

**DEVELOPMENT OF A MULTIMEDIA INTERACTIVE
LEARNING PACKAGE (MILP) FOR LIS 161 (COMPUTER-
BASED INFORMATION SYSTEM)***

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ABSTRACT

Discusses the development of an MILP for LIS 161 and presents the evaluation of the LIS students and LIS IT faculty members on this.

**MULTIMEDIA INTERACTIVE LEARNING PACKAGE FOR
LIS 161, UPSLIS**

One of the identified problems in teaching computer applications in LIS courses is the differences in student learning pacing. Some students learn at a faster pace than the others. Because of this, the instructor has to keep on repeating the entire lesson or parts of the lesson to help the slow-paced students. In a worst-case scenario, the students with slower pace go out of the classroom without understanding anything at all because they are too shy to ask the instructor to repeat the entire lesson. These circumstances have led to the development of a Computer Based Training (CBT) material in the form of a Multimedia Interactive Learning Package (MILP) for LIS 161 students. In the development of an MILP, the following questions were asked:

1. How effective is the MILP as a medium of instruction?
2. How do students and faculty rate the MILP?

Computer Based Training (CBT) materials, Web-Based Training (WBT), Online Resource-Based Learning (ORBL), Networked Collaborative Learning (NCL), Computer-Supported Collaborative Learning (CSCL) and

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others are often used interchangeably. According to Allan (2002) these involve “learning that is delivered, enabled or mediated by electronic technology, for the explicit purposes of training and/or education” (p. 3). Learning may occur with or without an instructor. A student can take the course on his own or through the guidance of a facilitator. The teacher now becomes an e-tutor who assumes the role of a facilitator. Even when these have their advantages, they also have disadvantages. However, due to the learning styles of the current generation of learners, it is suggested that CBT and other similar formats should be used. It was suggested by Lynn-Nelson (2007) “that millennial generation trainees who were born between 1980 and 2000 should be given tasks guided by an experienced trainer” (para. 1).

Several studies have been conducted to show how CAI and other similar learning packages can be used in teaching in the different fields of learning like in the library and information sciences for teaching online searching and user instruction (Fourie, 2001) in the health sciences specifically on teaching carpal bone radiograph interpretation to clinical clerks (Westendorp & McGraw, 2002), in teaching languages (Wang & Munro, 2004). Coppola and Myre (2002) were able to show that the web-based training program that they tested was as effective as the instructor-led course. Wright et al. (2002) developed a multimedia program for computer-assisted psychotherapy and found out that “patients with depression and anxiety disorders reported high levels of satisfaction with using” (para. 21) the software.

In the local setting, several studies were also conducted to determine whether CAI and other similar learning packages are effective with respect to the learners to which these were developed. Paras (2003) determined that the Computer Assisted Learning (CAL) was effective in teaching Philippine History among the students of Don Bosco Technical Institute in Tarlac. Paderes (2001) in a survey determined that majority of his respondents are interested in online courses and prefer this over classroom-based courses. This study showed that web-based training module is a usable and acceptable medium of learning. Cabbab (1999) developed an interactive multimedia software program for library and information science. A sample of 78 students were chosen as respondents to test the software program based on introductory courses in librarianship. CD encyclopedias were the most common form of multimedia the respondents were exposed to. A big majority of respondents (98.718%) agreed that there was a need for such a program.

In the University of the Philippines, the implementation of a computer-based information system is actively used in the University of the Philippines Open University (UPOU), Diliman Interactive Learning Center (DILC) and at the UP School of Library and Information Studies (UP SLIS). At the UP SLIS, the IT courses like LIS 160 (Computer Based Information Systems) and LIS 166 (Database Programming), an alternative means of teaching the computer applications part of these courses is through a CBT. Since LIS 161 is one of the course that trains students on using computer applications, it was chosen as the content for the development of the MILP.

Multimedia interactive learning packages (MILP) are user-friendly software packages that allow text, document files, images, sound, animation, and video to be integrated into web-based training materials. E-learners need to download and install plug-in software like RealPlayer and Macromedia Flash in order to use these packages. These plug-ins may have high system requirements that may not be met by the e-learner's computer. Due to this dilemma, many packages provide materials in alternative formats like HTML or Hypertext Markup Language which can be accessed through any computer with a web browser (Allan, 2002). Based on the suggestion of Lynn-Nelson (2007) the MILP is a good material for the current generation of learners.

The development of an MILP is a significant contribution to the field of LIS since it can serve as a prototype for future development of MILPs for other LIS courses. The MILP can also serve as a review material for LIS 161 students since they will have a resource that they can refer back to if they do not understand the lesson.

Furthermore, the MILP is helpful to faculty members who have to deal with the different learning paces of students. With an MILP package, the instructor does not have to repeat the entire lesson over again if some students do not understand it.

Results of the Preliminary Study

A preliminary study was conducted to determine the content and features of the MILP. Faculty members teaching LIS Information Systems courses were asked to fill out a questionnaire on the possible content and features of the MILP. They were asked to rank a topic based on importance. If they gave a rating of 1, this meant that the topic was the most important and if they gave a rating of 5, this meant that the topic was the least important.

Based on these results, the most important topics identified for inclusion in the MILP are as follows: Introduction to Computers, Computer Hardware, Computer Software, the Internet and the World Wide Web, Communications and Networks, and Programming Languages. The following were also suggested for inclusion by one of the respondent instructors: Description and discussion about blogs, Open access archives, Open source software, free Internet resources, web harvesting and data mining, other new trends affecting librarians. Blogs and web harvesting are included in the topic The Internet and the World Wide Web along with Free Internet Resources. Open Source Software are discussed in the software part while Data Mining is discussed in the Enterprise Computing part.

The faculty members were also asked to rank the topics they thought required or needed a multimedia touch in the MILP. The following are the topics ranked by the faculty members::

1. How do computers work?
2. How does the printer work?
3. How does the hard disk work?
4. How do optical discs store information?
5. What happens when the computers start up?
6. How does the Internet work?
7. What are the mechanics of data transfer in computer networks?
8. Wwhat are the threats to Internet security?
9. What issues are related to ICT?
10. How are web pages created?

In terms of the features of the MILP, the following are the answers of the faculty memers:

1. Navigation buttons
2. Glossary
3. Help Features
4. More Information Button
5. Lesson and Topic Button
6. Video Files
7. Quizzes
8. Games
9. Examples and Demonstrations
10. Others: instructions for teachers, files ready to be sent to students, answers to quizzes and online links

Three sets of data were tested to see if there was a significant difference between them. The first data set that was tested was the pre- and post-test scores of students from the control group. The test determined whether the conventional way of teaching is an effective methodology for teaching LIS 161. The second data set that was tested was the pre- and post-test scores of students from the experimental or treatment group. The test determined the effectiveness of the MILP as a teaching tool. The last data set that was tested consisted of the posttest scores of the students from both the control and experimental group. This test determined if there was a significant difference between the scores of the students from the control group and scores of the students from the experimental group.

Developing the Prototype

Prototyping is the process of developing a working model of the full-scale system. It enables the user to get a sneak preview of the system. Software development through prototyping involves four phases:

- I. Define System Specifications
- II. Create Prototype System
- III. Refine Prototype System
- IV. Develop Operational System (Long, 2005)

System analysis and design was done in the first phase. In order to conduct System Analysis, the manual or existing system must be understood. The following results were derived from the System Analysis:

- Existing system review
- System objectives
- Design constraints
- Requirements definitions (Long, 2005)

In System Design, the information provided by System Analysis served as a basis for designing the target system. The system specifications were translated into a System Design. The following procedures and activities were based from Long (2005) In Phase II, the system design and system specifications were translated into instructions that can be interpreted and executed by the computer. This phase involved coding the software.

System evaluation took place in Phase III. Users tested the system and evaluated it (black box testing). User comments and suggestions on improving the system were gathered in this phase. The system was modified based on the comments and suggestions. This phase was done repeatedly

until the users were satisfied. White box testing was conducted in this phase. It was checked for system bugs.

The last phase involved enhancing the system based on the prototype system. The prototype was not a fully functional scalable prototype.

Fully functional scalable prototypes are working models of the target information system that can be scaled to meet the information processing needs of the organization. Scalable systems are implemented directly (p. B48).

The figure below was based on Long's (2005) prototyping framework. All the four phases of the prototyping process were included; however the implementation and testing / evaluation steps were separated from the third phase.

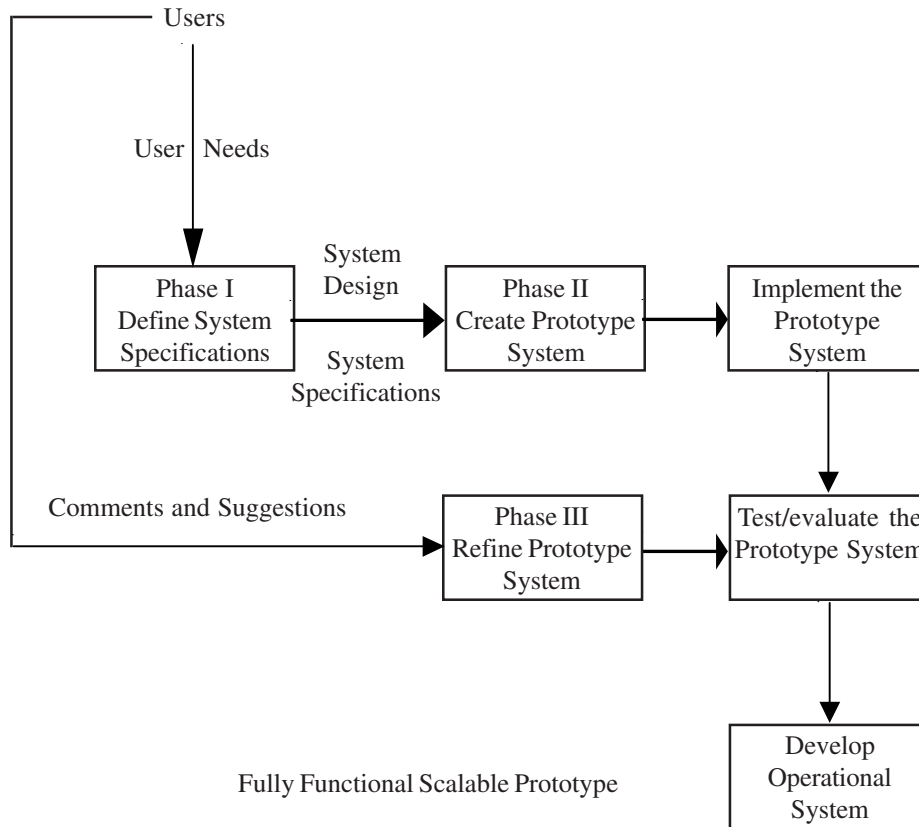


Figure 1. Prototyping Framework by Long (2005)

Methodology

The study made use of both descriptive and experimental research methods. The descriptive part involved the distribution of questionnaires while the experimental part involved an experimental/treatment group wherein the MILP was used; and a control group wherein the MILP was not used.

Respondents for the evaluation questionnaires were the LIS 161 students and faculty members teaching IT courses in LIS. The LIS 161 students were chosen as respondents because they were the end-users of the software. Faculty members were also chosen as respondents because their feedback was necessary for the improvement of the software and they are also the ones who may want to use the system as a teaching tool.

The development of an MILP was conducted in four phases. These were defined system specifications, creation of a prototype system, refining the prototype system, and developing the operational system.

Phase I: Define System Specifications

The UPSLIS IT faculty members were surveyed for topics and features that should be included in the MILP. This was the basis for the requirements specifications and system design.

The LIS 161 students from the experimental group were asked if they owned a computer with an Internet connection at home. Since not all of them owned a computer and not all of them had Internet access at home, the researcher decided to store the MILP in CDs and distributed these to the students.

Phase II: Create Prototype System

The requirements specifications and system design served as basis for coding the system. The MILP was created using HTML, CSS, JavaScript, and Hot Potatoes.

Some of the videos were created using Windows Movie Maker. The video files were converted using Total Video Converter. The said converter is a freeware and can be downloaded through its site. The other video files were downloaded from YouTube.

Phase III Refine Prototype System

Implementation and testing of the system came in this phase. Since the UPSLIS does not have a file server to host the MILP, the software was implemented as a standalone package. It was stored in CD-Rs and distributed to the students.

The MILP was used for the entire second semester of the academic year 2007-2008. The experimental class was handled using a combination of face-to-face interaction with the instructor and the use of the MILP. Students viewed the tutorial and proceeded to the drill and practice exercises and instructional games afterwards. At the end of the semester, the students were asked to evaluate the software by filling up a form. The IT LIS instructors were also given a copy of the MILP along with its documentation. They tested it from their computer of choice. A software evaluation form was also given to them. This served as a guide for them to evaluate the MILP.

Phase IV: Develop Operational System

Based on the comments and suggestions of the students and faculty, the system was modified and the fully scalable prototype was produced.

The Experiment, Results and Discussion

There were two LIS 161 classes for the 2nd semester AY 2007-08. One section was labeled as the control group and the other section as the experimental group. Pre- and post-test questionnaires were distributed to both sections to determine the effectiveness of the MILP as a medium of instruction.

A survey questionnaire was used to gather user needs in terms of content and features of the MILP in the preliminary study. The LIS 161 syllabus served as a basis for the list of topics in the questionnaire. The choices for the list of features were based on Lee and Owens' (2004) book entitled *Multimedia-Based Instructional Design*.

A net connection survey was conducted to determine the number of students who owned computers with Internet connection. The results of this survey enabled the researcher to determine if the MILP needed to be uploaded online or just distributed as a standalone package.

Pre-test and post-test questionnaires were created to determine if the MILP is an effective medium of instruction.

Another survey questionnaire was used to evaluate the system functionality and features. The criteria for evaluation were based on Bitter and Pierson's (2005) book entitled *Using Technology in the Classroom*.

The results of the survey questionnaires were tabulated and analyzed using frequency distribution and percentages. The T-test was used to determine significant differences between pre- and post-test scores of the control group and the experimental group. Confidentiality of grades was maintained since no names appeared in the presentation of data and only summary statistics

were presented.

Out of the 15 students in the control group, only 12 took both the pre- and post-tests. Since the remaining 3 did not take both tests, their scores were excluded from the data. As seen in the above table, the general trend was an increase in test scores. The mean percentage of increase of test scores in the control group is 52.97%.

Since both the control and experimental groups are the same subjects to which the pre-and post-tests were administered (Wasson, 2008b), the dependent t-test was used to analyze the test scores. The research hypothesis tested for both control and treatment groups is formulated as $H_1: \bar{i}_1 < \bar{i}_2$ where \bar{i}_1 is the mean pre-test score and \bar{i}_2 is the mean post-test score of the control/treatment group. It is therefore hypothesized that the mean pre-test score of the control /treatment group is less than the mean post-test score of the control group. The null hypothesis on the other hand is formulated as $H_0: \bar{i}_1 = \bar{i}_2$ where \bar{i}_1 is the mean post-test score and \bar{i}_2 is the mean pre-test score of the control group. The null hypothesis is therefore stated, thus, the mean post-test score of the control group is equal to the mean pre-test score.

Applying the formula, the result is a t-value of 7.6295. The degrees of freedom (n-1) is 11. At $\alpha=0.05$ or at 95% confidence level, the null hypothesis is rejected if $t > 1.795885$. Since $7.6295 > 1.795885$, it can be concluded that the conventional way of teaching students is effective because there is a significant increase in test scores.

Out of the 20 students in the experimental group, only 14 took both the pre- and post tests. The scores of the remaining 6 were excluded from the data. Like the control group, the general trend was also an increase in test scores. The mean percentage of increase in test scores was 71.66%.

Again, the dependent t-test was used to analyze the scores. Applying the formula, the result is a t-value of 15.9302. The degrees of freedom (n-1) is 11. At $\alpha=0.05$ or at 95% confidence level, the null hypothesis is rejected if $t > 1.77093$. Since $15.9302 > 1.795885$, it can be concluded that the introduction of the MILP in teaching students is effective because there is a significant increase in test scores.

The t-test for independent samples was used to determine whether there is a difference in the post-test scores of the control group and the treatment group for which the treatment or the MILP can be considered as more effective than the conventional way of teaching. The research

hypothesis tested was formulated as $H_1: \bar{i}_1 < \bar{i}_2$ where \bar{i}_1 is the mean post-test score of the control group and \bar{i}_2 is the mean post test of the treatment group. The null hypothesis on the other hand was formulated as $H_0: \bar{i}_1 = \bar{i}_2$ where \bar{i}_1 is the mean post test of the control group while \bar{i}_2 is the mean post test of the treatment group.

Applying the formula, the t-value was computed as 2.2828 with 24 degrees of freedom. At $\alpha=0.05$ the t-table value is 1.710882. The null hypothesis is rejected if $t > 1.710882$. Since $2.2828 > 1.710882$, it can be concluded that the introduction of the MILP significantly increased the students test scores.

The students were asked to rate the MILP according to a set of criteria. The rating was from 1 to 5 where 1 is the lowest and 5 is the highest. Out of the twenty students from the experimental group, only sixteen were able to evaluate the MILP. The following tables show the ratings of the students per criteria and sub-criteria for each.

Table 1. Student Evaluation of the MILP

	Mean	Standard Deviation
Program Content	4.49	0.70
Presentation	4.28	0.67
Effectiveness	4.37	0.75
Audience Appeal and Suitability	4.47	0.62
Practice Assessment Feedback	4.29	0.71
Ease of Use	4.51	0.62
User Interface and Media Quality	4.31	0.85
Overall Rating for the MILP	4.39	0.10

The rating for the components of the MILP as well as the overall rating of the MILP is relatively high. This shows that the students approved of the MILP as an accepted tool for learning among the students who participated in the experiment.

Out of the six instructors who teach IT for LIS, only five answered the evaluation questionnaire. The faculty was provided with the documentation of the MILP and they were asked to rate it.

Table 2. Faculty Evaluation of the MILP

	Mean	Standard Deviation
Documentation and Supplementary Materials	3.88	1.30
Program Content	3.79	1.08
Presentation	4.21	0.82
Effectiveness	4.17	0.87
Audience Appeal	3.89	1.15
Practice Assessment Feedback	3.94	0.96
Ease of Use	3.97	1.02
User Interface and Media Quality	4.17	0.82
Overall MILP Rating	4.00	0.16

The MILP received average ratings from the faculty members where the lowest rating was under Program Content and the highest was Presentation. Based on the ratings given it can be said that the faculty members who rated the MILP approve of the program as a tool for instruction however, this can still be improved based on the suggestions that they gave. The following are the comments from the faculty members of the LIS IT track on the MILP:

- Include screen size in system requirements. It was difficult to navigate using 1024 x 768.
- Instructions in the quizzes were not very clear.
- Content was biased on only one source/reference.
- Some questions in the quizzes were ambiguous.
- Navigational button in quizzes beside the back button was misleading. Use alternate text to provide a clearer meaning on the button or change it to a labeled text.
- More videos

Based on these comments, the following changes have been made to the MILP:

- Screen size included in system requirements
- Added a site map for better navigation
- Rephrased the instructions on the quizzes
- Revised the content of the MILP
- Changed the label of the buttons on the quizzes

Conclusion

Applying the dependent t-test formula to the pre- and post-test scores of the students from the control and experimental groups, it can be said that both the conventional way and the introduction of the MILP are effective means of teaching the students since both exhibited an increase in test scores. However, it can also be said that the MILP effectively increased the test scores of the students from the experimental group, based on the results of the independent t-test comparing the post test scores of both the control and the experimental group. Thus, it can be concluded that the MILP is an effective medium for instruction.

The MILP passed the students' evaluation with an overall mean rating of 4.39 out of 5. For the faculty's evaluation, the overall mean rating was 4.00 out of 5.

The students' as well as the faculty members' comments and suggestions were very helpful for the further improvement of the MILP. Changes were consequently made, based on the comments and suggestions, namely: the inclusion of screen size in the system requirements, addition of a site map for better navigation, instructions on the quizzes were rephrased, the content of the MILP was revised, and the labels of the buttons on the quizzes were changed.

Finally, the following measures are recommended for the continuous improvement of the MILP to make it an even more effective medium for teaching information systems and technology courses in Library and Information Science: (1) There should be an annual update of the content of the MILP since IT topics can become obsolete in a short period of time; (2) The MILP should also be tested in other LIS IT classes; and (3) Other CBT materials on LIS should be developed.

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