# Developing an e-Learning Material for Arts Learning

Szu-Hsin Lee, Hui-Ching Tseng, and Yu-Sheng Chen

***Abstract*—This paper describes the idea of recent advances in graphics and software tools have facilitated the development of visual interfaces based on designing a two-dimensional animation textbook. These interfaces use interactive two-dimensional graphics to represent visual and spatial information transformed from the traditional text book, and allow natural interaction with direct object manipulation. Particularly in the educational field, interactive two-dimensional graphics offers effective, supporting learning-by-doing and case-based reasoning approaches. To gain insight to the target students' perceptions of how the two-dimensional e-Book motivated them came to their understandings of specific content areas, the researchers in this study designed a two-dimensional animation unit for the participants. The participants were 4th grade students who learned the topic of Vincent Willem van Gogh (Van Gogh) in their art course. The purpose of this study was to measure the learning achievement of the participants in an art unit when a multimedia form of instruction was used in place of traditional instruction. More significantly, this study purpose provided an opportunity to explore the use of using an e-Book based instrument in the art course among elementary students at the target school, which may contribute to a further sophisticated understanding of digital content instruction for other elementary schools.**

***Index Terms*—E-Book, Learning Achievement, E-Learning, Art Education.**

## I. Introduction

This study addressed a quasi-experimental research design, which measured if the usage of an e-Book instrument produced better learning achievement, when compared to traditional instruction. The researchers randomly selected two groups of 4th grade students form a target elementary school. The researchers assigned one class as the experimental group, and the other as the control group. The purpose of this study was to measure the learning achievement of the participants in an art unit when a multimedia form of instruction was used in place of traditional instruction. The research question was: Does the use of an e-Book module for the Van Gogh Unit in the art course at the target school produce a significant difference in student achievement, as measured by a researcher's developed instrument, when compared to traditional instruction?

## II. Literature Review

Szeto pointed out that the effectiveness of digital contents used as instructional tools in art classes is due to the fact that new information is received through more than one of the five senses [1]. For example, students may read the text, hear the explanation, use the software, or view the art works within the same class period. Burg and Wong addressed using computer technology as the students' artistic tool and medium of communication [2]. Instructors' use of digital content in art class applications helped stimulate students' learning achievement based on the use of computer technology; the more stimulation the art classroom provided, the more creativity and learning achievement students expressed [3]. Moreover, the use of digital content-based instruments guided students to create multimedia presentations during or after the class.

Using slides, digital image sources, instructional CD-ROMs, network services, or technology-aided lectures for art classes in elementary education has become a common concept [4]. Technology bought possibilities for digitalized text information and can integrate new or historical art works together [5]. The main purpose of using digital content in art classroom instruction is not to *simulate* the art world, but to *stimulate* different kinds of interactions for students. The use of digital contents such as e-Books, efficient software and internet-based environments allowed students to gain more information about art. As a result, it could increase learners' creativity and learning achievement. Another benefit of using digital content as an art instructional tool was that it provided students a richer and more abundant classroom environment, rather than a darkened classroom with slides or films, or just lecture. Digital content instruments increased opportunities for collaborating existing art history and new art exploration in classroom environments, because digital materials could be supplementary to the printed textbooks and provided multimedia possibilities to learners [6].

## III. Methodology

### A. Description of Research Design

A quasi-experimental research design was employed in this study because participants were not randomly assigned to experimental or control groups [7]. The participants of the study were 4th grade students who took the arts class in the fall semester, 2010. Seventy-six students in two intact classes were selected for the experiment (N = 76). The researchers assigned one class as the experimental group (n = 36), and the other as the control group (n = 40).

Both the experimental group and the control group received a pretest one week before the treatment, and the data from it were collected before the treatment. During the

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treatment period, the experimental group received the e-Book, and the control group received the traditional instructional materials: handouts and textbooks (Table I).

Both groups received a hands-on activity, which required them to create projects related to Van Gogh during the instructional period. The students all received a posttest after the instruction, and the results of the posttest were then collected. Analysis of variance (ANOVA) was used based on the result of the pretest and the analyzed data from the posttest. This analysis was done using SPSS software.

TABLE I: QUASI-EXPERIMENTAL RESEARCH DESIGN

| Treatment | Posttest | | Pretest |
|---|---|---|---|
| Experimental group | $O_1$ | $X_1$ | $O_2$ |
| Control group | $O_3$ | | $O_4$ |

*Note.* $O_X$ = observation of pretest and posttest.
$X_1$ = Treatment of e-Book based instruction.

### B. Instrumentation

The e-Book was developed through the following steps of the Kemp instructional model with nine steps: problem finding, learners' characteristics, task analysis, instructional objectives, content sequences, and instructional strategies, designing the messages, instructional delivery, and evaluation the instruction [8]. Kemp instructional design consists of simple step methodologies that can be utilized for integrating new technology into creation courses [7]. The following figures show part of the contents from the e-Book (Figures 1-8).

### C. Study Design and Data Analysis

This study employed a quantitative research design. The researchers aimed to determine the relationship between instruments (independent variable) and students' results on the posttest (dependent variable) among the participants who took the arts class. A quasi-experimental research design was used for this research (Table I) because samples were not randomly selected into experimental or control groups. As stated, the test data were analyzed by an analysis of variance (ANOVA). A one-way ANOVA was used to determine if there were any significant differences between the means of the experimental group and that of the control group. There were three measures of central tendencies: mean, median, and mode, which were also analyzed to describe the results of each question on the pretest and posttest.


Fig. 1 and Fig. 2. e-Book: the introduction pages of Van Gogh.

Fig. 3 and Fig. 4. e-Book: the history of Van Gogh's art works.

Fig. 5 and Fig. 6. e-Book: the analysis of Van Gogh's art works.

Fig. 7 and Fig. 8. e-Book: the Q & A pages.

## IV. RESULTS AND CONCLUSIONS

The researchers developed 20 questions about the knowledge of Leonardo da Vinci learning. The reliability of the Leonardo da Vinci instrument (pretest/posttest) was established through the split-half method. According to Spence-Diehl, a reliability of .60 or higher indicates an acceptable level for educational research. The reliability coefficient for the testing instrument used in the pilot test was .82, which indicates satisfactory reliability. The pretest and posttest both had twenty, four-item, multiple-choice questions about knowledge of Leonardo da Vinci. Both groups received a pretest one week before the treatment and a posttest one week after the treatment. The total possible score was 20, the data in Table II indicate the distributions between the two groups were similar.

Table 2 also displays the mean pretest scores and reflects the frequency distribution data. The Leonardo da Vinci unit pretest consisted of 20 questions. The data show the mean of pretest scores for the experimental group was 4.97. The mean of pretest scores for the control group was 4.73. The

mean of pretest scores for all participants was 4.85; this reveals the subjects correctly responded to only 19% of a total of 20 pretest questions. This was not sufficiently high to indicate that participants had enough knowledge of Leonardo da Vinci. The standard deviation, as Table 2 indicates, accounts for the small and similar variance in both the experimental group (SD=2.10) and the control group (SD=1.87). The experimental group had a slightly larger range (9) than the control group (7). To address the research question, a one-way ANOVA was used to determine the homogeneity of the pretest means between the two groups. The result indicates a non-significant F ratio ($F(1,74) = .238$, $p>.05$). In other words, the experimental and control groups were considered homogeneous before the treatment; there is no statistical significant difference between the scores of the two groups.

TABLE II: PRETEST SCORES IN THE EXPERIMENTAL AND CONTROL GROUPS

| Group | N | Mean | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Experimental | 36 | 4.97 | 2.10 | 9 | 2 | 11 |
| Control | 40 | 4.73 | 1.87 | 7 | 2 | 9 |
| All Subjects | 76 | 4.85 | 1.99 | 9 | 2 | 11 |

Table III reports posttest descriptive statistics for both groups. Both groups show great increase in scores on the posttest. The control group shows an increased mean of 14.88, while the experimental group shows a higher increased mean of 18.86. The standard deviation scores of the pretest for the two groups were similar – experimental group (SD=2.10) and control group (SD=1.87). The standard deviation scores of the posttest in the two groups indicated a greater variance – experimental group (SD=2.33) and control group (SD=3.78). The posttest in the control group had the highest standard deviation within all pretests and posttests, which indicates the large variance in their scores (SD=3.78). It is interesting that the distribution curve for the experimental group looks very similar between the pretest and the posttest, the mean score has translated from 4.97 to 18.86, while the variance of the group remained similar (SD=2.10 compared to SD=2.33. The opposite effect appeared to be true of the control group, while mean scores moved from 4.73 to 14.88 and the variance of the group changed radically form SD=1.87 compared to SD=3.78. The researcher did not notice any effect in the control group population that could account for this change in variance.

TABLE III: POSTTAST SCORES OF THE EXPERIMENTAL AND THE CONTROL GROUPS

| Group | N | Mean | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Experimental | 36 | 18.86 | 2.33 | 10 | 16 | 20 |
| Control | 40 | 14.88 | 3.78 | 16 | 7 | 18 |
| All Subjects | 76 | **16.87** | **4.36** | **19** | 7 | **20** |

The ANOVA analysis in Table Ⅳ indicates that the use of a digital content instrument in the arts class produced a significant difference in student achievement, when compared to traditional instruction only ($F(1,74) = 67.108$, $p < .05$). As reviewed in Table 3, the posttest mean in the experimental groups, 18.86 (94% correct rate), was higher than in the control group, 14.88 (74% correct rate), and the perfect score was 20. This clearly indicated that the experimental group did statistically better than did the control on the posttest performance measure.

TABLE Ⅳ:ONE-WAY ANOVA USING POSTTEST SCORES OF THE EXPERIMENTAL GROUP COMPARED TO THE CONTROL GROUP

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 678.951 | 1 | 678.951 | 67.108 | .000 |
| Within Groups | 748.681 | 74 | 10.117 | | |
| Total | 1427.632 | 75 | | | |

This result corresponds to the studies of Hoover and Fabian, utilizing digital content in art education [9]. These articles reported using digital technology in art education helped learners to express different thoughts of learning and conjoined their ideas in varied ways, which impacted learning achievement more than the traditional instruction. Moreover, a number of research articles have shown that integrating digital content as instructional materials in art classrooms provided learners with better educational experiences[10]-[11].

Note: The e-Book of this study is designed by New Media and e-Learning Lab, KSU, Taiwan.

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