of evaluation phase 3 is presented in Table 4.

Table 4. Result of Evaluation Phase III

No.	Components	Errors Found
1	Instructions for exercises	One instruction in topic "Time" does not have a text but only sound, i.e.: *My daily activities. Click a sentence and repeat.* This instruction cannot be repeated. Therefore, it can make the users get lost when they do not catch the message that is spoken only once and cannot be repeated.
2	Spelling	The spelling for *color* is not consistent. It is sometimes written as *colour* and some other times as *color.*
3	Quality of voice	In topic "Time", when the exist button is clicked, the voice *good bye* appears double.

The result of evaluation phase 3 that consists of suggestions related to instruction for exercises, spelling, quality of voice as presented in Table 4 are acceptable. Therefore, the product was revised accordingly.

Result of Evaluation Phase IV (Field Try-Out)

After the developed software had been revised for the third time, the product was ready to be tried out to user-candidates in a larger group (field try-out). The software was tried out to 82 students and 8 English teachers. The results of the try-out can be examined in Table 5 and Table 6.

Table 5. Result of Field Try-Out (to students)

No.	Variables	Respondents	
		f	%
	Suitability of the developed software for students to learn		
	- very suitable	1	1.22
a	- suitable	76	92.68
	- not suitable	4	4.88
	- not suitable at all	1	1.22
b	Clarity of voice for students to imitate the pronunciation model		
	- very clear	11	13.41
	- clear	59	71.95
	- not clear	7	8.54
	- not clear at all	5	6.10
c	Practicality to operate the software for students		
	- very easy	9	10.98
	- easy	49	59.76
	- difficult	13	15.85
	- very difficult	11	13.41
d	Students' ability in answering the exercises in the software		
	- very good	3	3.66
	- good	61	74.39
	- bad	11	13.41
	- very bad	7	8.54
e	Students' interest in the software		
	- very interested	54	65.85
	- interested	24	29.27
	- not interested	4	4.88
	- not interested at all	0	0.00

No.	Variables	Respondents	
		f	%
f	Attractiveness of animations used in the software		
	- very attractive	15	18.29
	- attractive	67	81.71
	- not attractive	0	0.00
	- not attractive at all	0	0.00
g	Attractiveness of images used in the software		
	- very attractive	38	46.34
	- attractive	44	53.66
	- not attractive	0	0.00
	- not attractive at all	0	0.00
h	Students' interest to repeatedly learn English from the developed software		
	- very strong	16	19.51
	- strong	66	80.49
	- weak	0	0.00
	- very weak	0	0.00

Based on the result of the field try-out (Phase IV) attended by students as presented in Table 5, it appears that:

a. There were 76 students (92.68%) who felt that the developed software was suitable for them and 1 student (1.22%) who felt that it was *very* suitable for him/her. Where as 4 students (4.88%) felt that it was not suitable for them and 1 student (1.22%) felt that it was not suitable at all for him/her. Thus, for most of the students (77 students or 93.90%) the software was suitable to learn English from.
b. There were 11 students (11.41%) who felt that the voice of pronunciation model in the software was very clear for them to imitate; most other students (59 students or 71.59%) felt that the voice was clear; whereas 7 students (8.54%) felt that it was not clear and 6 students (6.10%) felt it was not clear at all. So, for most of the students (70 students) or 85.37% the voice of pronunciation model was clear to imitate.
c. For 49 students (59.76%) the software was easy to operate; for 9 students (10.98%) it was *very* easy to operate; whereas for 13 students (15.85%) it was difficult to operate and for 11 students (13.41%) it was *very* difficult to operate; thus, for most of the students the software was easy to operate (70.73%).
d. Most of the students (74.39%) felt that they were able to answer the exercises in the software and 3 students (3.66%) felt that they were

able to answer the exercises very well; for some students (13.41%) felt that they got it difficult to answer the exercises, whereas for 7 students (8.54%) the exercises were very difficult to answer. Thus, most of the students (78.05%) felt that they were able to answer the exercises in the software well.

e. Most of the students (65.85%) were very interested in the software. There were 24 students (29.27%) who were interested in the software; and the rest of the students (only 4.88%) were not interested in the software. Thus, most of the students (95.12%) were interested in the software.

f. There were 15 students (18.29%) who were very interested in the animation used in the software; other students were interested in the animation (81.71%). Thus, all the students (100%) were interested in the animation.

g. There were 38 students (46.34%) who thought that the images used in the software were very attractive; and the rest of the students (53.66%) thought that the images used in the software were attractive. Thus, all the students (100%) thought that the images were attractive.

h. All the students (100%) were interested in learning English using the software repeatedly.

Table 6. Result of Field Try-Out to English Teachers

No.	Variables	Indicators	Scores	Respondents	
				f	%
1	Fitness of the multimedia software for purpose	a. Does the software suit its audience?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		b. Is it suited to the medium that's being used to deliver it?	4	8	100
			3	0	0
			2	0	0
			1	0	0
		c. Does it achieve what it sets out to?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0

Average of Score: 97.92%

No.	Variables	Indicators	Scores	Respondents	
				f	%
2	Suitability of learning content	a. Does the content have good structure?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		b. Does the content suit its audience (students)?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		c. Are types of exercises appropriate?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		d. Is the feedback informative?	4	8	100
			3	0	0
			2	0	0
			1	0	0
			Average of score: 97.66%		
3	Audio-visual impact and aesthetics	a. Is the design clear and visually appealing?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		b. Does it have attention-gaining materials at the beginning of the software?	4	8	100
			3	0	0
			2	0	0
			1	0	0
		c. Is it appropriate for the audience and the content it is supporting?	4	6	75
			3	2	25
			2	0	0
			1	0	0
		d. Are the images/illustrations/ animations relevant?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		e. Are text and images presented simultaneously?	4	8	100
			3	0	0
			2	0	0
			1	0	0
		f. Is background music used appropriately?	4	8	100
			3	0	0
			2	0	0
			1	0	0
		g. Is sound used appropriately?	4	8	100
			3	0	0
			2	0	0
			1	0	0
			Average of Score: 98.21%		

No.	Variables	Indicators	Scores	Respondents	
				f	%
4	Usability and Accessibility	a. Does the software have consistent navigation?	4	6	75
			3	2	25
			2	0	0
			1	0	0
		b. Is it easy to navigate?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
		c. Does it have consistent visual themes?	4	8	100
			3	0	0
			2	0	0
			1	0	0
		d. Does it present information in clear and easily readable fashion?	4	6	75
			3	2	25
			2	0	0
			1	0	0
		e. Are the instructions clear?	4	6	75
			3	2	25
			2	0	0
			1	0	0
		f. Is text in appropriate fonts?	4	7	87.5
			3	1	12.5
			2	0	0
			1	0	0
			Average of Score: 95.83%		

Based on the result of the field try-out to English teachers as presented in Table 6, it can be concluded that:

a. 97.92% of the teachers agreed that the developed multimedia software fits its purpose.
b. 97.66% of the teachers considered that the learning content is suitable for the students.
c. 98.21% of the teachers considered that the audio-visual impact and aesthetics of the software are relevant and visually appealing.
d. 95.83% of the teachers considered that the developed multimedia software is usable and accessible.

Based on the result of the field try-out (Phase IV) to students as well as English teachers and the results of the previous phases of the try-out, it can be concluded that the developed multimedia software fulfills the criteria of suitability, meaning that the software is appropriate to be used as one of English learning resources for Year 1 students of elementary school.

Upon completion of the phase by phase evaluation/try-out and revisions, it is the time to see the effectiveness of the multimedia software to increase the students' motivation to learn English and to improve their learning achievement through quasi-experimental study.

Result of the Quasi-Experimental Research

As mentioned earlier, this experimental research aims at answering the following hypotheses:

a. The developed multimedia software can increase the motivation of Year 1 students of elementary school in learning English.
b. The developed multimedia software is effective to improve the achievement of Year 1 students learning English.

The quasi-experimental research was conducted in two Elementary Schools in Surabaya. The number of subjects in each school was 40 students for each group (experimental and control groups). The total number of subjects in the experimental group and control group was 80 students each. Details of subject has been presented earlier.

Data of Students' Motivation in Learning English

As mentioned earlier, before and after the quasi-experimental research was conducted, the students' motivation in learning English was measured using questionnaires. Based on the result of the questionnaires administered to 80 students (they are also the subjects for the quasi-experimental research), it was revealed that the mean score on their motivation to learn English before and after the experiment was 15.38 : 19.58. Repeated measures t-test was performed and the result showed that there was a significant increase ($p<.05$). It means that the developed multimedia software is able to increase the students' motivation in learning English.

Data of Students' Learning Achievement

The result of the research indicated that the mean scores of the pretest and posttest of the experimental group were 46.72 and 74.45 respectively. Thus, the gain score (from pretest to posttest) was 27.73. T-test was performed and the result showed that there was a significant difference between the mean score of

the pretest and that of posttest, with p=0.00 <0.05, meaning that the students had better score after learning using the developed multimedia software. In addition, the result of the research indicated that the mean score of the posttest of the experimental group was 74.45, which is higher than that of the control group, 64.32. Based on the t-test analysis, the difference is significant, with p=0.00 < 0.05. From this result, it can be concluded that the experimental group that learned English from the developed multimedia software had the mean score of learning achievement significantly better than the control group that learned from the printed-version materials. It means that the hypothesis that the multimedia software is effective to improve the achievement of Year 1 students of elementary school learning English is accepted.

Based on the result of the quasi-experimental study, it is indicated that (a) the motivation of the students to learn English increased when they learn from the developed multimedia software, (b) the learning achievement of the experimental group significantly outnumbered that of the control group, and (c) the mean score of the experimental group's posttest was higher than the minimum standard of achievement (70.00). Based on these results, it can be concluded that the developed multimedia software meets the criteria as an effective learning resource for Year 1 students of elementary school learning English.

The finding of the present study supports the findings of most previous studies that aim at revealing the influence of learning software on students' learning achievement although some previous studies of this kind did not always show significant effects on the students' learning achievement. The present study, therefore, provides an evidence of the success of multimedia software in improving the students' learning outcome. It can be explained why the developed multimedia software is effective to improve the students' learning outcome. There are many factors that may make the students' learning outcome improve. The attractiveness of the software can psychologically improve the students' motivation to learn; learning with motivation tends to be more successful than without motivation. Besides, the instructional design of the software is designed in a way that can give pleasant nuance, i.e., as an edutainment tool, the developed multimedia software can make learning easy for the students and therefore can promote the students' understanding and retention of the materials they have learned.

Other features in the software can also support the improvement of the students' learning, among others, are the existence of multiple forms of representation, i.e., the combination of texts, realistic pictures or graphics (static as well as animated), and sound. This involves a semiotic level and sensoric level

and accordingly it can improve the students' understanding of the materials and their retention of materials they have learned. Information that enters through multiple sensoric modalities is better understood and remembered than through one sensoric modality (eye or ear) only. A well established research result concerning the use of multiple forms of representation is that text information is remembered better when it is illustrated by pictures. This effect is usually explained by Paivio's dual coding theory (Paivio, 1986). According to this theory, the human cognitive system includes two subsystems: a verbal system and an imagery system. Words and sentences are usually processed and encoded only in the verbal system (except for concrete content), whereas pictures are processed and encoded both in the imagery system and in the verbal system. Thus, the memory-enhancing effect of pictures in texts was ascribed to the advantage of a dual coding (compared to a single coding) in memory. In addition, the idea can be explained using Mayer's model (1997). His model can explain why pictures in texts support memory and comprehension under specific conditions: Learners are more likely to build mental connections between verbal and the pictorial information, if text and pictures are coherent and if the verbal and the pictorial information are presented close to each other. Mayer calls this the principle of coherence and the principle of contiguity.

In addition, the developed multimedia software has been evaluated and revised through four phases based on the comments and suggestions obtained through each phase of the evaluation/try-out. One crucial input obtained from the try-out is the information related to cognitive prerequisites and therefore the level of materials difficulty is made relevant to the students' cognitive condition, especially their prior knowledge. This can support the success of the developed software in facilitating the students to learn English.

Based on the above explanation, it can be concluded that the effectiveness of multimedia software is determined by how well the software is designed, in particular how well all the three levels of multimedia concept (technical level, semiotic level, and sensoric level) are addressed.

CONCLUSION

The developed multimedia software had been designed by addressing the three levels of multimedia concept (technical level, semiotic level, and sensoric level). Ignorance of these three levels may make the quality of the software ineffective. Based on the results of a series of evaluation (try-out) and the experimental research into the effectiveness of the developed multimedia software conducted in this present study, it can be concluded that: (a) the students

involved in this study could learn English easily and well from the developed multimedia software, (b) all the students attending the try-out were interested in learning English through the developed multimedia software, (c) the teachers involved in the evaluation considered that the learning content of the software was suitable for the students and that the software was easy to access and use, and (d) the motivation and learning achievement of the students who learned English from the software improved significantly compared to those who did not study from the software. Based on these results, the developed multimedia software can be used as one of relevant and effective English learning resources by Year 1 students of elementary school. Because the effectiveness of the developed multimedia software is due to the design features that address the three levels of multimedia concept (technical level, semiotic level, and sensoric level), it is the design features that matter not the computer as the technical medium that delivers the lesson *per se*. Therefore, in order to produce educationally effective software, it is suggested that in designing software, developers need to address the three levels of multimedia concept.

Considering the fact that English learning resources of this type is still lacking, it is recommended that further materials be developed through computers as the delivery mode so that students will be facilitated with a variety of learning resources to foster their English proficiency and motivation to learn English.

REFERENCES:

Ainsworth, S. (1999) "The functions of multiple representations". *Computers & Education, 33,* 131-152.

Burke, R.L. (1982) *Computer assisted instruction*. Englewood Cliffs, New Jersey: Prentice Hall, Inc.

Depdiknas. (2003) *Kurikulum 2004: Standar kompetensi mata pelajaran bahasa Inggris sekolah dasar dan madrasah ibtidaiyah*. Jakarta: Departemen Pendidikan Nasional.

Fraenkel, J.R., & Wallen, N.E. (2007) *How to design and evaluate research in education* (Seventh ed.). New York: McGraw-Hill Education.

Hannafin, M.J., & Rieber, L.P. (1989) Psychological foundations of instructional design for emerging computer based instructional technologies: Part II. *Educational Technology Research and Development,* 37(2), 102 114.

James, W.B. & Galbraith, M.W. (1985) "Perceptual learning styles: Impliclations and techniques for the practitioner." *Lifelong Learning*, 8, 20-23

Judging Criteria, [online] Available: http://www.aimia.com. [retrieved 2007, January 12].

Lowe, R. K. (1999) "Extracting information from an animation during complex visual learning". *European Journal of Psychology of Education*, 14(2), 225-244.

Kulhavy, R.W., Stock, W.A., & Caterino, L.C. (1994) "Reference maps as a framework for remembering text". In W. Schnotz & R.W. Kulhavy (Eds.), *Comprehension of graphics* (pp. 153-162). Amsterdam: Elsevier Science B.V.

Mayer, R. E. (1997) "Multimedia learning: Are we asking the right questions?" *Educational Psychologist, 32*(1), 1-19.

Mayer, R. E. 2001. *Multimedia learning*. New York: Cambridge University Press.

Paivio, A. (1986) *Mental representations*. New York: Oxford University Press.

Pramono, H. (2008) "Instructional animations in english preposition learning: Is high-tech delivery effective?" *Widya Dharma, 18*, 173-187.

Rieber, L.P. (1990) *Computers, graphics, & learning.* Englewood Cliffs, NJ: Prentice Hall.

Schnotz, W. (2001) "Educational promises of multimedia learning from a cognitive perspective". Paper presented at the 9th European Conference on Research on Learning and Instruction (EARLI), Fribourg/Switzerland.

Schnotz, W., & Bannert, M. (2003) "Construction and interference in learning from multiple representation". *Learning and Instruction, 13*, 141-156.

Schnotz, W., Böckheler, J., & Grzondziel, H. (1999) "Individual and co-operative learning with interactive animated pictures". *European Journal of Psychology of Education, 14*, 245-265.

Schnotz, W., Picard, E., & Henninger, M. (1994) "The use of graphics and texts in constructing mental models". In W. Schnotz & R. W. Kulhavy (Eds.), *Comprehension of Graphics* (pp. 185-205). North-Holland: Elsevier Science B. V.

Shamir, H., Hercules, K., & Crowther, M. (2008) "The effects of different voices in computer-based instruction on children's learning". *Journal of Educational Multimedia and Hypermedia, 17*(4), 581-595.

Spiro, R.J., Feltovich, P.J., Jacobson, M.J. & Coulson, R.L. (1991) "Cognitive flexibility, constructivism, and hypertext: random access instruction

for advanced knowledge acquisition in ill-structured domains". *Educational Technology, 31*, 24-33.

Sponder, B., & Hilgenfeld, R. (1994) Cognitive guidelines for teachers developing computer assisted instruction. *The Computer Teacher,* 22(8), 9 15

Sweller, J. (1999) *Instructional design in technical areas*. Camberwell, Victoria: ACER Press.

Wislock, R.F. (1993) "What are perceptual modalities and how do they contribute to learning?" in D.D. Flanery (Ed.) *Applying Cognitive Learning Theory to Adult Learning* (59: 5-13). San Francisco: Jossey-Bass Publishers.