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Editorial

Dark Age or New Age for Public Education

The global economic crisis is forcing industries, governments, and social organizations (including education) to rethink their business plans. Recovery in this changed environment requires more than scaling down, restructuring, or rigorous discipline. The economic model we know is broken. It is the end of an era. It is a time to reassess and redefine public education to meet the needs of the new millennium. It is a time for change.

For the United States to continue as an incubator of new and creative ideas, it must invest in its people, especially education, health care, and the environment. The economic model was broken by greed, excesses; and lack of regulation. Public education was broken by politics, neglect, and over-regulation.

For a century and a half, education was built upon a mass schooling model initiated by Thomas Mann, Sears Harper, and Edward Thorndike. During this period there have been great social changes as a result of immigration, wars, economics, technology, and globalization. The end result is an inefficient and overburdened public education system that does not meet the requirements of people or government. Its situation can be compared to General Motors; its core business is built around a reciprocating engine powered by fossil fuels and cannot meet environmental standards.

In the 19th and early 20th century, the core business of mass education was to provide compliant workers for industry. In the information age, workers need to be creative, intelligent, and self-reliant. However, our tools and teacher training are geared to a pre-industrial age.

Like the Swiss watch industry and silver-halide photography, the automobile industry ignored alternative and sustainable (transportation) solutions – alternatives that would be less costly to produce, operate and maintain, and friendly to the environment. General Motors continued its traditional products, lost market share to foreign competition, and went into bankruptcy. Public education can learn from these experiences by assessing its performance in several areas.

Self Reliance: Social programs such as public education and healthcare are inherently inefficient because of the number of personal services involved. Some savings are possible using paraprofessionals. An educated populace is capable of making many decisions previously made by professionals. Self help and guided help can substantially reduce the face-to-face time for routine and non-critical decisions.

Efficiency: Education is notably lacking in the labor saving technologies, integrated communication systems, and quality control. A computer based Learning Management Systems (LMS) is needed to track student progress, perform diagnostic-prescriptive procedures, guide student progress, and deliver instructional materials.

Individualization: Batch processing methods for instruction and evaluation are inefficient. Everybody receives the same treatment with a minimum of customization. This produces variable results (designated as "grades"). Grading systems should be replaced by performance criteria and rubrics that meet ISO 9000 quality standards. Individualized learning should adapt for individual differences in experience, aptitudes and needs.

Redundant Effort: Every semester, tens of thousands of teachers prepare and present the same lessons. This energy would be better spent on collaborative development of materials. Based on feedback, these materials can be continually improved and adapted

for students with special needs. The best instructional materials will be interactive and adapt dynamically to the needs of each individual student.

Locus of Control: In an educated populace, individuals can be involved in decision making, or even make their own decisions. Education should prepare students to be s*elf-reliant* by exercising *individual responsibility, learning independently,* and *working in teams.*

Learning Environments: Learning can take place anywhere and anytime. To sit and listen in a classroom is one of many options. Concepts such as *small class size, teacher-student interaction,* and *local development of curriculum,* are ideals that are rarely achieved in under-funded and overcrowded schools. Alternatives to traditional classroom learning require activity areas, computers and networks beyond what a school can provide..

Funding: Seat time does not necessarily produce learning, yet K-12 school funding is based on Average Daily Attendance, which is seat-time. High truancy results in loss of teaching positions and reduction in the quality of education.

Testing: Billions of dollars are wasted on standardized tests that do little to improve performance. They rarely show significant change, so their real value is questionable.

Access to Learning Resources: Privatization of knowledge, the Digital Millennial Copyright Act, and the extraordinary cost of textbooks and learning materials reduce access for teachers and learners. Teachers and students need protection to use copyrighted material and access knowledge protected by subscription.

Public education needs an alternative model tailored to the challenges of the 21st century. A paradigm change is needed that will greatly expand the capabilities of the existing system. The new system of education must have:

1. **Research Base:** Combine research findings, proven theories and best practices to design motivating, interactive, easy-to-learn activities that facilitate higher levels of learning.
2. **Superior Communication and Management Tools:** Use technology to assist text and visual communication. Learn via interactive multimedia, computer databases, powerful search engines, and simulation. Combine all aspects of learning and evaluation into learning management systems.
3. **Individualized**: Provide diagnostic and prescriptive guidance to ensure that every learner receives an appropriate education for living in a modern global economy. Use feedback to continually improve instructional materials and enhance individual/group performance.
4. **Scalable**: Accommodate the needs of much larger and/or smaller numbers of students at different grade levels and in different geographic areas.
5. **Cost-Effective**: Achieve global performance criteria across a broad and up-to-date curriculum. Achieve a quantum jump in performance without significant increase in cost.
6. **Relevant**: Focus on life skills and job skills that are relevant for today and for the future.

All of us must be part of the solution. The editors sincerely believe that instructional technology and distance learning are an important part of the new learning paradigm. They meet many of the criteria listed in 1-6 above – research, proven theories and best practices, individualized and scalable, effective, relevant and affordable. Many of the administrative details are yet to be determined. Adoption of this futuristic model will stimulate research and continued innovation.

Editor's Note: In 1962, I attended a presentation on artificial intelligence by Professor Herbert A. Simon from Carnegie-Mellon University. With Allen Newell, he gained renown in the mid-1950s when they created the first "thinking machine" and launched the field of artificial intelligence using computer models to study human thought processes. Their research was based on a theoretical model called the Turing Machine. Fifty years later, this model continues to be the criterion for studies on human intelligence and learning.

Imagination Effect in Teaching and Learning of Turing Machine

R S Tiwari, S N Deore
India

Abstract

This paper presents the study on application of imagination effect on teaching and learning processes carried out for computing course on "Theoretical Computer Science". Experiments on high element interactivity topics namely *Turing machine, Finite Automata* and *Push Down Automata* were conducted to observe the imagination effect on teaching as well as learning. The current paper reports the work conducted for the Turing Machine. The study used experimental design with two groups, a control and an experimental group, each having 15 students. The control group was taught using traditional methods of lecturing and problem solving followed by physical study and practice with problems. The experimental group was provided a treatment that consisted of lecturing and problem solving followed by mental imagination of procedures required to get solutions for the given problems.

Keywords: Turing Machine, cognitive load, imagination effect, element interactivity, cognitive architecture, intrinsic load, worked example, finite automata, push down automata, working memory, schema.

Background

In 1936 Alan Turing (Hodges, Mrch, 1992) devised a theoretical machine whose computational ability has yet to be surpassed by any concrete and physical computing machine developed by man. Alan Turing's invention is called Turing Machine and it is a purely hypothetical machine, a computing system that operates using finite series of symbols. It is useful for teaching the philosophical background of basic computing because fundamental ideas regarding computing are still the same as those used in working the Turing Machine. The basic principles underlying the workings of the Turing Machine are equally applicable to modern computers. No machine has been devised so far which can do some advanced computing task that cannot be done by the Turing Machine provided an infinite amount of time and an infinite amount of memory is made available. Hence, it has become mandatory to teach the Turing Machine in particular and formal languages in general. Curricula of computer science of various universities all over the world incorporate a course in Theoretical Computing.

The theory of computing has evolved from linguistics, engineering, logic and mathematics. Turing's celebrated work on computational functions is the foundation for building a logical framework for computing. The work of Church (Rowland, 2009) and Kleene (Kleene, 1952; Sakharov, 2009) on recursive functions, Post's (Post, 1943) and Markov's work string manipulation systems, Shannon's work on application of Boolean algebra to switching networks, Moore and Mealy's (Mealy, 1955) work on the finite state machines, Kleene's work on regular sets, and Chomsky's work on formal grammars and languages form strong pillars of the logical framework of computing. The major topics covered in the theory of computer science are algorithms, machines, recursive functions, grammars and computation. Traditionally, an academic course on theoretical computer science consisting of topics like Finite Automata, Push-Down Automata, Turing Machines, formal languages, and regular expressions are perceived to be dry and monotonous to teach. The amount learned by students depends upon the instructional

design used to develop study material and the methods, tools and techniques used by the teachers in the classroom. The content covering formal languages, theory of Automata and Turing Machine has a high degree of dependency on various concepts, rules, algorithms and procedures used in computer science. The interrelationship of concepts and procedures demand a lot of mental resources for students to understand the subject.

To comprehend the Turing Machine, students need to bring all the related content into their working memory and try to relate this content with their pre-existing knowledge. Moreover, students have to practice problem solving on the Turing Machine. During problem solving, teachers and students draw a series of diagrams on the blackboard and in their respective notebooks. For processing an input string, they have to show head movements and transitions of states of the machine. This is a time consuming and tedious task resulting in low efficiency in solving problems.

The investigators in this study conducted a series of experiments to study "imagination effect" on solving problems related to the Turing Machine. The research findings suggest that if students are encouraged to solve Turing Machine problems through "mental processing of head movements and state transitions", their performance in achievement tests increases.

Cognitive Load Theory

Cognitive load theory is an instructional theory based on our knowledge of human cognitive architecture (Clark Ruth Colvin, 2006). It has been used to generate a variety of instructional effects (Pass, 2003; Pass F., 2004) that provide demonstrations of effective instructional practice. The Cognitive Load Theory is a major theory of learning and problem solving (Sweller J., 1988; Chandler P., 1991; Sweller John, 1998). It provides a set of guidelines useful for instructional design of study material for teaching and learning purpose. The theory views the human mind as an information processing system. It corresponds to input, processing and output component stages of a computer. The human mind is modeled to have an architecture which consists of three basic components, Sensory Memory, Working Memory and Long-term Memory (Shiffrin & Atkinson, 1969). The information from the outside world is first received through the human senses which are decoded in the sensory memory and subsequently sent to the working memory for further processing. During processing of information in the working memory, the relevant pre-existent information is retrieved from the long term memory and used in deriving the meaning of the given content. The part of the meaningful information processed in the working memory is stored into the long term memory. The human consciousness arises due to the information being processed in the working memory. Unless the mental resources are applied to retrieve information from the long term memory, humans are not always aware of the knowledge that is stored in the long term memory. The storage capacity of long term memory is virtually unlimited. On the contrary, the capacity of storage of the working memory is finite ranging between 5 to 9 units of information which G. A. Miller (Miller, 1956) coined the famous term, "the magical number seven plus or minus two". However, the exact storage capacity of the working memory is shown to depend upon a number of factors like age, health, fatigue, type of item, content familiarity, and education (Baddeley A., 1994; Shiffrin R. M., 1994; Stoltzfus E. R., 1996).

The knowledge in the long term memory is stored in the form of schemas which are hierarchical structures of concepts and their relationships. The mechanisms of Schema Formation (Chi, 1982; Schneider, 1977; Shiffrin R. &., 1977) are useful in overcoming the finite limits of working memory. Meaningful items are grouped and form a chunk which is stored in a separate schema which in turn is treated as a single entity when brought into the working memory. Thus, a large amount of information (facts, concepts, situations etc.) can be processed by the working memory by remaining within the limits of the magic number "seven".

The processes carried out by humans are also stored in the form of schemas (scripts) in the long term memory. When certain processes are repeatedly performed by humans in their day-to-day lives, humans develop the ability to perform those processes automatically (perform without being aware of them) over a period of time. This is known as schema automation. For example, people talk on cell phones while driving vehicles. We can read paragraphs of text line by line without concentrating on individual letters of the alphabet.

People become expert when they develop schema automation for a number of processes in their field of specialization. At an expert level, people are able to select and use complex schemas and automated processes to reduce the cognitive load that arises during processing of information in the working memory.

Instructional Techniques and Imagination Effect

Scientists have studied various instructional effects which are derived from cognitive load theory. Several instructional techniques have been evolved on the basis of these effects (Cooper G., 1998). Some of the main effects are: worked example and problem completion effect, goal free effect, split attention effect, redundancy effect, modality effect and imagination effect. The instructional material designed on the basis of these effects enables the cognitive load to be kept within the limits of the working memory.

The worked example effect suggests that instructional material should include varied worked-examples. In the problem completion effect, students are presented with partially completed worked examples. This effect has similar benefits on learning. When students are not familiar with a specific problem type, they use a problem solving strategy called means-ends analysis (Larkin, 1980). In this strategy, students solve the given problem by following steps which reduce the difference between the current problem state and the goal state. Often, students have to switch between working from current state to goal state and from goal state to current state. This imposes heavy cognitive load on students. Instead of giving goal-directed problems, goal-free problems reduce the cognitive load. In goal free problems, no specific goal state is given to the students. Instead, students are asked to solve what they can.

Usually, instructional material printed in books as well as material presented on black/white boards contain text and graphics. When graphics and the associated text are located at different positions, students have to frequently shift their attention between graphics and text. This leads to high value of cognitive load which can be reduced by integrating text into the graphics.

The worked examples show students the steps required to solve a given type of problem that promotes acquisition of schemas and automation. Thus, students acquire knowledge and skills required to identify the type of problem and the procedure (steps) required to solve problems of each particular type. The worked examples impose a low level of cognitive load because students have to pay attention to only two problem states at a time and the rule that connects them. Worked examples are presented to the students in alternating sequence consisting of worked example and the problem to be solved so that students can focus their attention on the problem type and the associated procedure.

The worked examples help limit the cognitive load on working memory. Traditionally, students are taught to solve problems using means-ends analysis which works by reducing differences between the stated goal and the given problem. Consequently, means-ends analysis may be rendered inoperable by redefining the problem goal so that no obvious goal exists (for example, "find what you can"). This is the principle behind the generation of goal-free problems. If problems are "goal free" then a problem solver has little option but to focus on the information provided (the given data) and to use it wherever possible. This automatically induces a forward

working solution path similar to that generated by expert problem solvers. Such forward working solutions impose very low levels of cognitive load and facilitate learning.

Imagination effect involves mentally simulating the functioning and interaction of elements. Student learning is improved when they are instructed to imagine the processes covered in their study material. This phenomenon is called imagination effect. The imagination effect occurs when learners imagining a procedure or concept perform better on a subsequent test than learners who study material physically. Cognitive load theory predicts that information is more likely to be transferred from working memory to long-term memory under imagination conditions. Cognitive theory has been used to explain the effect by suggesting that when learners imagine information, they process the relevant schemas in working memory, which facilitates automation. It also suggests that effectiveness of the imagination effect depends upon the number of cognitive elements contained in the problem and the prior knowledge of the students. Mental practice is supposed to enable schema automation.

Various terms for "imagining", e.g. symbolic rehearsal and imaginary practice, are used in the literature. The imagining or mental practice is "…the cognitive rehearsal of a task in the absence of overt physical movement" (Driskell, 79 , 481 - 492.). Imagining is a useful technique to achieve expertise. In problem solving, based on imagining techniques, students are asked to look at the steps that describe a procedure on how to solve a problem. Next, students are asked to close their eyes or look away from the material and deliberately try to visualize or verbalize the procedure. The imagination effect is dependent on the expertise level of the student. Reverse imagination effect occurs when students have a low expertise level because, in such a situation, studying information is more efficient than imagining it because students may find it difficult to imagine. In order to imagine information, a student must process the information in working memory, which would not be possible till schemas are formed in the long term memory. Until that time, studying content physically may be superior to imagining.

Experiment

The research study on imagination effect on Turing Machine was conducted using an experimental post test design.

Variables

Two variables were selected for this study. The details of an independent variable and dependent variables are shown in the Table 1

Table 1
Definition of Variables

Variable	Definition	Value
Independent	Instructional Method	• Problem solving using Conventional Method • Problem solving using Imagination
Dependent	Post-Test Score	Test Score

The operational definition of *teaching the method* requires 4 one-hour classes for third year science students. An instructional method using imagination is the instructional strategy for the experimental group while the conventional method is the instructional strategy for the control group. Therefore, values of the independent variable for those who had the conventional method can be compared with those who used the imagination method. The post-test achievement score is the dependent variable. The value of the dependent variable is raw scores on the post-test.

Hypotheses

Using the Cognitive Load Theory and knowing high element interactivity in solving problems on Turing Machine, it was hypothesized that students learning the Turing Machine through the imagination method would outperform the students who would learn the machine through physical study of the material. As part of the hypothesis testing procedure, a null hypothesis was devised which stated that there would be no difference in performance of students learning from imagination and conventioal study methods.

Participants

The sample selected for the experiment consisted of 30 students from third year computer science department of KTHM College, Nashik. The students were randomly distributed into the two groups, each consisting of 15 students.

Experimental design

The two-group posttest-only randomized experiment, despite its simple structure, was selected for the study as it is one of the best research designs for assessing cause-effect relationships. One group was the control group which received instruction using the conventional method. The second group was the experimental group which received instruction using the imagination method. Because the participants were *randomly* distributed into the two groups, a pre-test was not conducted to verify the equivalence of two groups.

Material and Instruments

A questionnaire was prepared on topics in the "Theory of Computing" syllabus for a third year science program. A five-point rating scale was used in the questionnaire to judge the level of difficulty of various topics in the syllabus. Difficult topics were identified. Turing Machine, Finite Automata and Push Down Automata were found to be some of the difficult topics. The instructional material on the Turing Machine was prepared in the form of a PowerPoint presentation, animation, graphics, solved problems and imagination problems. An achievement test was devised to test the performance of students in solving problems based on the Turing Machine.

Treatment

A lesson plan consisting of four lectures on Turing Machine was prepared. Each lecture consisted of 20 minutes of face-to-face instruction, 10 minutes for student interaction and 20 minutes for problem solving.

Lectures were delivered on 4 different days using Power Point slides containing graphics and animations. Students of both the groups attended the lecture of the same teacher. Then the students were divided into control and experimental group for solving problems on the Turing Machine.

The students were given pairs of problems. Each pair consisted of a worked example and a problem to be solved. Instructions were given to the control group students to study the worked problems without using imagination. Students in the experimental group were asked to study the worked problems using imagination. Then both groups were asked to solve a problem which was very similar to the worked problem that students had already studied.

Results and Discussions

The number of correct answers was the test score. The t-test was used for testing the hypotheses. As a pre-requisite for t-test, the score was analyzed to verify normality. The observation of histograms given in Figure 1 shows the normality of score distributions.

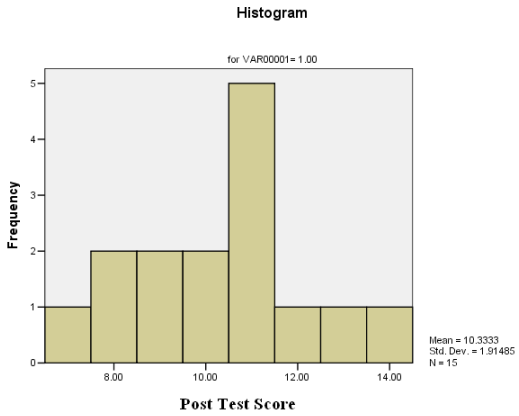

Figure 1. Histogram for score distribution of control group

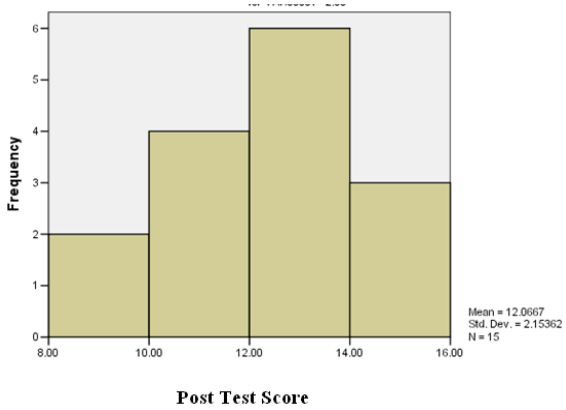

Figure 2. Histogram for score distribution of experimental group.

Tests of Normality

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Score	1.00	.169	15	.200*	.964	15	.757
	2.00	.134	15	.200*	.978	15	.951

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Figure 3. Results of Normality Test.

The test score of the two groups of students was found to be normal.

The results given in Figure 3 show that Kolmogorov-Smirnov (control: p=0.200, experimental: p=0.200) and Shapiro-Wilk test (control: p=0.757, experimental: p=0.951) for normality are not significant and hence distributions of scores are normal. The means and standard deviations are given in the Figure 4.

The summary of t-test results is given in Figure 4.

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Score	1.00	15	10.3333	1.91485	.49441
	2.00	15	12.0667	2.15362	.55606

Figure 4. Means and standard deviations

The summary result of t-test is displayed in Figure 5.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score	Equal variances assumed	.134	.717	-2.330	28	.027	-1.73333	.74408	-3.25751	-.20916
	Equal variances not assumed			-2.330	27.622	.027	-1.73333	.74408	-3.25845	-.20822

Figure 5. Summary of t-test scores.

The t-test is significant ($p=.027 < .05$) at the assumed level of significance of .05. Hence, the null hypothesis is rejected and the alternative hypothesis is supported. The alternate hypothesis states that students learning through imagining method outperform students learning though study method.

Conclusion

The experiment covered in this paper examined the imagination effect on learning the Turing Machine. The results provided evidence for the hypothesized improvement in learning from the method which used mental imagination than the learning done through study of material. The cognitive load theory predicts that imagination effect is prominent when students are learning high interactivity material. In case of low interactivity material, the imagination effect is not negligible because overall cognitive load is small and can easily be processed the working memory. On contrary, cognitive load of the content on Turing Machine is high because it involves many elements of information that need to be studied simultaneously.

After conducting lectures on the Turing Machine and solving problems in the classroom, students are able to construct a sufficient number of schemas to understand the steps involved in given problems. By engaging students in imagining the procedure of solving problems, construction of higher level schemas, schema automation is achieved which helps students to perform better than those students who simply study the Turing Machine without imagining procedures. Studying the Turing Machine is a redundant activity which interferes with learning process.

Similar experiments were conducted for topics on Finite Automata and Pushdown Automata. The results of these experiments also show that the learning is enhanced when students are engaged, after delivering lectures and solving problems, and in imagining procedures required for solution of additional problems. It is found that students are reluctant to study the material and carry out problem solving steps on paper because the number of state transitions, stack operations and head movements are large in number which requires considerable time and effort to solve problems. Hence, engaging students in imagining procedures is a good alternative for the teaching as well as the learning process.

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About the Authors

Ramchandra Satyadeo Tiwari is Director, School of Computer Science, Yashwantrao Cahavan Maharashtra Open University, Nashik-5. He is MSc in Physics currently completing a Ph.D.

He has 34 years of experience in the computer field including 17 years development of Computer Programmes for the Open Education System and major work in satellite image processing for remote sensing and multimedia, computer graphics for education. As visiting faculty he taught Software Engineering at the KKW College of Engineering and Windows Programming at RYK Science College Nashik. He is winner of the "Yashokirti Award" by the Computer Society of India

He is a Former Member of the Board of Studies, Computer Science University of Pune, Chairman of the School Council for Computer Science, YCM Open University, Member of the Academic Council, YCM Open University, and Former Member of the Board of Studies, Computer School, Indira Gandhi National Open University), New Delhi.

tiwari.ycmou@gmail.com

R S Tiwari
School of Computer Science,
Yashwantrao Chavan Maharashtra Open University
Nashik-422 222

Sunita Nimba Deore, M.C.M., M.C.S. is Lecturer in the Computer Science Department, K.T.H.M.College, Nashik-2. She has 15 years of experience of teaching computer courses to undergraduate and postgraduate students, was exam maker and examiner at University of Pune, and visiting faculty at Indira Gandhi National Open University (IGNOU). She has a special interest in Theoretical Computer Science, Object Oriented Software Engineering, and Modeling languages like UML She is advisor and guide to graduate and postgraduate level students

Snd70@rediffmail.com

S N Deore
Department of Computer Science
KTHM College
Gangapur Road, Nashik-422 225

Editor's Note: In a discipline responsible for the well-being of others, the quality of education and training is a major concern for both teachers and learners. Does distance learning create anxiety because teacher and learner are physically separated? And does this impact the quality of learning? This study explores and compares depression, anxiety and academic performance for traditional and distance learning.

The Effects of Synchronized Distance Education (SDE) on Anxiety, Depression, and Academic Achievement in a Physician Assistant Studies Program

Carroll-Ann W. Goldsmith, Kathryn E. Miller, Louise Lee, Tom Moreau, Susan White, Scott Lee Massey
USA

Abstract

Purpose: This pilot study examined depression, anxiety, and academic achievement among two cohorts of Physician Assistant (PA) students; one cohort received the majority (>80%) of class content via synchronous distance education (SDE), while the other received the majority (>80%) of class content onsite via traditional delivery (TD).

Methods: Depression, using the Beck Depression Inventory-II (BDI); anxiety, using the Global Severity Index (GSI) from the Brief Symptom Inventory-18 (BSI); and academic achievement, measured by test scores across the curriculum, were studied. The BSI and BDI were administered four times during the students' first didactic year (N≥9, Jan., May, Sept. and Dec. 2008).

Results: Mean BDI and GSI scores were not significantly different between SDE and TD cohorts at each survey administration, but depression and anxiety scores significantly increased for all students over the course of the academic year. Academic achievement was not significantly different between the SDE and TD cohorts.

Conclusions: These results suggest that PA students receiving their classroom content via SDE were as academically successful as their TD peers, but that over time both cohorts experienced statistically significant increases in depression and anxiety. These data can assure PA students, faculty, and administrators that SDE is an effective model for didactic education, while suggesting that interventions be considered to alleviate the anxiety and depression that accompany intensive study during PA didactic course work.

Introduction

In recent years, communications technology and infrastructure have developed to the point where interactive educational content can be delivered effectively in real-time across broad geographical terrain. The use of synchronous distance education (SDE) and virtual classrooms have been shown to be effective for delivering content in a variety of educational settings.1-3 The impact that such technological innovations has on student levels of depression and anxiety remains largely unexplored. In addition, the Accreditation Review Commission on Education for the Physician Assistant Inc.-Physician Assistants (ARC-PA) standard B1.10 states "The [PA] program must assure educational equivalency of course content, student experience and access to didactic and laboratory materials when instruction is conducted at geographically separate locations" http://www.arc-pa.org/Standards/3rdeditionwithPDchangesandregionals4.24.08a.pdf. This study provides valuable data to demonstrate equivalency of academic achievement between two geographically separated cohorts.

Post-graduate education is typically more intense than undergraduate coursework. This has been shown to be particularly true for students actively engaged in professional educational programs

such as medical school. Often, considerable intellectual challenges are encountered at a time when the individual is subjected to an incursion of significant financial debt and alterations of personal and family lives. It is no surprise then that several studies have shown elevated measures of depression and anxiety in graduate, law, and medical students.[4-8]

The intensive PA professional program is likely to expose students to stressors similar to those seen among medical students and students enrolled in other professional education programs. Despite a call for studies of affective parameters of stress within individuals who are learning the PA profession, no published data exists.[9] Furthermore, no studies of stress symptoms have been found for health care professionals who receive the majority of their content education via synchronous distance education.

To answer this call, two surveys were utilized to measure anxiety and depression in the PA students enrolled in this study, the Brief Symptom Inventory-18 (BSI) and Beck Depression Inventory-II (BDI), respectively. The BDI, a tool for assessing depression, utilizes a four point scale, ranging from 0 to 3, for each of 21 questions.[10,11] These scores may be presented as means, medians, or categorized according to severity of depression (total score of 0 – 13 is considered minimal, 14 – 19 mild, 20 – 28 moderate, and 29 – 63 severe). Medical students at the onset of their first year of medical school in the fall had a mean BDI score of 3.28 ± 4.41; this score had increased to 6.14 ± 6.22 by the spring of their first year of medical school.[12] Over the course of the 4-year study mean scores ranged from 3.03 ± 3.94 to 8.27 ± 8.55.[12]

The BSI measures anxiety and depression, utilizing a five point scale, ranging from 0 to 5, for each of 18 questions. The BSI can be broken into three subscales of six questions each, anxiety, depression and somatization.[13] This work focused on the total score produced by the BSI, referred to as the Global Severity Index (GSI), an overall measure of stress. The mean GSI score can vary from one population to another. For example, Cochran and Hale examined cohorts of male and female college students and compared their levels of distress to adolescents and adults.[14] The average GSI for college men and women in the Cochran study was significantly different from that of adult women and men.[14] According to the BSI manual, the average community GSI is 8 for women and 5 for men.[15]

The primary objectives of this pilot study were to examine levels of depression, anxiety, and academic achievement among two cohorts of PA students, one that received the majority (>80%) of its course content via SDE, while the other received the majority (>80%) of its course content via TD. It was hypothesized that measures of depression and anxiety, using the established self-reporting instruments, the BDI and the BSI[10,11,13], would be different for students participating in SDE and TD. It was expected that academic achievement would be similar for the two cohorts.

Methods

Subjects: Subjects who elected to participate in the study came from two different student cohorts in the PA Program at two of the three campuses at the Massachusetts College of Pharmacy and Health Sciences (MCPHS). The pool for this research study included 43 incoming students of the class of 2009 at the Manchester Campus and 24 students at the Worcester Campus. Thirty-three students from the Manchester cohort and 19 from the Worcester cohort consented to participate in the study in January 2008. Both groups entered the didactic portion of the PA program in January 2008. The curriculum and learning experience were equivalent between the two cohorts. The difference in pedagogy was the SDE format: the experimental group, the entering class at the Worcester Campus (PA-W), received >80% of classroom content via SDE, transmitted in real-time from the Manchester Campus (PA-M); the control group, the PA-M cohort, received the same classroom content, the majority of which (>80%) transpired with faculty physically present.

In accordance with MCPHS institutional review board (IRB) guidelines and recommendations from the MCPHS IRB committee, participants were educated about the study at the time of orientation. All appropriate consent forms were distributed at both campuses by a designated individual who explained the reason and rationale for the study and was not involved in the students' educational process. The same script was utilized for both PA-M and PA-W students to avoid bias. Students were given the option not to participate in the study, and both cohorts of students were informed that they could withdraw from participation at any time. Though 33 subjects in the PA-M cohort and 19 in the PA-W cohort initially enrolled, study subject attrition was high, as demonstrated by the total number of participants who filled out the BSI and BDI at all four administrations (PA-M=14 and PA-W=9). This attrition was addressed statistically, as described below.

Materials: The Brief Symptom Inventory-18 (BSI) and Beck Depression Inventory-II (BDI) were from Pearson Education, Inc. (Minneapolis, MN) and Harcourt Brace & Company (San Antonio, TX), respectively. The instruments were used according to manufacturer instructions.

Hypotheses and statistical analyses: The first research hypothesis was that there would be a statistically significant difference in levels of anxiety and depression between the cohort of students educated in the SDE format (PA-W) and the cohort of students receiving a majority of education with TD (PA-M) at each survey administration after the first, baseline, administration. The second research hypothesis was that there would be a statistically significant effect of time when comparing the BDI score and GSI score from the BDI over the three semesters that encompass the didactic year. The final research hypothesis was that differences in academic achievement between these groups would not be statistically significant.

Study data were generated from January 2008 until December 2008 using two validated surveys to measure anxiety and depression, the BSI and BDI, respectively.[10,11,13] The BDI utilizes a four point scale, ranging from 0 to 3, for each of 21 questions. These scores may be presented as means, medians, or categorized according to severity of depression; mean scores were utilized for this work. The BSI measures anxiety and depression, utilizing a five point scale, ranging from 0 to 5, for each of 18 questions. The BSI can be reported as a total score, referred to as the Global Severity Index (GSI), or it can be broken into and reported separately as three subscales (of six questions each), anxiety, depression and somatization. The GSI, the sum of all these subscales and an overall measure of stress, was analyzed in this investigation. All scales (anxiety, depression, and somatization) on the BSI can be converted to standardized area T scores, characterized by a mean of 50 and standard deviation of 10. Using community norms, as reported by the manufacturer, for females and males combined, the mean T score of 50 equates to a raw GSI score of 5, with a raw GSI score of 15 being within one standard deviation, and a score of 33 being within two standard deviations.[15]

Students' levels of anxiety and depression were measured four times using the BDI and BSI instruments (baseline: January 2008; after semester one: May 2008; after semester two: September 2008; and at the end of year one: December 2008). Data were analyzed separately for BDI and GSI and a Bonferroni adjustment was used to control for Type I error; all tests used the adjusted alpha .025. Data were analyzed using a mixed between-within subjects analysis of variance to evaluate the influence of the two educational delivery models (TD and SDE) on students levels of depression and stress, as measured by the BDI and the GSI, respectively, over time. The assumption of sphericity was violated, so the Greenhouse-Geisser correction was used.

A series of post-hoc dependent samples t-tests were conducted to locate marginal mean differences on the BDI and the GSI over the four administrations. The Bonferroni adjustment was used to control family-wise Type I error and all tests used the adjusted alpha critical value of 0.008.

Course grades and practical exam grades were used to measure student achievement and compare the performances of the SDE and TD students. At the end of the spring (May 2008), summer (August 2008), and fall (December 2008) terms, grades were recorded and compared across delivery models. Non-directional independent samples t-tests were conducted to test for difference in academic achievement between the groups.

No variables were manipulated during the study nor did one cohort receive benefits that the other did not receive. No specific interventions were involved in the study. Participants had full access to counseling services at all times and any student who was identified as being depressed, anxious or in need of academic support was promptly referred. This study maintained strict adherence to the institution's protocols for studies involving human subjects.

Results

Did the method of delivery, TD or SDE, affect anxiety and depression over time?

There was no significant interaction between BDI score over time and delivery model [F (1.764, 42.343) = 0.522, $p = 0.572$], indicating that delivery model was not a significant factor contributing to the students' depression scores on the BDI over time. There was also no interaction between educational delivery model and the GSI (the summary index produced from the BSI) over time [F (3, 81) = 0.542, $p = 0.655$], indicating that delivery model was not a significant factor contributing to the students' GSI scores over time.

Was there a statistically significant difference in anxiety and depression between students educated in an SDE setting versus a TD setting?

The main effect, delivery model, was not statistically different in anxiety or depression scores, suggesting no difference between the SDE and TD groups. [BDI: F (1, 24) = 0.005, $p = 0.945$; GSI: F (1, 27) = 0.104, $p = 0.749$]**.** In other words, both the SDE and TD groups were statistically equivalent at each of the four administrations, indicating that stress and depression scores were the same regardless of delivery model. Means and standard deviations are reported for the BDI and GSI in Tables 1 and 2, respectively.

Table 1
Scores on the BDI for the Traditional Delivery (TD) and Synchronized Distance Education (SDE) models across three semesters

	SDE			TD		
TIME	n	M	SD	n	M	SD
January	9	4.56	2.79	17	5.77	4.02
May	9	10.44	10.86	17	9.06	7.11
September	9	8.67	8.66	17	10.29	9.25
December	9	10.67	13.51	17	10.06	9.03

Table 2
Dependent samples t-tests for BDI for the Traditional Delivery (TD) and Synchronized Distance Education (SDE) models

	SDE			TD		
Contrast	n	*t*	*p*	n	*t*	*p*
January & May	9	-1.804	.109	17	-2.545	.022
May & September	9	1.325	.222	17	1.133	.274
September & December	9	-0.937	.376	17	0.312	.759

Was there a statistically significant change in anxiety and depression over time in PA students, regardless of method of delivery?

The main effect, time, was statistically significant for both the BDI and GSI, suggesting that all students experienced more anxiety and depression as they progressed through the didactic year. Scores over time for the BDI and GSI are shown in Figures 1 and 2, respectively. The main effect for mean BDI score over time was statistically significant [F (1.764, 42.343) = 5.712, $p = 0.008$], as was the GSI score over time [F (3, 81) = 6.699, $p < 0.0005$], suggesting time was a significant factor affecting both BDI and GSI scores.

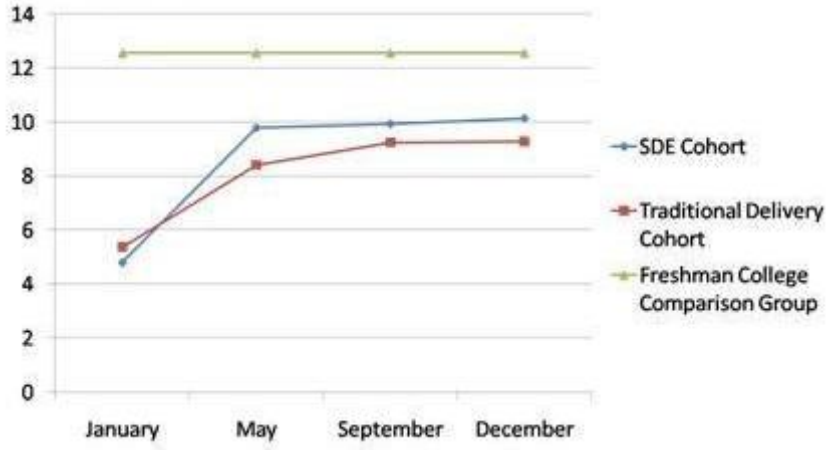

Figure 1. Beck Depression Inventory (BDI) Scores

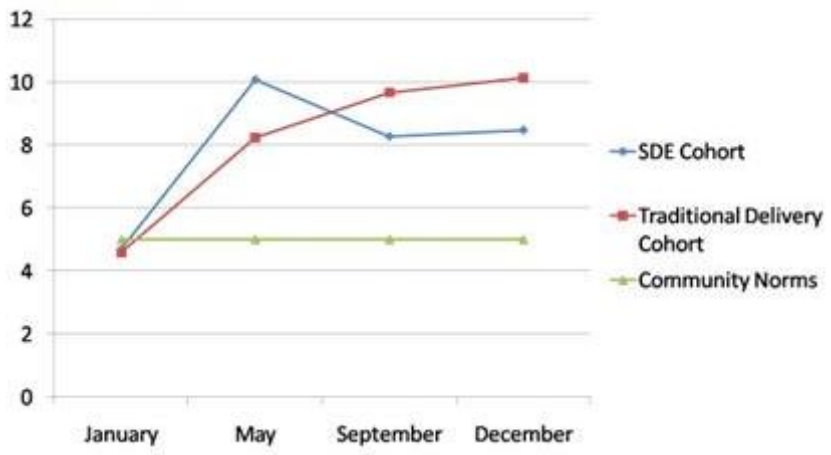

Figure 2. Brief System Inventory (BSI) Scores

Comparisons of mean BDI score changes over time are located in Table 3, while those for the GSI are in Table 4. While none of the comparisons were statistically significant at the adjusted alpha of 0.025, there may be some practical significance worth noting, especially considering the relatively low p-values for both delivery modes from the January to the May administrations. As more cohorts are tracked and sample sizes increase, it is expected that significant results for both cohorts will be seen.

Table 3
Scores on the BSI (Global Severity Index) for the Traditional Delivery (TD) and Synchronized Distance Education (SDE) models across three semesters

	SDE			TD		
TIME	n	M	SD	n	M	SD
January	10	2.60	3.17	19	4.79	3.74
May	10	10.60	11.61	19	9.05	7.72
September	10	7.90	7.92	19	9.16	10.27
December	10	9.20	11.23	19	11.00	11.50

Table 4
Dependent samples t-tests for BSI (Global Severity Index for the Traditional Delivery (TD) and Synchronized Distance Education (SDE) models

	SDE			TD		
Contrast	n	*t*	*p*	n	*t*	*p*
January & May	10	-2.502	.034	19	-2.655	.016
May & September	10	1.397	.196	19	-0.060	.953
September & December	10	-0.724	.487	19	-1.144	.268

The attrition rate for both groups (TD and SDE) was approximately 50%, contributing to error in the study. In an attempt to control for this, independent samples t-tests were conducted to test whether those who completed all four BDI administrations differed at baseline (January) from those who did not complete all four administrations of the BDI. Tests showed no statistically significant differences in baseline from those who completed all four administrations of the BDI and those who did not, for either delivery method. Independent samples t-tests were also conducted to test whether those who completed all four BSI administrations differed at baseline from those who did not complete all four administrations. Tests showed no statistically significant differences in baseline from those who completed all four administrations of the BSI and those who did not, for either delivery method. Results are shown in Table 5.

Table5
Independent Samples t-tests for Baseline Comparison of Incomplete Study Data

	Completes			Incompletes				
Group	n	M	SD	n	M	SD	*t*	*p*
SDE BDI Score	9	4.56	2.79	10	5.00	5.58	-0.216	.832
SDE BSI Score	10	2.60	3.17	9	7.00	5.52	-2.099	.057
TD BDI Score	17	5.77	4.02	14	4.86	4.35	0.603	.551
TD BSI Score	19	4.79	3.74	13	4.31	3.73	0.359	.722

Was there a statistically significant difference in academic achievement between students educated in the SDE setting compared to the TD setting?

Academic achievement was not statistically significantly different between the SDE and TD cohorts on any of the 13 course grades or 8 practical/lab grades measured; thus, the SDE group achieved grades and scores statistically similar to their TD classmates. Figures 3 (spring 2008), 4 (summer 2008), and 5 (fall 2008) show comparisons and respective p-values for the two cohorts.

Table 6 shows mean grades for each course and lab/practical scores for both delivery methods.

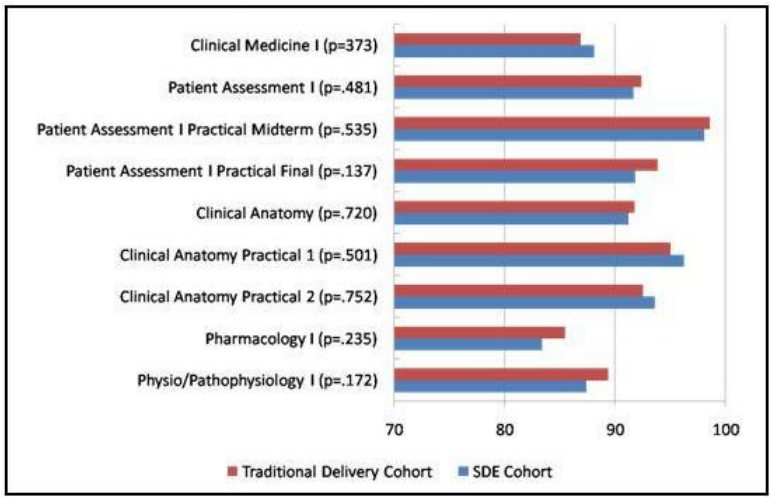

Figure 3. Course and Practical/Lab Grades: Spring 2008

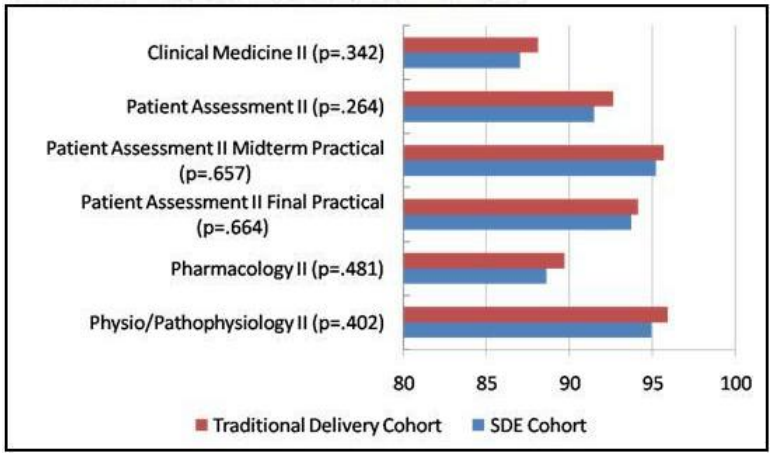

Figure 4. Course and Practical/Lab Grades: Spring 2008

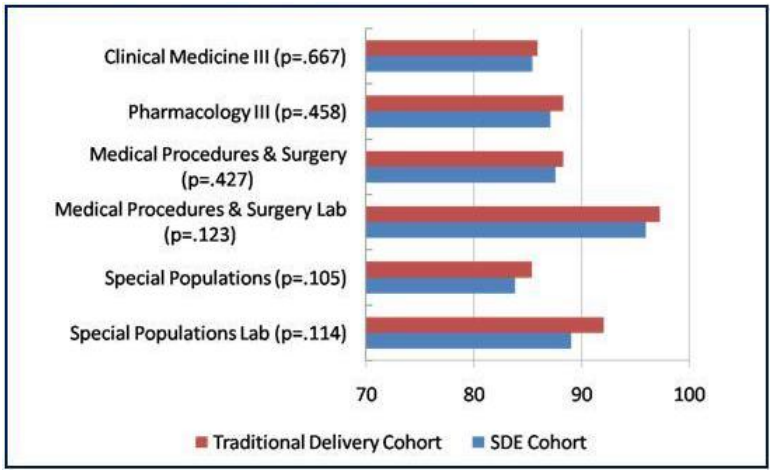

Figure 5. Course and Practical/Lab Grades: Fall 2008

Table 6 Course and Practical/Lab Grades

		SDE			TD		
Course	n	M	SD	n	M	SD	*p*
Spring 2008							
Clinical Medicine I	19	88.11	3.86	30	86.90	5.03	.373
Patient Assessment I	19	91.72	3.22	31	92.41	3.38	.481
Patient Assessment I Practical Midterm	19	98.08	3.07	31	98.57	2.39	.535
Patient Assessment I Practical Final	19	91.82	5.75	31	93.85	3.80	.137
Clinical Anatomy	19	91.16	5.73	30	91.77	5.87	.720
Clinical Anatomy Practical 1	19	96.25	5.39	30	95.05	6.42	.501
Clinical Anatomy Practical 2	19	93.61	8.34	30	92.76	9.71	.752
Pharmacology I	18	83.43	6.82	31	85.52	5.35	.235
Physio/Pathophysiology I	19	87.43	5.72	31	89.43	4.42	.172
Summer 2008							
Clinical Medicine II	19	87.02	4.21	32	88.10	3.70	.342
Patient Assessment II	19	91.47	3.59	32	92.62	3.48	.264
Patient Assessment II Practical Midterm	19	95.21	4.54	32	95.69	3.08	.657
Patient Assessment II Practical Final	19	93.71	3.03	32	94.11	3.23	.664
Pharmacology II	19	85.95	6.85	32	89.71	5.25	.481
Physio/Pathophysiology II	19	94.94	3.51	32	95.90	4.10	.402
Fall 2008							
Clinical Medicine III	18	85.46	3.45	32	85.95	4.02	.667
Pharmacology III	18	87.14	5.72	31	88.32	5.10	.458
Medical Procedures & Surgery	18	87.58	3.87	31	88.34	2.71	.427
Medical Procedures & Surgery Lab	18	96.00	3.61	31	97.29	2.15	.123
Special Populations	18	83.88	3.16	31	85.42	3.14	.105
Special Populations Lab	18	89.08	7.16	31	92.10	5.77	.114

Discussion

These results indicate that there were no statistically significant differences between method of delivery, SDE and TD, on measures of anxiety and depression in cohorts of first year PA students. Scores of depression and anxiety, as measured by the BDI and the GSI, were statistically equivalent for both the SDE and TD groups at each of four administrations, indicating that stress and depression were the same regardless of delivery model. These results do demonstrate that PA students, regardless of mode of delivery, experience increased anxiety and depression as they progress through the didactic year.

Mean differences in academic achievement, measured by using final course grades and practical exam grades over the course of the PA didactic year, were not statistically different between the two groups, SDE and TD, on any of the 13 course grades or 8 practical/lab grades. Thus, despite the SDE cohort having most of their didactic lessons taught via synchronized distance education, this group was able to achieve grades and scores statistically equivalent to their TD classmates. This measure can assure students, faculty, and administrators that SDE is an effective model for didactic education.

It should be noted that these results represent one class progressing through a PA program and that small subject numbers likely contributed to lack of significance in some of the parameters studied. In order to increase subject numbers and more precisely reflect the influence of mode of didactic delivery on depression and anxiety, the study was expanded in September 2008 to include doctor of pharmacy (PharmD) students at the MCPHS Manchester and Worcester campuses. The PharmD program has a similar cohort structure, though the locations of the SDE and TD cohorts are reversed in comparison to the PA cohorts, with the PharmD SDE cohort located in Manchester and the TD cohort located in Worcester. It is believed that a larger subject number and the ability to longitudinally follow two cohorts in a different discipline will provide further statistical validity to the data and valuable insights to plan interventions that can be implemented to define emerging best practices for student services, academic support services, and pedagogy for students in programs that utilize SDE.

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About the Authors

Carroll-Ann W. Goldsmith, DSc, Massachusetts College of Pharmacy and Health Sciences Manchester;

Kathryn E. Miller, MA, Massachusetts College of Pharmacy and Health Sciences - Boston;

Louise Lee, MHS, PA-C, Massachusetts College of Pharmacy and Health Sciences - Manchester;

Tom Moreau, MS, PA-C, Massachusetts College of Pharmacy and Health Sciences - Manchester;

Susan White, MD, Massachusetts College of Pharmacy and Health Sciences - Manchester;

Scott Lee Massey* PhD, PA-C, Massachusetts College of Pharmacy and Health Sciences – Manchester. Email: scott.massey@mcphs.edu

corresponding author:
Scott Lee Massey
Massachusetts College of Pharmacy and Health Sciences
1260 Elm Street
Manchester, NH 03101
Phone: 603-314-1708
Fax: 603-314-0147

Editor's Note: With the move toward Universal Health Care in the United States, there is a growing interest in the economic impact of various reimbursement policies. The economic impact of various decision models is studied next..

Teaching Healthcare Reimbursement Systems Using System Dynamics Models

Michael H. Kennedy
USA

Abstract

Methods for reimbursing healthcare providers and facilities are frequently taught in courses addressing healthcare finance. Unfortunately, defining the method of reimbursement and illustrating solutions to various problems incorporating these reimbursement methodologies often fail to convey the dynamic nature of payment systems or to set the context for informed decision-making. System dynamics software provides an appropriate medium for demonstrating the flow of funds associated with healthcare reimbursement and for illustrating the impact of typical management decisions. Three reimbursement methods are modeled generically: cost-based reimbursement, prospective payment, and capitation.

Keywords: Finance, health care, payment systems, system dynamics

Introduction

Financing healthcare in the United States is not a static enterprise. Getzen (2007) uses a "flow of funds" approach to characterize the dynamic nature of financial transactions. Premiums and tax dollars flow from the patient and public to insurers and the government, and reimbursement dollars flow from insurers and the government to hospitals and doctors. Methods for reimbursing healthcare providers and facilities are frequently taught in courses addressing healthcare finance. Unfortunately, defining the method of reimbursement and illustrating solutions to various problems incorporating these reimbursement methodologies often fails to convey the dynamic nature of payment systems or to set the context for informed decision-making. System dynamics software provides an appropriate medium for demonstrating the flow of funds associated with healthcare reimbursement and for illustrating the impact of typical management decisions. Three reimbursement methods are modeled generically: cost-based reimbursement, prospective payment, and capitation.

Cost-based reimbursement results in a payment to the provider based upon the cost of the resources consumed to provide care. Until the advent of prospective payment systems in the United States in the early 1980s, hospitals were paid by Medicare and other payers on the basis of reasonable costs (Cleverley and Cameron, 2007; Gapenski, 2005). Shi and Singh (2008) note that Medicare actually paid in excess of costs ("cost-plus") because a percentage of capital costs were factored with operating costs into a formula used to compute a per diem reimbursement rate. Neumann, et al. (1993) report that hospitals were paid reimbursable costs plus 2% from 1966 until 1970. Cost-based reimbursement is a form of retrospective reimbursement – the amount to be paid to the provider is determined after the service is rendered. The system dynamics model explicitly demonstrates why cost-based reimbursement (especially cost-plus) has fallen out of favor as a reimbursement method.

Prospective payment methods determine the amount to be paid to the provider before the service is rendered (Gapenski, 2005). Diagnosis-Related Groups were introduced in 1983 as the method succeeding cost-based reimbursement to pay hospitals for Medicare inpatients in the United States. Diagnoses coded from the *International Classification of Diseases, 9th Edition, Clinical*

Modification are currently assigned to 700+ MS-DRGs grouped by 25 major diagnostic categories (Cleverley and Cameron, 2007). Other prospective payment methods have been subsequently adopted to include Ambulatory Payment Classification (APC) for outpatients and Resource Utilization Groups now in version 3 (RUG-III) for skilled nursing facilities (Castro and Layman, 2006).

Capitation represents a method to pay providers that is usually associated with managed care organizations in the United States. The provider agrees to provide a menu of services to the managed care organization's enrolled members in exchange for a prospective payment of *x* dollars per member per month [PMPM] (Cleverley and Cameron, 2007; Gapenski, 2005; Shi and Singh, 2008).

Explanation of Reimbursement Models

iThink® software was used to create the three generic healthcare reimbursement models: Model 1 – Cost-Plus Reimbursement, Model 2 – Prospective Payment, and Model 3 – Capitation. The models are a variation of cost-volume-profit analysis based upon the profit equation: Profit = Revenue – Costs.

Model 1 – Cost-Plus Reimbursement

Model 1, the Cost-Plus Reimbursement Model, is used to introduce system dynamics modeling. Figure 1 provides the model's schematic.

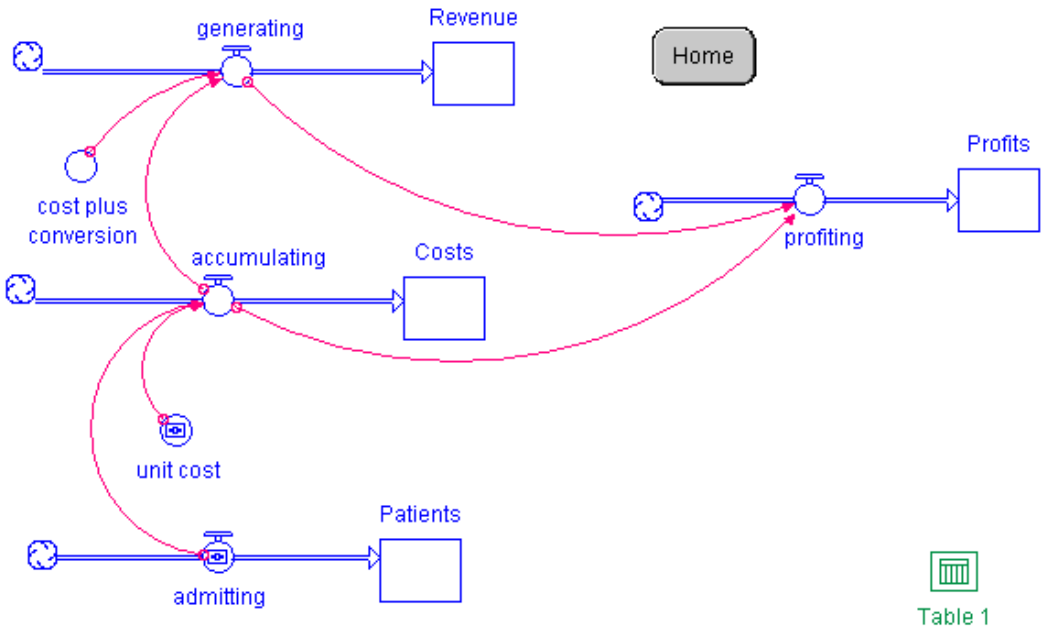

Figure 1. Cost-Plus Reimbursement Model

In this model, patient admissions to the hospital drive reimbursement. The flow *admitting* is initialized at 100 patients per month and patient admissions are recorded in the stock *Patients*. The unit cost per admission is initialized at $500 as represented by the converter *unit cost*. Costs accumulate at a rate of *admitting* times *unit cost* [100 patients per month x $500 per patient = $50,000 per month] as captured by the flow *accumulating*. Patient costs are recorded in the stock *Costs*. Revenue is generated by the recovery of costs plus 2% as represented by the converter *cost plus conversion* initialized at 1.02. Therefore, revenue builds at a rate of *accumulating* x *cost*

plus conversion [$50,000 per month x 1.02 = $51,000 per month] as captured by the flow *generating*. Cumulative revenues are recorded in the stock *Revenue*. Profits represent revenues minus costs, so the profit rate is represented by the flow *profiting* whose formula is *generating* minus *accumulating* [$51,000 - $50,000]. As initialized, the profit rate is $1,000 per month, so that annual profits are $12,000

Model 2 – Prospective Payment

Prospective payment methods establish payments in advance of treatment. Figure 2 provides the schematic for Model 2, Prospective Payment.

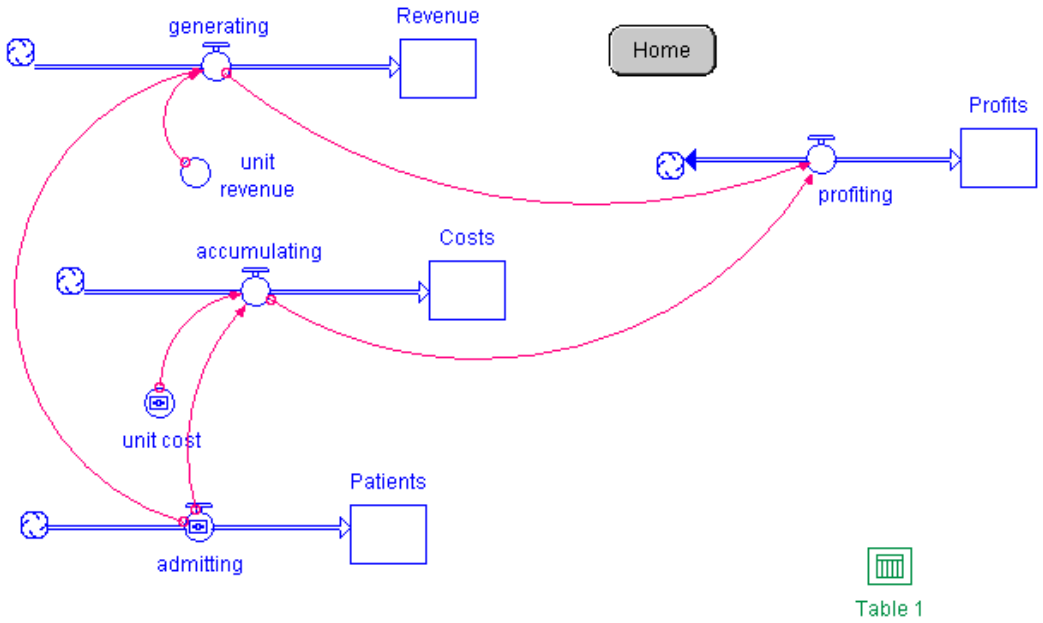

Figure 2. Prospective Payment Model

The stocks and flows representing patient admissions and the accumulation of costs are the same for Model 2 as Model 1. Revenues are generated differently. The revenue generated by each admission is established prospectively as captured by the converter *unit revenue*. In order to produce the same initial profits, the prospective payment for each patient admitted is set by initializing the converter *unit revenue* to $510. Therefore revenue builds at a rate of *admitting* x *unit revenue* [100 patients admitted per month x $510 per patient admitted = $51,000 per month] as captured by the flow *generating*. Model 2 represents a simplification of real-world prospective payment models. The prospective payment of $510 can either be thought of as one diagnosis (rather than many diagnoses represented by 700+ MS-DRGs) or thought of as the diagnostic case-mix represented by an average prospective payment. Either way, the basic incentives associated with prospective payment remain the same. Cumulative revenues are recorded in the stock *Revenue*. Profits represent revenues minus costs, so the profit rate is once again represented by the flow *profiting* whose formula is *generating* minus *accumulating* [$51,000 - $50,000]. As the model is initialized, the profit rate is $1,000 per month, so that annual profits are $12,000.

Model 3 – Capitation

Modeling capitation rates is somewhat more complex. Figure 3 provides the schematic for Model 3, Capitation. Unlike cost-plus reimbursement and prospective payment, patient admissions to the hospital do not drive reimbursement, but they do determine costs. Capitation involves up-front reimbursement of the provider at an established dollar per member per month ($PMPM) rate

multiplied by the number of enrolled beneficiaries which are recorded by the converters *$pmpm* and *covered lives*, respectively. The converter *covered lives* is initialized at 30,000 members, and the value for the converter *$pmpm* is set at $1.70 per member per month. Therefore revenue builds at a rate of *$pmpm* x *covered lives* [$1.70 per member per month x 30,000 members = $51,000 per month] as captured by the flow *generating*. Cumulative revenues are recorded in the stock *Revenue*. Monthly admission rates under capitation depend upon covered lives, the annual service rate, and a monthly conversion factor as denoted by the converters *covered lives*, *annual service rate*, and *monthly conversion*, respectively. *Annual service rate* is established at 40 admissions per 1000 members per year, and *monthly conversion* is established as 1 year per 12 months. Therefore admissions build at a rate of *covered lives* x *annual service rate* x *monthly conversion* [30,000 members x 40 admissions per 1000 members per year x 1 year per 12 months = 100 admissions per month] as captured by the flow *admitting*. The stocks and flows representing the accumulation of costs are the same for Model 3 as Models 1 and 2.

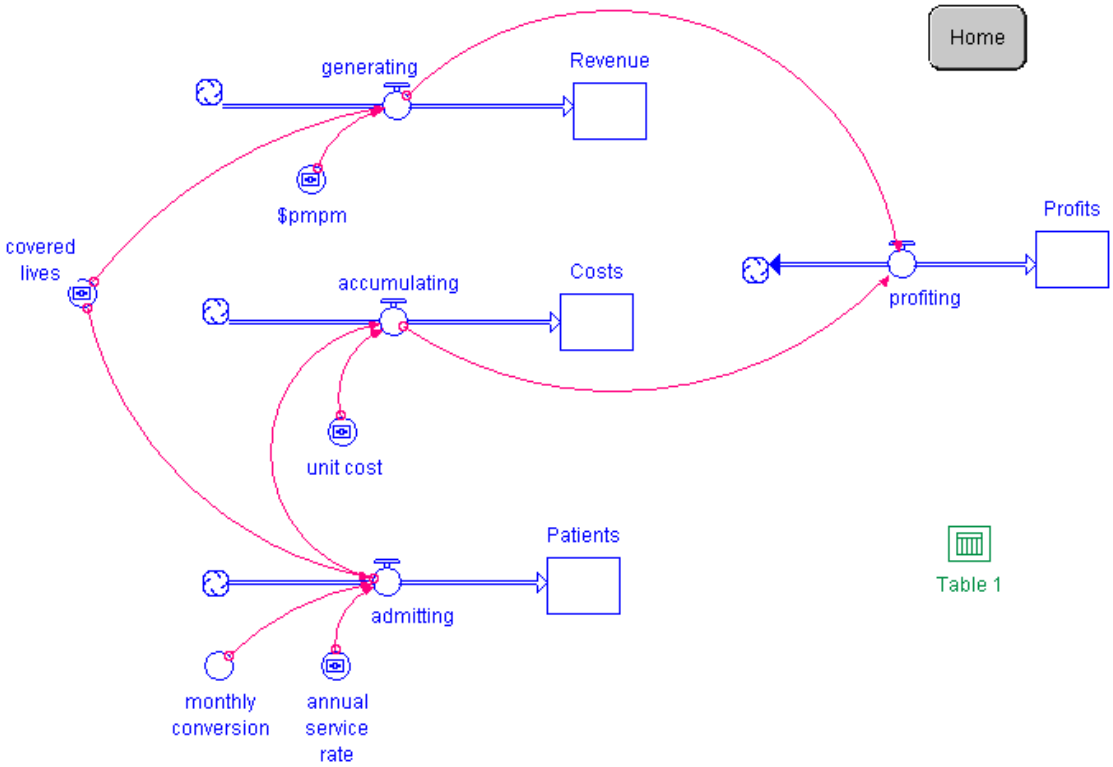

Figure 3. Capitation Model

Profits represent revenues minus costs, so the profit rate is once again represented by the flow *profiting* whose formula is *generating* minus *accumulating* [$51,000 - $50,000]. As initialized, the profit rate is $1,000 per month, so that annual profits are $12,000.

Student/Model Interaction

The model interface is a "flight simulator" that allows the instructor or student to modify the value of selected model variables For Models 1 and 2, a slider can modify the converter *unit cost* within a range of $400 to $600 by increments of $10. Similarly, a slider can be used to modify the converter *admitting* within a range of 75 to 125 admissions by increments of one. A similar approach is taken for Model 3 except that a slider can be used to modify the values for the converter *annual service rate* within a range of 30 admissions per 1000 covered lives to 60

admissions per 1000 covered lives by increments of 10 which produces the same range of admissions from 75 to 125 as Models 1 and 2. Model 3 is more complex than Models 1 and 2. Covered lives and $PMPM are part of the negotiated contract and are beyond the immediate scope of decision-makers who may be able to influence unit costs and admissions. Modifying these variables involves a second stage of decision-making, but sliders are included in the model interface to modify the converter *covered lives* within a range of 22,500 to 37,500 covered lives by increments of 100 lives and to modify the converter *$pmpm* within a range of $1.50 to $1.90 per member per month by increments of $0.10.

To begin model execution, the student is read a short narrative describing the reimbursement method incorporated into that model followed by a challenge to modify sliders one at a time to produce a configuration that maximizes profits. The student interacts with the model in one of two ways. The first form of interaction involves the instructor running each model as initialized and then seeking input about whether to increase or decrease the value of the sliders on subsequent runs. The second form of interaction occurs with the student operating the software independently, but with the instructor standing by. Each run result is posted to a comparative graph and a comparative table.

Table 1
Run Results

Model	Run	Unit Cost	Annual Service Rate	Admitting	Covered Lives	$PMPM	Annual Profit
Cost-Plus	1	$500		100			$12,000
Cost-Plus	2	$400		100			$9,600
Cost-Plus	3	$400		75			$7,200
Cost-Plus	4	$600		125			$18,000
PPS	1	$500		100			$12,000
PPS	2	$400		100			$132,000
PPS	3	$400		75			$99,000
PPS	4	$400		125			$165,000
PPS	5	$600		75			($81,000)
PPS	6	$600		125			($135,000)
				Admitting Computed			
Capitated	1	$500	0.04	100	30,000	$1.70	$12,000
Capitated	2	$400	0.04	100	30,000	$1.70	$132,000
Capitated	3	$400	0.03	75	30,000	$1.70	$252,000
Capitated	4	$400	0.05	125	30,000	$1.70	$12,000
Capitated	5	$600	0.05	125	30,000	$1.70	($288,000)
Capitated	6	$500	0.04	75	22,500	$1.70	$9,000
Capitated	7	$500	0.04	125	37,500	$1.70	$15,000
Capitated	8	$500	0.04	100	30,000	$1.50	($60,000)
Capitated	9	$500	0.04	100	30,000	$1.90	$84,000
Capitated	10	$500	0.04	75	22,500	$1.50	($45,000)
Capitated	11	$500	0.04	125	37,500	$1.50	($75,000)
Capitated	12	$500	0.04	75	22,500	$1.90	$63,000
Capitated	13	$500	0.04	125	37,500	$1.90	$105,000

Observation and Conclusions

Typical model runs have followed the pattern recorded by Table 1.

The initial model explored is Model 1, Cost-Plus Reimbursement. Run 1 proceeds at initialized values which produce an annual profit of $12,000. Students are typically conditioned by the contemporary fiscal environment to reduce unit costs and run the model again. Cutting unit costs to $400 for Run 2 produces a counterintuitive result; rather than increasing profits, a reduced profit of $9,600 is produced. This result generally stimulates a class discussion which produces the insight that since unit revenue in this model is always 2% greater than unit costs, increasing, not reducing, costs is the optimal strategy. Run 3 illustrates the result of simultaneously decreasing unit costs and admissions which produces the lowest profit of $7,200. Run 4 illustrates the result of simultaneously increasing unit costs and admissions which produces the greatest profit of $18,000.

Figure 4 illustrates the model interface for Model 1 with sliders for unit cost and admitting and a comparative graph displaying the results of Runs 1 - 4.

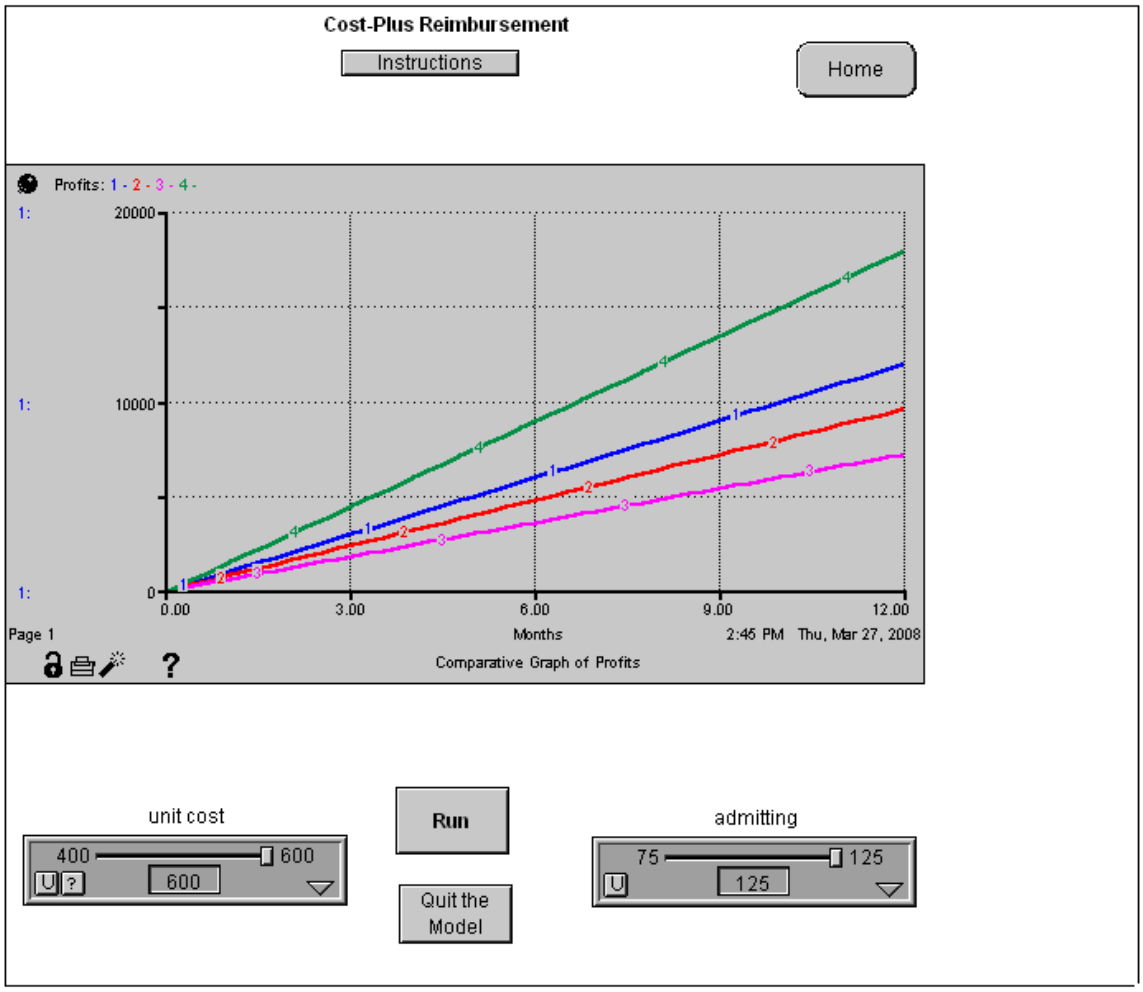

Figure 4. Model interface demonstrating typical runs for Model 1, Cost-Plus Reimbursement Model.

Model 2, Prospective Payment, is usually explored next. Again, Run 1 proceeds at initialized values which produce an annual profit of $12,000. Students are conditioned by the contemporary fiscal environment to cut unit costs and run the model again. Cutting unit costs to $400 for Run 2 produces an intuitive result; profits are increased to $132,000. Follow-up discussion with the class usually reveals student understanding that since unit revenue is fixed, reductions in costs can produce dramatic increases in profit. Holding unit cost constant at the lowest value of $400 and simultaneously decreasing admissions to 75 during Run 3 produces the expected result of a lower profit of $99,000. Run 4 illustrates the optimal strategy of simultaneously decreasing unit costs and increasing admissions from the initialized values to $400 and 125 admissions which produces the greatest profit of $165,000. Two additional runs typically produce additional insights. If unit costs are set at $600 and admissions at 75 a loss of $81,000 is incurred. Since the unit revenue of $510 is $90 less than the unit costs of $600, each additional admission produces additional losses, so that increasing admissions to 125 results in the loss of $135,000.

Model 3, Capitation, is usually explored next. Again, Run 1 proceeds at initialized values which produce an annual profit of $12,000. [Note - Setting annual service rate at 0.4 per covered life and covered lives at 30,000 produces a monthly admission rate of 100.] Variables are manipulated in two stages, unit cost and annual service rate during stage one, and covered lives and $PMPM during stage two. The variables not manipulated are held constant at initialized values. The first stage perturbs variables whose values are likely to change during the operating year. The second stage models variables reset upon review of the annual contract Reducing unit costs to $400 for Run 2 produces the intuitive result; profits are increased to $132,000. Follow-up discussion with the class usually reveals student understanding that since total revenue is fixed, reductions in costs can produce dramatic increases in profit. Holding unit cost constant at the lowest value of $400 and simultaneously decreasing admissions by reducing the annual service rate to 0.03 during Run 3 increases profits to a maximum of $252,000. Unlike Models 1 and 2, under capitation, total revenue is fixed by the capitated rate and number of enrolled beneficiaries. Reducing service volume increases profits as demonstrated by Run 3; increasing service volume decreases profit as demonstrated by Run 4. The greatest stage one loss of $288,000 is experienced during Run 5 when unit cost and annual service volume are both increased to their highest values. Runs 6 – 13 illustrate the effects of holding unit cost and annual service rate constant while perturbing the values of covered lives and $PMPM in turn and then simultaneously.

Lessons learned by the students typically include:

- Different payment methods produce different incentives when pursuing even a simple goal like profit maximization.
- Cost-plus reimbursement is inherently inflationary. If costs are always reimbursed plus a little more, the optimal strategy to maximize profits is to spend more.
- Prospective payment provides an incentive for the provider to reduce costs. Reducing costs does not affect the payer, since the level of reimbursement has been determined ahead of time for the service provided. If costs for providing a medical service are less than the prospectively determined reimbursement for that service, the profit maximizing strategy is to increase the volume of services. This will cost the payer more.
- Capitation is more complex than either cost-plus reimbursement or prospective payment as indicated by the number of variables in the models. Since total revenues are determined by covered lives times $PMPM, total revenues are usually fixed for the duration of the contracting period. It is therefore very important that the negotiated $PMPM rate be negotiated at a level to produce sufficient revenue for the provider. The provider has some ability to reduce unit costs and to reduce annual service rate during the

contract period. Since total revenue is fixed, reductions in either or both can dramatically improve profits.

- Anticipating the effects of simultaneous changes to two or more variables in a model is difficult.

Limitations

As presented, the system dynamics models are basic stock-flow representations of generic healthcare reimbursement systems. Coupled with the "flight simulator" capabilities inherent in the software, students do gain insight into how manipulating variables within the decision-maker's control affects profitability. This is a useful and sufficient first lesson. Additional complexity can be added by incorporating feedback loops and delays into the model in subsequent lessons.

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About the Author

Michael H. Kennedy PhD, MHA, FACHE is an Associate Professor in the Health Services and Information Management Department of the College of Allied Health Sciences at East Carolina University. He has a PhD from Rensselaer Polytechnic Institute in Decision Sciences and Engineering Systems and a Masters in Health Administration from Baylor University. He has 33 years experience in teaching and health services administration that have been divided between both academic positions and operational assignments in the military health system as a human resources manager, equal opportunity advisor, ambulatory care administrator, and other positions of leadership culminating as the Chief Operating Officer of a small hospital.

In past academic assignments, Dr. Kennedy has served as Director of the Doctor of Health Administration Program at Central Michigan University, has taught in the Health Services Administration Program at Slippery Rock University, and was the Deputy Director of the U.S. Army-Baylor University Graduate Program in Healthcare Administration.

Dr. Kennedy is a Fellow in the American College of Healthcare Executives.

E-mail: kennedym@ecu.edu

Editor's Note: Although this simulation is highly successful in the classroom, it also has great potential for distance learning. Quality training of this kind should lead to an extremely high level of guest satisfaction n at hotels and restaurants.

A new paradigm for gaining access to hospitality applications in classroom environments

Galen Collins
USA

Abstract

Almost since its inception, students at the School of Hotel and Restaurant Management (SHRM) at Northern Arizona University (NAU) have received training on an actual property management system (PMS) in a required core course entitled Hospitality Information Technology (HA 270). A PMS is a computerized lodging system that performs both back and front office functions and a variety of other functions such as housekeeping, sales, catering, energy management, and call accounting. In 1989, Phoenix-based Multi-Systems (MSI), founded in 1985 as International Property Control Systems, donated the PM 1300 PMS to NAU. The MSI PMS, which is presently used by more than 2800 properties throughout North America, was selected because of its functionality, simplicity, and reliability. The student learning outcomes were positive. Students gained practical, transferable skills in completing common PMS tasks (e.g., making a reservation). However, configuring the MSI PMS for a classroom environment utilizing university computers presented ongoing technical, financial, and support challenges. In 2007, the School of Hotel and Restaurant Management entered into a partnership with Choice Hotels International (CHI), one of the world's largest hotel franchisors (e.g., Comfort Inn, Rodeway Inn, Quality, Clarion, etc.), enabling NAU students to gain hands-on experience using their Web-based PMS on any computer equipped with a browser. Providing student access to an industry-specific application via a corporate intranet was the first of its kind in hospitality education. This article discusses the issues of using PMS software on classroom computers at NAU and the viability of Web-based PMS solutions.

Challenges of installing and maintaining PMS applications on classroom computers

Successfully installing and maintaining an industry-specific program in a university computer lab requires control over certain information technology (IT) resources and knowledge of the application's technical requirements and database architecture, which evolve over time. Assistance from IT personnel is often necessary. Patience and persistence are also required to solve thorny implementation problems.

Operating system and hardware incompatible. In 1989, the author created a training database using MSI hardware. The next step entailed installing MSI's DOS-based PMS and training database onto a Zenith desktop computer in the SHRM computer classroom lab. It took several weeks to make this industry-specific application work on a generic desktop system. Operating systems files, such as "config.sys," a text file containing a number of special commands, had to be modified to enable the PMS application to use the computer's hardware components (e.g., memory), without disabling other resident applications. Furthermore, new releases of the MSI application software sometimes required a newer version of the operating system (e.g., DOS 4.0 to DOS 5.0) and a hardware upgrade (e.g., 640K RAM to 2 MB of RAM). Budget constraints and university technology replacement cycles resulted in delayed updates of the MSI PMS application.

Database incompatible. The 2003 edition of *Hospitality Information Technology: Learning How to Use I,* the required text for HA 270*,* included a demo version of the Micros Opera PMS

(Collins et al, 2003). Most of the universities who adopted the book were not able to use the program because of the Oracle database requirements, which required a particular version of Oracle, 6 gigabytes of hard disk storage space, and a dedicated PC that was not already running Oracle for any other purpose.

Software failure. During the first year of using the MSI PMS, the training database had to be loaded repeatedly due to user errors. Students would accidently perform a processing routine or database maintenance task that would break file links and render the PMS program inoperable. Consequently, a batch file, a text file containing a series of computer commands, had to be created that copied the pristine training data files over existing ones each time a student used the PMS application. This limited the scope and depth of assignments and prevented the completion of the night audit because the business and calendar dates were always out of sync.

Web-based PMS Solutions

Various communication applications (e.g. central reservations) have been designed to facilitate the flow of information in a geographically dispersed organization. Enterprise-wide Web-based applications are the latest development. They enable a single centralized server to support workstations and printers throughout a hotel group or chain. Web-based applications are installed on one server. Workstations are required only to have a Web browser installed. As a result, product installation and updates are faster, easier, and more reliable. In addition, the cost and maintenance of Web-based workstations are significantly cheaper than windows-based workstations. Choice Hotels International completed the full deployment of its proprietary Web-based hotel property management system, Choice Advantage, to all Econo Lodges and Rodeway Inns in 2007. Among users of this Web-based solution, the company reports satisfaction ratings of about 90%.

Since the fall 2007 semester, online and traditional students enrolled in HA 270, Hospitality Information Technology, have been using the CHI Web-based PMS and accompanying training modules at no cost. CHI built a training database (57-room Econo Lodge) exclusively for NAU students. The advantages of a Web-based PMS over a traditional PMS for instruction include:

- **Ease of deployment.** A Web-based application does not require hard disk space and the installation and configuration of additional software at each local workstation. The only technical issue preventing students from logging on the CHI PMS Web site has been pop-up blocker software, which prevents annoying ads from opening new windows on workstations. However, they can also block legitimate content. Pop-blockers can be easily disabled and are part of the CHI PMS logon instructions, which also include the CHI PMS Web site address, user identification, and password.
- **Ease of classroom management.** Because CHI handles all system upgrades and enhancements, students are always learning the latest version of the software. The instructional time devoted to the PMS application is greatly reduced. Prior to lab activities, students are required to complete the interactive multimedia Web-based training (WBT) modules for the Choice Advantage PMS (see Table 1). Successfully completing a particular module requires a minimum score of 75% on the module quiz. Students can print a certificate of completion for each module. For several years, MSI provided computer-based training using CD-ROM technology. The program was discontinued in the early 90s when it became too costly to keep current. In 2008, MSI and d'Vinci Interactive, a provider of digital training products, became partners to create WBT tools for MSI's Enterprise suite

of products. According to Vincent Hellane, the President of d'Vinci Interactive, WBT is perfect for the hospitality industry, as so many entry-level positions require computer-based expertise, and hotels require a well-trained staff if they are to provide great guest service" (www.msisolutions.com).

- **Cost reduction.** Ongoing expenses associated with deployment, support, and maintenance are greatly reduced or eliminated.
- **Broad accessibility**. Students, including those enrolled in the online HA 270 course, have access to the application from any computer with Internet Explorer browser software and Internet access.

Table 1
CHI WBT training modules completed by students at NAU.

PMS Training Topics
Welcome and Introduction to the PMS
Making Reservations
Checking in and Checking out Guests and Guest Folios
Housekeeping
Advanced Folio Functionality
Groups and Direct Billing
Working with Guest Accounts
Night Audit and Shift Reports
Revenue Management
Manager Reports

Evaluation of the CHI Web-based PMS

There are a number of evaluation techniques. Designers are primarily interested in feedback that helps improve design. Managers are worried about whether the application is cost effective, while end users are concerned whether the application helps them achieve their goals. Educators are concerned with learning outcomes. Consequently, the form of evaluation will vary with the group (users, managers, educators, designers, etc.) assessing the product (Boyle, 1997). In this evaluation, only users or students were used for assessing the Web-based PMS and training system.

Forty-five students enrolled in HA 270 evaluated the CHI Web-based PMS and training system. The evaluation instrument consisted of 17 statements, where the respondents rated each statement using a rating scale that used a range of numerical values to indicate the performance level. Possible responses included: Poor (1), Fair (2), Good (3), and Excellent (4).

The User Rating Evaluation Form, found in Appendix A, addresses three basic areas: interface design, learning experience, and program functionality. Critical items evaluated included ease of use, navigation, cognitive load, screen design, information presentation, media integration, aesthetics, performance, and reliability. The average score for each item evaluated is denoted in Appendix A.

Results

The average scores for each of the three basic areas, denoted in Table 2, indicate the respondents had a favorable perception of the PMS design and learning experience. Although program functionality received the lowest score due to pop-up blocking problems and slow response times when Internet congestion peaks on the NAU Flagstaff campus, especially in the early afternoon, these factors did not undermine the overall perceived instructional effectiveness of the PMS and training modules.

The performance ratings indicate that the CHI Web-based PMS and training system are suitable for classroom use and appropriate for a sophomore-level college course in hospitality information technology. The students felt that the PMS skills gained are practical and transferable. The convenience of having the PMS and training modules available on the Web received the highest score. Many of the students completed assignments on their personal computers.

Table 2
Summary of ratings by students enrolled in HA 270.

Item	Average Score (sample size=45)
User Interface	3.1
Learning Experience	3.2
Program Functionality	3.0
Overall Rating	3.2

Conclusion

In the past, deployment of sophisticated commercial hospitality applications (e.g., PMS) in a university classroom was not feasible or sustainable for most hospitality programs. However, with the migration of hospitality applications to the Web, universities now have the opportunity to develop partnerships that enable students to use the Internet to learn state-of-the art hospitality systems without past constraints. NAU's partnership with CHI has demonstrated the viability of this instructional model. It has eliminated technological and financial barriers and resulted in increased instructional and staff productivity, positive student learning experiences, and easier and more flexible student access to a key hospitality application. A variation of this approach is for a university to partner with a hospitality technology vendor that provides complimentary access or charges a reasonable flat or per student fee. For example, students at the University of Delaware Hotel, Restaurant, and Institutional Management program are using a Web-based PMS provided by WebPMS, a full-service online company that provides a fully integrated property management system with an online booking engine, remote access to real-time hotel inventory, and secure off-site hosting of property data (www.webpms.com).

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Appendix A

User Rating of the Choice Hotels International Web-based PMS

Item Evaluated	Evaluation Rating Scale				
User Interface	**Poor**	**Fair**	**Good**	**Excellent**	**Avg. Score**
1. The PMS training modules provide the necessary information on how to successfully use the PMS.					3.2
2. Picture, graphics and audio enhance the text in the PMS training modules.					2.9
3. PMS navigation links are easy to use and understand.					3.0
4. PMS tasks are logically grouped and easily spotted.					2.9
5. PMS task descriptions are understandable and precisely defined.					3.0
6. Chosen colors display well.					3.2
7. Font type and size is easy to read.					3.5
8. You always know where you are in the PMS.					2.9
Learning Experience	**Poor**	**Fair**	**Good**	**Excellent**	**Avg. Score**
9. Program content, structure, and available response options are appropriate for a sophomore-level college course.					3.2
10. PMS skills gained are practical and transferable.					3.2
Item Evaluated	**Poor**	**Fair**	**Good**	**Excellent**	**Avg. Score**
11. Different media in the PMS training modules are thoughtfully combined to produce a meaningful, cohesive learning experience.					3.0
12. In-class PMS assignments and activities strengthen and add depth to the learning experience.					3.3
13. Having the PMS and training modules accessible on the Web makes learning convenient and desirable.					3.3
Program Functionality	**Poor**	**Fair**	**Good**	**Excellent**	**Avg. Score**
14. The program was void of errors.					2.7
15. Audio segments in the training modules were of acceptable quality.					3.1
16. The response time was acceptable.					3.0
17. Technical requirements did not impede use of this program					3.1
Overall Evaluation					3.2

About the Author

Galen Collins, Ph.D., Professor at the School of Hotel and Restaurant Management (SHRM) at Northern Arizona University, has been with SHRM since its beginnings as a free-standing school in 1987. He was an early adaptor and advocate of distance learning as a radical tool for bringing SHRM instruction to far-flung locales and diverse students. He developed the first Web-based course in the United States on hospitality information technology in 1998. He is the founding publisher of the Information Technology in Hospitality journal and co-founder of HITA, the Hospitality Information Technology Association. He received his B.B.A. and MS degrees from Florida International University and his Ph.D. from the Graduate School of Computer and Information Sciences at Nova Southeastern University.

Galen Collins, Ph.D., Professor
School of Hotel and Restaurant Management
W.A. Franke College of Business
Northern Arizona University
Galen.Collins@nau.edu

Editor's note: These concepts and their implementation are, 50 years later, an extension or variation of John Dewey's "Learning by Doing". Here the Dewey principle is supported by innovative and flexible modern technology.

Incorporate Project-Based Learning in Daily Instruction: Has Self-Direction Changed?

Y.X. Zhou, F.L. Lee

Abstract

Self-direction is vital for life-long learning, and the challenge of fostering self-direction is to facilitate students' self-directed learning by tackling authentic problems similar to those faced by students in formally registered schools and training classes. This was facilitated through Project-Based Learning (PBL). This study, integrating qualitative with quantitative methods, was conducted to explore the impact of self-direction when Project-Based Learning was added to traditional instruction. The result showed a significant difference for the experimental group; that is to say, introducing Project Based Learning into daily instruction will benefit students by enhancing their self-direction skills.

Keywords: Self-direction, Project-Based Learning, Responsibility for Learning

Introduction

Self-directed learning is critical since lifelong learning is becoming so important (Hiemstra, 1991). Instead of merely solving a problem given in a classroom setting, a lifelong learning perspective implies that schools and universities need to prepare learners to engage in self-directed learning processes because this is what they will have to do in their professional and private lives outside of the classroom.

The challenge for methods supporting self-directed learning is to allow learners to work on authentic problems and tasks of their own choosing, and yet still provide them with learning support contextualized to their chosen problem. Project-based learning (PBL) is an approach to open-ended learning that encourages meaningful learning through student-directed investigation (Blumenfeld, Soloway, Marx, Krajcik, Guzdial, & Palincsar, 1991), negotiation and exploration in real-world project. However, there are only few studies on self-direction in PBL (Thomas 2000). Therefore, this study will conduct an experiment to explore whether self-direction level is improved by use of PBL comparing with traditional instruction.

Theory Framework

Definitions of Project-based learning, self-direction in learning, and relationship between them will be explored as follows:.

Project-based learning

According to the definitions found in project learning handbooks (BIE 2002), "PBL is a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks." This definition encompasses a spectrum ranging from brief projects of one to two weeks based on a single subject in one classroom to yearlong, interdisciplinary projects that involve community participation and adults outside the school.

Self-Direction in Learning

Self-direction in learning is a term including both external factors that facilitate the learner taking primary responsibility for planning, implementing, and evaluating learning, and internal factors or personality characteristics that predispose one toward accepting responsibility for one's thoughts and actions as a learner (Hiemstra, 1991). In this study, more emphasis will be put on the internal factors.

Self-Direction(SD) and PROJECT Based Learning (PBL)

Self-directed learning has long been associated with preferred learning styles of adults (Cross, 1981). Unfortunately, this preference is not always realized. This may be because students in a formal educational environment have come to expect teacher-directed approaches or they may not have developed adequate skills for self-direction. In order to enhance the ability of learners to function as self-directed learners, Mezirow (1991) offers dozens of guidelines, one of which is project-based learning.

Why choose PBL rather than traditional instruction model to foster self-direction? It can be clarified from two aspects. In the first place, PBL can supply a real-world environment for nurturing learner self-direction, which is collaborative rather than competitive. In the second place, on the part of process, PBL involves the same activities as self-directed learning (Hammond & Collins, 1991; Knowles, 1975).

This study will analyze how eight factors of self-direction can be applied in the context of PBL.

Literature Review

There is no special research on SD and PBL except an incidental statement in which SD "increased self-direction and motivation" through PBL (Diane Curtis, 2001). This conclusion is deduced from several researches on effectiveness of PBL, but no there are no details or reasons to support these assertions. The review puts emphasis on the effectiveness of PBL since these studies were, more or less, related to SD.

The most extensive research on the effectiveness of PBL, *Expeditionary Learning Outward Bound* (ELOB), reported significant improvement in academic test scores, school climate, student motivation, attendance, and structured changes in schools (Thomas, 2000).

A recent study, conducted by SRI International, reports on a five-year evaluation of the Challenge 2000 Multimedia Project in California's Silicon Valley. Students who had taken part in the Multimedia Project outperformed comparison students on all three measures associated with the brochure task: content mastery, sensitivity to the audience, and coherent design (integrating multiple graphical and textual elements). However, students in the Multimedia Project made the same progress as did students in the comparison classes on standardized tests of basic skills (Thomas, 2000).

In Hong Kong, Chan (1992) and Chik (1995) examined the contributions and limitations of PBL from a teaching perspective. PBL can be considered as an effective educational technique for enhancing the student's ability in analysis and in problem-solving (Chan, 1992). Learners had greater responsibility for their own learning instead of deriving information from a transmission model of teaching. PBL is also strongly advocated on Taiwan and Mainland China. It is known as inquiry learning in the Mainland China. Fok and Cheung (2001) stated that the role of PBL is to provide means for stimulating students through trial and error. Products and results are not key concerns.

It is concluded from above studies that PBL seems to be equivalent or slightly better than other instructional models for producing gains in general academic achievement and for developing lower-level cognitive skills in traditional subject areas. PBL, in comparison to other instructional

methods, has value for enhancing the quality of students' learning in many subject areas, improving students' responsibility for learning, and prompting them to apply learning results in novel, problem-solving contexts.

However, above studies of effectiveness of PBL are mostly related to achievements and problem-solving skills, and slightly associated with social and emotional perspective, such as attitude toward future learning, self-reliance and collaborative skills. Despite discovery of a variety of factors about self-direction, such as self-responsibility, improved attitude and setting own goals, factors that make up self-direction have not been a topic for research.

This study, through qualitative and quantitative methods, will explore the changes of eight factors of SD respectively resulted from PBL and discover in-depth reasons and further advice for PBL. The two methods could complement each other to produce both specific and general results.

Research design

Research questions

The research questions are as follows:

- What, if any, are the differences in self-direction readiness before and after PBL?
- How did PBL change each of the eight factors of self-direction?

The benefits expected from this research can be articulated in terms of theory and practice.

In theory, this research will fill the gap of self-direction research in the context and process of PBL, because current research is limited.

In practice, the benefits are concerned primarily with teacher training and student learning. Incorporation of PBL models into courses early in the computer science curriculum can facilitate the process of creating self-directed learners who move toward self-actualization and are better prepared for their future careers. Their achievements will encourage teachers to adopt PBL, which in turn, will prompt teachers to face real-world challenges and build a broad and convincing knowledge structure.

Participants

A teacher and one hundred of sophomores majoring in computer science from Guangzhou University were involved in this study. The age of students ranged from 17 to 20 years old. Ten percent of the participants were female, and the mean age was 18.7 (SD = 1.1). Before the experiment, subjects had been informed that they could choose to quit anytime. The teachers in Guangzhou University had a common level of teaching experience according to peer and student evaluations.

Method and Procedure

A quasi-experimental pretest/posttest design was used for this study. The controlled group took part in a traditional lecture and the experimental group took part in project-based learning.

The questionnaire, a diagnostic tool, embracing eight factors, was used for for assessing readiness for self-directed learning before and after experiment. A revised self-directed learning readiness scale (SDLRS) designed by Lucy M. Guglielmino in 1977 set the criterion. Brockett (1985c) noted that the SDLRS contains 58 items assessing self-directed learning readiness on a 5-point Likert scale ranging from 1 "almost never true of me" to 5 "almost always true of me." The 58 items are summed to ascertain the participant's SDLRS score. Overall, the SDRLS is a global measure of self-directed learning readiness. Prior researchers have reported high internal consistency for this instrument (Reio & Leitsch, 2003).

Questionnaires and semi-structured interviews were tools to collect data. The former was employed to investigate the improved self-direction readiness of both groups and factors of self-direction, and the latter for deeply investigating the attitude of experimental subjects toward PBL.

Results

Results from this study focused on performance in a self-direction test given as both a pretest and posttest. Gains between the pretest and posttest for the 50 students in the experimental group were compared to those for the 50 students in the comparison group that did not participate in the PBL course. Forty-nine questionnaires were taken in the experiment group.

Table 1
Group Statistics

category		N	Mean	Std. Deviation	Std. Error Mean
Improved Self-direction	Experimental group	49	5.33	3.699	0.528
	Control group	50	4.00	2.777	0.393

Table 2
Independent Samples t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	MD	SED	95% Confidence Interval of the Difference	
									Lower	Upper
X	Equal variances assumed	3.81	.054	2.02	.97	.046	1.33	.657	.023	2.630
	Equal variances not assumed			2.01	88.061	.047	1.33	.658	.018	2.635

Table 1 shows that the mean improved score of the experimental group was 5.33 and the mean of controlled group was 4.00. From Table 2, the t-value was 2.020, and degree of freedom = 97. The significant values that might be expected were .046<.05. The standard deviations in the original data set were very similar and the sample sizes were close, so using the unequal variances t-test gave very similar results to the t-test which assumed equal variances. Therefore, we could hold that the improved self-direction level in experimental group was significantly larger than that of controlled group, i.e., PBL is better than traditional didactic instruction for enhancing self-direction in students.

The final scholar examination scores showed a surprising result. In Figure 1, the level of self-direction showed a positive relation with academic achievement with a coefficient of 0.97, $p<0.01$. This result confirmed that students with high self-direction readiness make high scores in learning performance. Also, it proves the importance of nurturing self-direction in instruction.

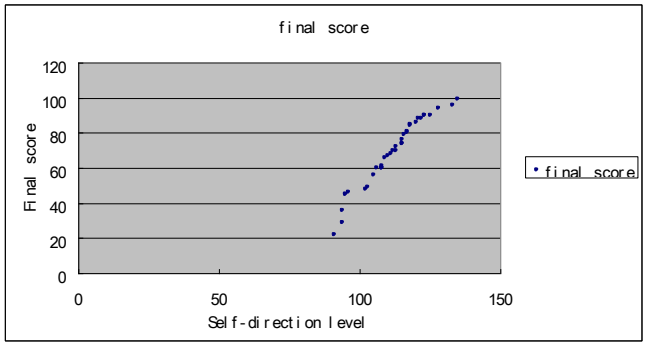

Figure 1. Scattered plot of SDL and final score (r=0.97) of experimental group

According to the interview with subjects, responsibility for their own learning and their self-confidence are obviously enhanced after PBL. Most students are more interested in PBL than traditional instruction model for reasons stated below:

> From the aspect of individual communication, the subjects experienced the happiness of exchanging information with others in order to solve common problems rather than private matters. In addition, their skills for deeply communicating with others were improved..
>
> About PBL, there are more opportunities for students to design the framework, develop a project, and analyze and solve a series of problems than in traditional instruction.
>
> From the aspect of learning, students built up self-confidence. Most important, they grasped self-learning skills to develop plans, organize related resources, solve problems, and overcome difficulties. More than half of the subjects gained more positive attitudes to learning.

It is possible that there is a culture discrepancy in Chinese and English. The SDLRS questionnaire was designed by Lucy M. Guglielmino in 1977. Culture differences may affect the validity. In PBL, teacher skills and style may also affect results. There is a proverb saying, "No static method in teaching" that suggests teaching style will affect learning effectiveness in any kind of instruction model, not only in PBL. Observation is needed to collect data from classroom where PBL happens and evolves because an interview is not enough to objectively describe the complex interactions that promote learning..

Conclusion

PBL is preferred over traditional instruction by many students because of a sense of ownership, sharing knowledge, self-learning skills, improved communication, closer social relationships, and creativity. For SD, self-confidence and responsibility for learning are improved as noted ny students and teachers. Other factors such as love of learning, attitude, and tolerance of risk, remain about the same. Even self-consciousness has declined, because, as teachers suggest, students in PBL have more chances to introspect against the real-world background.

These findings necessitate further in-depth research so that our knowledge of all factors in SD will be enhanced.

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About the Authors

Y.X. Zhou is a Post doctor in Faculty of Education, The Chinese University of Hong Kong.

e-mail: zhouyx@cuhk.edu.hk

F.L. Lee is an associate professor in Faculty of Education, The Chinese University of Hong Kong.

e-mail: fllee@cuhk.edu.hk

Editor's Note: This is an extension of an earlier study by these same authors published in this Journal. It looks at the results of proctored vs. non proctored tests. This has special relevance for large distance learning programs. One of our editors believes that these concerns could also be solved using alternative forms of evaluation such as portfolios and actual performance .

Leveling the Playing Field for Online Testing

Patricia Royal, Paul Bell
USA

Abstract

The purpose of this research study was to follow up an original study that tried to determine if a relationship exists between test performance and test delivery methods, particularly for those taking proctored versus un-proctored online exams. The follow-up study replicated the previous research using the same students, instructor, and textbooks. The class was second semester sequence of a year-long course in applied sciences for undergraduate students. In the previous study students were randomly divided into two groups. One group completed exams via web-based delivery proctored, while the other half completed exams via we-based delivery un-proctored. In the current study, students who had previously taken exams un-proctored were now proctored while those who had previously taken proctored exams were now un-proctored. After three exams, a comparison of scores was analyzed to assess if a difference in mean test scores existed for the two groups. Although the difference in scores was not statistically significant, the test means scores for the un-proctored group were higher than scores obtained for the proctored group on all three exams. This pattern of test results replicated what had been previously found in the first study. Therefore, the results of both studies suggest that student achievement in on-line exams may be influenced by whether or not the test taker is supervised (proctored) or unsupervised (un-proctored). The implication of these findings for the design of on-line course assessments is discussed.

Keywords: proctored versus un-proctored testing, test delivery, web-based testing, supervised testing, unsupervised testing, asynchronous web-based learning, online testing, test delivery methods, learning or online learning, online assessment, on campus learning, distance learning.

Purpose

Among undergraduate students in a first semester web-based applied medical course, Royal and Bell (2007) found that un-proctored test takers consistently scored higher than proctored test takers. The purpose of this follow-up study is to determine whether this difference can be replicated in the second semester sequence of the course.

Introduction

The availability of on-line or web-based distance education courses has led to a surge of degree seeking students who learn and have their learning assessed in the virtual classroom known as cyberspace. This situation has placed colleges and universities in the position of assuming that students are being honest when taking exams. Furthermore, the issue of honesty not only applies to distance education students. Many faculty teaching both campus and distance courses employ computer-aided exams for their students. The use of computer-aided exams provides the student with instant feedback and flexibility, while alleviating faculty the arduous task of administrating and grading the exams (Turner, 2005; Warren & Holloman, 2005; Wellman & Marcinkiewicz, 2004; Greenberg, 1998). However, while using computer-aided exams, faculty must also face potential problems such as student accessibility, learning styles, limited computer skills, student motivation, and of course, academic integrity (Turner, 2005; Summers, Waigandt and Whittaker, 2005; Lorenzetti, 2006). The problem is that as with online learning, computer-aided testing

confers a certain amount of autonomy and independence to the student. Moreover, is such an environment the test taker is assumed to adhere to principles of academic integrity. Unfortunately, such as assumption may not always be valid or may be naïve.

Royal and Bell's study (2008), was similar in design to Wellman and Marcinkiewicz's study (2004) which looked at the impact of proctored versus un-proctored quizzes upon student learning. While Wellman and Marcinkiewicz's study sought to define student learning as a change in pre versus post test scores, Royal and Bell's study was interested in comparing proctored vs. un-proctored student test scores. The students in the study were enrolled in an Applied Medical Science course at East Carolina University. The students were seeking degrees in Health Information or Health Services Management. The cohort included both campus and distance education students who were randomly divided into two group. Group 1 became the un-proctored group while group 2 became the proctored group. Both groups had the same instructor, the same text book, and access to the same power point presentations as well as lecture content that was recorded on campus via mediasite technology. One group was un-proctored while the other group was proctored during all exam taking sessions. Both groups were given 4 multiple choice exams which were taken through WebCT interface. Before taking the exams, the students were told they could not use textbooks, notes, or talk with other students when taking the exam. Once the exam was accessed, students in either group had to complete it within the same amount of time. However, the un-proctored students had a window of availability during which they could access the exam, while the proctored students, who were supervised by either a faculty member or a proxy from the local community college, had to take their exams at particular scheduled times. Except for this difference in test taking supervision, no other differences existed between the two groups. Results from the study indicated that for every exam, the un-proctored students outscored the proctored students. Out of the 4 exams, only two showed results that were statistically significant. However, the overall pattern showed that students being proctored consistently scored lower than the un-proctored students. In addition to comparing the grades, Royal and Bell calculated students' grade point averages (GPA), and compared ages of both groups to further characterize the relationship between exam scores and test delivery methods. There was no significant difference in these two variables.

Follow Up Study

To further test the hypothesis that un-proctored students score higher on exams, a follow up study using the same students, instructor, textbooks and instruction method was conducted. The study was completed in the spring semester of 2008 using undergraduate students enrolled in the second semester sequence of a year- long undergraduate applied medical science course. Students participating in the study had signed a consent form at the beginning of the first semester which advised potential participants the study included fall and spring semesters.

Methods

Participants: Undergraduate students who were enrolled in an Applied Medical Science II course at East Carolina University. The study began with 63 students. The original number of students in the first study was 71. At the end of the first semester, a total of 66 students remained in the study. Of those 66 students, 3 students failed the first semester leaving a total of 63 students who were enrolled in the course and had signed proper consent documentation.

Course: The Applied Medical Science II course is the second part of a required course for students seeking a degree in either Health Information Management or Health Services Management. The students had been admitted to the program prior to the first course taken during the fall semester and all students had the same prerequisites. Although there is only one course, it was divided into 3 sections due to the large number of students. While one section is considered distance education, the other two sections are counted as campus courses and are taught on two

different days to provide for adequate space in the classroom. Students were not required to attend class because the instructor used video recordings for the lectures which were placed on WebCT. All students, whether proctored or un-proctored used computer-aided testing.

Procedure: In the first study, students were randomly divided into two groups. One group was the un-proctored students while the other was the proctored. In the current follow up study, the group that had originally been proctored in the first study was now un-proctored and the group that had been un- proctored in the first study was now the proctored. The students were told whether they would be proctored about 10 days prior to the first exam. The proctored students were provided with a specific day(s) and time to take the exam, or assigned to be proctored at a local community college. There were a couple of students who were unable to either come to the university or attend a community college due to either proctor fees charged by the college or the distance involved in the travel was too great. These students were responsible for finding their own proctors and then had to email the instructor ahead of time describing their specific test taking. After the exam was completed, the proctors emailed the researchers confirming the students had taken the exam under proctored conditions. The un-proctored students were allowed to take their exam at their convenience, but within a specified time frame. All students received the same instructions regarding the use of textbooks and notes, and all students took their exams through WebCT interface. All students were given 3 multiple choice exams during the semester with the same time allocation for each. The second semester students followed the same protocol followed by the students during the first semester.

Results

This current research was a follow- up to a study conducted in fall of 2007 which was designed to determine if a relationship exists between method of test delivery and student performance.

Test Results

Exam 1: There were 32 un-proctored students and 31 proctored students who took exam 1. There was one student who was supposed to be proctored, but took the exam unsupervised.

Exam 2: There were 31 un-proctored students and 32 proctored students who took exam 2. The student who was un-proctored in exam 1 took the second exam with a proctor as originally scheduled.

Exam 3: There were 31 un-proctored students who took exam 3 and 32 students who took the exam with a proxy.

Exam Scores:

Exam 1: The mean score for the un-proctored students was 87.0, while the mean for the proctored students was 83.7.

Exam 2: The mean score for the un-proctored students was 88.3, while the mean for the proctored students was 86.5.

Exam 3: The mean score for the un-proctored students was 95.4, while the mean for the proctored students was 89.3 (see Table 1).

Table 1
Summary Statistics for Scores on Exam 1

	N	Minimum	Maximum	Mean	SD	Variance
Un-proctored	32	45.00	112.00	87.0	16.1	261.1
Proctored	31	54.00	112.00	83.7	17.2	298.6

Summary Statistics for Scores on Exam 2

	N	Minimum	Maximum	Mean	SD	Variance
Un-proctored	31	62.00	104.00	88.3	9.4	89.7
Proctored	32	66.00	103.00	86.5	10.2	104.3

Summary Statistics for Scores on Exam 3

	N	Minimum	Maximum	Mean	SD	Variance
Un-proctored	31	60.00	109.00	95.4	11.0	121.8
Proctored	32	37.00	113.00	89.3	17.9	322.8

Relationship between exam scores: To establish whether the relationship between the mean test scores for each group was statistically significant, a T-Test, assuming equal variances, was used to compute the significance (see Table 2).

Table 2
T-Test Analysis of Exam Scores

	UP (M)	P (M)	Diff	T	Probability
Exam 1	87.09	83.70	3.39	.803	.425
Exam 2	88.38	86.59	1.79	.722	.473
Exam 3	95.41	89.37	6.04	1.60	.113
Total	90.29	86.55	3.74	1.22	.289

*Correlation is significant at the 0.05 level.

Discussion

Summary

Purpose

The purpose of this follow-up study was to determine whether a relationship exists between test performance and method of test delivery among undergraduate students in a medical science course offered at East Carolina University.

Methodology

The sampling frame was the same students involved in the previous study conducted in fall, 2007. All students were enrolled in the medical science course. The students who were un-proctored (Group 1) in the first study became the proctored students (Group 2) for the follow up while the

proctored (Group 2) in the first study became the un-proctored (Group 1) in the follow-up study. As in the first study, faculty version 15.0 of the Statistical Package for the Social Sciences (SPSS) was used for statistical analyses. Frequencies and summary statistics were computed for exam scores for both student groups while the mean and standard deviations were computed for each group's scores. To determine the relationship between the two variables, (test scores and performance) a T-Test analysis was computed.

Discussion

Student Sample

The students were the same students who were in the fall 2007 research study. They were all admitted students in the same program and had the same required prerequisites. There was no significant difference between GPA's and student ages between the two groups. All students received the same study materials and access to lectures via mediasite recordings.

Exam Scores

Consistent with the previous study, the un-proctored students consistently outscored the proctored students. Although the analysis of the scores does not indicate a statistically significant difference between the groups, the pattern remained the same for both studies.

Conclusions

In the previous study conducted in fall, 2007, the results, whether statistically significant or not, indicated that for every exam the un-proctored students scored higher than proctored students. So what explains theses results…differences in the knowledge level or preparedness of the students in each group or differences in the test taking conditions between the two groups? The way to zero in on the reason was to repeat the study replicating the same methods using the same subjects but switching group assignments such that those who had originally been proctored are now un-proctored and vice versa. If the mean test grades per group repeat the pattern found in the first study: that is the un-proctored groups still performed at a higher mean compared to the proctored group, then we can state with a fair amount of confidence that for the sample in this study, the test-taking condition affected test outcome. Again the students who were supervised score lower than the unsupervised group. The original hypothesis that un-proctored students score higher than proctored students was consistent although the results were not statistically significant. The rationalization for these results may lie in the honesty or dishonesty of the students. When students are allowed to take exams via computer-aided testing, it is logical to imagine that certain students will use notes, textbooks, or other students to assist them. Even in this study, the researchers heard comments from some of the proctored students indicating that it was unfair for them because "everyone knows that students use books when taking exams". These comments were made by several students either directly to the researchers or via email. It was almost like some of the students were not concerned about the instructor/researchers knowing that cheating did occur. In addition, some of the students who withdrew from the first study indicated that they felt it was unfair because they were unable to use their notes so they wanted to withdraw from the study.

Recommendations for Future Research

The findings suggest that the difference in mean test score performance between the two cohorts of test takers may have been due to the different test-taking conditions they experienced. Un-proctored test takers had higher mean test scores than proctored test takers because they were unmonitored while they took their tests. As a result unlike the proctored cohort, the un-proctored test takers could potentially use resources such as notes, text, and the internet while taking their exams. Therefore, the difference in test achievement may be attributable to the "proctored"

condition. Future research, then, should test this hypothesis by eliminating the differences in test taking conditions for the two groups. If, after replicating the previous study methodology, and standardizing test taking conditions for both groups, their mean exam scores are similar, then, one can conclude that the previous difference in mean exam scores was more than likely due to the proctored status of test-takers. It would be useful then to conduct a future study where both groups of students (on campus face-to-face and online distance learners) take their test under equivalent conditions. Specifically, both groups will be proctored or monitored: the on-campus group will take their exams as before, on campus with a proctor, and distance students will be proctored using technology (web cams and software) that can block web surfing and/or the use of notes and texts during the exams. The bottom line is to eliminate the test taking condition as a factor that affects student test performance; if not, then online testing is not an accurate measure of student learning.

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About the Authors

Patricia Royal, Ed.D is an assistant professor in the Health Services and Information Management Department in the College of Allied Health at East Carolina University in Greenville NC. She holds a masters degree in social work and a doctoral degree in higher education, and completed post graduate work in public health. Email: royalp@ecu.edu

Paul D. Bell, PhD, RHIA, CTR, is Associate Professor of Health Services and Information Management in the College of Allied Health Sciences at East Carolina, University in Greenville, NC. Email: bellp@ecu.edu

Address for both Drs. Royal and Bell:
Health Services and Information Management, Suite 4340, Health Sciences Drive
College of Allied Health, East Carolina University
Greenville, NC 27858

Editor's Note: In communication theory (and practice) we use feedback to confirm that messages are correctly received and understood. It is especially important in teaching and learning for reinforcing correct responses and providing negative reinforcement for incorrect behavior. This is a comprehensive study to determine how well feedback systems in distance learning achieve the desired outcomes.

Can Students Improve Learning with their Use of an Instructor's Extensive Feedback Assessment Process?

Ni Chang
USA

Abstract

What kinds of feedback are welcomed by e-students and what are reasons behind their positive or negative perceptions? Unfortunately, these are not much and well documented by published literature. The present research study was designed to fill the void by exploring pre-service teachers' perceptions toward the ways an instructor employed to provide feedback to their assignments. This study was also intended to understand reasons behind the students' perceptions. A sample of 29 students participated in the survey study. The data was analyzed quantitatively and qualitatively. The research findings show that the students strongly and positively supported the way that the feedback was communicated to them. The qualitative analysis identified two themes, including Promptness and Helpfulness. The theme of Helpfulness also attaches several categories, offering specific reasons for the participants' strong preferences to ways that the instructor provided feedback to their assignments. This research report will also share the negative cases, future research recommendations, and educational implications.

Keywords: online feedback, personalized instruction, interactions between instructor and student, student learning, assessment process.

Introduction

Feedback is intended to help improve one's study or work. Assessment of students' assignments, therefore, should move beyond the practice usually performed by instructors. In other words, awarding a summative grade is not an adequate response for an instructor to facilitate student learning. Summative grading is "too little, too late" even if the grade is accompanied by some brief notes denoting positive feedback, such as "Good" or "Excellent" or by a few words indicating the need for improvement. The reason is largely due to the fact that these symbols are unlikely to propel students' higher level of thinking or to encourage them to genuinely reflect on their performances for enhancement. Unfortunately and traditionally, this type of assessment appears to be employed frequently in higher education.

In a virtual learning environment, assessing quizzes and exams in this or a similar fashion has been observed as well. Popular and widely utilized by many e-instructors in higher education is automatic/machine-generated feedback. This relatively novel means of assessment has been proclaimed by some researchers. Peat and Franklin (2002) argued that the machine-generated feedback provided students with quiz or exam results without any lingering delay. Northcote (2002) agreed with Peat and Franking in that this methodology reduced the time and cost needed by the course instructor when grading a large number of student assignments. However, this approach fails to acknowledge diverse learning styles, which have pervaded most classrooms today irrespective of their nature, be it a traditional face-to-face meetings or e-learning environments. A lack of information appropriate to an individual student's specific learning needs could be adverse to the student's otherwise high confidence in learning (Chang & Petersen, 2006).

Feedback generated by machine/computer signifies an interactive exchange between a learner and a machine. Human interactive elements, unavoidably omitted through this assessment process, in fact, are crucial to effective learning (Chang, 2009), as they not only allow students to know how and where further work is needed, but also enable a course instructor to analyze obstacles to student desirable learning (Chang & Petersen, 2006). Given the pros and cons of the traditional conception of grading and the nature of automatic feedback disseminated by computers, an individualized coaching type of feedback makes a lot of sense in promoting student learning and may be something that a course instructor would like to attempt (Chang, 2009). This present study was intended to explore pre-service students' perceptions and their related rationales toward the way the instructor provided their online assignments with personalized feedback.

Theoretical Framework

Feedback, by design, is to advance student learning and to promote understanding as a communicative process (Public Broadcasting System, 2007). Thurmond and Wambach (2004) further defined feedback as information exchange between a course instructor and student about course related activities and projects for the purpose of student learning. While it is no longer a question whether or not feedback needs to be provided to students, the crucial questions to ask are how and when feedback needs to be offered for students' assignments.

Given that immediate feedback might be appreciated by students, Bonnels (2008) questioned when feedback ought to be provided to actually facilitate learning and how often students wanted feedback from course instructors. Feedback helps allay the students' sense of isolation and inform the status of work completion (Billings, 2000). It is important for helping students maintain pace and schedule in the online classroom (Thurmond, 2003). Vella (2002) suggested that formative feedback be provided at scheduled points for students to improve their learning.

With respect to preferable means used by an instructor to offer feedback to students' assignments, Morgan and Toledo (2006) compared the students' reaction toward handwritten and typewritten feedback. Using Table PC and computer to offer feedback, the researchers found that the students had favorable inclinations toward handwritten feedback generated by Table PC. Handwritten feedback seemed to students less distant than the typewritten. The drawback of this approach lies in the limited space in which to provide specific comments. Lack of detailed information consequently would result in students' confusion and possible frustration.

Although another strategy is pervasive and has been deployed by a wide array of higher institutions, it still has its shortfalls. Machine/computer generated feedback enables students to receive rapid feedback to their quizzes and exams. Not only does it provide students with quiz or exam results without any lingering delay (Peat & Franklin, 2002), but it reduces the cost and time needed by the course instructor to grade a large number of student assignments (Northcote, 2002). However, negative aspects might be that mechanical corrections might not provide the instructor with adequate information needed to analyze obstacles to student success (Chang & Petersen, 2006). This standardized evaluation form or feedback does little to promote learning. The students are not encouraged to examine or change any instructional learning behaviors based on feedback or discussions of the event. Since a grade granting process with a few words tucked in the margin as feedback does little to promote students' content understanding, it appears unlikely that a conscientious and conscious examination of limited feedback in order to enhance academic understanding will occur. Most importantly, it lacks individualized and personal interaction. It fundamentally is about a one-size-fits-all policy to attend to all learners' work. This does not address the principle of advocating for the rights and needs of diverse learners in the educational field with the understanding that there are distinctive learning styles.

To address the deficiencies the aforementioned approaches possess, an e-instructor is encouraged to consider employing an individualized coaching type of feedback (Chang, 2009). Feedback provided is in response to an individual learner's specific learning status expressed by his or her homework. Reading and contemplating the instructor's feedback allows learning to take place. Therefore, it is regarded as personalized coaching (Chang & Petersen, 2006). Most importantly, this type of interaction via a virtual learning environment is crucial to effective learning (Chang, 2009). Vasilyeva, De Bra, Pechenizkiy, and Puuronen (2008) were in favor of the personalized feedback with the provision that tailoring feedback to a student's preferences and responses to questions of an online test should be part of the responsibilities of faculty. These researchers took a close look at the differing feedback, which was designed for multiple-choice quizzes and concluded that providing feedback was a process of scaffolding, as it rendered assistance compatible to an individual student's expressed level of learning. It did this by allowing students to receive feedback that they believed suited the way that they answered questions. El Mansour and Mupinga (2007) further endorsed the theory by surveying 34 online students. They found that the students supported quick and personalized feedback, as it kept them on right track and allowed the instructor to gain further knowledge of the student's learning progress. If "the teachers did not get to know the students personally," the students felt lost in cyberspace (p. 245). Even though there is some literature addressing merits derived from feedback in terms of facilitating student learning, specific discussion on facilitating student learning through individualized coaching has not been explored extensively (Gallien & Oomen-Early, 2008; Mason & Bruning, 2003). There is also a scarcity of discussions in the published work targeting the undergraduate students' perceptions toward an instructor's immediate and detailed feedback. The findings of this research study, as such, will fill a void in the field by sharing pre-service teachers' perceptions toward the way that the instructor communicated with them in regards to their homework as well as the rationale behind their perceptions. The research question underlying this study was, "What are students' preferences and related reasons for an instructor's feedback in the process of online assessments?"

Methodology

Subject and Site

Twenty nine pre-service teachers participated in this study on a Midwestern regional university campus. The majority of the students were seniors (69%) with an age range between 21 and 24, and (66%) with a GPA at 3.0 or over (69%). It was a convenience sample because it happened that the researcher was their instructor (hereafter referred to the instructor). The instructor taught these students through a course entitled, "Introduction to Early Childhood Education." There were two sections for this course with one having 20 students and the other having 10 with both meeting twice weekly.

After being admitted into the teacher preparation program, the enrolled students must move through the entire program in cohort. To graduate from this institution, the students must successfully complete three semesters (three blocks—Block One, Block Two, and Block Three) as well as their student teaching. This present study took place during Block One—the first semester after their enrollment in the teacher education preparation program. With respect to computer technological skills, every student must take a required course entitled, "Using Computers in Education" (W200) before their admission to the teacher preparation program. Through this course, the students acquire basic knowledge and skills about computers and familiarize themselves with how to use Oncourse CL (Oncourse Collaboration and Learning (https://oncourse.iu.edu/portal) is one of the course management systems developed by Indiana University in collaboration with other major universities). The knowledge and skills gained from this course paves the way for subsequent learning with computer technology.

Data Collection

The students and the instructor met on Tuesdays and Thursdays in accordance with the university academic calendar. In the traditional face-to-face meeting, normal classroom activities, including lectures, small and large group discussions, and hands-on activities, were conducted. All their assignments, however, were submitted through Forum on Oncourse CL. The students were allowed to pace and control their learning by deciding when to submit assignments provided that they conscientiously followed the corresponding deadlines for those assignments. Once receiving an assignment, the instructor reviewed it by making necessary comments and corrections in light of the guidelines (the protocol) with the use of Comment and Track Changes features available in the Microsoft Word. These two features enabled the written feedback to elaborate and explain in order to inform the student of what had been expectedly and extraordinarily achieved and why certain areas needed improvement. The feedback not only covered course-related content, but also was concerned about the use of the APA style (the citation guidelines stipulated by the American Psychological Association) and grammatical and mechanical errors. At the end of the student's writing, the instructor also left a summary note, acknowledging the student's effort in completing and submitting the work, e.g. "Thank you for the submission," confirming good work, e.g., "Your introduction and objective note are well done," and/or pointing out where, if any, he or she was expected to concentrate, e.g., "There are areas for further improvement (please see the comments in the right margin of the text)." In short, the instructor made every effort to respond to their work thoroughly and promptly.

If there was the need for improvement, the instructor would mark 1 on the electronic gradebook to indicate that revision from the student was expected. However, the student was able to freely make his or her own decision as to whether or not the relevant revision would be made or whether or not he or she would take the grade as indicated in the feedback without revising the work. If the instructor received a student's revised work, a grade (usually represented by points) corresponding to the quality of that revision was granted. If the work was still below expectations, this same student would be expected to make another decision on whether or not continual revision would be made. Once the second round of revision was received and was up to the expectation, this assignment would then earn 60% of missing points. For example, if an assignment was awarded 80/100 in the first review, it is clear that this assignment misses 20 points. If the revision was up to the expectation, the grade would then be changed to 92 by adding 12 points (newly gained points as a result of revision) to 80 (the original points) through this formula: 20 (missing points) X.60% (the maximum % of missing points one can earn provided that the work is in good quality) = 12 in the second review. A similar protocol of grading on the student' ensuing revisions would continue in such a manner until the instructor's satisfaction was achieved or until the student informed the instructor of his or her unwillingness to continue the e-communication revisions.

The instructor frequently encouraged and reminded the students to email or telephone the instructor when they either had a question or felt confused about the feedback or any assignment to avoid unnecessary frustration, which may tend to discourage an otherwise positive learning disposition.

Instrument

The survey questions were administered during the last day of class. The students completed the survey in their own individual classrooms. The instructor was not present when the students were answering the survey questions in either of these two classrooms. A student representative was responsible for collecting the completed surveys with their informed consent forms. Then, the entire pack was stored in the Assistant Dean's office until all the grades were formally submitted online. There was no limit of time set for the students to respond to the survey questions.

The survey consisted of three demographic information questions, four close-ended questions, and two open-ended questions. The three demographic questions solicited the students' age range, student status, and GPA. Four close-ended questions included their preference with respect to how helpful the online feedback provided by the instructor was (their preference was noted on a 5-point Likert scale with 5 indicating the most preferred and 1 the least preferred), whether or not they had easy access to computers, whether or not they were interested in computers, and a percentage from 0% to100% of computer integration that they would like to see computer technology integrated into their teaching and learning (the present online submission of assignments and communication between the instructor and students consisted of approximately 30% integration, based on the instructor's knowledge). Two open-ended questions asked the students to elaborate rationales for their choice of a certain numeral relating to their preference of the way that the instructor offered feedback and the percentage they believed should be the appropriate amount of computer integration into their future learning (if they would take this course again). There was no limitation on the number of reasons that the students were allowed to note on the survey. Because of its scope, this present study focused only on the questions with reference to the students' insights regarding the instructor's feedback.

Data Analysis

The data were analyzed both quantitatively and qualitatively. With respect to the quantitative analysis, the instructor recorded frequencies for the students' degrees of preference toward the way that the instructor provided feedback to their assignments submitted via Forum on Oncourse. Qualitative data analysis was intended to obtain the reasons for the students' selection of a specific numeral on a 5-point Likert scale. To analyze, the instructor first read and re-read the completed surveys to get a sense of the content focusing on the central idea of the present study. The data were then coded with the abbreviations of the tentative categories, which were transposed to a list. The instructor then re-read through the raw data to confirm or add to the initial decisions and to combine or refine those that might overlap. This approach enabled the instructor to ensure that all the data were saturated and sorted to a corresponding category. Identifying common threads from the coded categories was the next step in the data analysis process. The common threads were the basis for the written thematic statements and narratives concerning the various aspects of preservice teachers' reactions toward online feedback.

Trustworthiness

The general purpose of this research study was to obtain two measures, one of knowledge production (regarding the perception of the pre-service teachers toward the way that the instructor provided feedback to their assignments) and the rationale (why the students liked or disliked that approach to the provision of personalized online feedback). These purposes coincided with the "trustworthiness" principles set forth by Lincoln and Guba (1985).

Results and Discussion

This study was intended to explore the viewpoints of pre-service teachers with respect to immediate and elaborate online feedback that the instructor provided through the fall semester of 2008. The primary question underlying the study was, "What were students' preferences and related reasons for an instructor's feedback in the process of online assessment?" None of the participants disliked the way that the instructor provided feedback to their assignments. It was found that 66% of the students selected 5 (strongly preferred) while 36% chose 4 (strongly preferred). None of the students selected 3 or below (see Table 1). This result demonstrates that all the participants were in favor of the way that the instructor communicated with them online in the process of assessment. With respect to the reasons explicating why they preferred the way that the feedback was given, two themes have been identified as a result of the data analysis:

Table 1
Students' preferences for the instructor's feedback in the process of assessment

*Preference	5	4	3	2	1
percentage	66	34	0	0	0

*5 denotes strongly preferred and 1 denotes the least preferred

Promptness and *Helpfulness*. There were no categories found for the theme of *Promptness*, but there were several categories expounding the theme of *Helpfulness*. The *Helpfulness* categories include the following: being essential, encouraging, stimulating thinking, reflecting, building a learning community, being personal, revising, enhancing knowledge and skills, and anytime and anywhere. This research report also addresses negative cases and discrepant data as a separate theme—*Confusing*, *but*. All the students' names used in this report are pseudo to protect their identities. The following provides detailed explanations.

Promptness

In response to why they felt the online feedback was helpful, 11 students particularly noted that the feedback was timely and quick. Because of the immediate feedback, the participants implied that their learning was greatly helped. Alisha wrote: "I felt it was helpful that Dr. Chang provided us with immediate feedback." Mary and Nina chimed in:

- There would be times when I'd email a paper and not even an hour later, I'd have feedback on it (Nina, Fall, 2008).
- E-mail responses on Oncourse were given back promptly after the original email [after the instructor received my email] (Mary, Fall, 2008).

The fact that immediate feedback received a favorable vote from the participants was substantiated by Riffell and Sibley (2003). These researchers found from their survey study that even if the feedback were given in a programmed standard form, the students felt that frequent and detailed hints (programmed feedback) were fundamental to significantly increasing their ability to learn. They reasoned it was due to that fact that adequate feedback was not only helpful, but also enabled them to understand the course materials. Song, Singleton, Hill, and Koh (2004) translated immediate feedback to immediacy. That is, immediate feedback was a manifestation that the course instructor cared about student learning (Chang & Petersen, 2006). Piffell and Sibley further argued, based on the result of a survey study, that immediate feedback was tied to three components useful for effective learning. These include self-motivation, time management, and organization. In this sense, immediate feedback motivated students to learn and encouraged them to reexamine their ways of managing time and organizing their learning process.

Some students appreciated the effort the instructor made to send the feedback to them in a prompt fashion. Myliana wrote, "I think that feedback is great and I really think that you are very good about getting it back fast, that is really appreciated." The students' gratitude also alludes to the fact that delayed responses would result in varying levels of student frustration (Riffell & Sibley, 2003; Song et al., 2004). El Mansour and Mupinga (2007) confirmed this through the analysis of 34 online student surveys and found that without the quick feedback, many students would feel lost in cyberspace.

Helpfulness

All the participants were either strongly supportive or supportive of the way that the instructor provided feedback to their assignments submitted via Forum on Oncourse (see Table 1).

Furthermore, nearly half of the students (14 students) particularly stated that the online feedback provided by the instructor was helpful. The participants' specific rationales behind their choices vary from student to student and were reported in several sub-categories as follows:

Being essential: Seven participants recognized the feedback provided to them was essential, because "[it] is essential for us to improve [learning] (Kim, 2008). Some students added,

- It gives me a deeper understanding of the projects and helped me prepare for the next one (John, 2008).
- It showed me the expectations for future assignments (Kathlyn, 2008).

The comments made by Kim, Kathlyn, and John positively supported the notion that detailed feedback was deemed useful, because the feedback assisted them in understanding why certain points or segments of their assignments were acceptable and why other perspectives were off track. With clear directions and support given by the instructor, the students felt confident in moving on to the next level.

Even though there were guidelines spelled out for each assignment available in the course syllabus and even though the students were often reminded and encouraged to carefully follow the guidelines when completing their assignment, there were still some students who were unclear about the expectations. Kathlyn (Fall, 2008) provided the reason behind it by attributing it to a lack of time to read owing to their time commitments. Kathlyn's notion was echoed in a survey study conducted by Killian and Willhite (2003), which solicited the insights of students concerning online learning. It found that some non-traditional students with long commutes and multiple adult responsibilities commonly recognized that there was an insufficient amount of time for them to communicate with others online. This deficiency, therefore, resulted in their dissatisfaction with online discourse in the preservice teacher preparation program. The circumstance, nevertheless, was, is, and will be pervasive to many commuter campuses. To mediate the situation, coercing these students to read the guidelines would elicit little in desirable learning outcomes. The "double dosage" tactic—encouraging the students to read the guidelines while offering detailed feedback to facilitate their learning—appears to be helpful for student's learning. However, it deserves a further investigation to corroborate this conclusion.

Encouraging: The instructor's feedback worked as a propeller to "push" students to work harder and better with assistance appropriate to their individual situations. Mary wrote, "The feedback was always positive, encouraging the success of the students, including myself." Even though there are only 13 words in this sentence, an in-depth meaning embedded in it was much sensed. Mary expressly had exchanged the idea with some of her fellow classmates, if not all of them. Their resultant discussions converging on this topic verified the impact that the instructor's feedback had on students' learning success. The explanatory feedback explained why a student did a good job and/or why a need for improvement was expected. Such an attentive approach to providing positive feedback was consistent with Sull's (2008) perspective, which suggested that an instructor always be cognizant to heed word choices when it came to providing feedback. After all, the purpose of feedback was to help improve students' learning by assisting them in understanding why things that have been done are up to or below expectations.

Stimulating thinking: The students recognized that the content of the feedback evoked their thinking. Anthony wrote, "Your comments make me think." Michael went on to explain, "You make me think about what I observed and recorded. I [thus] included a lot of thoughts [in my writing]." In the contemporary society, a fast-paced living style is prevalent, leaving little room and time for people to think in depth about things they have encountered or experienced. Effective learning requires deepened thinking, because learned knowledge might possibly become one's own through the necessary thought processes. If there is no stimulus to stir up

one's thinking, one might simply indulge in receiving, but not digesting information. In this way, superficial knowledge is likely to blossom.

Does the way that feedback was offered to the students' assignments provide evidence that students' thinking was provoked, which promoted their desires to extend their learning by including more in their writing or assignments? Garrison, Anderson, & Archer (2000) noted that there was a positive link between written communication and a higher order of thinking. Assisted by the instructor's explanatory feedback that contains "good insights" (Casity, Fall, 2008) and that provides "good ideas" (Michelle, Fall, 2008), students gradually learn how to think as the dialogical communication is domain-specific and context-dependent; it directs students to focus on what to think (Garrison et al., 2000). "Explanatory feedback becomes crucial when one's ideas are being constructively but critically assessed" (Garrison et al., 2000, p. 25). This is a strategy to cultivate student's tendency to question obtained information, rather than to simply translate it into words without thinking and reflection. This is a "knock-on effect," which is supported by such an e-course instructor's guidance (Hall, 2002, p. 157).

Reflecting: Some students decided not to revise any or some assignments for varying reasons. Nonetheless, the decisions, as such, are not equivalent to the abandonment of reviewing the online feedback. In fact, they still read the feedback and found that the feedback was meaningful and helpful to them. Synthia wrote, "Due to the many assignments, I did not revise much of my work, but was happy with my grade and reflected after the comments." Synthia's expression conveyed a message that the feedback did encourage her to think about her learning experience, thus influencing her performance; it was a helpful way for her to gain knowledge and skills. This is consistent with Garrison et al.'s (2000) notion that critical discourses are fundamental to successful attainment of knowledge and exercised through one's own reflection on performance. In re-examining what has been done is a process' one must undertake to scrutinize all pertinent aspects for improvement.

Cultivating pre-service teachers to become reflective practitioners is strongly expected by the Interstate New Teacher Assessment and Support Consortium (INTASC, http://www.wresa.org/Pbl/The INTASC Standards overheads.htm). Standard 9 is about "Reflective practice: Professional development." Specifically, it states, "The teacher is a reflective practitioner who continually evaluates the effects of his or her choices . . ."

Building a Learning Community: Emily commented, "I think that the communication and feedback creates a community within the classroom." In the instructor's feedback, the students are reminded and encouraged to read one another's work and to comment on the reading afterwards. The expectation worked as an additional avenue for the students to communicate with one another outside class so as to enhance their understandings of course related materials and to establish ties to one another in and out of school. A dynamic atmosphere positive to learning was initiated in this unique manner. As learners are left alone to work with computers, all visual body gestures are absent. The instructor's feedback, in a sense, could have a favorable effect on learning in making the instructor's presence visible (Chang, 2009; Chang & Petersen, 2006). Instructor's feedback is regarded by students as being supportive of their learning (Lim and Cheah, 2003), which paralleled Garrison et al.'s (2000) "social presence." Social communication via a course management system is one of the essential means to bring about dynamic interactivity with the guidance of a course instructor, which was beneficial to student learning via an online learning environment.

Being Personal: Being personal was stated by students to be helpful feedback. Christina shared, "I really enjoyed getting personal feedback from you on my papers." It was viewed that the feedback was at personal levels as it targeted every individual's paper with individually specific comments and notes toward the student's paper rather than with a one-size-fits-all approach to

treating all the papers received. Christina explained her notion this way: "I think by having you give feedback online, it provides individualized instruction that could not be accomplished in the classroom." In a traditional face-to-face classroom setting, it is hard for an instructor to provide feedback specific to every student's concrete learning status. Generalizing how the assignments have been done by the students appears something ordinary for an instructor to do in a group face-to-face setting. An instructor might announced, "You all did well on this assignment." "I am proud of you for your doing such a nice job." Yet, this generalized statement would bring on consequent probable questions. Had all the students achieved such a level high enough to deserve the praise like this? Had all the students made similar progress in uniformity? What would the students make out of this general statement with the knowledge that some of them did not do well at all? What would those students feel and think of the biased or untruthful praise? Moreover, as addressed earlier, even if an instructor grades a student's paper with a few simplified comments here and there, these comments might temporarily perk up one's either happy or displeased emotion, but hardly could make explicit what was needed so as to help the learners discern the rationale behind the marks or remarks. To address these inadequacies, detailed comments compatible to individual learning levels through the assessment process would be one of the assessment approaches that a course instructor should take into account and exercise (Chang, 2009) and it is one that is significant in student high-level knowledge building (Garrison et al., 2000).

Revising: The instructor's feedback was conducive to students' reworking on their assignments. Cheryl commented, "It [feedback allows] me to revise my work individually and [to] strive to perfect my papers." Lena agreed and said that the feedback was helpful because "your online feedback was very clear and was helpful for me to correct my paper." It is clear that explanatory feedback is helpful and useful as it supplies the students with orientations for amelioration. The students reasoned that useful and helpful feedback was feedback that the students were able to clearly follow when revising their work. Furthermore, such feedback enabled them to deepen their knowledge through the revision process (Chang, 2007; Hall, 2002), as "[a]llowing the student to rework and resubmit an answer is important in the learning process" (Siew, 2003, p. 46). Although the participants' wordings, such as "helpful for me to correct my paper" seemed to be indicative of their aim to solely correct papers, a close analysis of the students' remarks would advert to the notion that the students must reexamine and ruminate on the areas for improvement so as to achieve expected conceptual understanding through the process of revision.

The explanatory feedback given by the instructor could also help move away from the development of learners' unnecessary frustration and intimidation to a great degree. There might be a gap between a developer of the guidelines and that of a user concerning the way to interpret them. It could well be that the guidelines might be crystal clear to a developer, but confusing to a user. To abate the incongruity and to facilitate student learning, the instructor needs to explicate and reinterpret the guidelines to the user in the process of reviewing the student's work. This type of individualized assistance and instruction was favored by the participants, e.g. "It showed me the expectations for future assignments" (Clare, fall, 2008). Garrison, et al. (2000) posited the instructor's active intervention was a way to identify students' misconceptions and to assist them in constructing deep levels of knowledge. It enables the instructor to remove barriers to student successful learning (Chang & Petersen, 2006).

Enhancing knowledge and skills: Prior to studying in the teacher education preparation program, the majority of students were familiar with the MLA style (citation guidelines by Modern Language Association) although some were exposed to the APA style (citation guidelines by American Psychology Association) to varying degrees. In Block One (the first semester after the students were admitted into the teacher education preparation program), the APA style is the primary expectation when it comes to citation guidelines. The requirement of this citation style

often imposes difficulty on student learning. The explanatory feedback assisted the student learning: "It [Feedback] helps me with the APA style" (Synthia, Fall, 2008). Even though examples and instruction of how to cite APA style were accessible to the students online, as with assignment guidelines, the students seemed to feel that deepening their understandings of the APA style with the assistance of the instructor's feedback was the most helpful.

Such a notion was further substantiated by a student's voice that the instructor's feedback was inextricable to student learning. As have been indicated earlier, even though there had been several lectures, class discussions, and group practices taking place precedent to their development of lesson plans through formal assignments, explanatory feedback enabled the students to develop a clear understanding of their lesson planning. Sherry noted, ". . . [feedback] helped me learn the format of the lesson plan. Lesson plan development is construed as one of the most difficult tasks to some education students. It is expected of the students to master numerous crucial aspects in lesson planning so as to execute it successfully. The feedback suitable for the students' varying levels of learning provides scaffolding to students' understandings on those seemingly complicated aspects of a lesson plan format.

All the aforementioned findings were echoed in the study conducted by Jelfs, Nathan, and Barrett (2004) regarding when, how, and what students used external help. These researchers argued students expected external help from a course instructor, which would mostly derive from the instructor's diagnostic and constructive assessment. Evaluating and diagnosing student work is a way to provide scaffolding to student learning.

Anytime and anywhere: Some students perceived the provision of feedback was helpful, because corresponding with the course instructor was ubiquitous and independent of location and time. This method of retrieving and responding to the instructor's feedback, if a student has access to the Internet, is also unbridled. Becky wrote, "I could get the feedback when I was at home, in class, or other places that have the Internet." Being omnipresent with the use of course management systems is, by no means, a new topic in instructional technology. However, the feedback that was downloadable from the Internet at a time best suited to a student's own schedule is of great significance to discuss. As a student is ready to retrieve the feedback from a course instructor, it could also be the time when the student is mentally prepared to read, reflect, and revise the task at hand. Communicating with a course instructor could also be genuine and effective with the learner's full pledged concentration. This approach to gaining and deepening knowledge might be effective as the student could be very much in earnest. In contrast, when feedback is handed back to students before, in, and/or after a face-to-face meeting, the students might, at best, be able to give it a quick cursory view. Some related questions might arise at the time when the student viewed the feedback, but those questions might not have a chance to survive if the students' schedules were "hectic" and if their imminent obligations were other than seeking answers from the professor present in the class at the moment. Hall (2002) pointed out that students attending to normally scheduled on-campus meetings once or twice a week might have a limited vision of study. It may be the students' false perception that learning takes place only a day or two before or after the scheduled class meetings. With respect to communications, they may not be able to have frequent dialogues with their professors due to the limitation of face-to-face meetings offered weekly. Online communication breaks the pattern and allows unconstrained access to materials helpful and useful to student learning.

Confusing, but

Though no student marked 3 or below on the 5-point Likert scale, a couple of students were concerned about clarity of feedback. These concerns were classified into two categories:

1. pointing out insufficiency of the feedback, but acknowledging the usefulness of the feedback simultaneously. For example, Brian wrote, "At times, feedback was difficult to follow, but overall I found it very helpful."
2. expressing negative feelings toward the instructor's feedback. For example, Terri wrote, "Sometimes it is difficult to understand her comments. They don't make any sense to me.

These two students' viewpoints toward how the feedback was provided stand in stark contrast to those of many pre-service teachers in this study, such as Tyler, who commented, "[I] was able to really see comments well. [The feedback was] made it easier [for me] to revise [my work]." Although small, the discrepancy, nonetheless, still is worthy of the instructor's attention. Online communication is largely dependent on text communication. The paradigm of teaching and learning has been shifted from auditory and speaking to visual and writing. To those who are not accustomed to learning primarily based on reading and writing, they very likely will experience a huge learning curve. This level of discomfort was reported by Becky (fall, 2008), "It was a little hard to get comfortable with the comments on the word documents." While these participants had taken a pre-requisite technology course prior to the course under study, the major learning tasks involved in that course, in essence, were comprised of technology know-how skills. Rarely did these students have a direct experience of communicating with others or a professor in a way similar to that expected by this course. This fundamental change from listening and speaking to reading and writing is challenging and consequently causes discomfort to some students. Another reason for the emerged confusion might be grounded in the fact that the course under study was one of the first courses for the participants in the teacher education preparation program to undertake. Immersed in this learning process, new terminology, jargon, or concepts might become temporary barriers to their comprehension. Although an initiative taken by a student to request clarification from the professor could well be one way to resolve this problem, as one of the students pointed out, "If I was unclear of her feedback meaning, I would e-mail my question. She was very quick to respond and helpful in clarifying." Regrettably, the instructor had not received many such email queries. This phenomenon could be caused by a lack of time on the students' part or by the unfamiliarity of this novel way to learn. Facing this circumstance, the instructor might need to modify means currently being undertaken in communicating with students via the text-based medium to assist learners who have much on their plates, who have a weak sense of self-regulation, self-management, and self-organization skills, and who are intimated by this new modality of learning.

Special effort also needs to be made to seek appropriate approaches to interacting and dialoguing with students with special needs. Terri, who wrote the second comment (see (2) above), had a learning disability. Although the instructor had believed that considerable electronic assistance had been rendered to Terri over the course of the fall semester of 2008, it evidently led to an undesired outcome. More adverse effect on Terri's learning might also lie in Terri's frequent absences from classes. At any rate, helping students with special needs to strive in class has led the instructor to suggest a future research effort. Essentially, engaging in Content Analysis to compare/contrast between the course instructor's feedback to those who deemed the feedback beneficial and helpful in various ways and those who held different opinions could be helpful and useful. Wanstreet (2007) found, after engaging in an ample literature review, that there was not much emphasis on how an instructor would know what a learner knew and might be able to do and what the learner might need to know and need to do. The research results may inform the related field as to how to assist diverse learners to reach their learning goals successfully.

Conclusion

This study was designed to explore pre-service teachers' perceptions with respect to immediate and elaborate feedback that the instructor provided during the fall semester of 2008 as well as their corresponding rationales behind the revealed perceptions. All the students were in support of how the instructor furnished their homework with feedback. The rationale related to their strong preferences involved the following: the instructor's feedback was prompt, confirmed the expectations of the assignments, stimulated their thinking, and encouraged their reflections upon their work and observations. The instructor's feedback also has been translated by the students to be personalized and individualized instruction, as it was tailored to their own needs and learning levels to advance their understanding. There were a couple of students who were unable to follow the instructor's feedback, which is indicative of the need for further improvement so as to arrive at satisfactory learning outcomes. All in all, the ideology of personalized coaching, as such, was consistent with the three presences identified by Garrison et al. (2000), namely, social presence, cognitive presence, and teaching presence. Vygostky's (1978) theory of the zone of proximal development (ZPD) pointed to the necessity that learning should take place in a social context.

The fact that the instructor analyzed each individual's work through the assessment process represents teaching presence. Teaching presence is also embodied in the dialogical communication that lends itself to students' heightened understanding. Cognitive presence takes place when the instructor's comments had positive effects on the students' level of understanding and when the student was earnestly engaged in the revision process.

Future Research

Future research effort is needed to corroborate the present research results by utilizing a diverse and comprehensive sampling. Additionally, considering online teaching and learning is still in its infancy, there have been a growing number of research studies looking at this novel way of teaching and learning. However, there is a scarcity of literature addressing the issue of feedback to student learning (Gallien & Oomen-Early, 2008; Mason & Bruning, 2003). Therefore, effort should be made to converge on questions, such as, "How can instructors interact with online learners in this novel teaching and learning environment so that students are apt to self-regulate their own learning?" More understanding is useful with respect to how, what, and when automatic/machine generated feedback and/or individually tailored feedback is suitably employed to accurately, authentically, and fairly assess and facilitate student learning. A further investigation also involves seeking ways to encourage students to feel free to ask questions without feeling intimidated in an online learning environment. Howland and Moore (2002) found that some students lacked initiative in asking questions online because "it was hard for me to compose a question in writing that didn't sound rude or silly" (a student comment in Howland and Moore, p. 191). Furthermore, according to Wanstreet's (2007) extensive literature review, it is noticeable that social connection has been enormously and frequently addressed, whereas psychological connection has been unfairly underrepresented with respect to e-classroom instruction. Future research foci, in this sense, should be placed on how to successfully and effectively promote student affective involvement in learning. Lastly, considering that the participants were mostly seniors, young (ages ranging from 21 to 24), and somewhat academically advanced (the grade point average was about 3.0), future research may specifically be desired to investigate the relationships between these variables and their respective preferences toward the way that the personalized feedback is provided. Could those factors affect the outcomes of the study?

Educational Implications

This new modality might lessen the burden of an instructor as a large chunk of work (grading papers from every student in the class all at once) can thus be reduced into smaller, more manageable pieces. The short turnaround period between receiving and returning the work promotes effective learning as well. It is because concepts just learned might still be fresh in the student's mind, which is conducive to students' deepened understanding. Students using this new method of online submissions and a new way of interacting with a course instructor might be enabled to learn how to work with computers to assist in their learning. They also may learn how to organize and regulate their own time in a more productive manner. While it is a rewarding and worthwhile effort, a course instructor might need to be flexible, expecting students to submit their work anytime prior to the expected deadline. To this end, an instructor ought to find a way to help his or her students to change their mindset by fully taking advantage of e-communication that is available 24/7.

To provide students with immediate and elaborate feedback requires a course instructor to make a large commitment as executing this undertaking is time consuming. An instructor has to write detailed comments to different segments in a student paper and must do so for every student's paper. This commitment provides scaffolding for students' learning, because some students have not yet possessed skills to communicate in a text-based context (Jelfs & Colbourn, 2002). Some have not yet been exposed to experiences necessary for learning success in higher education, nor have they learned self-management skills. These students have a high propensity to hinge on external assistance (Li, Lee, & Kember, 2000). Dialogues between an instructor and a learner in a constructivist manner whereby the student is learning how to construct knowledge with the use of computer technology are consistent with Vygotsky's (1978) notion of the zone of proximal development (ZPD). ZPD defines scaffolding as "an activity in which teachers or more experienced learners provide support and guidance" to the learner (in Jelfs et al., 2004, p. 87). Providing assisted learning is to foster "independent and non-assisted learning" competency. 1st phrase: The scaffolding strategies appropriate for the needs of the students and for being responsive to learners might help them to move closer and closer to the new way of learning. This typology of interaction might also establish a rapport between the instructor and student.

Limitation

The participants involved in the study largely were first generation college students. As this was a survey-based study, the data were entirely drawn from the participants' insights. It could be that the participants might not have completely recorded their responses. The sample used for this study was not large enough and was an examination of one university in the Midwest. Generalization of the research findings should be made with caution. However, the findings of this study are provocative and may help interested e-instructors. Those instructors who may have recently begun a similar teaching adventure may see similarities between their own classroom situations and the context described in this study. The findings of the present study could help such persons seek innovative ways to reach out to their students in an individualized manner to facilitate learning.

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About the Author

Dr. Ni Chang is Associate Professor of Education at Indiana University South Bend. She received her master's and doctoral degrees from Peabody College of Vanderbilt University. She has over 12 years of web-based and hybrid teaching experiences. These experiences have been researched and transformed into numerous conference presentations, book chapters, and refereed journal articles.

Email: nchang@iusb.edu