E-LEARNING SYSTEM FOR FUNDAMENTALS OF PROGRAMMING USING C LANGUAGE IMPLEMENTING REINFORCEMENT LEARNING

[1]ARMAN BERNARD G. SANTOS, [2]MARMELO V. ABANTE

[1]Asiatech College – Philippines Brgy. Dila, City of Sta. Rosa, Laguna
[2]World Citi Colleges – Philippines 960 Aurora Boulevard Quezon City, Manila
E-mail: armie_santos@yahoo.com, docmelo888@gmail.com

Rationale- E-Learning is very applicable in a classroom setting specially in the subject Introduction to Programming using C Language. It covers the nine major concepts: History of C Language, Flowcharting, Input/Output, Program Logic Formulation, Conditional Statements, Looping Statements, Arrays, and String and Functions. The subject will be more interesting when it integrates multimedia concepts such as videos, graphics, text, animation and sounds. E-Learning in the subject Introduction to Programming using C Language can be a big help because it has elements needed to make learning easier. Studies show that students' minds absorb seventy five (75) percent of what they see, hear or experience, not as much as when they just memorize a poem, reviewing a lesson or reading a book. [1] Also, Reinforcement Learning Algorithm will be applied to the proposed system. Reinforcement Learning is a type of Machine Learning, and thereby also a branch of Artificial Intelligence. It allows machines and software agents to automatically determine the ideal behavior within a specific context, in order to maximize its performance. Simple reward feedback is required for the agent to learn its behavior; this is known as the reinforcement signal. Reinforcement Learning allows the machine or software agent to learn its behavior based on feedback from the environment. This behavior can be learnt once and for all, or keep on adapting as time goes by. If the problem is modeled with care, some Reinforcement Learning algorithms can converge to the global optimum; this is the ideal behavior that maximizes the reward. [2] Categories and Subject Descriptors

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I. INTRODUCTION

Filipino culture places a high value on education. For the majority of Filipinos, the only best thing for a person to acquire and secure a better future is through education. Because a good education has become increasingly hard to attain nowadays, there is increased demand for new and more convenient ways to obtain a school degree. Even the government has tried to change the formal school system by introducing new methods in learning. [3]

Better educational principles navigate and direct the introduction and use of technology in educational institutions, rather than trying to make the educational system fit the technology. In this way, E-Learning as a part of technology can be used as a lasting vehicle for change and for improving teaching-learning system.

With the approved government recognition, some institution and students of BS Computer Science and Information Technology are in need of the new learning technology such as e-learning. E-learning helps to facilitate lecture presentation, videos, and information about the subject Introduction to Programming using C Language. Through the proposed online system, students can get additional information even if they are not inside the institution. E-learning, as part of an online process can serves as supplementary resources for learning.

II. STATEMENT OF THE PROBLEM

Specifically, the researcher will answer the following questions:

1.1 Low students' participation inside the classroom.

The teachers of Introduction to Programming using C Language use the traditional way of teaching to present the topics to the students. Teachers do their best in injecting information to the students' mind but there is actually a necessity to motivate their students. Sometimes, students are not listening to their teacher and do something else to entertain them. Their interests in the usual classroom teaching are not actually high and they tend not to participate in the classroom discussion.

1.2 Poor students' progress on the side of slow learners.

Teachers monitor their students by giving the objective type of test such as quizzes, recitation, research, and seatwork. The teachers provide quizzes and other activities that measure the classroom performance of the students. Recitations are given also to determine if the students are progressing or not. By objective type of test, teachers have identified the slow learners and the fast learners.

1.3 Limited resources such as books and other reference materials.

The students use textbooks and other library materials to gain information. Adequate information is needed by the students of Introduction to Programming to learn and to gain knowledge. Teacher uses other materials in their classroom teaching but they cannot use it every day due to limited resources. Teachers use their books, board, and pen for their teaching. There is a demand for E-Learning technology to facilitate classroom teaching that can also awaken the interest of the students.

1.4 Restricted access to lecture files for hard copy.

Students are restricted to copy any lecture files of the teachers inside the laboratory. They are not allowed to use flash drive because the institution is preventing any malware or virus inside the laboratory. Some students are in need of a hard copy of the lessons for them to be able read it as future reference. Downloadable files will become helpful to them even if they are outside the campus.

III. STATEMENT OF RESEARCH OBJECTIVES

The E-Learning System for Introduction to Programming using C Language aims:

1.5 To develop learning module that integrates multimedia presentation in the subject Introduction to Programming using C Language.

The proposed system can be a big help for the learning of students and it will help them in absorbing the entire concepts of Programming. The proposed system will integrate multimedia concept such as animation, sound, videos, and text. The system will catch the attention of the students as it becomes more effective tool in delivering the subject matter. One module of E-Learning is the incorporation of multimedia in which the students will be convinced with the subject being discussed.

1.6 To develop a cognitive learning module that supervises student's progression through reports.

The proposed system provides quizzes which includes pre and post assessment for the evaluation of student's performance. Teachers can now determine the progress of the student and can monitor the students if they have learned or not. The teacher will not have a hard time in preparing the quizzes and activity because the system will provide it. Teachers can now facilitate classroom teaching and can even monitor and evaluate students.

The system will have the pre assessment before proceeding to one of the topic in Introduction to Programming using C Language. If a student has finished the topic, he or she will be going to take post assessment. If he or she has passed the post assessment he or she can proceed to the next lesson. Otherwise, student who failed to pass the post examination will be going to take again the recent lesson. The lesson being presented to those who failed the post assessment will be easier than the first presentation. In this module, teacher will identify the slow learner and the fast learner.

1.7 To develop a cognitive learning module that would serves as supplementary learning tool.

By the system, the teachers could integrate additional information pertaining to the lesson being discussed. The proposed system will provide updated information about Introduction to Programming and provides very interesting topic as it conforms to the logic formulation. One book or one article from the library is not enough in grabbing information. Researcher will collect information from some other books, reference materials, and from the internet. Precise information can be vital in the effectiveness of the lessons. The proposed system aims to provide reference materials to the lesson which also include videos as well as current information. By an aid of videos and current information, the student will get more information about the subject Introduction to Programming and learned from it.

1.8 To develop a module that will provide downloadable files for the students.

The proposed system will provide downloadable files of each student taking the subject Introduction to Programming. With their student personal account on the proposed E-Learning, students can have a fully access on the lectures and can download files even when they are in their homes or outside the institution.

IV. PURPOSE AND SIGNIFICANCE OF RESEARCH

Like in a classroom setting, both learners and instructors have to play certain roles in an e-learning environment. These roles are vital, for they specify and clarify the responsibilities that are essential to guarantee efficient and rewarding learning experiences for both parties. In e-learning, students are encouraged to become independent learners. This only means that the learning experience does not solely depend on the instructor's efforts. Certain amounts of preparation must be done, and certain amounts of effort must be exerted by the student in order to productively contribute to online learning. [4]

E-Learning System for Introduction to Programming as a supplement in classroom can enhance students'

comprehensive learning ability. The proposed system would benefit the following:

- IT Teachers

The study will benefit the Teacher of Introduction to Programming using C Language, for it could serve as an alternative way of teaching and for assessing students' performance on the subject.

- College Students

The study will benefit the College Students for them to easily understand a certain topic in Introduction to Programming through the use of multimedia and graphical methods. They can also download files for their own reference.

- Parents

The study will benefit the Parents for it would give them satisfaction in terms of the education of their son/daughter.

- Researcher

Through the system, the researcher will be able to develop programming skills at the same time understanding the needs of his users. The ability of designing and analyzing a particular problem will be helpful for his continuous learning.

- Future Researchers

The study will be the basis of the future researchers to create their own educational e-learning software. The study will guide the future researchers on how e-learning will be achieved and deployed to the target beneficiaries.

- Higher Educational Institutions

The study will benefit the Information and Communication Technology Department of those schools in the Philippines as the first innovative venue for education. The institutions will benefit in terms of their marketing strategy. Parents will encourage enrolling their son/daughter to the institution and by the proposed system, the school will be known for a technological advancement.

V. FRAMEWORK AND FINDINGS OF PRIOR PUBLISHED RESEARCH

The Related Literature and Studies helps the researcher in formulating the conceptual framework. Through different existing studies, the proposed system will be modeled according to the design specifications and requirements. The researcher will synthesize the existing system and the proposed system.

1.9 Related Literature

1.9.1 E-Front: E-Learning Software

eFront is designed to assist with the creation of online learning communities while offering various opportunities for collaboration and interaction through an icon-based user interface. The platform offers tools for content creation, tests building, assignments management, reporting, internal messaging, forum, chat, surveys, calendar and others. It is a SCORM 1.2 certified and SCORM 2004 / 4th edition compliant system translated in 40 languages. [5]



Figure 1. eFront Admin Page

eFront is commonly included in lists of well-known open-source learning systems or is referred to as a Moodle alternative. Independent comparison matrices between learning management systems often favor eFront especially under usability characteristics.

Same with the eFront, the proposed system will integrate file management such as lessons, course and curriculum module. It will also include communication tools (such as calendar, forum, glossary), progress tracking, and report generators.

1.9.2 Ilias Learning Management

ILIAS is one of the first Learning Management Systems that have been used in universities. A prototype has been developed since end of 1997 within the VIRTUS project at University of Cologne. On November 2, 1998 version 1 of the learning management system ILIAS was published and offered for learning at the Cologne faculty of business administration, economics and social sciences. Due to increasing interest of other universities, the project team decided to publish ILIAS as open source software under the GPL in 2000. Between 2002 and 2004, a new ILIAS version was developed from scratch and called "ILIAS 3". In 2004, it became the first open source LMS that reached full SCORM 1.2 compliance. SCORM 2004 compliance has been reached with version 3.9 in November 2007. [6]



Figure 2. Screenshot of Ilias Learning Management

The idea behind ILIAS is to offer a flexible environment for learning and working online with integrated tools. ILIAS goes far beyond the idea of learning being confined to courses as a lot of other LMS do. ILIAS can rather be seen as a type of library providing learning and working materials and contents at any location of the repository. This offers the possibility to run ILIAS not as a locked warehouse but as an open knowledge platform where content might be made available for non-registered users too.

Compared to Ilias, e-learning for TIST has a flexible test system where time based tests can be created with multiple choice, single choice, allocation questions, close questions, and identification. E-Learning for TIST is a powerful web-based learning application where every user has comprehensive downloadable lectures, keep notes, and bookmarks.

1.10 Related Studies

1.10.1 Implementing e-learning in the Jordanian Higher Education System: Factors Affecting Impact

The increased involvement of technology in all aspects of our lives places educational institutions under pressure to include these aspects at the heart of their learning. This ensures that they continue to be competitive in a constantly changing market with international and cultural links. This study explores the factors that influenced the development of learning through technology at two Jordanian universities, focusing on full-time staff and students. It considers the general attitude towards engaging in learning through technology with outcomes demonstrating that training and development is required prior to implementation to adequately support the learning transition. The organizational infrastructure often presents the greatest barrier to such developments. Informed by the outcomes of the study, a training and development programed has been designed, developed and implemented to support the cultural change and increase its impact.

This study focused on the abilities of full time students and faculty members of Al-Zytonah and the Applied Science Universities in Jordan to successfully engage with e-learning programs. The research investigated the technological factors that could influence the involvement of both groups in participating. It also explored their attitudes and readiness to integrate learning through technology into their learning experiences. Outcomes demonstrated that students in Jordan need to increase the level of their technological skills to significantly benefit from the opportunities offered by e-learning. Considerable preparatory support is required to ensure that faculty and students feel adequately and appropriately supported in their individual learning processes. Further studies could be undertaken to explore the strategic and operational opportunities focusing on technological readiness, skills and attitudes alongside cultural influences before e-learning can have a significant impact to influence changing practices within the Jordanian student learning experience. [7]

The proposed system will be patterned to the research presented above. The greater needs of e-learning in TIST will be the same needs as of Jordanian Higher Education System. Engaging with an online technology helps the students to perform abilities in learning the subject matter.

1.10.2 Best Practices for Creating E-Learning

Instructional theorist Robert Gagne, developed nine events of instruction that when put together, make up a practical process for effective learning. Most instructional design is based on these events and the process is widely used in teaching practices. These principles of instruction should also apply in any design of e-Learning. Gagne's Events of Instruction adapt exceptionally well in e-Learning design. When all of the Instructional Principles are put together into one course, the end result is a compelling and solid learning package that will motivate learners and achieve the desired results. These best practices address each of the Events of Instruction in a way that will provide guidelines for applying sound instructional principles to e-Learning. [8]



Figure 3. Gagne's Nine Events of Instruction

5.2.2.1 Gaining Attention – While using effective means of gaining and holding learners' attention is important throughout a course, it is particularly so at the beginning of a course. Instructional designers will often use a Flash presentation as it can provide all the components mentioned.

5.2.2.2 Objectives - Well constructed and presented learning objectives provide both guidance and motivation. Learning Objectives in e-Learning are no different than for traditional instructor-led training. The most important things to remember are:

- Learners should be informed of the objectives before the lesson begins.
- Ideally objectives would accompany the lesson/course outline.
- Learning content presented should provide all the information needed to meet the objectives.
- Assessment questions should be based on and test against the learning objectives.
- With e-Learning, prescriptive learning can be constructed based on the learning objectives.

5.2.2.3 Stimulate Recall – Stimulating recall of prior learning provides the learner with a sense of personal relevance and stimulates motivation.

5.2.2.4 Presenting Content - Presentation of content (subject matter) is where traditional Instructor-Led Training (ILT) and e-Learning differ greatly. In the absence of an instructor, e-Learning designers must rely heavily on the content presentation of their lessons. The way in which content is presented in e-learning, and especially with a "Page-Based" development application such as Trainer is of prime importance and can "make or break" a course.

5.2.2.5 Learning Guidance - Wherever possible, additional guidance should be provided to the learner to facilitate recall. E-Learning is perfect for providing any of the learning guidance strategies, especially anything of an interactive nature.

5.2.2.6 Elicit Performance – It is important to elicit learner performance by providing the opportunity to practice new skills and confirm understanding. This should happen at the end of each section/topic/lesson, before going on to a new one. E-Learning enables a variety of dynamic, interactive, and "hands-on" practice opportunities, such as:

- Interactive Questions
- Controlled Simulations
- Real on-the-job Activities

5.2.2.7 Feedback - Providing formative feedback to learners within the context of practicing new skills and behaviors is crucial to confirming understanding. This is even more important within e-Learning in the absence of instructor feedback, which is largely dependent on the practice activity involved.

5.2.2.8 Assessment – As with any instruction, e-Learning should give learners the opportunity to assess their knowledge. It is important to remember the following points:

- Assessment/Test questions must be used to test against the objectives set for the lesson/course.
- Assessment/Test results should include remediation to guide the learners in areas where they may need to reinforce or review their knowledge.
- Assessments/Tests should provide the learner with their resulting scores. Scoring can trigger the delivery of a certificate for print, if appropriate.

5.2.2.9 Enhance Retention - To enhance a learner's retention so that they may transfer new knowledge and skills to their jobs can be achieved in a variety of ways in e-Learning. For example, repetition of content can be achieved in creative ways, such as simulations/activities that first show the learner, then let them try for themselves.

Integration of Gagne's Nine Events of Instruction will be the basis of the proposed E-Learning for TIST. The nine events of instruction will help the researcher in designing the system and analyzing the needs for supervision of learning. Through this theoretical concept, students can gain and retain information to their minds.

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