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Table of Contents – July 2014

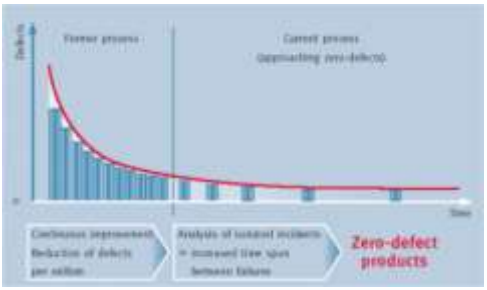
Return to Table of Contents

Editorial

Zero Defects

Donald G. Perrin

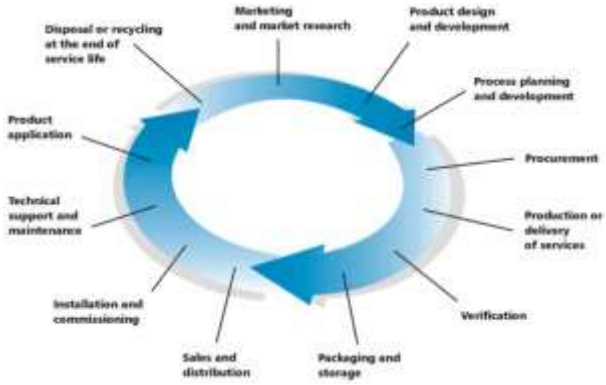
Critical processes such as construction of spacecraft require Zero Error programs: All errors must be detected, known, and resolved. Measures are required to avoid repeated errors. Zero defects criteria should be applied to critical areas of education to ensure that criterion performance is achieved.



Zero defects products - Infineon Technologies – www.infineon.com

The first requirement is feedback. Students can be a part of the error correction process is they receive feedback on all of their tests, projects and assignments. In education we do not provide adequate feedback; instead, we assign a score or letter grade. A better approach is to set criteria for every critical objective and continue learning until the criterion is reached. It may be argued that education does not have the resources to provide this level of support. A better response would be to ask the question: Can we afford not to?

There is a lot of replication in the education al process. Instructors teach the same lessons year after year and in K-12 thousands of instructors teach the same lesson. If we pooled some of this effort to produce instructional materials, we could improve teaching and learning. It is faster and less expensive to upgrade instructional materials than continually retrain teachers. Also, web technologies and hyperlinks would make the latest resources available globally to millions of students.



Zero defects production cycle - Arnold-uk.com

Industry once used a measure called Mean Time Between Failures (MTBF). On large and complex systems like airplanes or computer programs there is always a long list of items to be fixed. MTBF was later changed to include only failures that significantly impacted safety or performance. Education needs to know which learning objectives are critical. Computer based learning and learning management systems create a plethora of performance data that can be used to assess effectiveness and support continuous quality improvement in the same way that marketing data is collected over the internet.

Education should continually conduct needs assessments to determine what learnings are critical for graduating students. Education needs to set exacting and relevant standards with superior diagnostic, learning, feedback, and support systems to complete the learning process for criterion performance.

Return to Table of Contents

Return to Table of Contents

Editor's Note: Role playing, discovery, and empathy are powerful tools to engage students in the rich learning environments offered by virtual worlds. Adventure games come very close to real life experience in many instances, and the skillful teacher can enhance what is learned by individual or group participation.

Instructional tendencies of aspiring teachers creating their first lesson plan incorporating virtual worlds

Steven E Downey
USA

Abstract

Virtual worlds, such as Second Life, represent one of the fastest growing segments of the gaming industry, and they are also rapidly increasing in usage as educational delivery environments. This article presents the findings from a project that examined the content of 91 lesson plans created by aspiring teachers as they created their first lesson plan incorporating a virtual world. The findings show that aspiring teachers frequently employ inquiry learning methods in their learning activities and expressive, creative techniques for their assessment methods. Using insights gained from this and related research, teachers/educators can better design instruction that recognizes the tendencies of aspiring teachers and shapes them into effective, formalized, instructional techniques which are appropriate for their delivery environment, i.e., virtual worlds.

Keywords: virtual worlds, teacher education, instructional design, lesson plans, training, aspiring teachers, novice designers, tendencies, challenges

Introduction

Virtual worlds represent one of the faster growing sectors in the global gaming industry (Business Insights, 2011). Similarly, there is an ever-growing array of online courses and academic services from small and large institutions alike, who are utilizing virtual worlds. A quick search on the Internet finds a large collection of courses at numerous top-ranked universities that have a virtual world presence (SimTeach, 2011). Given their increasing usage as educational platforms, there is a growing need to train educators on how to design instruction that effectively incorporates virtual world content into their lessons.

Significantly different from their Web-based cousins, virtual world environments possess unique characteristics that facilitate learning, and at the same time pose distinct challenges to instructional designers (Dempsey, Reese, & Weston, 2011). From a facilitation perspective, virtual worlds enable learners to immerse themselves into their curriculum (Bardzell & Odom, 2008); and, in doing so, learners encounter an experience-based form of learning (Jarmon, Traphagen, Mayrath, & Trivedi, 2009; Downey, in press-a). Given their open, massive multi-person nature, virtual worlds facilitate social interaction and collaboration, versus learning in isolation (Steinkuehler & Williams, 2006; Dawley, 2009).

Virtual worlds also possess unique challenges when it comes to designing and delivering instruction. Foremost among these is the complexity in creating models, texture mapping, scripting, etc. needed to create engaging, interactive, in-world content (Berge, 2008; Downey, in press-a). In addition, the time needed for learners to orient themselves to a virtual world is much longer than with Web-based environments (Bedford, Birkedal, Erhard, Graff, & Hempel, 2006; Lui, 2006). Finally, learners must be more responsible for their time-on-task as it is easy to get distracted in the virtual world (Hansen, 2008).

While there is a variety of research examining the educational affordances of virtual worlds (Chang, Gutl, Kopeinik, & Williams, 2009; Dalgarno & Lee, 2010; Dickey, 2003; Girvan &

Savage, 2010), much of the instructional content in virtual worlds to date lacks pedagogical underpinnings (Savin-Baden, 2008). As such, there is a strong need to train current and aspiring educators in instructional techniques appropriate to these settings. Recognizing this need and acknowledging that for all of their recent growth, virtual worlds are still a little-known technology for most educators, the researcher (for the sake of this article) has set out to examine how aspiring teachers would go about learning how to use virtual worlds, and then how to integrate them into an instructional lesson plans. In doing so, the research described in this paper seeks to better understand the tendencies of aspiring teachers as they (i) learn about and adopt new technologies, such as virtual worlds, and (ii) learn to develop lesson plans integrating new technologies.

Purpose, scope, and research questions

The purpose of this research is to establish baseline measures for instructional tendencies employed by aspiring teachers as they learn to create instructional lessons incorporating virtual worlds. By understanding their tendencies and pedagogical preferences, teachers/educators in higher education programs can adapt their own instruction to better train aspiring teachers to utilize and effectively design instruction for massive multi-person online environments.

In terms of scope, this paper focuses purely on identifying trends and tendencies in instructional design practices employed by novice educators during their initial stages of adoption (Rogers, 1995; Hall, Loucks, Rutherford, & Newlove, 1975) as they learned to use virtual worlds and design lessons for these online environments. It is not within the scope of this paper to evaluate which methods are most/least appropriate and/or effective in terms of learning gains; nor is it in the scope of this paper to measure the rates of adoption cycles experienced by teachers over long periods of time.

Bearing this in mind, the research questions guiding this study target three different critical elements in instructional plan deliver – presentation, learning activities, and assessment methods. As such, the specific research questions were asked:

> What is the nature of the virtual world lesson plans created by aspiring teachers (e.g., discipline focus, learner roles, etc)?
>
> What instructional practice tendencies are employed by aspiring teachers as they incorporate learning activities into their lesson plans?
>
> What instructional practice tendencies are employed by aspiring teachers as they define assessment methods to be used in their lesson plans?

To answer these questions, the content of 91 lesson plans were analyzed for recurring themes and unique contributions in each of the key areas – presentation, activities, and assessment. The findings from these analyses are presented below.

Significance

During the 1990s when the education field began its rapid adoption of Web-based instruction, the field went through a long and costly trial-and-error process when it came to learning of how to design migrate instructional design and teaching practices from the traditional classroom, to a Web-based environment. Education sits at a similar crossroads today – virtual worlds are seeing rapid adoption by educational institutions, yet very few educators understand how to design engaging and effective lessons for the virtual world platforms being currently adopted by education institutions.

The findings put forth in this work emerged from a line of research informing educators in teacher preparation programs about the early adoption practices, and instructional design tendencies and behaviors their pre-service teachers are likely to demonstrate as they learn how to develop virtual

world based instructional lessons. Using this knowledge, program educators and administrators can design more effective instruction to aid their aspiring teachers in adopting virtual world technologies, and using those technologies for producing engaging and effective learning experiences for their own classrooms and online programs.

Underlying frameworks

As part of the work associated with this project, participants underwent a simultaneous adoption processes: adoption of a new technology (i.e., virtual world environments) and adoption of an instructional framework for designing virtual world lessons. Researchers, in turn, were interested in observing demonstrations of change, as documented in the content of the lessons designed, as the individuals went through different stages of adoption with these innovations.

As a point of clarification, it should be noted that when discussing innovations and their adoption, many readers often have the preconceived notion that innovations are hardware and digital technologies. Many fail to recognize innovations as being broader in nature, i.e., new procedural practices. To address this point, Everitt Rogers (1995) in his classic text, *Diffusion of Innovation*, writes "an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 11). Bearing this in mind, the suitability of the adoption three frameworks presented below should be more apparent.

Frameworks explaining levels of adoption by users

Each of the following three frameworks examines how innovations are adopted by individuals into their daily lives. Everitt Rogers' Stages of Adoption is a preeminent model in the field; however, it is not specific to educators. Ertmer's Barriers to Change and Hall et al.'s Levels of Use, conversely, are adoption models specific to educators. For the purpose of presenting a holistic view of the innovation adoption process, all three models are presented below.

During the 1990s, Peggy Ertmer identified first- and second-order barriers to change encountered by teachers as they began integrating new technologies into their instruction. According to Ertmer (1999), first-order barriers stemmed from factors external to the teacher (e.g., access to an innovation, training, etc) and second-order barriers related to internal factors (e.g., beliefs, values, etc). The work described in this paper, and the underlying frameworks affecting this work, relate to those issues described by Ertmer as first-order barriers to technology adoption. In particular, researchers were interested in observing what tactics and tendencies participants demonstrated in their lessons as they encountered first-order barriers during the early stages of the adopting process.

Rogers (1995) describes the adoption process as the process by which innovation is communicated through certain channels over time among members of society. Through this process, individuals undergo change in knowledge and perception as they pass through five stages of adoption (Rogers, 1995): Knowledge, Persuasion, Decision, Implementation, and Confirmation. Gene Hall, Susan Loucks, and others employed a model similar to Rogers' as they examined technology adoption specifically by educators. Over the span of 20+ years, they developed and refined their *Concerns-Based Adoption Model (CBAM)* which includes an eight stage Levels of Use protocol for articulating an individual's progress towards adoption of an innovation (Hall & Hord, 1987; Hall, et al., 1975; Loucks-Horsley, 1996; Loucks-Horsley & Stiegelbauer, 1991). A comparative summary of Rogers' Stages of Adoption and Hall's et al. Levels of Use frameworks are provided in Table 1.

Table 1
Comparison of activities in Rogers' and Hall's adoption process models

Rogers (1995) stages of adoption	Hall, et al. (1975) levels of use
Knowledge: User is exposed to an innovation and gains some understanding of how it functions	Level 0 (Non-Use): User has little or no knowledge of the innovation
Persuasion: User, through his/her early experiences, forms a favorable/unfavorable opinion of the innovation	Level I (Orientation): User is acquiring/has acquired information about the innovation
Decision: User engages in activities that lead to the choice to adopt or reject the innovation	Level II (Preparation): User is preparing for first use of the innovation
Implementation: User puts an innovation into actual use. "Until the implementation stage, the innovation-decision process has been strictly a mental exercise" (Rogers, 1995, p. 172).	Level III (Mechanical Use): User focuses on short-term use and basic production
	Level IV-A (Routine): Use of the innovation is stabilized; little thought given to its improvement
	Level IV-B (Refinement): Use is varied to increase impact on individuals within user's influence
	Level V (Integration): User combines own efforts with innovation with that of colleagues
Confirmation: User seeks information to reinforce the adoption decision s/he made earlier	Level VI (Renewal): User re-evaluates innovation and seeks major modifications to increase impact

As discussed later, the overwhelming majority of participants in this project began at the lowest level (i.e., had little/no knowledge or prior experience with virtual worlds). As they conducted their lesson plan development work, participants progressed through varying levels of use/adoption. This progression is reflected in the quality and nature of the work produced in the lesson plans.

It should be noted that while other prominent models of technology adoption exist – for example Venkatesh's *Unified Theory of Acceptance and Use of Technology*, UTAUT (Venkatesh, Morris, Davis, &Davis, 2003) and Davis's *Technology Acceptance Model*, TAM (Davis, 1986; Davis, Bagozzi, & Warshaw's 1989) – they tend to focus on the long term adoption process (i.e., participants reaching through the Confirmation / Renewal levels) versus initial changes of users (i.e., those traits demonstrable in the early levels of use/adoption). Given that this project focused only on the early stages of adoption, and the behaviors and tendencies demonstrated by aspiring teachers in those early stages, these frameworks were set aside for use with later, longer-term projects planned for future research.

i-MMOLE instructional framework for lesson plans

Lesson planning is a critical skill for educators (Brittin, 2005). Lesson plans serve the dual purpose of being a conceptual map of instructional elements (e.g., goals, readings, equipment, etc) as well as a procedural guide for the delivery of the actual lesson itself. Because of its integral nature to the instructional cycle, the lesson plan creation process is an ideal opportunity to examine how individuals transform conceptual ideas of a domain to the practical delivery of a lesson to students.

Implementation of the i-MMOLE instructional framework (Downey, 2011-a, 2011-b) has been influential in developing virtual world lesson plans, and is comprised of the second element for change. It is through these lesson plans that participants demonstrate their instructional tendencies (e.g., learning activity types, predominant assessment methods, etc.) as well as their varying levels of use/adoption described above.

The instructional framework for massive multi-player online learning environments (i-MMOLE) was developed in recognition of the unique instructional requirements and affordances associated with virtual world environments, and the acknowledgement that current instructional design models provide insufficient guidance in devising lessons that incorporate virtual world environments (Downey, in press). i-MMOLE incorporates multiple learning theories and basic game design practices into its framework.

i-MMOLE is comprised of five phases with each phase addressing a separate component of the overall lesson, see Figure 1. Connecting each of the phases together is an on-going "learning quest." Not unlike quests used in virtual world games, learning quests challenge learners with focused problems, presentation of new materials (either in-world or out-world), and engages the learner in experience-driven activities. From the teacher's perspective, i-MMOLE provides guidelines for each of the phases and how to tie them all together into one cohesive lesson plan.

Five phases of i-MMOLE

Establish a context – establish a setting in which learning is occurs – location, era, learner role – and a learning quest (e.g., problem with clear goal) that generates curiosity in the learner

Investigate underlying concepts – examine readings, videos, and other materials to investigate core elements associated with a student's learning quest

Provide experiences & construct knowledge – create (or utilize existing) in-world content and simulations that learners can *experience* and subsequently devise solutions/insights related to their learning quest

Assess knowledge – utilize in-world and/or out-world tools for demonstrating and sharing knowledge, testing solutions, and assessing knowledge for the learning quest

Follow-up & expansion – extend the knowledge gained during the learning quest activities such reflective learning or transferring of learning to new contexts by bridging the current learning quest to a new quest in a new setting or using a new perspective

Figure 1. Description of the purpose and nature of the five phases of the i-MMOLE framework (Downey, 2011-b)

Methods

The research presented in this paper employs primarily qualitative procedures to analyze the data (i.e., lesson plans) and identify prominent trends and unique findings necessary to answer this study's three research questions. In producing the lesson plans used in this study, undergraduate students from a large university in the southeastern United States participated in a 3-hour instructional session as part of their teacher preparation coursework. During this session, students were instructed on (a) basic components of instructional lesson plans and (b) basic navigation, search, and interaction methods for a prominent virtual world environment, Second Life. The product of this session was the students' creation of individual lesson plans for use by the general public. It is these lesson plans that are the focus of this research study.

Sample group characteristics: Prior knowledge & experience to lesson plan creators

The lesson plans analyzed as part of this research were produced by undergraduate students who are aspiring teachers, but are not yet fully enrolled in a teacher educator program. These students are required to complete a state-mandated course, *EME 2040: Introduction to Educational Technology,* as part of their preparation for entering a teacher pre-service program. The majority of the content in EME 2040 focuses on production software (e.g., Microsoft Office), multimedia applications (e.g., audio recording), and Internet resources (e.g., search engines, podcasting). The remainder of the course addresses locating and assessing existing instructional materials online (e.g., Webquests).

No formal instruction in lesson plan creation or instructional design practices are provided, except for the module on virtual worlds. With regard to virtual worlds, themselves, over 85% of the participants had no experience with virtual worlds prior to the instruction they received as part of the EME 2040 module used in this study.

Instructional intervention

As part of the instruction in their EME 2040 course, students engaged in a three-hour, face-to-face, instructional session addressing (a) basic components of a lesson plan and (b) basic navigation, search, and interaction operations of Second Life. The first 90 minutes were dedicated to learning how to navigate and interact in Second Life, as well as how to conduct searches and find topics and locations of interest in-world. Following this, there was a 15 minute break with the remaining 75 minutes allocated to studying lesson plan creation and brainstorming ideas for instructional activity. All of the instructional sessions were conducted by the same guest lecturer.

Upon completion of the session, students were given two weeks to continue their explorations of Second Life and/or another virtual world of their choosing. During this time, they found in-world content (e.g., simulations, museum exhibits, etc) to incorporate into their lessons. Using their in-world content, students then developed a lesson plan for submission. Given that the majority of the students' Second Life explorations and lesson plan creation work were to occur on their own, students were provided job aids for (i) conducting in-world searches, (ii) addressing key issues/items in each of the five phases in their instructional framework; and (iii) procedural guidelines for submitting their final lesson plan to an online database via the Web.

Data collection & cleaning

Using the handout provided to them, students created user accounts and submitted their lesson plans to the *Worlds of Education* Lesson Plan database via the Web (http://www.coedu.usf.edu/we/). The *Worlds of Education* database provides a template that follows the i-MMOLE instructional framework into which students could copy, paste, and edit their instructional lesson. Upon entry into the system, students could review their lessons and make edits where desired. The lessons submitted for final approval were then reviewed for inclusion in this paper.

Screening/cleansing of lesson plans

A total of 125 lesson plans were submitted by aspiring teachers during this project. A few of those teachers indicated they did not want their lessons to be publicly accessible (15 out of 125, 12.0%). These lesson plans were removed from the data set and only publicly accessible lesson plans were analyzed. To ensure that only fully completed lessons were included in this work, all lessons were reviewed for completeness and those lessons missing significant content (e.g., one of the five phases was left blank) were removed from the data set. A total of 19 incomplete lessons (17.3%) were removed from the 110 publicly accessible lesson plans; thereby leaving 91 public, complete, lesson plans for analysis.

Content analysis of lesson plans

Prominent themes and tendencies within the 91 lesson plans reviewed were derived by following the basic procedures outlined in Patton's (2002) *Qualitative Evaluation and Research Methods*. The themes and tendencies appearing in the Findings section were derived from inductive analysis of the participants' actual statements. In accordance with Patton's guidelines, the themes emerged two ways—as Indigenous Concepts and as Sensitized Concepts (Patton, 2002, 452 - 457). Indigenous Concepts use the participants' actual words. Whereas, Sensitized Concepts use terms assigned by the research that are intended to encapsulate the respondent's meaning. Where possible, indigenous concepts were used; however, for conciseness' sake, participant responses expressed over the range of several sentences frequently were consolidated into a single term. Lessons were randomly selected for reading by multiple reviewers to mitigate the potential for research bias. Variations between readers' analyses typically took the form of semantic phrasing of labels for themes versus more critical conceptual interpretations of the participants' narratives. Once themes were labeled, frequency counts were conducted and prominent tendencies were identified and reported.

Limitations

This research establishes baseline measurability. There is not enough data to establish trend changes as participants become more sophisticated – both in their use of virtual worlds and in their creation of lesson plans. Therefore, while the results in this paper might be generalizable to other aspiring teachers learning to use virtual worlds, they may or may not apply to individuals with more advanced experience.

Second Life was the virtual world of choice in 92% of the lesson plans examined. This is due in large part to most of the participants not having prior knowledge or training in other virtual worlds. As exposure to and knowledge of other virtual worlds increases, aspiring teachers of the future may demonstrate different behaviors, tendencies, and choices in virtual world selection as they move through the stages of adoption/use.

Finally, as the worlds themselves change, the features and affordances of the worlds will affect educators' abilities to readily adopt and adapt these worlds for use as instructional platforms. This would likely include affecting the creation, complexity, and nature of their instructional lessons.

Findings

The term "virtual world" is applied and misapplied frequently in mainstream media and educational research (Downey, in press). To clarify its use in this article, and to eliminate the range of online environments to which findings in this paper should be applied, the following definition of virtual worlds is offered to assist researchers and practitioners in determining where the findings of this paper could be and shouldn't be applied:

Virtual worlds are massive, persistent, multi-dimensional graphical environments in which people establish in-world personas (avatars), and come together in real time to form communities to interact – whether it be to play, socialize, learn, etc. (Downey, in press).

With the above definition in mind, it is reasonable to see how the findings from this work could be applied to environments such as Second Life, Whyville, Minyanland, etc. Conversely, the following findings should not be extended to include environments such as Facebook, Twitter, and other social spaces frequently associated with, and labeled as, virtual worlds as they do not possess all of the traits associated with virtual world spaces, e.g., graphical interfaces, avatars.

Research question #1:

What is the nature of the virtual world lesson plans created by aspiring teachers (e.g., discipline focus, learner roles, etc)?

The findings for this research questions were heavily influenced by the virtual world experience levels of the aspiring teachers and the general make-up of the content in the virtual world Second Life. Less than 15% of the lesson plan creators had experience with virtual worlds prior to receiving instruction as part of their EME 2040 course. Consequently, few knew of the hundreds of other virtual worlds that exist, much less the nature and make-up of the content in those worlds. As a result, 84 of the 91 lesson plans created used Second Life, the virtual world in which they received their EME 2040 instruction, as the setting for their virtual world lesson plan. World of Warcraft (three lessons), Whyville (three lessons), and Club Penguin (one lesson) were the other virtual worlds used.

With regard to the selection of disciplines and topics to target in their lessons, designers stated that personal interest and realism/authenticity were factors in their decisions. In addition, the make-up of the content in-world directly affected the topic choices made by novice designers. Within Second Life, it's easy to find an array of historical recreations, scientific models, etc., as compared to finding materials suitable to the study of math and mathematical concepts. As a result, the initially surprising finding of zero lessons addressing mathematics is partially explainable, see Table 2.

Table 2
Disciplines addressed by the lesson plans

Discipline	Total Lessons
Science	41
Social Studies	33
Art, Music & Theatre	12
English/Language	5
Math	0

Table 3
Learner role in lessons

Learner Role	Lessons Used
Scientist-Physical	13
Explorer	5
Scientist-Social	5
Time Traveler	5
Educator	4
Non-Human	4
Artist	3
Travel Agent/Tour Guide	3
Museum Curator	2
NASA Employee	2
Scuba Diver	2
Zoo or Aquarium Employee	2
Other (1 instance each)	11

Given that virtual worlds facilitate users taking on a role while in-world (e.g., explorer, mage, etc), lessons were examined to see if/how the nature of the learners' roles varied from lesson to lesson. In two-thirds of the lessons (61 out of 91 lessons, 67%), learners took on the role of various scientists, artists, scuba divers, etc., see Table 3. The remaining 30 lessons did not have learners taking on a role. When compared with results from other research that examined how established (i.e., in-service) teachers designed lessons incorporating virtual environments, the ratios were exactly opposite with only 34% of lessons from in-service teachers utilizing role playing and 66% ignoring this aspect of virtual world affordances (Downey, 2013). On a related front, pre-service teachers also were more likely to incorporate the notion of travel time in their learner experiences (16 of 91 lessons, 18%) as compared to in-service teachers (4%). Explanations for these variances are still uncertain. Follow-up discussions and related research outside of this study have yet to ascertain consistent rationales among the two groups of educators for why they do or do not use role play in their lesson designs.

Research question #2:

What instructional practice tendencies are employed by aspiring teachers as they incorporate learning activities into their lesson plans?

In the majority of the lessons created, aspiring teachers employed partial/pseudo inquiry learning methods. That is to say, they did not strictly follow the Inquiry-Based Learning model (National Research Council, 1995), but they did employ several of the techniques associated with this form of instruction – making observations, recording events, etc., see Table 4. In a few instances (8 of 91 lessons, 8.8%) learners were even instructed to generate hypotheses based upon their observations. This is partially explainable in that 41 of 91 lessons (45%) targeted a science discipline. However, it is still somewhat surprising in that so many of these aspiring teachers mimicked the Inquiry-Based Learning model given that none of them had yet been admitted to a teacher training program in which they would receive some formal training in learning theory and/or instructional design. Speculations as to this phenomenon are provided in the Discussion section, below.

Table 4
Instances of instructional techniques in learning activities

Activity type	Occurrence in lessons
Observations	79
Record Events (Screen Shots)	46
Research (Fact Finding)	45
Guided Questioning	11
Generate Hypothesis	8
Role Play	5
Collaborative Learning	4
Other	

The overwhelming majority of the learning experiences presented in the lesson plans from aspiring teachers were designed for individualized learning. Only four (4) lessons incorporated collaborative learning practices. This lack of group interactions and collaborations is interesting given that virtual worlds have built a lot of their success upon the social nature of these interactive environments. Yet, very few lesson plans from pre-service creators capitalized upon the collaborative affordances of virtual worlds. Related research shows a higher percentage of collaborative learning activities in lesson plans from in-service teachers (58%) versus those from pre-service teachers (Downey, 2013). A partial explanation of this discrepancy is the fact that in-

service teachers have had greater opportunity to see the positive effects of collaborative learning and, subsequently, are more likely to incorporate this element into their lessons versus their pre-service counterparts.

Research question #3:

What instructional practice tendencies are employed by aspiring teachers as they define assessment methods to be used in their lesson plans?

In developing their lesson plans, participants were asked to conceptualize and describe an assessment befitting the content and context of the materials in their lesson. They were not required, however, to develop the entire assessment instrument. That is to say, they could describe a quiz (i.e., identify topics) that could be given to students, but they did not have to write the individual quiz questions. This approach was taken for two reasons. First, since this was their first attempt at creating lesson plans, participants were to focus on the plan as a whole versus focusing on the minutia of an individual section of the plan. Second, since participants had not entered their formal teacher training programs, they did not have any formal training in measurement and assessment with which they could develop formal assessment devices. With the above thoughts in mind, the following narrative summarizes the tendencies of aspiring teachers as they tried to define assessments for use within their lesson plans.

Given their lack of experience and training in conceptualizing and developing instructional assessments, one might expect that aspiring teachers would fall back on traditional methods of assessment that they experienced during their own studies – e.g., quizzes, exams, workbook sheets, etc. Surprisingly those types of assessment methods appeared infrequently. Instead, they demonstrated at tendency to employ expressive and creative methods of assessment (e.g., writing, presentations, creation of artifacts, etc.), see Table 5.

Table 5
Instances of instructional techniques in learning activities

Assessment Method	Lessons Used
Writing	48
Give Presentation	30
Create [an Artifact]	26
Assigned Questions	10
Collaborative Learning	6
Discussion	4
Quiz/Test	4
Other	2

In addition to examining the method of assessment, the location of the assessments, were also noted. Nearly all assessments took place outside of the virtual world. Of the lessons examined, ‘give presentation’ was the only assessment method that occurred in-world and those instances were very few. Typically, presentations were delivered in a traditional classroom setting. While it is understandable that these novice virtual world participants would not expect prospective users of their lesson plans to create in-world artifacts, e.g., reproductions, simulations, etc., as part of an assessment, it was a little surprising that more lesson plans didn’t have their assessment discussions and presentations occurring in-world. Finally, as a point of clarification, the “Create [an Artifact]” category pertained to the creation of out-world artifacts such as portfolios, posters, sketches, diagrams, etc., and does not allude to the creation of in-world artifacts.

Discussion

Just as what occurred with the Web during the early/mid-1990s, virtual worlds represent an emerging venue for designing and delivering instruction. As was also the case with the Web during the 1990s, new forms of instructional design must be devised to fit the affordances of this emerging venue. The development of instructional design knowledge and skills befitting these various venues is especially imperative for new and aspiring teachers as they may need to design lessons for face-to-face, Web-based, virtual world, and other venues as new technologies emerge throughout their careers. This paper examines the nature and instructional tendencies found in lesson plans created by aspiring teachers as they are (i) introduced to a new technology for instructional delivery, i.e., virtual worlds, and (ii) receive some of their earliest instruction on how to design lessons – in particular how to design lessons incorporating virtual world environments.

The creators of the lesson plans included in this study, were quick to recognize the potential for learners to immerse themselves into the roles and lives of different individuals throughout time. Learners could take on the role of more than a dozen vocational types from the present as well as the past. In developing the above role playing scenarios, lesson creators were very creative in the scenarios and activities learners were to experience and the products learners were to produce as a result of their lesson. These aspiring teachers were equally creative in the forms of assessment outlined in their lessons. Surprisingly, they did not rely on traditional paper-in-pencil based assessments (e.g., quizzes, workbooks), but instead sought to use more creative, expressive forms of assessments (e.g., portfolios, presentations, and role plays).

One of the most unexpected findings was the highly frequent use of inquiry learning methods in lessons – even if those lessons did not target scientific fields. Part of this finding is explainable by the nature of the work being conducted by participants as they went about orienting themselves to their virtual world. That is to say, as they were undergoing the adoption process – i.e., Roger's (1995) Stage 4 and Hall's et al. (1975) Level III – and were gaining an understanding of the instructional potential of virtual worlds, they would have been making a lot of observations, recording of ideas, and hypothesizing of instructional scenarios as they progressed from one stage/level of use to another. Subsequently, these behaviors are reflected in their own works as well. It also is possible, albeit speculative, that they are mimicking methods they've observed in their own studies given that most of the participants were college sophomores and would be completing their general education science requirements. Additional research will be needed to observe if this trend continues and/or to identify its underlying cause.

As much as inquiry learning was noted in the lessons, one of the most prominent traits of virtual worlds, synchronous collaboration of users, was rarely observed as an instructional method in the lesson plans. Only four (4) lessons employed collaborative learning experiences (i.e., Phase 3 activities) while in-world and only six (6) lessons used collaboration in its assessment (Phase 4) activities; and all six of those assessments took place outside of the virtual world. This again would appear to be a reflection of the participants' experience levels and progress towards adoption of virtual world environments. As participants continued their progression – i.e., reaching Roger's (1995) Stage 5 and Hall's et al. (1975) Level VI – their depth of knowledge regarding an innovation would increase as would their knowledge of how to employ that innovation in new and imaginative ways.

In terms of applying these findings to designing and delivering effective teacher training service, educators can readily apply four lessons learned to their own programs in order to improve the instruction their students are receiving. These lessons learned are:

> Provide more hands-on sessions (spread over time) for learners to gain experience in using virtual worlds, and to further understand how they might be used to support various instructional methods.

Focus on how to incorporate in-world assessments into lessons. The longer students can remain in-world, the more immersed they can become in their learning. As such, lesson plan creators need more assistance for creating in-world learning assessments.

Demonstrate and provide learning experiences for students to observe and practice synchronous collaborations in-world (e.g., group dungeons in World of Warcraft). The more they observe the collaborative potential of virtual worlds, the more likely they will be to incorporate synchronous collaborative elements into their own lessons.

Give assistance in efficiently searching for in-world content versus just browsing and randomly exploring. Although not documented in their lesson plans, it was observed during the project that students appear very willing to investigate worlds on their own time but that willingness wanes as their frustration in locating in-world content grows.

By better understanding the tendencies and preferences of teachers, both novice and experienced, as they adopt and adapt virtual world technologies into their instruction, new and more effective instructional design guidelines and teacher training practices can be developed and refined. Through these enhanced practices, teachers can be better trained to produce and deliver lessons that are more advanced, engaging, and effective.

References

Bardzell, S., & Odom, W. (2008). The experience of embodied space in virtual worlds: An ethnography of a Second Life community. *Space and Culture, (11)*3, 239.

Bedford, C., Birkedal, R., Erhard, J., Graff, J., & Hempel, C. (2006). Second Life as an educational environment: A student perspective. *Proceedings of the First Second Life Education Workshop* (pp. 25-27). San Francisco, CA.

Berge, Z. L. (2008). Multi-user virtual environments for education and training? A critical review of "Second Life". *Educational Technology Magazine, 48*(3), 27-31.

Brittin, R. V. (2005). Pre-service and Experienced Teachers' Lesson Plans for Beginning Instrumentalists. *Journal of Research in Music Education, 53*(1), 26-39.

Business Insights. (2011). *The Video Gaming Industry Outlook*. London: Business Insights.

Chang, V., Gütl, C., Kopeinik, S., & Williams, R. (2009). Evaluation of collaborative learning settings in 3D virtual worlds. *International Journal of Emerging Technologies in Learning, 4*(Special Issue 3), 6-17.

Dalgarno, B., & Lee, M. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology, 41*(1), 10-32.

Davis, F. D. (1986). *A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results*, (Doctoral dissertation). Massachusetts Institute of Technology, Cambridge, MA.

Davis, F. D, Bagozzi, R.P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models, *Management Science, 35*(8), 982-1003.

Dawley, L. (2009). Social network knowledge construction: Emerging virtual world pedagogy. *On the Horizon, 17*(2), 109-121.

Dempsey, J. V., Reese, R., & Weston, S. (2011). Designing in Virtual Worlds. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and Issues in Instructional Design and Technology* (3rd Ed.) (pp. 333-341) Boston: Pearson.

Dickey, M. D. (2003). Teaching in 3D: Pedagogical affordances and constraints of 3D virtual worlds for synchronous distance learning. *Distance Education, 24*(1), 105-121.

Downey, S. (in press). History of the (virtual) worlds. *Journal of Technology Studies*.

Downey, S. (2011-a, April). *Instructional Framework for Massively Multi-person Online Learning Environments (i-MMOLE)*. Presented at the meeting of the American Education Research Association, New Orleans, LA.

Downey, S. (2011-b). i-MMOLE: instructional framework for creating virtual world lessons, *TechTrends 55*(6), 33-41.

Downey, S. (2013). *Learning Lessons from Novice Virtual World Lesson Designers*. Presented at the international conference of the Association for Educational Communications and Technologies, Anaheim, CA.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61.

Girvan, C., & Savage, T. (2010). Identifying an appropriate pedagogy for virtual worlds: A communal constructivism case study, *Computers & Education, 55*(1), 342-349.

Hall, G. E., & Hord, S. M. (1987). *Change in schools: Facilitating the process*. New York: State University of New York Press.

Hall, G. E., Loucks, S. F., Rutherford, W. L., Newlove, B. W. (1975). Levels of use of the innovation: A framework for analyzing innovation adoption. *Journal of Teacher Education, 26*(1), 52 – 56.

Hansen, M. M. (2008). Versatile, immersive, creative, and dynamic virtual 3D healthcare learning environments: A review of the literature. *Journal of Medical Internet Research, 10*(3): e26.

Jarmon, L., Traphagen, T., Mayrath, M. & Trivedi, A. (2009). Virtual world teaching, experiential learning and assessment: An interdisciplinary communication course in Second Life. *Computers & Education, 53*, 169-182.

Loucks-Horsley, S. (1996). The Concerns-Based Adoption Model (CBAM): A model for change in individuals. *National Standards & the Science Curriculum*. Retrieved June 10, 2011 from http://www.nas.edu/rise/backg4a.htm

Loucks-Horsley, S. and Stiegelbauer, S. (1991). Using knowledge of change to guide staff development, in A. Lieberman and L. Miller (Eds.) *Staff Development for Education in the 90s: New Demands*, *New Realities, New Perspectives*. New York: Teachers College Press.

Lui, C. (2006). Second Life learning community: A peer-based approach to involving more faculty members in Second Life. *Proceedings of the First Second Life Education Workshop* (pp. 6-10). San Francisco, CA.

National Research Council. (1995). *National Science Education Standards*. Washington, D.C.: National Academies Press.

Patton. M. Q. (2002). *Qualitative Research & Evaluation Methods*. (3rd Ed.). Thousand Oaks, CA: Sage.

Rogers, E. M. (1995). *Diffusion of Innovation*. New York: The Free Press.

Savin-Baden, M. (2008). From cognitive capability to social reform? Shifting perceptions of learning in immersive virtual worlds. *Association for Learning Technology Journal, 16*(3), 151-161.

SimTeach. (2011). *Institutions and Organizations in SL – Educational Organizations*. Retrieved from: http://simteach.com/wiki/index.php?title=Institutions_and_Organizations_in_SL#UNIVERSITIES.2C_COLLEGES_.26_SCHOOLS

Steinkuehler, C. A., & Williams, D. (2006). Where everybody knows your (screen) name: Online games as "third places." *Journal of Computer-Mediated Communication, 11*(4), 885-909.

Venkatesh,V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view, *MIS Quarterly, 27*(3), 425-478.

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Return to Table of Contents

Editor's Note: Moodle is open-source software that is continually under development by its user population. Updates and customization add to its functionality and increase its value for learning and teaching. As in construction of a building, upgrades may be a temporary inconvenience that is more than outweighed by benefits. It is important to keep users informed and involve them in the change process.

Using a Moodle upgrade and customizations to support distance learning objectives: a case study

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Abstract

The Mexican Institution of Greater Houston (MIGH) provides technology infrastructure and hybrid learning for its under-served constituency. Moodle is a Learning Management System used by MIGH that is part of that infrastructure. It improves teaching and learning experiences by allowing students to engage in hybrid education with the support of instructors who develop and design the learning content. The case study analysis includes the application of the online content of the hybrid-learning framework to address the problem, an account of the phases of the resulting project, a description of implementation activities, and some of the outcomes associated with the learning structure. The project underlying the case focused on upgrading Moodle from version 2.1 to version 2.5 in order to provide the students, instructors and administrator greater accessibility and improved performance. The study results represent guidelines for the development of a project structure that provides a framework for future improvements.

Keywords: Moodle, upgrade, hybrid learning, online courses, Learning Management System (LMS), Course Management System (CMS)

Introduction

In recent years, there has been an increase in the number of students enrolled in courses in which some online content is used instead of learning through live audio or television (Su, 2005). Currently, a number of expressions are used to represent online learning including Internet-based, web-based, hybrid and education via computer communication (Savic, Stankovic and Janackovic (2012). An online learning course is defined as one in which at least 80% of the content is delivered online (Allen & Seaman, Jan. 2013). Kaleta, Garnham and Aycock (2005) defined hybrid learning as instruction that includes a significant portion of the learning content conducted online, and face-to-face instruction time is decreased but not eliminated. Based on a survey conducted in 2013 by Babson Research Group for Higher Education, the growth of online learning indicates that over 7.1 million students were enrolled in at least one online course during the fall 2012 term (Allen & Seaman, Jan. 2013). More than two-thirds of all higher education institutions now have some form of online offerings, with the majority of these providing programs that are fully online (Allen & Seaman, 2007). While hybrid and online courses have become more popular, there are under-served populations who do not take advantage of these opportunities for a number of reasons. One reason is a lack of information and computing skills in these communities. In Texas, the Mexican Institute of Greater Houston (MIGH) attempts to alleviate this problem by offering free instruction, plus infrastructure for the development of information and computing technology skills (Mexican Institute of Greater Houston, 2014).

MIGH serves as an under-served, primarily Hispanic constituency in the greater Houston area, with additional outreach in other Texas cities with under-served populations. Their target is individuals with limited English proficiency, with low income or unemployed, and senior citizens. The organization's vision is "to become the region's premier collaborator in delivering Computer Technology Educational Services for under-served Hispanic, African American and Asian

families" (Mexican Institute of Greater Houston, 2014). Their educational services improve the region's workforce by developing critical knowledge and skills in the information and computing technologies, for the parents and grandparents of under-served youth. This enables the parents to use computers more efficiently and effectively and to better supervise their children's Internet usage including help with homework. The instruction is human-facilitated with some course content provided online, and the instruction was designed assuming the students had no prior computing skills or knowledge. The training is offered in both English and Spanish (Mexican Institute of Greater Houston, 2014).

MIGH uses Moodle for its learning platform, and for delivery of the online course content. Moodle is a Learning Management Systems (LMS), also known as a Course Management System (CMS). Because Moodle is an open source learning software system, blended learning was developed as an alternative learning approach to traditional face-to-face instruction (Al-Ani, 2013). A LMS or CMS is a staging tool for offering many types of courses online. Staging tools, such as Moodle, are online teaching platforms that provide basic services for course management to deliver course instruction to an online audience (Al-Ani, 2013). Using Moodle's LMS enables students and instructors to interact by sending and receiving emails, having discussions through discussion boards, sharing digital course materials, creating and submitting assignments, and administering and taking tests. While there are other types of LMS and CMS available, some are quite costly and difficult to manage. Moodle was the right fit for a non-profit enterprise that needs scalable infrastructure as its constituency grew.

The purpose of this study is to provide lessons learned from the application of a framework for the online portion of hybrid learning to (a) analyze a problem and develop a project-based solution strategy, (b) document the phases and implementation activities associated with the project, and (c) report the post-project assessment activities. The project team consisted of faculty members and graduate student researchers from the University of Houston and MIGH information technology support staff. The project scope entails upgrading the existing Moodle platform for MIGH and implementing customized functionality. The mapping of specific organizational objectives, as identified by the project's mandate, to project activities will be noted as part of the problem analysis. The Moodle upgrade included tools and techniques to assist in the learning experience with an emphasis on improving the interface between students and instructors. An overall assessment of the project results was conducted that included analysis of survey data collected from student users. The data collection enabled the researchers to gain an understanding of the factors contributing to the success of Moodle as an LMS. According to Zuvic-Butorac, Roncevic, Nemcaninm, and Nebic (2011) implementing and developing a successful e-learning environment is accomplished by understanding student's perception regarding e-learning. It has been noted that students like the idea that they can access learning material and exercises from anywhere and that the learning material is located in one place (Goodson, Miertschin, & Stewart, 2012; Holbl, Welzer, Nemec, & Sevcnikar, 2011).

Background and literature review

The arrival and expansion of new information, communication, and computing technologies have brought online education to the attention of millions of potential distance learners in America, and around the world (Moore & Greg, 2012). Technology has allowed education to be viewed from different perspectives (Uzunboylu, H., Bicen, H., & Cavus, N., 2011). Ever since 2012, MIGH has offered technical training to hybrid learners in Spanish and, in response to a request from the African-American and Asian communities as well as the English speaking members of the Hispanic community, in English. Beyond remote access, the online content portion of hybrid education provides a greater degree of control to the learner in relationship to the teaching institution (Moore & Greg, 2012). One student from MIGH acknowledged that online learning

allows students to apply skills that were learned through a governmental grant from the Broadband Technology Opportunity program (BTOP). Additionally, the student shared the desires from his classmates to become more marketable employees and, possibly, entrepreneurs (Ligia, 2011) through the design, application and structure of online learning provided by MIGH.

As MIGH expanded its online instruction offerings, it identified a need to assess the efficacy of the hybrid learning opportunities they had developed. In the Web-Based Learning Framework developed by Kahn, Dimensions and factors within dimensions of web-based learning are identified for consideration when planning or assessing online learning initiatives (Kahn, 2001). Three dimensions in the framework were important to MIGH, namely the technological dimension, the management dimension, and the interface design dimension. MIGH uses Moodle, LMS and CMS to manage and deliver its online instructional content. From experience, MIGH knew that Moodle had been popular for more than a decade and that it is a powerful tool, designed to flexibly organize and distribute coursework and learning resources. However, Moodle required some customizations in order to meet its management needs. In addition, MIGH wanted to be certain that it was delivering the online instruction part of the learning through the simplest and most user-friendly format. This concern is in the interface design dimension. Their third concern had to do with a version upgrade that had become available for Moodle, an aspect that falls in the technological dimension of Kahn's framework. MIGH wanted to carefully consider important aspects of each of these dimensions in the context of upgrading the current Moodle LMS version versus changing to a different LMS/CMS system. Thus, the organization conducted research to determine whether Moodle would continue to be the best tool for their needs.

Part of the research included a literature review on Moodle and its capabilities. It was found that instructors, including those at MIGH, use Moodle, as both LMS and CMS, to create and deliver content, assignments, surveys, and exams to students. Online delivery of course content is one of the critical elements of any hybrid instruction. Content is delivered using a variety of methods and materials including lecture notes, slides, videos, and handouts. With Moodle, instructors may vary their teaching methods to suit the learning objectives of the course (Singh & Mangalaraj & Taneja, 2010).

Moodle, as a LMS, provides educators tools to manage and promote learning (Shulamit & Yossi, 2012). The system enables instructors to use multiple tools in order to enrich the learning experience (Sadanand & Kumbhar, 2012).The system integrates tools for offering interactive exercises that provide choices of varying levels and types of activities. Varied activities help students of all levels stay active in learning, while working at their own pace. The benefit of using Moodle as a LMS system is that it facilitates students and instructors interacting in virtual classrooms, enabling instructors to maintain close observation of the learning abilities of students (Cavus, 2007). Moodle also facilitates another important form of interaction, namely the feedback instructors provide to students. It is documented that communication tools in LMS are important for improved learning (West, Waddoups, Kennedy, & Graham, 2007).

Moodle, as a CMS, provides support for instructors to better manage online course content in multiple ways. The system provides a secure environment for creating and managing courses online, including class rosters and grade books (Yamauchi, 2009). This includes instructors providing more flexible access to grades and supporting better and more flexible access to course resources (West, Waddoups, Kennedy, & Graham, 2007). Additionally, Moodle facilitates communication in various languages, an important responsibility for the MIGH mission. It also enables social interaction between the instructor and students as well as among the students (Yamauchi, 2009). Perkins and Pfaffman's study in 2013 highlights the benefits of using a CMS to enable teachers to easily post assignments, lesson plans, announcements and course documents (Al-Ani, 2013).

Perkins and Pfaffman (2013) document the advantages of using Moodle over other LMS and CMS systems. The advantages of Moodle include (a) it is a free and it is an open-source software program whose source code can be changed for customized needs; (b) it provides a set of features similar to those of its proprietary competitors; and (3) it is easier to implement, administer, and use both from a course-developer perspective, and from a student perspective. The ease-of-use characteristic promotes improved student performance through well-organized content and simple communication tools (Al-Ani, 2013).

The MIGH installation of Moodle was in version 2.1, and the organization conducted research related to upgrading to version 2.5. MIGH found that migrating from Moodle 2.1 to Moodle 2.5 would provide better efficiency for students to gain access to course resources. New functionalities within Moodle 2.5 support monitoring and categorizing of homework assignments based on specific student submissions (Sadanand & Kumbhar, 2012). The monitoring feature includes a grading status, in which instructors are able to provide feedback based on the number of attempts students are allowed. Additionally, according to Smith (2013), before Moodle 2.5, assignment submissions were limited to either repeated use of the 'revert to draft' feature of Moodle or setting up separate assignment submissions. As noted by students attending the University of Madrid, Moodle 2.5 has helped to reinforce their learning (Sadanand & Kumbhar, 2012) by allowing instruction to become more user friendly and accessible for anywhere-anytime learning (West, Waddoups, Kennedy, & Graham 2007).

The Moodle Virtual Learning System Architecture upgrade project was divided into five different phases, each with its own project life cycle. Each phase is marked by completion of one or more deliverables. The deliverables, and hence the phases, are part of a general sequential logic designed to ensure proper definition and implementation of the product. The life cycle for upgrading Moodle 2.1 to version 2.5 includes the following phases: Initiation, Planning, Execution, Monitoring and Controlling, and Closing (Project Management Institute, 2013). This approach was used to define the process and identify requirements for the project including features and functionality. The deliverables for each phase provided a high level description which ensured that all the work required to complete the project was finished. Each task was put into a sequence that properly defined the scope and resources of the project. During the completion of major tasks, the project manager was able to gather information, which was essential to effectively implementing the next phase of the project.

Project mandate

From the background research conducted, a project mandate was formulated. MIGH needed to implement a fully functional upgraded version of Moodle 2.5 LMS. Upgrading Moodle 2.1 to version 2.5 would increase the performance required to support an expanded teaching and learning environment. The deliverables of the project were to include: (a) Moodle version 2.5, running and fully functional on the server with a defined and implemented security architecture, (b) migration from MIGH's local server used for testing purposes, to a dedicated virtual server for production, (c) existing courses with all the activities and lessons restored to the new server and Moodle implementation, and (4) a reconfigured Moodle to meet the standards required for a successful MIGH virtual learning system.

From the project mandate, the project expectations and the objectives were defined as follows.

Objective 1: To include assignment settings to handle resubmissions.

Objective 2: To deliver a platform with compelling new functionalities and features such as searching for a list of enrolled students in a course to perform an analysis of the current version of Moodle.

Objective 3: Enhance overall student learning. This project includes providing an account of the phases and implementation activities, in the context of supporting an academic project, in order to provide a framework for future research. This project is focused on providing the necessary upgrades in order to deliver the most effective and efficient online CMS and LMS.

Project framework including implementation activities

The Moodle 2.5 project framework identified the phases and structure used in project implementation. More specifically, the project framework included an account of the phases of the project, as well as a description of the implementation activities. The implementation activities were structured using five different phases including Initiating, Planning, Execution, Monitoring, Controlling, and Closing (Project Management Institute, 2013). Each phase represented a project milestone including several tasks executed by the project team including academic and organizational members. See Figure 1 for the project framework including the phases, activities and project team involvement. Note the framework included the project activities by phases and a separate column noting involvement by the project team. The project team included academic support for the initiating, planning and closing phases with an emphasis on developing, reviewing and approving project documentation. The project team included MIGH for the execution and monitoring and controlling activities. For each phase of the project's life cycle, one or more deliverables were developed to communicate an output and to ensure proper definition of the project. See Figure 2 for the deliverables for each phase.

The Initiating Phase included processes that were related to defining the scope of the project, committing financial resources, identifying stakeholders, and selecting the project manager (Project Management Institute, 2013). The Initiating Phase established the vision and identified the high level activities to be completed during the project. During the Initiating Phase of the project, the deliverables included a Project Charter and Business Case. More specifically, the Project Charter identified the scope, reported the project manager’s authority over the project, and documented the project budget and funding sources. The Business Case served as a guide to determine if the project justified an investment.

The Planning Phase included processes to document the total scope of the project including, defining the objectives and developing the high-level project plan (Project Management Institute, 2013). The deliverables completed during the Planning Phase included the Project Management Plan, Scope Management Plan, Work Breakdown Structure, and a Risk Register. During the Planning Phase, the project manager defined roles and responsibilities, established processes and procedures and documented the project’s organizational structure. The Planning Phase deliverables provided a high level roadmap by (a) ensuring that only work required to complete the project was performed, (b) providing a structural view of project activities including time frames, (c) identifying project team members and stakeholders, and (d) reporting risks associated with the project (Project Management Institute, 2013).

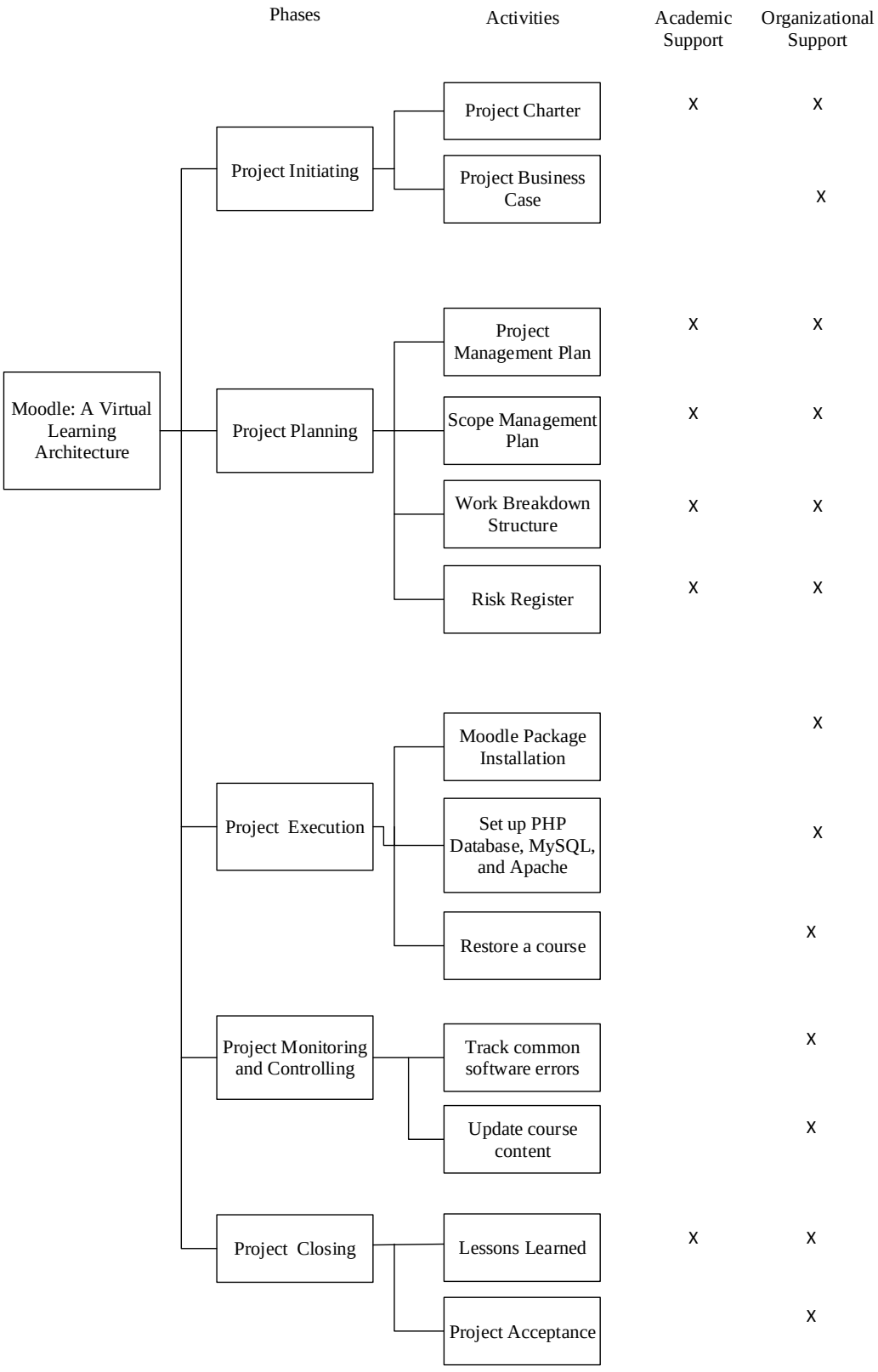


Figure 1 Moodle 2.5 Project Framework: Project Phases, Activities and Project Team

Process Groups / Activity Milestones	Initiating	Planning	Executing	Monitoring and Controlling	Closing
	Develop project charter and Business case				
		Develop project management plan Scope management plan Work breakdown Structure Risk register			
			Deploy prototype Test prototype		
				Mount new class Final test platform	
					Lessons learned Deliver documentation

Figure 2 Activities and process groups
(Project Management Institute, 2013)

The Execution Phase included the processes to perform the project work. More specifically, the Execution Phase included coordinating resources, managing stakeholders' expectations, and conducting the activities of the project as documented in the project plan (Project Management Institute, 2013). During the Execution Phase, the processes consisted of (a) installing a Moodle package, (b) configuring a PHP web server, (c) creating a data directory for Moodle files, and (d) developing a MySQL database. During the Execution Phase, the technical staff also performed tasks to upgrade Moodle from 2.1 to 2.5. The final deliverable of the Execution Phase included a fully deployed prototype that was tested using documented test cases. The first task, of the execution phase, was to verify that the server was capable of running the new Moodle version. The next task included making a copy of the production site to perform testing of the installation to prevent affecting the production site. Testing was conducted in MIGH's local server to verify that Moodle 2.5 was running properly. Thereafter, plug-ins were verified and updated to the newly installed version. The last task, prior to migration, included triggering the start of the upgrade process in Moodle. At the conclusion of the execution phase, the Moodle platform was migrated to a dedicated server.

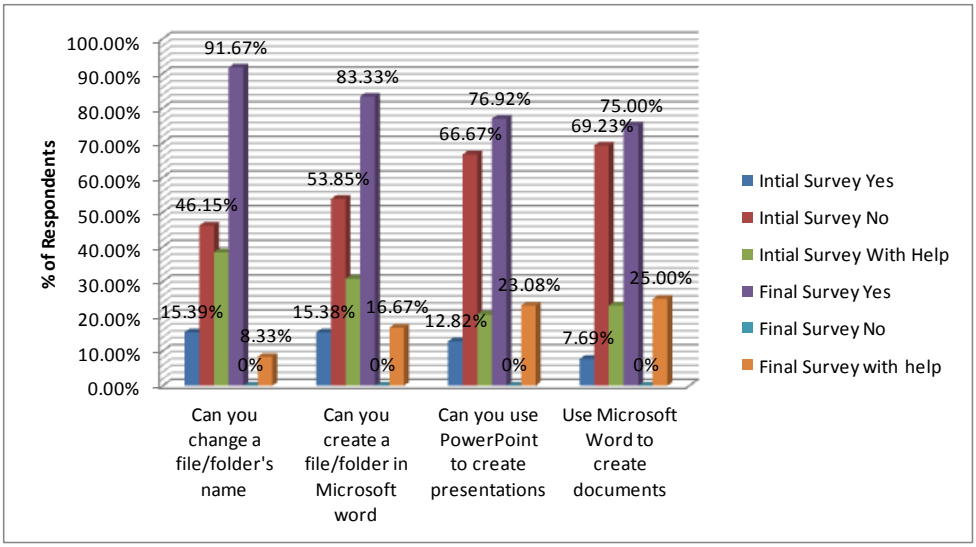
The Monitoring and Controlling Phase included an evaluation of the effectiveness of the project by measuring the progress and by verifying if the project objectives were met (Project Management Institute, 2013). The deliverables for this phase included the deployment of Moodle 2.5 (with the updated course functionality and features) and final testing of the software. The final testing of installing Moodle 2.5 included verification of common software errors during the phase. These activities included verifying login access for administrators, students and instructors, and reconfiguring student access to the platform.

During the Closing Phase, the processes included verifying that all activities were completed during the project and establishing formal closure of the project (Project Management Institute, 2013). More specifically, the deliverables included lessons learned and all project documentation. Additionally, the main stakeholders formally accepted Moodle 2.5.

Project outcomes

The project outcome discussion includes an assessment of the project based on the project objectives which included customizations to Moodle 2.5, as well as the student learning outcomes. The assessment of the overall student learning outcomes before and after the upgrade, are discussed first and thereafter the outcomes of the each of the three project objectives are discussed.

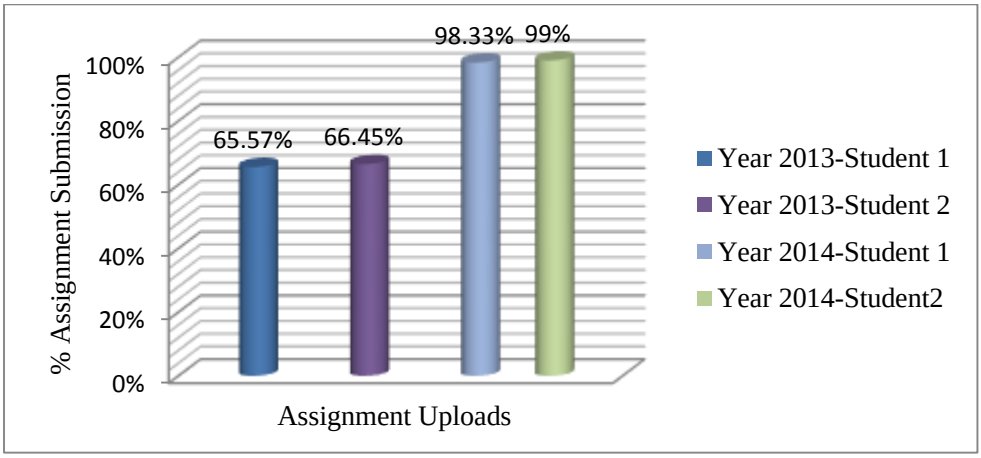
It has been noted that implementing and developing a successful hybrid learning environment is accomplished by understanding students' perception of the online learning content (Zuvic-Butorac et al., 2011). To understand the students' perception about their learning skills before and after hybrid learning, MIGH conducted a survey including students from one of the courses to answer initial survey questions (conducted on October 18, 2013 before the start of the Moodle 2.5 upgrade) and final survey questions (conducted on March 26, 2014 after the Moodle 2.5 upgrade). The surveys were conducted in order to evaluate the effectiveness and the ease in which students were able to interact using the Moodle tools before and after the course, and before and after the installation of Moodle 2.5. The surveys included questions related to the knowledge of the Microsoft Office tools before and after completing the course. As noted in Graph 1, at the beginning of the course, and prior to the Moodle 2.5 upgrade, the following results were noted: (a) 46.15% of the students were unable to change a file folder's name, (b) 53.85% of the students were unable to create a file in Microsoft Word, (c) 66.67% of the students were not able to create a presentation in PowerPoint, and (d) 69.23% of the students were unable to create documents in Microsoft Word. At the end of the course and after the Moodle 2.5 upgrade, the following survey results showed: (a) 91.67% of the students were able to change a file folder name, (b) 83.33% of the students were able to create a file in Microsoft word, (c) 76.92% of the students were able to use PowerPoint to create a presentation, and (d) 75.00% of the students used Microsoft Word to create documents.



Graph 1 Initial and final student survey
(Conducted on October 18, 2013 and March 26, 2014)

Objective 1: Assignment settings for resubmissions and timely feedback

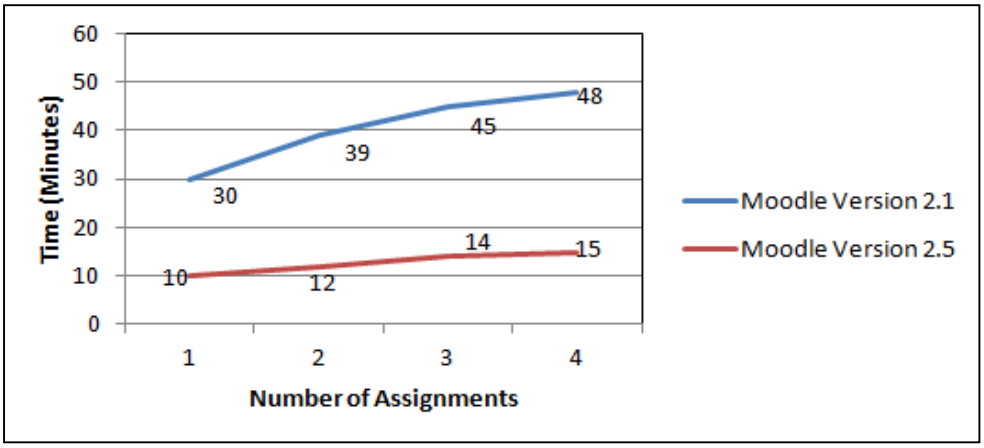
The project results indicated that students feel more confident in using tools such as assignment submissions after the Moodle upgrade to 2.5. According to the data in Graph 2, during 2013 when Moodle 2.1 was used by MIGH, two students were monitored when they were submitting assignments. As noted, student one uploaded only 65.57% of the assignments and student two uploaded only 66.45% of the assignments. Uploading assignments using Moodle version 2.1 was a slow process. Additionally, prior to the Moodle upgrade to 2.5, the students reported difficulty in accessing Microsoft tools. However, after the Moodle upgrade, student one uploaded 98.33% of the assignments, and student two uploaded 99% of the assignments. Moodle 2.5 included a new assignment submission feature including Drag and Drop. This feature reduced the assignment submission time from 15 minutes to approximately 2 minutes. Additionally, before the upgrade, students were allowed to submit assignments only once and after the upgrade students were allowed up to three attempts for assignment submissions.



Graph 2 Percent of student assignment uploads with Moodle 2.1 (Year 2013) and after upgrade with Moodle 2.5 (year 2014)

Research conducted by (Smith, 2013) indicated that the new functionality of Moodle 2.5 provided instructors an option to allow more attempts for students to submit their assignments. Smith (2013) further reported that the enhancement of assignments is a way in which Moodle 2.5 makes life easier for instructors to provide assessments, and students to keep track of their performance through the use of the feedback feature in assignment submissions. In Moodle version 2.1, the submission data would sometimes not be captured, and thus prevent students from receiving valuable instructor feedback. Also, instructors were faced with the difficulty of tracing the submission development through multiple assignment submissions prior to providing feedback.

Graph 3 shows a comparison of the time for students to submit an assignment while using Moodle 2.1 compared to using Moodle 2.5. The project manager collected the times for submitting assignments within the project log to evaluate the new enhancement features of Moodle version 2.5. The results indicated that a successful assignment submission using Moodle 2.1 would take a maximum of 48 minutes while the assignment submission time using Moodle 2.5 would take a maximum of 15 minutes.



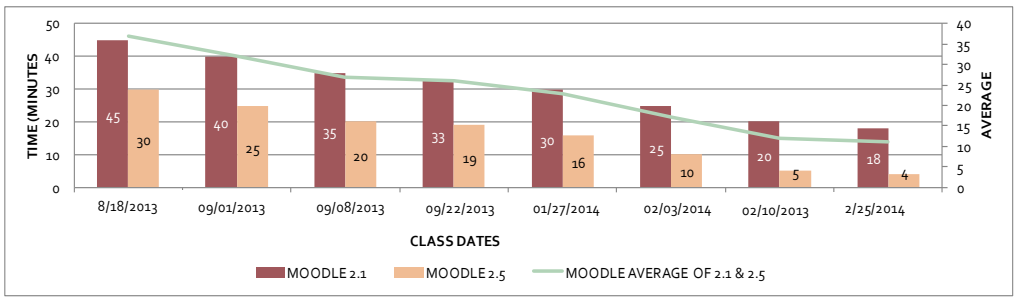
Graph 3 Statistics of assignment submission times using Moodle 2.1 and Moodle 2.5

Based on a review of the log of students' assignment submissions on MIGH's Moodle platform 2.5, instructors are also able to provide timely feedback to students. The feedback includes advising students on attaching the assignments, finishing the submission process, and denoting when activities were posted as drafts. The feedback also ensured instructors were able to assign grades to students. As also indicated by Sadanand and Kumbhar (2012), the assignment submission feature allowed instructors to monitor and provide timely feedback through the submission process. The communication through the assignment submission allows students and instructors to improve the grading and feedback capabilities. As noted by West et al. (2007), using a CMS improves the grading feedback process to students, and as a result, improves learning capabilities.

Objective 2: Deliver a platform with compelling new functionalities and features

By using LMS, instructors are able to create numerous resources using various functionalities to support students throughout the educational process (Plexousakis, Kalogiannakis & Skouradaki, 2013). After the Moodle upgrade to 2.5, the perception of the ease of learning revealed that instructors generally accepted the new technology changes. The instructors' acceptability of the changes was demonstrated by the ease of how they were able to access the following identified technical features: (1) instructor's attendance view, (2) instructor's student search, and (3) instructors' access to the platform. Overall, the instructors' interface within Moodle 2.5 was intuitive and easy to use. The graph in Appendix A includes detail information regarding some of the technical features of Moodle 2.5. Moodle-based online programs enable instructors to use multiple tools in order to enrich the learning experience (Sadanand & Kumbhar, 2012).

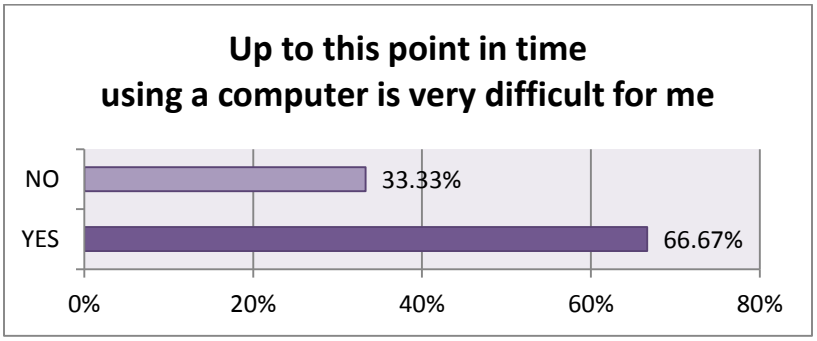
Perkins and Pfaffman (2013) reported the benefit of using Moodle, as a CMS, was to allow instructors to easily post assignments, lesson plans, announcements and course documents (Al-Ani, 2013). West et al. (2007) also noted that communication tools, used to post assignments and provide student feedback, are important for learning outcomes. Thus, one consideration for instructors is that they are able to use the communication tools in a timely manner. Graph 4 shows the time participation of an instructor for posting assignments and providing feedback to students from August 18, 2013 to February 25, 2014. Based on the project's teaching log for Moodle 2.1 and Moodle 2.5, note that on February 25, 2014 it took 18 minutes for an instructor to be able to upload assignments and to provide feedback using Moodle version 2.1. Conversely, using the functionality in Moodle 2.5 it took an instructor 4 minutes to upload assignments and to provide feedback. Al-Ani (2013) also noted that the instructors' ease of posting assignments and providing feedback improved while upgrading to Moodle version 2.5.



Graph 4 Instructor's log time on posting assignments and providing feedback

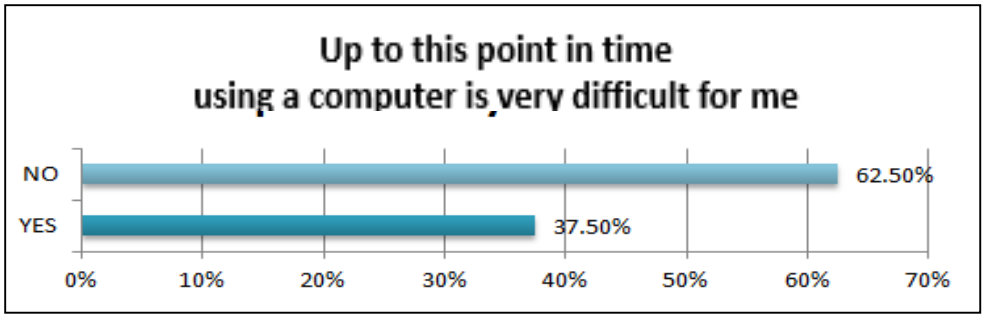
Objective 3: Enhance overall student learning

Al-Ani (2013) found that the ease-of-use characteristic supports improved student performance through well-organized content and simple communication tools. This Moodle upgrade project noted similar results. An opinion survey, to assess overall student learning, was conducted in the beginning of a course on August 18, 2013 using Moodle 2.1, and at the end of the course on January 13, 2014, using Moodle 2.5. Graph 5 indicates the initial understanding of the students' use of computers. Based on the students surveyed, 66.67% indicated that using the computer was difficult while only 33.33% indicated that using the computer was not difficult.



Graph 5 Student statistics of an initial survey using Moodle 2.1
(August 18, 2013)

Graph 6 indicates the overall opinion of students regarding the use of computers after the upgrade to Moodle 2.5. After the course concluded in January 2014, 37.50% of students indicated that using the computer was not difficult and 62.50% indicated that using the computer was difficult. The decrease in the percentage from using Moodle 2.1 to using Moodle 2.5 appeared to suggest that online student content and customizations to technical tools increased the students' technical skills. In the last decade, there has been a rush by higher education institutions to adopt CMS technologies in an effort to more easily transition courses into a hybrid or online experience (West, et al., 2007). In MIGH, the students' grades improved after completing a course which demonstrates how course management systems have impacted teaching by showing improvements in grades (Appendix B). This assessment of Moodle as a CMS was also noted by Seluakumaran et al. (2011).



Graph 6 Student statistics of a final survey using Moodle 2.5
(January 13, 2014)

Conclusion and lessons learned

In this paper, the authors used the case study analysis to document: (a) the application of a hybrid learning framework to the problem, (b) an account of the phases of the resulting project, (c) a description of implementation activities, and (d) outcomes associated with the learning structure. Additionally, this project provided the necessary upgrades in order to deliver the most effective and efficient online CMS and LMS that included a framework that can be used for future projects and future research.

The Moodle 2.5 platform was formally deployed on January 17, 2014. Overall, the decision for MIGH to upgrade to Moodle 2.5 was influenced by the following factors: (a) the requests by end-users to include assignments and other features as well as the overall goal to provide functionalities that are easily administered, and (b) to allow MIGH better control of the administration and maintenance of the platform. Table 1 represents the comparison between Moodle 2.1 and Moodle 2.5 and further supports MIGH's decision to upgrade to Moodle 2.5.

Table
Moodle version 2.1 versus version 2.5

Moodle 2.1	Moodle 2.5
Not enough documentation to support future upgrades	Ability to handle assignment re-submissions
Insufficient management communication tools	Ability to search for a list of students, view attendance and access the platform more easily
Lacked some technical and communication features and functionality	Improved technical and communication features and functionality
No significant technical issues fixed in this version	Improved login performance
	Improved security
	Improved database management

The lessons learned by the project team through the life cycle of the project included the need to: (a) update project documents, (b) control scope creep and (c) maintain a positive attitude and the willingness to do what it takes to successfully complete the project. More specifically, from an administrator's position, during the completion of this project some lessons learned included the necessity of backing up the platform before making any changes and understanding the need to place the site under maintenance mode for a successful upgrade.

Approximately, 90% of MIGH's Moodle upgrade failures during the execution phase were resolved on first point of contact. The factor that contributed to this success was the additional support provided by the Educational Platform Developer Department. The lesson learned, related to this scenario, is that you need to account for additional resources during certain phases of the project. The upgrade project was executed quickly and smoothly based on the coordination and management of HIGH. The findings in this study are consistent with those acquired by previous researchers who found that perceived usefulness, and perceived ease of use were critical factors in the use and adaptation of online learning (Teo, 2014).

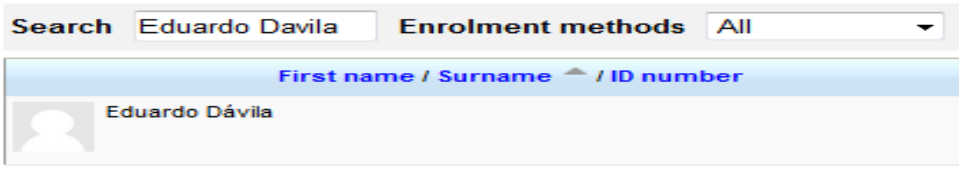
The major limitation of this study is that the case study is related to a Moodle upgrade project located at one entity – MIGH. An additional limitation of the study is related to the survey data. The data for the overall student learning enhancement were limited to one course before and after the Moodle 2.5 upgrade. Thus, the implementation framework and plan should be used as a general guide for Moodle upgrades but should be customized to fit the platform as well as the organization.

Appendix A

(1). Instructor's attendance view:

#	Date	Start Time	End Time	Class Name	Description	Keyword	Call Method	State	Action
1	01.13.14 (Mon)	09:00	12:00	All Students	nothing	-	Automatic	Closed (4/9)	
2	01.15.14 (Wed)	09:00	12:00	All Students	nothing	-	Automatic	Closed (7/9)	
3	01.20.14 (Mon)	09:00	12:00	All Students	nothing	-	Automatic	Closed (9/9)	
4	01.22.14 (Wed)	09:00	12:00	All Students	nothing	-	Automatic	Closed (8/9)	
5	01.27.14 (Mon)	09:00	12:00	All Students	nothing	-	Automatic	Closed (9/9)	
6	01.29.14 (Wed)	09:00	12:00	All Students	nothing	-	Automatic	Closed (8/9)	
7	02.03.14 (Mon)	09:00	12:00	All Students	nothing	-	Automatic	Closed (9/9)	
8	02.05.14 (Wed)	09:00	12:00	All Students	nothing	-	Automatic	Closed (7/9)	
9	02.10.14 (Mon)	09:00	12:00	All Students	nothing	-	Automatic	Closed (9/9)	
10	02.12.14 (Wed)	09:00	12:00	All Students	nothing	-	Automatic	Closed (8/9)	

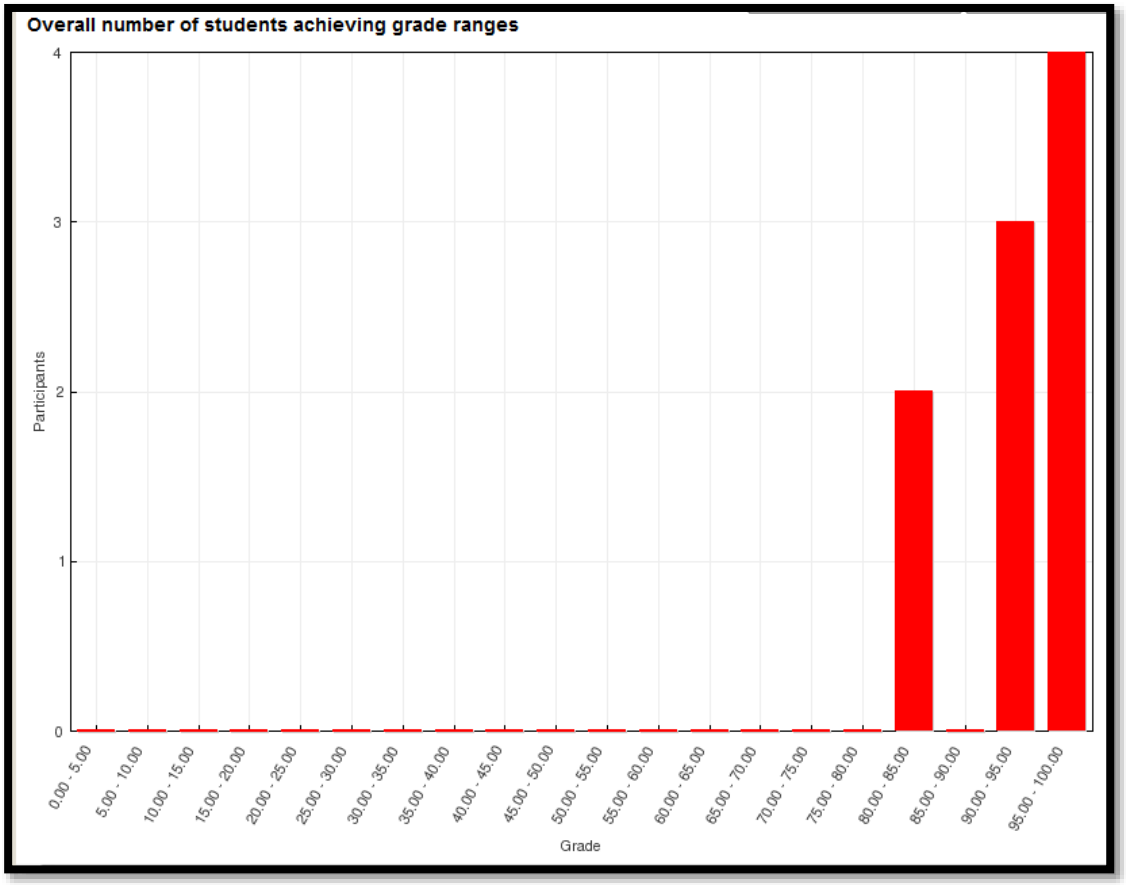
(2). Instructor's student search:



(3). Instructors access to the platform:

name	action	time	course	class	district
Ana L. Martinez	view	2014-03-14 10:28:59	45_021014_PARENTS_HBI_ES_MoWe_9:00am-1:00pm	Northside Parent Center	Northside ISD
Ana Maria Pacheco	logout	2014-03-13 14:45:17	Mexican Institute of Greater Houston		
Bertha Silvia Luna	logout	2014-03-12 21:19:54	Mexican Institute of Greater Houston		
Bertha Silvia Luna	view	2014-03-12 17:34:15	37_103013_BELLAIRE_HBI_ES_MoWe_5:30pm-8:30pm	Bellaire High School	Houston ISD
Carlos Blanco	view	2014-03-15 15:41:13	42_011814_MIGH_HBI_ES_Sa_3:30pm-8:30pm	MIGH	Houston
Carlos Blanco	logout	2014-03-15 20:28:25	Mexican Institute of Greater Houston		
David Guevara	view	2014-03-12 11:15:52	38_101813_MIGH_HBI_ES_Fri_9:00am-3:00pm	MIGH	Houston
David Guevara	logout	2014-03-12 11:19:13	Mexican Institute of Greater Houston		
Eduardo Dávila	logout	2014-03-12 12:18:32	Mexican Institute of Greater Houston		
Eduardo Dávila	view	2014-03-12 09:07:36	41_011314_MIGH_HBI_ES_MoWe_9:00am-12:00pm	MIGH	Houston
Jaxier Reyes	view	2014-03-12 08:43:29	47_022414_KENNEDY_HBI_ES_MoWe_8:30am-12:00pm	Kennedy Elementary School	Houston ISD
Jocelyn Resto	logout	2014-03-13 10:12:10	Mexican Institute of Greater Houston		
Jocelyn Resto	view	2014-03-13 10:06:28	48_120513_HUTSELL_BCS_EN_Fr_9:00am-3:00pm	Hutsell Elementary	Katy ISD
Nelson Queralta	logout	2014-03-14 09:48:43	Mexican Institute of Greater Houston		
Nelson Queralta	view	2014-03-14 09:44:31	39_120213_KATY_JUNIOR_HBI_ES_MoTh_6:00pm-9:00pm	Katy Junior High	Katy ISD

Appendix B



Moodle 2.5 (January 13, 2014):
Sample consists of 20 students and their improvement based on grading criteria

References

Al-Ani, W. (2013). Blended Learning Approach Using Moodle and Student's Achievement at Sultan Qaboos University in Oman. Journal of Education and Learning, I (3), 96-110.

Allen, I. E., & Seaman, J. (2013). Changing Course: Ten Years of Tracking Online Education in the United States. Retrieved March 16, 2014, from http://www.onlinelearningsurvey.com/reports/changingcourse.pdf

Allen, I.E., &, Seaman, J. (Jan. 2014). Grade Change: Tracking Online Education in the United States. Alfred P. Sloan Foundation. Retrieved May 30, 2014, from http://sloanconsortium.org/publications/survey/grade-change-2013

Cavus, N. (2007). Assessing the Success Rate of Students Using a Learning Management System Together with a Collaborative Tool in Web-Based Teaching of Programming Languages. Journal of Educational Computing Research, 36(3), 301-321. Doi: 10.2190/T728-G676-4N18-6871

Goodson, C., Miertschin, S. L., & Stewart, B. (2012). On-line delivery of courses: What components are important to students? Computers in Education Journal, 22(1), 47-58.

Holbl, M., Welzer, T., Nemec, L., & Sevcnikar, A. (2011). Student feedback experience and opinion using Moodle. EAEEIE Annual Conference. Retrieved from http://ieeexplore.ieee.org.ezproxy.lib.uh.edu/stamp/stamp.jsp?tp=&arnumber=6165728

Kaleta, R., Garnham, C., & Aycock, A. (2005). Hybrid courses: Obstacles and solutions for faculty and students. Proceedings of the 19th Annual Conference on Distance Teaching and Learning, Madison, WI. Retrieved from May 30, 2014 http://www.uwex.edu/disted/conference/Resource_library/proceedings/03_72.pdf

Khan, B. H. (2001). A Framework for Web-Based Learning. In B. H. Kahn (Ed.), Web-Based Training (pp. 431). Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Ligia, E. Gramajo (2011). MIGH Milestone, Retrieved February 10, 2014 from http://www.mexicaninstitute.org/include/About/history/milestone.html

Ligia, E. Gramajo (2012). MIGH History, Retrieved March 17, 2014 from http://www.mexicaninstitute.org/include/About/history/2012.html

Mexian Institute of Greater Houston. (2014). Retrieved from http://www.mexicaninstitute.org/include/About/about.html

Moore, M. G., & Greg K. (2012). Distance Education: A Systems View of Online Learning. Belmont, CA: Wadsworth, Cengage Learning.

Park, J.H., & Choy, H. J. (2009). Factors Influencing Adult Learners' Decision to Drop Out or Persist in Online Learning. Educational Technology & Society, 12 (4), 207

Perkins, M., Pfaffman, J. (2006). Using a Course Management System to Improve Classroom Communication. Science Teacher, 73(7), 33-37.

Plexousakis, D., Kalogiannakis M., & Skouradaki, M. (2013). Enhancing Learning Management Systems (LMS) with the Use of Web Technologies. In A. Lionarakis (ed.) Proceedings of the 7th International Conference in Open and Distance Learning (Vol. 3, Section A), Learning Methodologies (pp. 105-118). Athens, Greece. Retrieved Mardh 18, 2014, from http://www.iaas.unistuttgart.de/institut/mitarbeiter/skourama/res/ICODL_2013_paper.pdf

Project Management Institute. (2013). A Guide to the project management body of knowledge (PMBOK Guide), (5th Ed.). Newton Square, Pennsylvania: Project Management Institute. Retrieved March 20, 2014, from http://www.cs.bilkent.edu.tr/~cagatay/cs413/PMBOK.pdf

Sadanand Y. B., & Kumbhar, R (2012). E-learning Experience Using Open Source Software: Journal of Library & Information Technology. Retrieved March 3, 2014, from http://www.publications.drdo.gov.in/ojs/index.php/djlit/article/viewFile/2650/1320

Savic, S.M., Stankovic, M.S., & Janackovic, G.Lj. (2012). Hybrid model for e-learning quality education. International Journal of Emerging Technologies in Learning, 7(Special Issue 1), 6-13.

Seluakumaran, K., Jusof, F. F., Ismail, R., & Husain, R. (2011). Integrating an open-source course management system (Moodle) into the teaching of a first-year medical physiology course: a case study. Advances in Physiology Education, 35, 369-377. doi:10.1152/advan.00008.2011

Singh, A., Mangalaraj, G., & Taneja, A. (2010). Bolstering Teaching through Online Tools. Journal of information Systems Education, 21(3), 299-311.

Shulamit, K., & Yossi, E. (2012). Learning and teaching with Moodle-based E-learning environments, combining learning skills and content in the fields of Math and Science & Technology. Conference Proceedings of 1st Moodle Research Conference (pp. 122-131). Heraklion, Crete-Greece.

Smith, D. (2013). Moodle 2.5 improvements Synergy Learning [Web log post]. Retrieved from http://www.synergy-learning.com/moodle-2-5-improvements-assignment-resubmissions/

Su, B. (2005). Examining Instructional Design and Development of a Web-Based Course: A Case Study. International Journal of Distance Education Technologies. I 3(4), 62-76.

Teo, T. (2014). Pre-service Teachers' Satisfaction with E-Learning. Social Behavior & Personality. An International Journal, 42(1), 3-6.

Uzunboylu, H., Bicen, H., & Cavus, N. (2011). The efficient virtual learning environment: A case study of web 2.0 tools and Windows live spaces. Computers & Education. doi:10.1016/j.compedu.2010.10.014

West, R. E., Waddoups, G., & Graham, C. R. (2007). Understanding the experiences of instructors as they adopt a course management system. Educational Technology, Research and Development, 55 (1), 1–26.

West, R.E.,Waddoups,G.,Kennedy,M.,&Graham, C. R. (2007).Evaluatingtheimpact on usersfromimplementing a course management system.InternationalJournalof InstructionalTechnologyandDistanceLearning,4(2).Retrieved February 7, 2014, from http://www.itdl.org/journal/feb_07/article01.htm

Yamauchi, M. (2009). Integrating Internet Technology into the EFL Classroom: A Case Study. International Journal of Pedagogies and Learning. I (2), 3-19.

Zuvic-Butorac, M., Roncevic, N., Nemcaninm D., & Nebic, Z. (2011). Blended E-Learning in Higher Education Research on Students' Perspective, Issues In Informing Science & Information Technology, 8, 840-429.

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Return to Table of Contents

Editor's Note: The change process can lead to resistance or acceptance. Enthusiasm for the new system, in this case distance learning, can add momentum and stability to the change process. Incentives and activities can stimulate greater support and participation.

Attitudes of B.Ed. students' towards ODL institutions in Tamil Nadu Open University

A.S. Arul Lawrence and C. Barathi
India

Abstract

The present study aims to probe the attitude of B.Ed. students' towards Open and Distance Learning (ODL) institutions at Tamil Nadu Open University. A survey method was employed in the present study. A sample of 293 B.Ed. students studying in Tamil Nadu Open University, were selected by a simple random technique. The data was collected by Students' Attitude and Perceptions Rating of Open and Distance Learning Institutions Inventory (SAPRODLII) developed by Ojo, D. O., & Olankulehin, F. K. (2006). SPSS-17 Package was used for analysis of the collected data. The Percentile analysis, mean, standard deviation, level, t-test, ANOVA and chi-square were employed as statistical techniques to analyze the data. The findings show that (1) the attitude of B.Ed. students towards ODL institutions in TNOU is neutral, (2) there is no significant difference in the attitude of B.Ed. students towards ODL institutions in TNOU in terms of (i) gender, (ii) locality and (iii) teaching experience, (3) English medium students are having favorable attitude towards ODL institutions in TNOU than Tamil medium students, (4) Language subject students are having favorable attitude towards ODL institutions in TNOU, rather than arts and science subject students, and (5) there is significant association between age of the B.Ed. students and their attitude towards ODL institutions in TNOU.

Keywords: Attitude of B.Ed. students, Open and Distance Learning (ODL) institutions, TNOU, Tamil Nadu Open University.

Introduction

India has the second largest educational system in the world after China (Cheney et al., 2006, p.1). Although the Indian education system is the world's second largest, the country also has a high number of illiterates (Mujumdar, n.d., p.1). The Gross Enrolment Ratio (GER) in Higher Education, which was 11% in 2005-06, almost doubled to 19.4% from 2010-11. The GER for women in Higher Education increased from 9.4 to 17.9% during the same period (Singh, M., 2013). The GER in higher education in Tamil Nadu currently stands at 19%, a 1% point increase from the 11th plan period. The GER of marginalized sections of society in the context of social and gender is even less than 6% (Pokhriyal, n.d., p.1).

Open and Distance Learning (ODL) in the higher education sector contributes to about 24% of the total enrolment. The aim of Tamil Nadu government is to make it 21% by 2017 and 25% by 2025 (Thyagarajan, n.d., p.4). The Indian Government has ambitious plans for increasing this to 40%. India has only one central Open University, namely, Indira Gandhi National Open University (IGNOU). Each State also has a State Open University setup by the local State Government. In spite of this, and due to the need of educating huge population of the masses, many private, un-aided distance education providers have mushroomed in all corners of India (Mujumdar, n.d., p.1).

Tamil Nadu open university

The Tamil Nadu Open University (TNOU) was established to benefit those who have been deprived of and/or denied the access to higher education especially destitute, physically

challenged, working men and women, economically weaker sections of the society, and those who discontinued education for various reasons, etc. In the main, it aims to reach the unreached.

Tamil Nadu Open University offers 2 year B.Ed. programs, through a distance mode since 2004. A total of 500 students were admitted through 5 program study centers (PSCs) by English medium since 2004. After 2006, the university has admitted an additional 500 students through Tamil Medium. So, in totality, 1000 students are pursuing their B.Ed. program through 10 PSCs. In TNOU, the B.Ed. program mainly concentrates on improving the quality of teaching competency and articulating the innovative teaching strategies for the already employed/working teachers in the schools of Tamil Nadu. The main feature of the B.Ed. program is to help the teachers to study while working in various schools of Tamil Nadu without affecting their teaching career.

Significance of the study

Tamil Nadu Open University is the first university to conduct B.Ed. program through distance education in the state since 2004. Till today, roughly 9,000 students have completed their 2 years B.Ed. degree program through distance mode. All are teachers working in schools in Tamil Nadu, and among those, 95% of them are working in government and government aided schools. Tomorrow's nation depends upon the type of citizens trained and educated today in the temples of learning. Humayun Kabir said, "Teachers are literally the arbiters of a nation's destiny" (Kochhar, S. K., 1971, p.153).The role of primary and secondary school teachers are very important. They are like potters molding the habits and behavior of a child according to the needs and aspirations of the society. It needs no description that the teachers are the pivot of any educational system of the younger students. On them rests the failure or the success of the system. If the teachers are well educated and are intellectually alive and take keen interest in their job, success will be ensured. But if on the other hand, they lack training in education and if they cannot give their heart to their profession, the system is destined to fail. Taking this into mind, the investigator aims to study the attitude of B.Ed. students towards ODL Institutions in Tamil Nadu Open University.

Operational definitions

Attitude

Attitude is a tendency to show favor or disfavor for ODL institutions in TNOU. It is the amount or degree of positive or negative feelings towards ODL institutions in TNOU.

B.Ed. Students

The students studying their B.Ed. degree program through distance mode in Tamil Nadu Open University after completion of their UG/PG degree.

ODL Institutions

Open and Distance Learning Institutions approved by the Tamil Nadu Open University as Program Study Centers in Tamil Nadu.

Tamil Nadu Open University

Tamil Nadu Open University is the 10th Open University in India, established by the Legislative Assembly of Tamil Nadu State Government Act 27 of 2002 in Chennai.

Methodology

In the present study survey method was employed. A sample of 293 B.Ed. students studying in Tamil Nadu Open University was selected by simple random technique. The data was collected by Students' Attitude and Perceptions Rating of Open and Distance Learning Institutions Inventory (SAPRODLII) developed by Ojo, D.O., & Olankulehin, F. K. (2006). SPSS-17 Package was used

for analysis of the collected data. The Percentile analysis, mean, standard deviation, level, t-test, ANOVA and chi-square were employed as statistical techniques to analyze the data

Objectives:

To find out the levels, and attitudes of B.Ed. students towards ODL institutions in TNOU.

To find out if there is any significant difference in the attitude of B.Ed. students towards ODL institutions in TNOU in terms of background variables- (i) gender, (ii) locality, (iii) medium of study, (iv) major subject, (v) teaching experience and (vi) age.

Null hypotheses

There is no significant difference between male and female B.Ed. students in their attitude towards ODL institutions in TNOU.

There is no significant difference between rural and urban B.Ed. students in their attitude towards ODL institutions in TNOU.

There is no significant difference between Tamil and English medium B.Ed. students in their attitude towards ODL institutions in TNOU.

There is no significant difference among arts, science and language subject B.Ed. students in their attitude towards ODL institutions in TNOU.

There is no significant difference among below 10 years, 11 to 20 years, and above 21 years experience having B.Ed. Students in their attitude towards ODL institutions in TNOU.

There is no significant association between age of the B.Ed. students and their attitude towards ODL institutions in TNOU.

Data analysis and results

Table 1

Level of B.Ed. Students' attitude towards ODL institutions in TNOU

Negative		Neutral		Positive	
N	%	N	%	N	%
67	22.9%	175	59.7%	51	17.4%

It is inferred from the above table that the attitude of B.Ed. students towards ODL institutions in TNOU is neutral.

Findings and interpretations

H_o 1: There is no significant difference between male and female B.Ed. students in their attitude towards ODL institutions in TNOU.

Table 2

Difference between male and female B.Ed. students in their attitude towards ODL institutions in TNOU

Gender	N	Mean	SD	Calculated 't' Value	Remark at 5% level
Male	92	40.32	5.045	1.38	NS
Female	201	41.23	5.310		

At 5% level of significance the table value of 't' is 1.96

It is inferred from the above table that there is no significant difference between male and female B.Ed. students in their attitude towards ODL institutions in TNOU.

H_o2: There is no significant difference between rural and urban B.Ed. students in their attitude towards ODL institutions in TNOU.

Table 3
Difference between rural and urban B.Ed. students in their attitude towards ODL institutions in TNOU

Locality	N	Mean	SD	Calculated 't' Value	Remark at 5% level
Rural	172	41.10	5.154	0.63	NS
Urban	121	40.71	5.366		

At 5% level of significance the table value of 't' is 1.96

It is inferred from the above table that there is no significant difference between rural and urban B.Ed. students in their attitude towards ODL institutions in TNOU.

H_o3: There is no significant difference between Tamil and English medium B.Ed. students in their attitude towards ODL institutions in TNOU.

Table 4
Difference between Tamil and English medium B.Ed. students in their attitude towards ODL institutions in TNOU

Medium of Study	N	Mean	SD	Calculated 't' Value	Remark at 5% level
Tamil	183	40.42	5.190	2.21	S
English	110	41.81	5.223		

At 5% level of significance the table value of 't' is 1.96

It is inferred from the above table that there is significant difference between Tamil and English medium B.Ed. students in their attitude towards ODL institutions in TNOU. English medium students (M=41.81) are having favorable attitude towards ODL institutions in TNOU than Tamil medium students (M=40.42). This may be due to the fact that English medium students easily get enormous learning materials from internet and books. At the same time, the Tamil medium students do not get enough learning materials for their further references.

H_o4: There is no significant difference among arts, science and language subject B.Ed. students in their attitude towards ODL institutions in TNOU.

Table 5
Difference among Arts, Science and Language Subject B.Ed. students in their attitude towards ODL institutions in TNOU

Source of Variation	Sum of Squares	df	Mean Square	Calculated 'F' Value	Remark at 5% level
Between	83.861	2	41.931	3.535	S
Within	7924.152	290	27.325		

At 5% level of significance for (2, 290) df, the table value of 'F' is 3.03

It is inferred from the above table that there is a significant difference among arts, science and language subject B.Ed. students in their attitude towards ODL institutions in TNOU. Language subject students (M=41.21), have a favorable attitude towards ODL institutions in TNOU, than do arts students (M=40.30) and science students (M=39.60). This may be due to the fact that the B.Ed. students in ODL do not have enough time to spend with the instructional resources such as laboratory, library, etc. Art and science students may have unfavorable attitude towards ODL institutions.

H_o 5: There is no significant difference among below 10 years, 11 to 20 years and above 21 years experience having B.Ed. Students in their attitude towards ODL institutions in TNOU.

Table 6

Difference among below 10 years, 11 to 20 years and above 21 years, of experience having B.Ed. Students in their attitude towards ODL institutions in TNOU

Source of Variation	Sum of Squares	df	Mean Square	Calculated 'F' Value	Remark at 5% level
Between	46.598	2	23.299	0.849	NS
Within	7961.416	290	27.453		

At 5% level of significance, for (2,290) df the table value of 'F' is 3.03

It is inferred from the above table that there is no significant difference among below 10 years, 11 to 20 years and above 21 years of experience having B.Ed. Students in their attitude towards ODL institutions in TNOU.

H_o 6: There is no significant association between age of the B.Ed. students and their attitude towards ODL institutions in TNOU.

Table 7

Significant association between Age of the B.Ed. students and their attitude towards ODL institutions in TNOU

Age	Positive		Neutral		Negative		df	Calculated 'χ^2' Value	Remark at 5% level
	O	E	O	E	O	E			
Below 35	10	13.9	35	36.4	16	10.6	4	9.75	S
36 to 45	42	40.6	106	106.9	31	31.2			
Above 46	15	12.1	34	31.7	4	9.1			

At 5% level of significance, for 4 df the table value of , χ^2 , is 9.488

It is inferred from the above table that there is significant association between the age of the B.Ed. students and their attitude towards ODL institutions in TNOU. 36 to 45 year old students (M=41.16) have a more favorable attitude towards ODL institutions in TNOU, rather than below 35 year old students (M=41.07) and above 46 year old students (M=40.06). This may be due to the fact that those who are above 46 years old, are unable to pick up the modern technologies and innovative strategies followed in the ODL institutions and those who are below 35 years old are very familiar with these technologies and they find it monotonous.

Conclusion

From the above study, it is clearly recognized that the attitude of B.Ed. students towards ODL institutions in TNOU is neutral. So, the authorities of Tamil Nadu Open University and faculties of School of Education in TNOU have to take necessary planning and actions in order to improve the attitude of B.Ed. students. Tamil medium students should be given additional learning materials for further references and to strengthen their knowledge. ODL institutions of TNOU should give laboratory based methods of teaching and learning such as demonstration, computer assisted instruction, etc. Furthermore, all ODL institutions should give priority to Learner Centered Methods like brainstorming, role playing, discussion, buzz group, study assignment method, seminar and programmed instruction method. The ODL institutions should not halt at the teaching of the B.Ed. students more than that they should mold the students' life forever. So, they should train them for all-round development activities such as providing computer knowledge, value education, stress coping management, time management, emotional intelligence, etc.

References

Cheney, G. R., Ruzzi, B.R., and Muralidharan, K. (2006). *A profile of the Indian education system.* New Delhi: National Centre on Education and the Economy. Retrieved from http://www.teindia.nic.in/files/articles/indian_education_sysytem_by_karthik_murlidharan.pdf

Kochhar, S. K. (2008). *Secondary School Administration.* New Delhi: Sterling Publishers.

Mujumdar, Swati (n.d.). *Use of ICT for ODL / blended learning / research / administration & management.* Case Study - ICT in Education – Symbiosis, India for UNESCO – Bangkok. Retrieved from http://www.scdl.net/downloads/UNESCO_Casestudy_Symbiosis_India.pdf

Ojo, D. O., & Olankulehin, F. K. (2006). Attitudes and Perceptions of Students to Open and Distance Learning in Nigeria. *International Review of Research in Open and Distance Learning, 7* (1), 1-10. Retrieved from http://files.eric.ed.gov/fulltext/EJ806009.pdf

Pokhriyal. H. C., (n.d.).Governance of Open and Distance learning in a Dual-mode University: A case study of the University of Delhi, India. Retrieved from http://wikieducator.org/images/5/52/PID_732.pdf

Singh, Manmohan (2013). *PM's address at diamond jubilee celebrations of UGC.* Press Information Bureau, Prime Minister's Office, Government of India. Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=102184

Thyagarajan, T. (n.d.).*View points of Tamilnadu state on the road map for ensuring quality of higher and technical education using accreditation as a tool*. Retrieved from http://www.ukieri.org/images/pdf/session6/Prof-T-Thyagarajan.pdf

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Return to Table of Contents

Editor's Note: This study shows undisputed advantage for computer assisted vocabulary learning, but differs from other studies in terms of what software is most effective. Purpose (ESL/EFL), previous experience with the foreign language, and the level of support for that language in the local culture and environment should all be considered in the adoption of language teaching software.

Computer Assisted Vocabulary Learning (CAVL): does it facilitate learning?

Ali Asghar Ghasemi, Hojjat Maleki and Mehdi Moharami
Iran

Abstract

Vocabulary is the cornerstone of any language, as well as a great challenge to language learners. A common problem faced by students in learning a language is their deficient knowledge of target language vocabulary. Learners' difficulties, and the resulting problems for English teachers inspired the researchers to involve students in learning English vocabulary via a Computer Assisted Vocabulary Learning (CAVL) - based spaced repetition program. This study seeks to address the efficacy of language teaching software in developing English vocabulary among high school learners. 80 first-grade-high school students were randomly selected and assigned into experimental and control groups. The most remarkable result to emerge from the data is that CAVL-based language learning indicated greater achievement as compared with the traditional vocabulary teaching methods. This work could be a useful aid for decision makers to integrate this program for enhancing the ultimate performance of learners.

Keywords: Vocabulary, CAVL (computer assisted vocabulary learning), target, Spaced repetition software, English, Teacher, achievement, traditional, method, performance

Introduction

The fast growth of technology in the modern world, where information transfer plays a major role, necessitates the knowledge of an international language. Learning vocabulary constitutes the chief step for learning a foreign language (Erten & Tekin, 2008). Mackintosh (1998) believed that foreign language learning by means of a computer is a good alternative for traditional classroom instruction. Wong *et al*. (2010) believed that integrating CALL (computer assisted language learning) can provide learners with real-life contexts.

Importance of vocabulary learning

Lexical items are the cornerstone of language (Hoshino, 2010) and are required for achieving competency in all aspects of communication (Godwin-Jones, 2010). Second language learners know that limitations in their vocabulary knowledge impede their ability for effective communication (Read, 2004). In other words, the better the students learn the target vocabulary, the more likely they will succeed in learning the target language. Zhang and Li (2011) argue that L2 vocabulary learning is a basic task in SLA and proficiency of second language skills depends on lexical knowledge to a great extent. According to Laufer (1997), "the level at which good L1 readers can be expected to transfer their reading strategies to L2 is 3000 word familiarities, or about 5,000 lexical items" (p.24). Laufer concludes, "By far the greatest lexical obstacle to good reading is insufficient number of words in the learner's lexicon" (p.31). Schmitt et al. (2011) found out that for comprehending a text appropriately, there is a need to know 98% of its lexical items. However, the stylistics and methodology of teaching vocabulary needs further studies (Folse, 2004) and it is still uncertain which techniques are the most effective in vocabulary learning (de Groot, 2006)

CALL and vocabulary learning

The rapid growth of communication technology has made computers become an influential medium for second language learning. As students go through different stages of second language acquisition, applying computerized programs in language teaching can enhance collaborative and autonomous learning and equip students with language experiences beyond the classroom environment (Kung, 2002). Furthermore, through computerized teaching materials students can study language particularly at their favorable speed in a motivated situation with an acceptable level of interaction (Cellat, 2008).

One of the most prevalent applications of the CALL is computer assisted vocabulary learning (CAVL). According to Goodfellow (1994), this computerized technology may aid in learning a large number of vocabularies, accomplishing autonomous learning activities, facilitating deep learning and etc. Most of the CAVL programs were initially created according to spaced repetition principles. Since it was difficult to manage the spaced repetition details in the classroom or in process of individual learning; computerized softwares were suggested as an aid to administer the schedule as well as presenting vocabulary lessons at personalized time intervals to guarantee retention (Nation, 2001).

Statement of the problem

Without adequate vocabulary, learners cannot express their ideas and communicate meaningfully (Harley, 1996).

Pemberton (2003) states that of the many difficulties faced by those who want to improve their vocabulary in a foreign language are derived by two major problems. The first is that many learners at intermediate levels and above find it difficult to adequately learn large numbers of words within a short period of time to achieve progress in their language performance. The second problem arises when the intended words are susceptible to forgetting. In the same vein, Rahimi and Sahragard (2008) contend that language learners need effective ways for retaining new words in long-term memory.

On the other hand, Kim (2011) indicates that language teachers know the difficulty of retaining large numbers of vocabulary, but might not know how to help learners in performing this task. Second language learners are generally aware of the fact that their limited vocabulary knowledge affects fluency of their performance both in spoken and written language; however, they are not competent in the ways to improve their vocabulary.

Language teachers need to receive professional training in order to incorporate autonomous vocabulary learning into their teaching methods (Read, 2004). Both students and teachers need to know how instructional programs might promote the acquisition of large amount of words. This study can actually be helpful to English learners, and teachers as well as curriculum designers, and let them change the existing strategies in order to absorb students' attention while teaching (Read, 2004).

Research questions

The high school students' difficulties and the resulting challenges for teachers inspired the researcher to involve students in learning the vocabulary, via the CAVL program in order to study the effectiveness of this language teaching software in developing vocabulary among Iranian high school learners.

The main purpose of this study is to investigate the effect of learning vocabulary via computer assisted vocabulary learning software by Iranian high school students and how it contributes to the retention of vocabulary knowledge. In other words, the questions are as follows:

Q1: Does implementation of CAVL (spaced repetition software) have a positive effect on Iranian high school students' vocabulary achievement?

Q2: Does the use of CAVL have equivalent effects on learning different parts of speech (nouns, adjectives, verbs, and adverbs) and phrasal verbs?

Method

Participants

The participants of this research were 80 first-grade high school students, who were taking English as one of their courses at high school in Iran. They were all males, about fifteen years of age and had studied English as a compulsory high school course for the preceding three years. Two classes were randomly assigned as the experimental group and two classes as the control one. Their course book, based upon Grammar Translation Method, was the same. The experimental group learned and practiced new words through using spaced repetition computer software; the control group learned vocabularies via traditional teaching techniques, i.e. using synonyms, exemplifications and vocabulary drills. Both groups studied the vocabulary items of the same textbook under none-native teacher's supervision.

Instruments

Instructional software and materials

The vocabulary learning computer software based on spaced repletion learning; a spaced repetition software, Mandegar Leitner box (a software revised in Iran), was used for the experimental group to help learners foster the high school textbook vocabulary. According to Dr. Sida (2014), the creator of Mandegar, it is a program which facilitates remembering of vocabulary items. He believes that the technique is much more efficient than the traditional one to increase the amount of vocabulary and decrease the time that they generally spend for studying to remember vocabulary items ("Leitner Box", 2013).

The function of the software is based on a flashcard system with the question on the front and the answer on the back of the card. However, the appearance of Mandegar does not look like the paper flashcards. When we click on Show Answer button, the question part is also seen by default (see figure 1).

Fig.1 Screenshot of the Mandegar (Recognition Card)

It is possible to create two styles of flashcards in different groups that are recognition cards and recalling cards. In the recognition card format, learners are given some contextualized vocabulary, and are asked if they can understand it. However, the disadvantage of this card system is that words cannot be incorporated into active vocabulary of learners, so that learners can easily recognize the words (see Figure 3).

For recalling cards, learners are expected to produce an answer in the target language. In this technique, the translation of the vocabulary in the learner`s native language will be presented first, and the learner is required to find the correct word in the target language. In recalling techniques, the definition of the vocabulary as well as an example is given to students on the front part. The definitions, meanings and example sentences were all taken from Oxford Advanced Genie and Lingvosoft Dictionary softwares. The examples were selected according to their comprehensibility for this level of the students.

After showing questions to the learners, they are required to concentrate on finding the answer in order to recall the correct answer. When the learner is ready, "Show Answer" option should be clicked and the following options on the flashcard will be displayed (See figure 2).

Fig 2 Design of the Mandegar (Recalling Card)

Subsequently, learners choose an option based on how they remember the target item; then they push either true answer or false answer bottoms. Every time the learner remembers a word correctly, they will be shown the same word again after a longer period of time and if the learner cannot remember it correctly, the word will be carried over to the first stage for re-learning. Audio pronunciation of the new word is available in the software, and the written form of it can also be added to the flashcard to present the appropriate pronunciation of the vocabulary item.

In the control group, the same textbook vocabularies were taught through synonyms, exemplifications and practicing vocabulary.

Vocabulary test

A teacher-made vocabulary test based on units 1-5 of the first grade high school English textbook, was used as both the pre-test and the delayed post-test (see Appendix A). The pre-test was used to

measure the participants' prior knowledge of the target words, and the post-test was used to assess their vocabulary acquisition after treatment. The test was comprised of two separate sections: the first section contained 34 items in multiple choice completion form, and the second one contained 6 close test items.

The test was designed and administered by the researcher. The selected words included in the vocabulary test comprised different grammatical categories. 16 items were verbs and phrasal verbs; 8 items were nouns; 8 items were adjectives; and the remaining 8 items were adverbs. All categories had an equal number of items. The purpose was to investigate which category was more influenced by CAVL.

Procedure and data analysis

In this study, all of the students took part in their usual classes because of the educational regulations. It is worth mentioning that homogeneity of students was ensured, according to students' scores in the preceding term. The number of participants was 80; they were randomly assigned to four groups consisting of 20 students, i.e. two experimental and two control groups marked as groups 1 and 2.

The students in group 1 were treated using spaced repetition computer software (Mandegar software). In the learning phase, the participants learned their course vocabularies making use of Mandegar software every day for 8 weeks .The classes were held two sessions a week, each session was 90 minutes, in the computer room of the school; 10 new words were introduced to the learners every session. Yet, they had the option to choose the number of cards they wanted to review each session. For this study, learners were told to review at least 10 words a session, but they had the chance to increase this number according to their own pace. Mandegar is based on the spaced repetition learning system, which aims at helping learners to review target words for a short period of time every day.

In the case they were not able to do it in a single session, they could leave new cards blank, and when they open it for the next time, the software will prevent any new cards from being shown. This way, learners will not have too many new items to review a day.

Students had access to computers every day. They were told that Mandegar could be installed on laptops as well as on desktop computers. Hence, they could bring and use their laptops in class. A detailed presentation was given to students about how software works.

The students in the control group received ordinary classroom instructions each session. In order to teach the new vocabularies, the learners were asked to close their books, and then the following steps were taken. The first step consisted of reading aloud each vocabulary item two or three times then a short pause was made so that the students could learn the correct pronunciation. The second step included reading aloud each vocabulary word two or three times again, and allowing the students to repeat the words. In the third step, the students were requested to open their books to the intended page, and only listen to the teacher as the vocabulary items were read out to them. The last step consisted of going through the word list and explaining each word by presenting examples and writing the synonyms and antonyms on the board.

Results

Piloting the test

In order to ensure the reliability of the pre-test and delayed post-test, Kudar-Richardson Reliability Coefficient (KR 21 Formula) was used to compute. The outcome (0.87) represents a good level of reliability.

Table 1
Descriptive statistics for the pilot test

	N	Minimum	Maximum	Mean	Std. Deviation
pilot test	40	10	40	22.90	8.378

Homogeneity Analysis

An Independent-Sample T-Test ($p = 0.696 > 0.05$) signifies the homogeneity of two groups in terms of their vocabulary knowledge.

Table 2
Independent samples t-test analysis comparing control and experimental groups for pre-test

Pre-Test	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% CI	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	3.355	.071	.392	78	.696	.650	1.657	.071	.392
Equal variances not assumed			.392	73.50	.696	.650	1.657	.392	-

Testing the first research question

A Paired Samples T-Test was used on each group separately to see whether the difference, if any, was significant.

Table 3
Paired sample t-test comparing pre-test and post-test for control and experimental group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper			
Pair 1	control pre-test - control post test	4.1000	8.5838	1.3572	6.8452	1.3548	3.021	39	.004
Pair 2	experimental pre-test - experimental post test	8.9250	3.3003	.5218	9.9805	7.8695	17.104	39	.000

The T-test results ($P = .004 < 0.05$) for control group and ($P = .000 < 0.05$) indicate that the traditional and computer methods have had considerable effects on the learners' vocabulary learning.

Later, the researcher ran an independent sample T-test to compare post-test mean scores of the participants in both groups. Table 5 shows the descriptive statistics of Independent Sample T-test after the administration of the treatments.

Table 4
Descriptive statistics of independent sample test after administration of the treatments

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	.317	.575	2.884	78	.005	4.175	1.448
Equal variances not assumed			2.884	75.665	.005	4.175	1.448

Regarding the mean score of the pre-test for the control group (M=24.775) and the experimental group (M= 24.125), the T-test result shown in table 4.6 indicated that there is a meaningful distinction between the means of the two groups in the post-test after the administration of the treatment. This analysis reveals that CAVL in comparison to the traditional method had been more effective on grade one high school learners' vocabulary learning.

Testing the second research question.

Table 5
Paired Sample Test for Parts of the Speech

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper			
Pair 1	noun pre-test – noun post-test	2.400	1.809	.286	2.978	1.822	8.392	39	.000
Pair 2	adjective pre-test adjective post test	2.225	1.368	.216	2.662	1.788	10.287	39	.000
Pair 3	adverb pre-test – adverb post-test	1.500	1.155	.183	1.869	1.131	8.216	39	.000
Pair 4	verb pre-test – verb post-test	1.450	1.395	.221	1.896	1.004	6.574	39	.000
Pair 5	phrasal pre-test – phrasal post-test	1.350	1.292	.204	1.763	.937	6.609	39	.000

As seen in Table 5, the T-test results of all pairs ($p=.000<0.05$) reveals that Computer Assisted Vocabulary Learning software is effective on high school learners' vocabulary learning in different grammatical categories. However, does the use of CAVL have equal effects on learning various parts of speech and phrasal verbs?

In order to make clear improvement equivalence, a one way ANOVA Test as well as a Tukey Test were run in order to clearly distinguish significant improvements.

Table 6
Descriptive Statistics for Parts of Speech

		noun scores increases	adjective scores increases	adverb scores increases	verb scores increases	phrasal scores increases
N	Valid	40	40	40	40	40
	Missing	0	0	0	0	0
Mean		2.4	2.2	1.5	1.4	1.3
Median		2.0	2.0	2.0	1.0	1.0
Mode		2.0	3.0	2.0	1.0	1.0
Std. Deviation		1.8	1.3	1.1	1.3	1.2
Minimum		.0	.0	-1.0	-1.0	-2.0
Maximum		8.0	5.0	4.0	5.0	4.0

Table 7
The results of one-way ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	37.320	4	9.330	4.583	.001
Within Groups	397.000	195	2.036		
Total	434.320	199			

As the results in Table 4.10 indicates, there is a statistical significant difference between groups, as determined by one-way ANOVA ($F= 4.467>1.0$, $p = .001<0.05$).

Table 8
The results of the Tukey test

		Subset for alpha = 0.05	
Subject	N	1	2
Phrasal	40	1.35	
Verb	40	1.45	
Adverb	40	1.50	
Adjective	40	2.20	2.20
Noun	40		2.40
Sig.		.063	.971

Statistical significant differences were detected. As can be seen, improvements for nouns and adjectives are higher than other categories, respectively.

Discussion

The present study compared the effects of Computer Assisted Vocabulary learning with the traditional method of instruction on first grade high school EFL learner's vocabulary. The results of the study revealed that CAVL, i.e. experimental group, did far better than the control group. This indicates that the CAVL group learned and remembered more vocabulary than the traditional group. The findings of this study corresponds with the claims of Laufer (2005) and Schmitt (2008), who demonstrate that explicit vocabulary learning helps learners to learn a larger amount of vocabulary in a short period of time and retention is also greater.

The findings of current study are compatible with the findings achieved by Altiner (2011), and the other findings indicated in Tsou *et al*. (2002). Altiner examined the effectiveness of computer based flashcard program on academic vocabulary learning. The spaced repetition tool used for this study helped academically oriented college-level ESL students improve their academic vocabulary, and changed their negative perceptions about vocabulary learning.

The results of this study are also in line with Tabar and Khodareza's (2012). They investigated the effect of Computer-Assisted Vocabulary Instruction (CAVI) on pre-intermediate and intermediate Iranian EFL learners' vocabulary learning, and compared CAVI with Teacher-led Instruction (TLI) in term of vocabulary achievement. The results of their study showed a significant difference between the mean scores for the groups in the post-test. The group who had received the treatment by CAVL, performed significantly better than the groups who studied through teacher-led instruction.

The results of the current study, however, run counter to the study conducted by Iheanachu (1997). He investigated the effects of two multimedia computer assisted language learning programs on vocabulary acquisition of intermediate level ESL students. The results of his study showed no significant difference between scores of the post-tests for the group who learned the words with one software, and the group who learned the words through another software; however, both groups had positive achievements in their vocabulary knowledge. The current study, on the other hand, came up with opposite findings, i.e. the participants in the group who benefitted from using the Mandegar software, performed significantly better in the vocabulary post-test in comparison with the group who received traditional vocabulary teaching.

The difference in the results of this study, and those obtained by Iheanachu (1997) can be attributed to a number of issues including the difference in the mother tongue of the participants, the target language, the type of software, and the type of the tests through which the teaming outcome was assessed. The participants in lheanachu's study were in the context of ESL, while in the current study, the participants were learning vocabularies in an EFL context. It is evident that learners living in an English-speaking country will have different needs from those who are learning it as a foreign language. In addition, the selection of vocabulary teaching aids could have also had an effect. It could be said in lheanachu's study, the effects of two multimedia computer assisted language learning programs on ESL learner's vocabulary acquisition was investigated. But in the current study, the researcher compared the effects of Mandegar vocabulary learning software with the traditional vocabulary teaching. It might be said that in lheanachu's study, both programs might be efficient ones and having no superiority over each other.

Regarding the effect of CAVL on different speech parts, the results of the study were supported to some extent by Chen's (2005) examination. His major finding on overall error rates indicated that computer instruction operated significantly in the error categories of nouns and prepositions.

Conclusion and implications

The present research shows that CALL based spaced repetition over time programs, such as Mandegar software, are more effective as compared with late night cramming sessions or traditional book-based vocabulary learning methods. Although these programs are a little difficult in comparison with student's familiar translation paired learning method, by creating highly individualized, and student-centered strategies, and efficient learning solutions, they will be capable of enhancing materials using mnemonic strategies to facilitate and foster long term recall. This research supplied an evidence for effect of CALL-based spaced repetition software on Iranian high school EFL student's vocabulary knowledge. Therefore, teachers may integrate such programs on their language classrooms to improve their student's word knowledge at the level of guidance school, high school and universities.

References

Altiner, C. (2011). Integrating a computer-based flashcard program in to academic vocabulary learning. *Iowa State University*. Retrieved April. 22, 2013, from http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1122&context=etd

Cellat, S. (2008). Computer assisted vocabulary learning: A study with Turkish fourth grade EFL learners. M.A. thesis, *Anadolu University, Turkey*.

Chen, L. (2005). Examining the role of the computer in EFL instruction. *Electronic Journal for the Integration of Technology in Education,* vol. *4*.

De Groot, A. M. B. (2006). Effects of stimulus characteristics and background music on foreign language vocabulary learning and forgetting. *Language Learning*, *56*(3), 463-506.

Erten, I. H., & Tekin, M. (2008). Effects on vocabulary acquisition of presenting new words in semantic sets versus semantically unrelated sets. *System*, *36*, 407-422 .

Folse, K. S. (2004). *Vocabulary Myths*. Ann Arbor, MI: University of Michigan Press.

Godwin-Jones, R. (2010). *Emerging technologies, from memory places to spacing algorithms*: Approaches to second-language vocabulary learning. Language Learning & Technology, *14*, 4–11.

Goodfellow, R. (1994). Design principles for computer-aided vocabulary learning. Computers & Education, *23*, 53-62.

Harley, B. (1996). *Introduction: Vocabulary learning and teaching in a second language.* The Canadian Modern Language Review 53.

Hoshino, Y. (2010). The categorical facilitation effects on L2 vocabulary learning in a classroom setting. *RELC Journal*, *41*, 301–312.

Iheanachu, Ch. C. (1997). *Effects of two multimedia computer-assisted language learning vocabulary acquisition of intermediate level ESL students.* Retrieved April. 21, 2013, from http://scholar.lib.vt.edu/theses/available/etd-11397 193839/unrestricted/Clems.pdf

Kim, Y.J. (2011). The role of task-induced involvement and learner proficiency in L2 vocabulary acquisition, *61*(1), 100–140.

Kung, S. C. (2002). A Framework for successful key-pal programs in language learning, *CALL-EJ Online*, *3* (2). Retrieved May. 17, 2011, from http://www.clec.ritsumei.ac.jp/english/calleonline/6-2/SCKung.htm

Laufer, B. (1997). *The lexical plight in second language reading*. Cambridge: Cambridge University Press.

Laufer, B. (2005). *Focus on form in second language vocabulary learning*. EUROSLAB Yearbook, *5*, 223-250.

Leitner Box. (2013). Retrieved November 10, 2013, from http://leitnerbox.ir

Mackintosh, K., (1998*). Lexicographic Series Maior*. *88*, 123-149.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. New York: Cambridge University Press.

Pemberton, R. (2003). Learning and remembering vocabulary: A case study in spaced repetition. *Hong Kong University of Science and Technology*.

Rahimi, A., & Sahragard, R. (2008). Vocabulary learning can be fun. *The Asian EFL Journal, 14*(2), 63-89 .

Read, J. (2004). Research in teaching vocabulary. *Annual Review of Applied Linguistics, 24* ,146-161.

Schmitt, N. (2008). Instructed second language vocabulary learning. *Language Teaching Research, 12*(3), 329-363.

Schmitt, N., Jiang, X., & Grabe, W. (2011). The percentage of words known in a text and reading comprehension. *The Modern Language Journal, 95*, 26–43.

Tabar, H., & Khodareza, M. (2012). The effect of using multimedia on vocabulary learning of pre-intermediate and intermediate Iranian EFL learners. *Journal of Basic and Applied Scientific Research*, *2*(12)12879-12891.

Tsou, W., Wang, W., & Li, H. (2002). How computers facilitate English foreign language learners acquire English abstract words. *Computers & Education*, *39*(4), 415-428.

Wong, L.H., Chin, C.K., Tan, C.L., Liu, M., & Gong, C. (2010). Students' meaning making in a mobile assisted Chinese idiom learning environment.

Zhang, B., & Li, C. (2011). Classification of L2 vocabulary learning strategies: Evidence from exploratory and confirmatory factor analyses. *RELC Journal, 42*, 141–154.

Appendix A

Vocabulary pre-test and delayed post-test:

Time: 20 Minutes

Part A: Multiple Choice Test

Questions 1-34

Directions: choose the word or phrase (1), (2), (3) or (4) that best completes each sentence. Then mark the correct choice on your answer sheet.

1. Nurses usually …….. white clothes.

a. wear b. sell c. draw d. pay

2. What does your friend ……..? She is tall with dark hair.

a. look at b. look for c. look like d. look out

3. A ……. of teachers decided not to go to that class.

a. foreign b. first c. face d. group

4. He asked ……. for a glass of water.

a. completely b. brightly c. politely d. clearly

5. We have a lot of…… students in our universities.

a. foreign b. final c. comfortable d. loud

6. If we boil water, it …… steam.

a. goes up b. looks for c. goes away d. turns into

7. I want to be a doctor when I ……up.

a. get b. wake c. grow d. climb

8. If you can't ride the bicycle the first time. …… again.

a. make b. cry c. fly d. try

9. Be careful. This part of the river is very……..

a. deep b. loud c. high d. long

10. My grandmother was sick and weak. She could ……. get up.

a. easily b. slowly c. hardly d. clearly

11. Steam ……..when it comes out of the kettle.

a. starts b. travels c. changes d. sings

12. English is taught in Iran as a …… language.

a. special b. certain c. foreign d .entire

13. She walked so …… that fell down and broke her leg.
a. carefully b. slowly c. silently d. carelessly

14. The ……. In our sitting room doesn't give out much heat. It is cold here.
a. fire place b. kettle c. pan d. pot

15. It is dark here. Why don't you ……. The light ……. .
a. turn-down b. turn-up c. turn-on d. turn-off

16. He is trying to ……..many things about the sun.
a. reply b. receive c. discover d. believe

17. When they traveled to Kerman, they bought a map and they did not ..... in the city.
a. pay for b. get lost c. ask for d. drop down

18. Some parents ……. that internet is not good for their children.
a. believe b. study c. hope d. learn

19. We wanted to sell our house, but ……..we didn't sell it.
a. finally b. really c. hardly d. kindly

20. Many things about the birds' migration are still a.-------
a. mystery b. secretary c. master d. ministry

21. Please repeat these words after me ……..
a. hardly b. noisily c. finally d. loudly

22. Nobody can live on the moon because there is no ……..there.
a. space b. food c. art d. air

23. I love her very much. She is a (n) …… friend of mine.
a. bright b. secret c. special d. unhappy

24. It is very cold outside. Don't …….your coat.
a. turn on b. put on c. take off d. wait for

25. Maryam put closes on her little daughter every morning. "Put closes on" means.....
a. dress b. wear c. feed d. reply

26. He has a lot of money. He usually helps …… people.
a. kind b. rich c. poor d. angry

27. Ahmad is a wise boy. He always treats old people ……..
a. certainly b. really c. kindly d. brightly

28. They climbed the wall easily. "Climbed" means……
a. went up b. grew up c. took off d. put on

29. My sister bought some fine …… to make a dress.
a. close b. seat c. pockets d. food

30. The little old man could make …….cars out of wood.
a. beautifully b. likely c. carefully d. lovely

31. I like to have a little sister like Mary. She is very …….
a. careless b. attractive c. thirsty d. angry

32. When someone is too weak, he cannot walk ……..
a. hardly b. easily c. loudly d. warmly

33. We pick fruits when they are……. .
a. green b. ripe c. little d. long

34. We have a house with a ***little*** garden in the country. The opposite of <u>little</u> is……..
a. long b. big c. tall d. small

Part B: Cloze Test

Questions 35-40

Directions: Read the following passage and decide which choice (1), (2), (3) or (4) best fits each space. Then mark the correct choice on your answer sheet.

Man has always been guided by prophets. Prophets are …… (35)…… by the one God for the … (36)… of people. Prophets have been our …..(37)…… from the beginning of the creation of the..…. (38)…. . When and where there is something wrong with the people, they are sent to … (39)… we know good from bad. When we..…. (40)….. attention to the prophets, we'll have a happier life in this world and also in the world after.

35. a. received b. passed c. worshiped d. sent

36. a. creation b. guidance c. message d. truthfulness

37. a. teachers b. painters c. doctors d. creators

38. a. cities b. tittles c. idols d. world

39. a. begin b. leave c. help d. admire

40. a. give b. let c. tell d. pay

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Return to Table of Contents