Journal of Research in Innovative Teaching

Volume 5, Issue 1 (March 2012)

An Affiliate of the National University System

Journal of Research in Innovative Teaching

Volume 5, Issue 1, March 2012

Publication of National University

La Jolla, CA USA

ISSN 1947-1017

When referring to this publication, please use the following: Name, (2012), title. *Journal of Research in Innovative Teaching*, 5(1), pp. (use the online version pages).

Table of Contents

Editor's Column

Dear Reader,

We welcome our readers to the 5th issue of The Journal of Research in Innovative Teaching (JRIT). This journal was launched five years ago, in 2008, by and for the National University faculty to provide a forum for publishing and sharing their research. It is a double-peer reviewed journal distributed through the NU website and by EBSCO.

National University's mission is to make lifelong learning opportunities accessible, challenging and relevant to diverse populations. In accordance with this mission, the National University research journal's annual publication is an important benchmark in the University's maturity. Teaching, research and scholarship are interrelated; evidence shows that research enriches teaching and is capable of significantly improving student learning outcomes. JRIT is an annual multidisciplinary peer-reviewed publication of original research focused on new effective instructional approaches, methods and tools. It is intended to produce momentum to increase efficiency of learning and ensure better learning outcomes for our students.

The Journal is a forum to share faculty research and scholarship, which will ultimately benefit both the university academic community and our students. The Editorial Board is composed of top scholars and administrators from National University, as well as several internationally acclaimed scholars. The Review Board includes both internal and external reviewers.

During the past five years the Journal has published:

- Total issues - 5
- Total articles - 81
- Articles from only NU faculty - 48
- Articles from NU faculty in collaboration with outside authors- 12
- Articles from the outside US authors - 8
- Articles from international authors -13, representing Austria, Netherlands, Ukraine, Malaysia, Jamaica, Cameroon

- Total number of authors - 154
- Total number of NU faculty who have published in the journal - 63
- Editorial boards members from NU - 13
- Editorial board members from the outside - 3
- Reviewers from NU - 47
- Reviewers from outside the university - 38
- Total number of pages – 1065

Since 2008, the Journal has been accessed about 10,000 times from locations all over the world. This project demonstrates a steady progress in establishing a research culture at this institution. The National University community is proud of its research periodical.

Among this issue's authors, our readers will find National University faculty, joint authorship of National University researchers with outside scholars, US researchers from outside the University and international writers. All publications have been conditionally assigned in the following sections:

- General Issues
- Web-Based Learning
- Educational Technology Applications
- Instructional Methodology

The first section of the current issue named **General Issues** opens with an article by Kenneth D. Fawson, *The Global Economic Crisis: Winners and Losers in Higher Education*. The author compares and contrasts the relative impact of the global economic crisis on the public and private sectors of higher education. K.Fawson argues that institutions that may have benefited from the downturn are portrayed as "winner" institutions and he provides insight into strategies successful institutions have adopted to meet the global demand for higher education.

In the second article, *A Case Study Regarding the Purpose and Process of Public Schooling and Possible Indoctrination of Education Students*, R. D. Nordgren addresses the issue of the indoctrination of high school students. The author suggests a hypothesis that left-leaning education courses would influence students' beliefs about both the purpose of schooling and how this process should be enacted. The analysis of data collected in seven graduate and undergraduate education courses suggests, however, that education courses have little influence on these beliefs.

The second section, **Web-Based Learning**, offers six articles. Jodi Reeves, Mohammad Amin, Marcos Turqueti, and Pradip Peter Dey discuss *Improving Laboratory Effectiveness in Online and Onsite Engineering Courses at National University*. They state that engineering educators face unique challenges when teaching online classes, especially when the course incorporates experimental activities. In their study, the effects of using new laboratory activities in both onsite and online engineering classes have been investigated. Qualitative and quantitative assessment data show that students liked the Emona DATEx (Digital Analog Telecommunications Experimenter) system and rated it very highly as a new educational tool.

In *Practical Lens for Teachers in Their High Tech Learning Environment* Lynne Anderson and John Cartafalsa suggest that the quality of online communication and the degree of interaction with fellow students and the instructor contribute to student satisfaction and correlate with instructor response time. They describe two models for instructional quality preferences. Qualitative analysis has shown that student satisfaction and performance relate to quality e-learning preferences and possibly to preferences for e-teaching strategies.

Dee L. Fabry in her article *Using Student Online Course Evaluations to Inform Pedagogy* explores student evaluations of online instructors specific to instructor-student interactions. Results of her study indicate that students highly valued instructors who were active participants and effectively used interactive communications tools, such as email and assignment feedback. This data can be used to improve online teaching.

Michael P. Myers and Patric M. Schiltz write about the *Use of Elluminate in Online Teaching of Statistics in the Health Sciences*. The purpose of their study was to compare the effectiveness of teaching statistics in three different ways: onsite, online with live text chat, and online using Elluminate. Content assessments revealed that teaching online with Elluminate resulted in gains 16% above the other online class and 11.4% above the onsite class. Attitude

assessments showed a similar finding, suggesting that students learn statistics better online with the right tools.

Donald A. Schwartz in his *Effectiveness of Learning in Online Versus On-Campus Accounting Classes: A Comparative Analysis* article raises a question, do students learn as effectively in an online accounting program as they do in a traditional on-campus classroom? The results of his study show a lower level of achievement in the online sections. An analysis of the four metrics employed provides clues to opportunities for making student learning in online accounting classes as effective as in a traditional classroom environment.

Cynthia Sistek-Chandler presents a paper entitled *Connecting the Digital Dots with Social Media and Web 2.0 Technologies*. The author demonstrates how learning theory supports and explains the practice of social networking and the development of the wide net of social media. She explores key concepts of Web 2.0 technologies and applies learning theory to explain why this medium works in our contemporary society. This article discusses virtual communities, applications of social learning theory, immediacy, recency, and connectivism as a context for learning.

In the next section, **Educational Technology Applications**, a group of authors, Pradip Peter Dey, Gordon W. Romney, Mohammad Amin, Bhaskar Raj Sinha, Ronald F. Gonzales, and S. R. Subramanya, offer an article *A Structural Analysis of Agile Problem Driven Teaching*. Agile problem driven teaching (APDT) has dynamically changing features involving a wide range of interpretations that facilitate flexible and effective teaching methods adaptable to many environments. The central thesis is that major teaching activities are driven by a set of problems with agility for adaptation in a wide variety of teaching environments. This paper reveals how APDT activities are easily included in course contents and correctly mapped to course learning outcomes.

S. R. Subramanya presents his research in the paper *Enhancing Digital Educational Content Consumption Experience*. He writes that technological advances leading to widespread availability of cost-effective audio/video devices, processors, storage, and communications have resulted in enormous growths in the generation, processing, storage, and sharing, respectively, of huge amounts of digital content. Trends indicate that in the near future, tremendous amounts of digital educational material will be developed, deployed, and used. However, the capabilities of human beings in "consuming" digital content remain almost constant and do not scale up. This necessitates the development of techniques and tools for leveraging content-consumption efficiency and effectiveness. He proposes a model and some metrics for the consumption experience of digital educational content.

The last section is on **Instructional Methodology**. Patricia C. Skalnik and J. Robert Skalnik propose an article *Active Learning and Innovation in Marketing Education: A Case Review*. They say that renewed attention has been paid to the application of "active learning" techniques to enhance student achievement. In this case, an empirical/applied class has been changed from a traditional course to one that combines software and Internet applications, in addition to collaborative team-based learning. Student enthusiasm and interest has "morphed" an Internet Marketing class into a hybrid of Internet Marketing, Community Service, Web Design and Social Media Marketing.

Oleg Tarnopolsky talks about *Experiential Learning of EFL for Professional Communication at Tertiary Educational Institutions*. In his article he considers the experiential learning approach developed with the aim of teaching English for

professional communication to students of Ukrainian tertiary educational institutions who major in different non-linguistic fields (Economics and Business, Technology, Psychology, etc.). The suggested experiential learning approach is based on such structuring of a university EFL/ESP course that students' learning activities start to model their future professional activities and professional communication, these being conducted not in learners' first language but in English.

B. Charles Tatum and Julia C. Lenel provide *A Comparison of Self-Paced and Lecture/Discussion Methods in an Accelerate Learning Format*. They compared self-paced to traditional lecture/discussion instruction in an accelerated course. The results revealed that the self-paced students performed better on the unit tests. No differences were found, however, between the two methods with respect to performance on the final exam, one-year retention, or average course grade. The results further revealed that the students were more satisfied with the self-paced courses than with the lecture/discussion courses. It appears that the self-paced course is, in some ways, a better way to learn, and students are more satisfied with the self-paced format than with the lecture/ discussion style.

A *Note to the Authors* offers guidelines for the authors submitting their papers to the Journal of Research in Innovative Teaching.

We invite scholars to submit their research for the next, 6th issue, to be published in 2013.

Peter Serdyukov
March 1, 2012

General Issues

The Global Economic Crisis: Winners and Losers in Higher Education

Kenneth D. Fawson

Abstract
This article will compare and contrast the relative impact of the global economic crisis on the public and private sectors of higher education. Institutions that may have benefited from the downturn are profiled as "winner" institutions. Market research and emerging trends provide some insight into strategies successful institutions have adopted to meet the global demand for higher education. The pitfalls to be avoided are exemplified by institutions characterized "loser" institutions who have suffered significant losses as a result of the crisis.

Key Words
Higher education trends, public and private universities, challenges.

Global Economic Crisis

The global economic downturn, originating in the United States, has dealt a crushing blow to the stability of this country, triggering an economic domino effect around the world. The economic crisis, the most severe since the Great Depression of the 1930s, has cascaded through all sectors of the economy, including higher education.

To understand the causal factors and their subsequent impact on higher education, Eklavya (2009) explained that the boom in the housing sector, which developed over many years, was driving the economy to new levels in the U.S. A combination of low interest rates and large inflows of foreign investment funds helped to create easy credit conditions where almost anyone could qualify for a home loan. As more loans were issued, the demand for property increased, pushing home building and prices up to exponential levels, peaking in the summer of 2006.

To cash in on the boom individuals, investment banks, corporations, and even foreign governments were investing heavily in U.S. real estate. With so much money available to lend, loans requirements were relaxed over the years to the point where people with no income, no job, and no assets were able to obtain a home loan. Such loans were labeled Sub-Prime Loans, where the repaying capacity of borrowers was doubtful (Eklavya, 2009). Many of these loans also tended to be Adjustable Rate Loans, where payments for the first few years were very low and subsequently adjusted up to double or triple the original amount every year or two after the low-payment-rate period.

As home buyers saw their equity rising, they took advantage of this apparent windfall to take cash out of their investment via refinancing first mortgages or taking out second mortgages, which would later would exacerbate the problem. Major U.S. and European investment banks and institutions bought these loans, packaged as Mortgage Backed Securities (MBSs) to diversify investment portfolios. Most of these loans were purchased as part of Collateralized Debt Obligations (CDOs), backed by the loans themselves. At this point just about everyone was in the game, and the "greed factor" was moving at a frenetic pace (Eklavya, 2009).

With a glut of housing on the market, home prices began to fall—slowly as first, then picking up speed as homeowners realized they could not meet the obligations of their adjustable rate mortgages, nor could they refinance because their home equity was falling below the loan

amount. This situation has been referred to as homeowners' being "underwater" with their mortgage. By March 2008, an estimated 8.8 million homeowners, or 10.8% of total homeowners, had zero or negative equity in their homes (NPR, 2010). With little or no initial investment in their homes, many homeowners who could not make their payments simply stopped paying on their mortgages or walked away from their homes, leaving mortgage companies and investment companies holding their debt.

While the situation was more complex than is possible to review here, global banks and brokerages had to write off an estimated $512 billion in sub-prime losses, causing the collapse of Bear Sterns, one of the world's largest investment banks and securities trading firms. From this point, a chain reaction of panic began in financial institutions across the globe. Stock markets began to fall to new lows. In an effort to stabilize the economy, the U.S. Federal Reserve finally stepped in to literally bail out banks, insurance companies backing MBSs, and mortgage lending companies with over $700 billion in stimulus funds (Eklavya, 2009).

Financial institutions were unable to cover losses, and they were also unable to continue lending to major industrial firms, most notably those within the U.S. automotive industry. As lending virtually froze, companies of all sizes found themselves without sufficient working capital to continue business as usual. Some companies, such as those in the automotive industry, required an additional government bailout to avoid bankruptcy, while others required major restructuring to avoid collapse, resulting in massive layoff of employees, pushing unemployment rates to double digits (Eklavya, 2009).

To simplify where the economic domino effect currently stands, home prices have continued to fall; homeowners continue to default on loans, causing foreclosures to mount; lending agencies are unable to cover losses and have insufficient funds to lend to businesses; businesses are unable to borrow to continue business operations at pre-crash levels, and employees are losing their jobs at alarming rates. In the U.S., the unemployment rate peaked in 2010 at over 14% and has now fallen to a little over 9%, with thousands of workers still unemployed (Eklavya, 2009).

According to the Associated Press, the U.S. federal government saw the biggest tax-revenue drop since the great depression of 1932, with individual tax revenue falling by 22% and corporate tax revenue dropping by 57% (Ohlemacher, 2009), as shown in Figure 1.

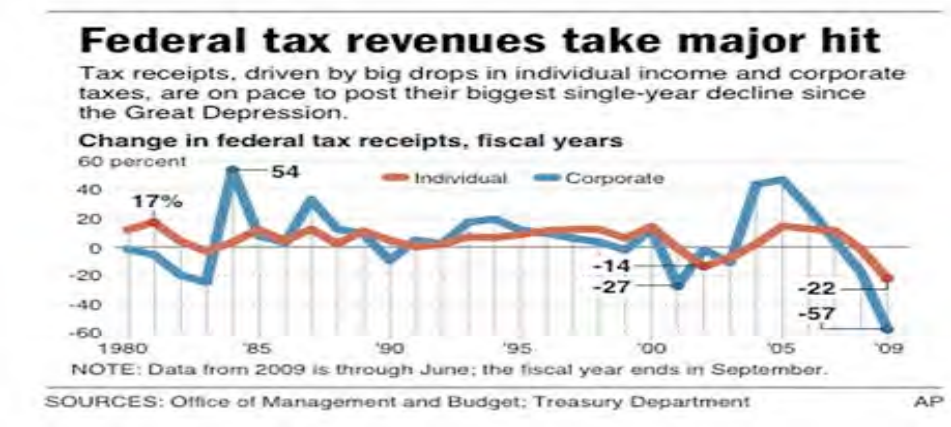

Figure 1. Change in federal tax receipts, fiscal years 1980–2009.

As is evident, the decline in federal tax revenue has had a dramatic effect on the ability of the U.S. government to maintain federal programs at pre-recession levels and to pass revenue on to states to fund programs at the state level under federal mandates.

The Fiscal Survey of States, Fall 2010, listing tax revenue from property, sales, businesses, and other fees, shows an average decline of 4.6% in 2009 and 6.4% in 2010, and a projected decline of 5.6% in 2011. Figure 2 shows revenue well below pre-recession levels (National Association of State Budget Officers, 2010). One must keep in mind that nearly all states are required by statute to have a balanced budget each year, whereas the federal government has no such mandate.

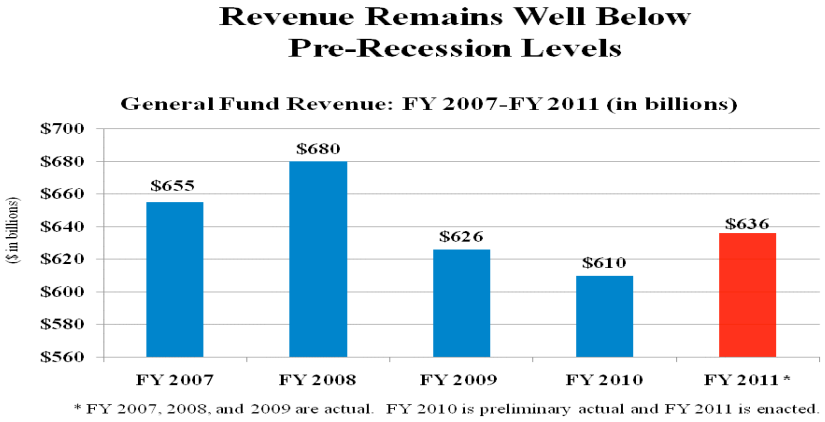

Figure 2. General Fund revenue, FY 2007 – FY 2011.

With many states facing the possibility of bankruptcy, the Federal Government again stepped in with the American Recovery and Reinvestment Act of 2009, for the purpose of increasing or extending certain benefits payable under the Medicaid, unemployment compensation, and nutrition assistance programs, typically funded by individual states. The package also provided funds that seek to spur clean energy, encourage science and technology research, modernize the transportation infrastructure, expand healthcare, and improve education (National Association of State Budget Officers, 2010).

While stimulus funding has kept reductions to publicly funded higher-education budgets artificially lower than anticipated, the act will sunset in 2012.

Impact of Recession on Public Higher Education in U.S.

Higher education in the U.S. includes a variety of institutions in a largely decentralized system. Public universities are administered solely by the individual states and vary in terms of goals: Some may emphasize vocational or technical curriculum, while others may emphasize a more general or liberal arts curriculum. Many combine some or all of these elements (Eckel & King, n.d.).

Two-year colleges, often called community or technical colleges, typically offer associate degrees, with most courses transferrable to 4-year colleges or universities. Four-year colleges (which usually have a larger number of students and offer a greater range of studies than do 2-year colleges) offer the bachelor's degree and are usually undergraduate institutions, although some might have limited programs at the graduate level (Eckel & King, n.d.).

Universities tend to be research-oriented institutions that provide both undergraduate and graduate education. For historical reasons, some universities have retained the term college, while some institutions granting few graduate degrees use the term university (Eckel & King, n.d.).

Strong research and stable funding have helped make American colleges and universities among the world's most prestigious. According to the Shanghai Jiao Tong University's *Academic Ranking of World Universities*, more than 30 of the highest-ranked 45 institutions are in the United States (Eckel & King, n.d.). An even stronger pattern seems to be shown by the year 2010, where Webometrics (2011) ranked 103 U.S. Universities in the Top 200 of World Universities.

According to UNESCO, the U.S. has the second largest number of higher education institutions in the world, with a total of 5,758, an average of more than 115 per state. The U.S. also has the highest number of higher education students in the world, a figure of 14,261,778, or roughly 4.75% of the total population. The U.S. Department of Education showed 4,861 colleges and universities with 18,248,128 students in 2007 (Eckel & King, n.d.).

Except for the United States service academies and staff colleges, the federal government does not directly regulate universities, although it can give them federal grants. The majority of public universities are operated by the states and territories, usually as part of a state university system. Each state supports at least one state university, and several support many more. California, for example, has three public higher education systems: the 11-campus University of California, the 23-campus California State University, and the 109-campus California Community Colleges System (Eckel & King, n.d.).

As noted in *U.S. News & World Report* (Clark, 2010), since the beginning of the fiscal year 2009, the U.S. has suffered an average drop of 5% (about $4 billion) in the amount of money state governments apportion for higher education.

While an average 5% reduction may seem modest compared to the impact of the recession on other sectors of the economy, it is having a significant impact on colleges and universities across the country. At least 46 states, plus the District of Columbia, have enacted budget cuts that range from 2% to 23%, certain to affect the quality of education and access to higher education (Johnson, 2010).

In responding to these reductions, many institutions of higher education have responded as they have in past short-term economic downturns, by implementing greater efficiencies at the administrative level, consolidating departments and raising class size, imposing incremental budget reductions across all program areas, laying off temporary workers, and raising student tuition. Regrettably, these incremental approaches have not been sufficient to balance budgets over the three consecutive years the recession has been running, and additional reductions have been announced for 2012 in states such as California, where higher education reductions may exceed $1.4 billion dollars. The state of Texas has also announced cuts of over $1.7 billion (Ray, 2011).

A continuing rise in tuition and fees is particularly troubling for students seeking access to higher education. According to *ABC World News* (Weir, 2008), college tuition and fees have increased 439% since 1982, about three times higher than the increase in family income. An increase in unemployment and financial losses has also caused 620,000 more students to apply for federal aid in the first quarter of 2010 compared to the prior year (2009). The report indicates that without financial assistance, students may be forced to drop out, transfer, or be laden with debt.

With shrinking budgets and pressure to cap tuition and fees, public higher education has been forced to downsize in the same way many businesses have had to do during the recession. This

comes at a time when the majority of public universities are also seeing significant increases in student applications as unemployment rises and access to jobs becomes increasingly competitive. The downsizing of public higher education has resulted in fewer classes, fewer programs available to students, and a reduction in the number of faculty. Enrollment caps have been raised in many classes where programs have been retained. For example, the California State System has lost one-fifth of its state funding in the past two fiscal years (2009, 2010), a $625 million reduction; and students have absorbed a 32% tuition increase. The system's 48,000 employees also took a 10% pay cut through furloughs—two full days per month, across the board. The system is cutting 20,000 student admissions this year (Ray, 2011).

With the recession at its peak, many college students have opted for the more affordable institutions—community colleges, according to ABC News (Dec. 2008). However, this influx of students has caused some community colleges to turn them away, claiming there's not enough room, teachers, and accommodations at these campuses (Dec. 2008). The California Community College System, the largest in the U.S., took $520 million in cuts in the 2009–2010 academic year, or 8% of its budget, and is reported to be serving 200,000 "unfunded" students, with thousands more being turned away from oversubscribed or unavailable classes (California Community Colleges Chancellors' Office, 2011).

At the same time more adults are seeking access to higher education as a result of the recession, greater numbers of high school graduates are enrolling in college. (See Figure 3.) For example, more than 70% of the members of the high school graduating class of 2009 were enrolled in college in October 2009. That is the highest portion on record, which goes back to 1959, according to a new Labor Department report (Rampbell, 2010).

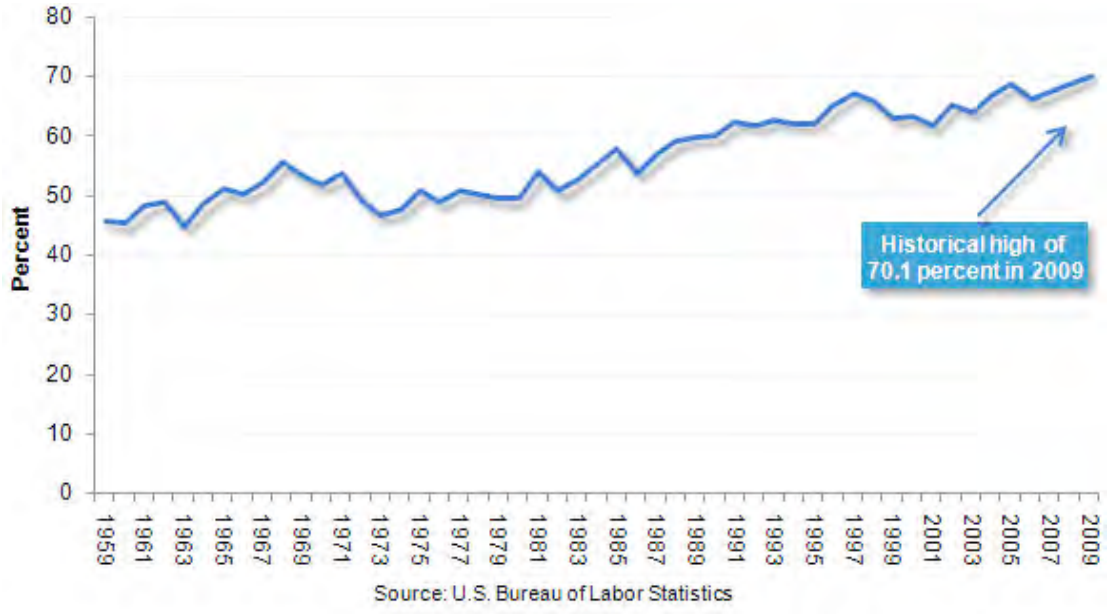

Figure 3. College enrollment rate of recent high school graduates age 16 to 24, October 1959–2009.

An additional factor in the educational downturn has been a decline in college endowments. According to the Center for Social Philanthropy (2010, p. 5), big and small donors simply aren't giving back right now, which has caused hiring freezes, cutbacks on financial aid, and a halt to construction projects.

Accelerating graduation from four to three years may be one way to slash college costs. A few U.S. colleges are now starting to offer 3-year college degrees, which is the normal time frame for many British and Canadian students. It's an emerging trend, according to CBS Money Watch, that could make "elite education" more affordable (O'Shaughnessy, 2009).

A growing area of the economy is online education. Whether people have lost a job, are fearful of losing one, or want a degree, online colleges have open seats. A CNN report, titled "Riding Out the Recession in a Virtual Classroom," (Pawlowski, 2009) touches on the idea of investing in education during troubled times. While this may seem evident, public higher education has been slow to embrace technology delivery systems in favor of more traditional instructional methods. Public higher education faculties tend to be more resistant to change than their counterparts in the private sector. Public higher education is also heavily dominated by faculty and staff unions slow to embrace new methods. Invoking the prerogatives of "academic freedom" and "lack of quality" have also been cited as reasons for not embracing online offerings. Nevertheless, the University of California, a public university, has initiated a "Pilot Project" on a volunteer basis to examine how online education can be effectively integrated into the UC undergraduate curriculum. Late adopters will find that launching online instructional delivery systems requires a substantial investment of funds and professional development that may not available to most colleges and universities.

The rise of tuition at public institutions and the availability of fewer spots for students have created an unintended boom for private colleges and universities, where tuition and fees are becoming more competitive with public institutions.

Impact of Recession on Private Higher Education in the U.S.

While the number is increasing, in 2005 High Beam Research reported 1,845 Private 4-year institutions and 596 Private 2-year institutions in the U.S. (National Center for Education Statistics, 2006). Of these, some are secular while others are involved in religious education. Some are non-denominational and some are affiliated with a certain sect or church, such as Roman Catholicism (with different institutions often sponsored by particular religious orders such as the Jesuits) or religion organizations such as the Lutheran and Mormon Church. Seminaries are private institutions for those preparing to become members of the clergy. Most private schools (like all public schools) are non-profit, although some are for-profit.

Most universities, public and private, have endowments. A January 2007 report by the National Association of College and University Business Officers (2007) revealed that the top 765 U.S. colleges and universities had a combined total of $340 billion in endowment assets as of 2006. The largest endowment is that of Harvard University, at $29 billion.

There has been rapid growth in recent years in for-profit schools; the University of Phoenix is the largest, with an enrollment over 400,000 nationwide. Other large institutions with numerous branch campuses and online programs include Devry and Kaplan University. All together, they enroll 9% of the students. They have aggressively recruited among military veterans, and in 2010 received 36% of all the tuition aid paid by the federal government. The University of Phoenix received 88% of its income from federal aid to students; the maximum allowed is 90%. In 2001 the University of Phoenix opened a 2-year online program oriented

toward lower-income students who receive federal financial aid; in 2010 it had over 200,000 students seeking 2-year degrees. Critics have pointed to the heavy dependence on federal loans and grants to students, the low student-completion rate, and the inability of the majority of graduates to pay their student loans because they failed to secure high-paying jobs. The University of Phoenix reported that in 2009, 23% of its students completed an associate degree within three years of enrolling, and for bachelor's degree students, its 6-year completion rate was 34% (National Center for Education Statistics, 2006).

The amount of debt accumulated by students for higher education has become an issue of concern, especially given the weak job market after 2008. Some loans are financed by the federal government, but students sometimes obtain private loans, which generally have higher interest rates and start accumulating interest immediately. In 2010, the U.S. Department of Education (USDOE) announced stricter eligibility rules for federal financing of loans to student at for-profit schools, which were experiencing higher default rates (Gorsky, 2010).

While no institution has escaped the impact of the recession, private colleges and universities have experienced the least impact for a variety of reasons. Unlike public institutions, private institutions are not funded by either the state or the federal government, although such institutions may compete for state and federal research grants. Tuition and fees from students make up the majority of income, along with interest income on endowments. While most endowments have seen devaluation during the recession, such investments are now rebounding as the stock market recovers.

The downsizing of public higher education as a result of shrinking state budgets has resulted in a somewhat unexpected windfall for private institutions. With higher tuition, fewer seats available, and fewer programs available for students at public institutions, students have had little alternative other than to seek acceptance at a private college or university. With tuition at an all-time high at public institutions, private institutions have become more cost competitive. Other factors also lead to a growing competitive edge of private higher education. Private institutions operating without collective bargaining agreements tend to have a more progressive, less traditional faculty, willing to implement online instructional delivery systems that have been resisted in the public sector. The growth of online instruction has also benefited private institutions in reducing the cost and maintenance of a large campus infrastructure.

In addition to embracing the use of technology, private institutions have proven more nimble in responding to both changing workforce needs and changing student-learning styles. Many private institutions have long ago abandoned the traditional 15- to 18-week quarter/ semester format of most public institutions in favor of an accelerated format of 4 to 8 weeks per course. Students also have a choice in delivery system at many private institutions for onsite, hybrid, or online classes. Compressed instructional components mean that students can reduce the overall cost of instruction and accelerate their time to achieve a degree.

According to the National Center for Education Statistics (NCES), the number of students enrolled in at least one distance education course increased significantly between 2002 and 2006, from 1.1 million to 12.2 million—and the growth spurt does not seem to be slowing. In fact, the research firm Ambient Institute expects this figure to skyrocket to 22 million within the next 5 years. By 2014, Ambient predicts that the number of students taking all their classes online will increase to 3.55 million, while the number of students taking all their courses in on-campus classrooms will drop to 5.14 million (U.S. Department of Education, 2008).

Research by The Sloan Consortium (2010) has found that online college enrollments have continued to grow faster than the total population of college students. This means that increasing

numbers of students are taking advantage of online learning options at their colleges and universities—particularly at 2-year public universities and other schools offering associate degree programs.

A survey of postsecondary institutions by the NCES (U.S. Department of Education, 2008) revealed that a variety of factors influenced schools' decisions to increase distance-education offerings in the 2006–2007 academic year:

- 92%—meeting student demand for more flexible schedules
- 89%—providing access to college
- 82%—seeking to increase enrollment
- 86%—making more courses available
- 62%—responding to needs of employers/business
- 55%—making more degree programs available
- 47%—meeting student demand for reduced seat time
- 34%—making more certificate programs available

Selected Global Comparisons

While the recession may have begun in the U.S., it has radiated through the economies of nearly every county around the globe. The impact of the recession in the U.S. highlights only one country in many that are struggling to address the needs of their citizens for access to higher education. In contrast, it may be instructive to compare the response of a few selected governments of other countries to the economic downturn relative to the higher education sector of their economies.

Europe has over 5,000 universities, all of which depend even more heavily on government funding than do American public colleges and universities.

In 2002, the European Commission at the Barcelona European Council called for European Union members to invest 3% of their GDP in research and 2% specifically in higher education. The current report of the European University Association (as reported by the Education Insider, May, 2010), echoes its 2009 Prague Declaration, in which the organization called on governments to renew their commitment to the "Barcelona target." The Prague Declaration reminds European nations that higher education is crucial to the process of economic recovery, and that "through research-based education at all levels we provide the high-level skills and innovative thinking our modern societies need and on which future economic, social and cultural development depends" (European Insider News, May, 2010).

In its latest financial monitoring report, the EUA (as reported by the Education Insider, May, 2010) found that national funding for higher education has been cut by at least 10 countries. Private funding is also down. Public funding cuts have resulted in faculty reductions in Belgium (Flanders), Estonia, Hungary, and the U.K., where reductions in teaching budgets have led to fewer educational programs, reductions in employees, and faculty salary cuts. Greece, Ireland, and Latvia have also been forced to slash university employee salaries, and Estonia and Latvia have both reported hiring freezes.

The most severe public funding cuts have been in Latvia, which slashed 48% of its higher education budget in early 2009. The country cut another 18% in 2010. The EUA blames these drastic reductions on pressure from the International Monetary Fund and the World Bank.

Although no other countries have cut funding on that scale, several have enacted heavy cuts of 5% to 10%. Italy has introduced a 10% reduction over the course of 3 years. Estonia cut 7% in 2009 and 10% in 2010, and Ireland cut 5.4% in 2009 and 9.4% in 2010. Romania's cuts have totaled 10% and Lithuania's are at 8%, and the U.K. plans to cut 6.6% between 2010 and 2013. A number of Eastern European countries are enacting smaller cuts of 5% or less, including Croatia, the Czech Republic, Macedonia, Poland, and Serbia (EUA, 2010).

Germany is certainly the exception, as it increased federal investment to the tune of 800 million Euros (EUR) in 2010. Germany also plans to invest another 2.7 billion EUR between 2012 and 2015 in a German Excellence Initiative and has committed to a 5%-per-year funding increase until 2015 for Innovation and Research (EUA, 2010).

France has also increased its higher education spending by almost 30 billion EUR in 2010 in such areas as research development, campus improvements, new campuses and "the overall quality of higher education" (Education Insider, May, 2010). And while Portugal had enacted funding cuts in previous years, its government has committed to a new investment of 100 million EUR in higher education to make up for previous shortfalls (EUA, 2010).

As universities have looked for other sources of funding to counterbalance funding cuts, many have proposed the imposition of tuition, where most EU universities have historically been tuition-free. In one of the only EU countries that already imposed tuition, a proposed increase recently led to student riots.

Another indirect effect on private funding comes from foundations, which represent a potential source of income for many universities. As the crisis has reduced most foundations' budgets, their contributions to higher education may be reduced significantly for years to come.

Loser Institution Profile

As a result of the recession, institutions that rely almost exclusively on state or federal funding will lose much of their pre-recession ability to meet their mission and student demand for access. The following are other factors indicating areas of loss:

- Reliance on public funding often coupled with increasing tuition and fees
- Rising tuition beyond student ability pay, opening the way for greater competition
- Maintenance of traditional instructional calendars and instructional delivery systems
- Traditional faculty's resistance to use of technology delivery systems
- Faculty and staff unions' resistance to greater efficiencies
- Slowness in adopting and adapting to changing student learning needs and styles
- Reliance on costly infrastructure for programs and services
- Inability to respond rapidly to changing economic and workforce needs
- Slowness in adopting and adapting to more efficient business models of management
- Reliance on a "traditional" student population of high school graduates

Winner Institution Profile

The recession, while devastating to all sectors of the economy, including higher education in general, has created unexpected opportunities for some in this sector. The following are indi-

cators of what institutions are doing that promise to make them winners even in an economic downturn:

- Minimum reliance on public funding subject to government cuts to balance budgets
- Maintenance of tuition and fees at competitive levels to provide access
- Not being bound by union contracts and faculty resistant to change
- Use of technology delivery systems to lower cost and shorten time to degree
- Providing of options for onsite, hybrid and online classes where economically feasible
- Adjustment in curriculum to meet changing workforce needs and demographic conditions
- Adoption of proven business practices at management levels
- Expansion of clientele to adult learners and other new degree-seeking populations

Long-Term Higher Education Forecast

Moody's "Special Comment" report on the global recession and public/private universities indicates that "universities are proving to be appealing investments for government stimulus efforts due to the sector's stabilizing, countercyclical nature in the short term as well as its potential to stimulate long term economic growth." (Moody's, June 2009, p.2)

The report further outlines five key ideas:

1. While universities will experience some stress, they will be more sheltered than other sectors from the global recession.
2. Public university "credit quality" will be steadier than that of private sector universities because government funding in most countries provides a relatively more stable source of revenue.
3. Private universities can achieve a high rating if they are able to show evidence of sustained demand, financial strength, and clear liquidity.
4. Universities are likely to seek more alternative sources of funding to offset the pressure on government balance sheets and limitations on public funding growth. Endowment fund building through philanthropy, enrollment of international students, and borrowing will rise in some countries.
5. Despite funding-diversification efforts, public-sector funding will continue to play a central role, given its strategic importance to a nation's long-term economic growth and wealth levels.

References

California Community Colleges Chancellors' Office. (2011*). Just the facts.* Retrieved from http://www.cccco.edu/Portals/4/News/press_releases/2010/MEDIASTATEMENTChancellorScottonGovJerryBrownStateBudgetProposal%20FINALWITHFACTSHEET_1-10-11.pdf

Center for Social Philanthropy, Educational Endowments and the Financial Crisis: Social Costs and Systematic Risks in the Shadow Banking System (2010, p5).

Clark, K. (2010, September 10). The Great Recession's toll on higher education. *U.S. News and World Report.* Retrieved from http://www.usnews.com/education/best-colleges/articles/2010/09/10/the-great-recessions-toll-on-higher-education

Eckel, P. D., & King, J. E. (n.d.). An overview of higher education in the United States: Diversity, access, and the role of the marketplace. In J. J. F. Forest & P. G. Altbach (Eds.) (2006), *The international handbook of higher education* (2 vols.), Netherlands: Springer. Online chapter update distributed by American Council on Education, Washington, DC. Retrieved from http://www.acenet.edu/bookstore/pdf/2004_higher_ed_overview .pdf

Education Insider, A Global Crisis: New Report Looks at the Effects of the Economic Recession on European Universities (May, 2009).

Associated Press, (August 4, 2009). Moody's 'Special Comment' report on the global recession and public/private universities. Retrieved from http://globalhighered.wordpress.com/2009/07/07/moodys-special-comment-report-on-the-global-recession/

Eklavya (2009, March 10). *Reasons for global recession: In plain simple English.* Retrieved from http://www .theindianblogger.com/problems/reasons-for-global-recession-part-two

European University Association. (2010, May 26). A global crisis: New report looks at the effects of the economic recession on European universities. See *Education Insider.* Retrieved from http://education-portal.com/articles /A_Global_Crisis_New_Report_Looks_at_the_Effects_of_the_Economic_Recession_on_European_Universities .html

Gorsky, E. (2010, July 23). Education Department proposes to end federal funding to for-profit colleges whose students can't get jobs or repay their loans. *Huffington Post.* Retrieved from http://www.huffingtonpost.com /2010/07/23/federal-colleges-funding-jobs-loans_n_657821.html

Johnson, N. (2010). The latest on state cuts in education and services. *Huffington Post.* Retrieved from http://www .huffingtonpost.com/nicholas-johnson/the-latest-on-state-cuts_b_591972.htm

Moody's International Public Finance: Higher Education. (June, 2009, p.2). *Global recession and universities: Funding strains to keep up with rising demand.* Retrieved from http://globalhighered.files.wordpress.com /2009/07/s-globrecess-univ-6-09.pdf

National Association of College and University Business Officers. (2007). *NACUBO—Commonfund study of endowments.* Retrieved from http://www.nacubo.org/Research/NACUBO_Endowment_Study.html

National Center for Education Statistics. (2006). Number of U.S. colleges and universities and degrees awarded, 2005. *Digest of Education Statistics.* Retrieved from http://www.infoplease.com/ipa/A0908742.html

National Association of State Budget Officers (2010, Fall). *The Fiscal Survey of States.* Retrieved from http://nasbo .org

NPR. (2010). *Interactive map: The economy where you live.* Retrieved from http://www.npr.org/templates/story /story.php?storyId=111494514

O'Shaughnessy, L. (2009). *Graduating from college in three years.* Retrieved from http://moneywatch .bnet.com/saving-money/blog/college-solution/graduating-from-college-in-three-years/482

Pawlowski, A. (2009, March 18). Riding out the recession in a virtual classroom. *CNN Tech.* Retrieved from http://articles.cnn.com/2009-03-18/tech/economy.online.degrees_1_excelsior-college-online-career-coach_s =PM:TECH

Rampbell, C. (2010, April 28). College enrollment rate at record high. *New York Times.* Retrieved from http://economix.blogs.nytimes.com/2010/04/28/college-enrollment-rate-at-record-high

Ray (blogger). (2011, March 4 & June 24). *Recession realities in higher education.* Retrieved from http://recessionreality.blogspot.com

The Sloan Consortium. (2010). *Class differences: Online education in the United States, 2010.* Retrieved from http://sloanconsortium.org/publications/survey/class_differences

U.S. Department of Education (2008). *Number and percentage of schools with students enrolled in distance education courses.* Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008008

Webometrics. (2011, July). *Ranking web of world universities.* Retrieved from http://www.webometrics.info /top12000.asp?offset=0

Weir, B. (2008, December 8). Soaring tuition pushes college out of reach. *ABC World News.* Retrieved from http://abcnews.go.com/US/story?id=6385265&page=1

About the Author

Kenneth D. Fawson
Ed.D, Associate Professor, Interim Dean
School of Education
National University
La Jolla, CA
kfawson@nu.edu
Major research interests: international education and educational technology

A Case Study Regarding the Purpose and Process of Public Schooling and Possible Indoctrination of Education Students

R. D. Nordgren

Abstract
Worried about indoctrination of his students, an education professor devised an activity asking groups of students to determine what P-12 graduates should know, do, and "be like," and how a school and schooling process could be designed to effectively support these outcomes. The author's hypothesis was that left-leaning education courses would influence students' beliefs about both the purpose of schooling and how this process should be enacted. The analysis of data collected in seven graduate and undergraduate education courses suggests that education courses have little influence on these beliefs.

Key Words
Compulsory education, education philosophy, curriculum, instruction, school reform, education ideology

Introduction

Eight years ago, as a second-year assistant professor[1] at a mid-sized Midwestern public university, the present author had a heated discussion with colleagues about his fear that the students in their school of education were being indoctrinated rather than educated. Although the author and his colleagues were of the same progressive, "constructivist" philosophy, he argued that based on the readings that he and his fellow education professors mandated in their syllabi, the students were getting a biased view of education. He further argued that many students, both undergraduate and graduate, were simply "studenting," or telling their instructors what they thought they wanted to hear in order to get a high grade. To alleviate this fear, the author decided to add a "fair and balanced approach" to his courses. That is, he required as many conservative education sources as progressive ones, searching the literature from the Heritage Foundation, the American Enterprise Institute, and other conservative organizations.

The search of these conservative organization's websites was done in an attempt to provide a counter to the left-leaning readings of Michael Apple, Paulo Freire, Jonathan Kozol, and Henry Girioux, to name a few. The topics on these sites and in their publications regarded market approaches to schooling; essentially, school choice and the privatization of most any aspect of schooling. The author found that the addition of these points of view caused the class discussions to become livelier, with students often deeply criticizing the conservative pieces. The author was forced to play "devil's advocate," defending the right-leaning views so as to add balance to the discussion. After one of these first classes, a student came to him and with a deeply concerned look on his face whispered, "You really don't believe all that stuff, do you?" At the very next class meeting, the author made public his learner-centered educational philosophy, but explained that what he believed should not sway their views—nor should any professor's personal beliefs, for that matter. He further explained that his goal was for them to know and understand various viewpoints, and assured them that their grade did not depend on their views, only their articulation of them as was relevant to the assignment. In fact, the author warned that if he felt they were pandering to his beliefs in discussions, he would turn into the staunchest conservative possible; and if he found evidence of this in their writing, they would have to rewrite the piece or

[1]During the collection of these data, the author progressed to an associate professor, and then on to full professor.

receive a low grade. In essence, they must think for themselves—a crucial element of becoming educated.

These class discussions and the assistant professor's role playing as an arch conservative led to the conclusion that many of his students were either fed a progressive ideology and may have simply been regurgitating these views in their assignments and class discussions. Or they really did not have a clear view or set of beliefs about curriculum, instruction, leadership, or the schooling process. The author feared that if he allowed them to do continue with this charade (or ignorance), there would be little chance they would develop into the critical, reflective practitioners he wanted them to be. This lack of personal insight and ability to discern fact from ideology would increase the chances that they would be passive, compliant, and ineffective members of their school's and/or district's learning communities—they would simply go through the motions of teaching or leading a school without truly thinking about why they did the jobs they do, and what the purpose was of requiring all young people from ages 6 through 16 (or 18, depending on the state) to engage in some sort of formal schooling.

Breaking the Indoctrination: An Examination of Why We Mandate Education

In an effort to combat this danger of passivity, the *Why Schooling?* activity was developed and was used the first day of class in the following graduate courses: Curriculum and Instruction Theory; School Personnel and Professional Development Assessment; Educational Leadership Theory; General Teaching Methods in Secondary Schools; and Curriculum, Alignment, and Assessment. The activity was based on an exercise that took place in the early 1990s in which the assistant professor, then a middle school teacher, was asked to participate in his school district's response to then-developing *Goals 2000*.[2] He was sequestered for nine hours per day for several weeks one summer with about 10 other middle and high school English teachers to determine what their district of 50,000 students should "know, do, and be like" upon graduation, in preparation for the dawn of the new millennium. Teachers in other content areas were asked to do the same, as were some of the district's elementary-level educators. The final document was to guide the district for the next decade or so.

The *Why Schooling?* activity consisted of questions posed to the education students, whose ages ranged from 18 to over 60 years, with the intention of enticing them to (a) re-examine why they decided to become educators or school leaders, (b) work collaboratively to answer these questions, and (c) use the students' answers to reinforce points made in class later in the course. Six of the seven classes were at a mid-sized public university in the Midwest, and the seventh was held at a private, non-profit, mid-sized university on the West Coast. Most students were in the curriculum and instruction program, but there were also some in counseling education, adult learning and development, special education, and early childhood education. All but four of the students from these three classes had previous classroom teaching experience. The total number of students contributing to the data was 106.

The *Why Schooling?* activity involved five sets of questions that groups of three to six students would receive, one at a time:

[2] *Goals 2000, Educating America Act* required states to develop standards that would improve quality of education.

1. What is the best reason for having compulsory education?
2. What are the top five things that should be learned in school?
3. What five things should students be able to do?
4. What do we want our high school graduates to be like?
5. How would you envision a schooling process that would be able to do the above? How does this differ from the school at which you work and/or attended as a youth?

Using the tenets of cooperative learning, each person took on a role (facilitator, recorder, timer, reporter, materials handler, and liaison). Small groups had to double up on roles. Usually groups would work in the hallway or in vacant rooms nearby; the author suggested this so one group would not influence another. They recorded their answers onto chart paper, which was displayed and used as part of the reporting process. During the activity, liaisons came back to the room every five minutes to receive the next card and question(s). When all questions were answered by each group, the reporters shared their results from the chart paper, discussing any differences or similarities with other groups' answers. Although they were allowed only 2 minutes to report, the audience was encouraged to pose questions and the presenting group was required to answer. After the presentations, the assistant professor used a marker to highlight similarities among the groups' answers as well as striking contrasts. After the class session, the author folded all papers and went back to his office to type the data. (Enjoying creativity, he first encouraged recorders to use pictures and symbols, but soon found this nearly impossible to accurately record, causing him to go back to the groups for interpretation.)

Beginning with the second course in which this activity was implemented, the author shared with each group the results from their class activity and the results from another class that had undergone this task. This was done for two reasons: (a) to verify their group's answers, and (b) to compare and contrast their answers with those of other classes—an attempt at peer analysis. The groups were again asked to report their findings in the compare-and-contrast segment; if the answers were recorded incorrectly, the recorder from each group was to submit a corrected version of their answers at the end of the class.

For each of the seven classes in which this activity was conducted, the consensus was that the differences among the groups within each class and the differences across each class were few. A consensus existed among the classes for why our society compels students to go to school and why parents and guardians are forced by law to send them. Table 1 lists the raw data collected from seven classes.

The category "administration" refers to classes where students were at the time either teaching or had taught in the recent past--a few had left the classroom and were working as school counselors, and two were charter school principals). They were studying to be school leaders in a program that would make them eligible for a license or credential as a school principal. "Curriculum" consisted of students who were seeking a variety of graduate degrees from the school of education; most of whom were teachers. The final category was for courses where undergraduate and graduate students were in programs that would allow them to apply for various categories of teacher licensure or credentialing.

Table 1. *Example of Raw Data for Question 1: What is the best reason for having compulsory education?*

Administration (teaching or have taught)	**Curriculum** (teaching)	**Pre-Service Teaching**
Course 1: All can obtain basic job skills [economics], sociological functioning [social], global competitiveness [economics], privilege vs. entitlement [?], ethics and morality [social] **Course 2**: Function in society, values, basic skills, literacy in 3 R's, Establishes norms, keeps out of workforce	**Course 3:** Contribute as members of society, exposed to their personal strengths/weaknesses, equal opportunity for free education, develop literacy… basic level of education to function in society, compete on a global scale… consistency for all children: equality, foundational building blocks, create productive citizens, ensure life and work skills… basic skills, understand subjects according to level of development, job training for changing economy. **Course 4:** Benefit all, better quality of life, socialization, be literate, possess skills to perform everyday jobs/trades… future success for students, keep children out of trouble, socialization, structure/rules, education leads to better job… learn tolerance for others, identify and meet special needs, learn acceptable behavior, learn general subjects, socialize, introduce children to technology, teach structure… education = wisdom, democracy = educated voters, build on societal standards, specialized skills for economy… guide ethical development of children, make a better society. **Course 5:** Equality of opportunity, keeps kids off streets, productive population, minimum level of knowledge guaranteed, empower individuals, socialization… organized & structured continuum, prepares children for future, provides communities with citizens that have baseline skills & knowledge… educate the entire population, promote equality, economic stability	**Course 6:** Ensure an adequate educator for children which produces valuable citizens… productive citizens who will vote, pass on knowledge, serve country, be critical thinkers… socialization, finding out what you're interested in, preparing for life… provide people with a basic skills set, condition them for workforce, teach responsibility and teamwork, expose to different subjects and cultures… to have a literate society with informed citizens who can democratically elect effective officials, so people can function in a capitalistic economy and society… so that people can put together the pieces of life's puzzle. **Course 7:** Keep our society globally competitive, allow children to socially develop equality in education, create a more skilled and efficient work force, maintain structure in society, gain basic understanding of the world… maintain a common base of understanding, consistency, learn to embrace diversity, parents can go to work, foster democracy, cut out competition with child labor, foster patriotism, tradition—it's just what we do, effectively foster stages of child & adolescent development

Key: Course 1: School Leadership (graduate)—5 students, 1 group
Course 2: Supervision of Instruction (graduate)—6 students, 1 group
Course 3: Curriculum and Instruction (graduate)—20 students, 4 groups
Course 4: Curriculum and Instruction (graduate)—24 students, 5 groups
Course 5: Curriculum and Instruction (graduate)—15 students, 3 groups
Course 6: Teaching Methods (graduate)—25 students, 6 groups
Course 7: Schools and Society (undergraduate)—11 students, 2 groups

Note: Ellipses between data within a course indicate break in groups' answers.

Findings

Schiro's Categories

As Table 1 indicates, the answers had great range, from traditional "back to basics" responses to highly progressive philosophies, even touching upon critical theory. In the analysis of the data, a categorization of educational philosophies developed by Schiro (2008) was utilized; Schiro's and similar categorizations were discussed in each of the classes involved in the *Why Schooling?* activity.

Schiro's first of four categories is "scholar academic" and is the most traditional view of education in that it views schooling as transmitting knowledge to the learner in hopes of making that learner an expert in that field. Scholar academics would believe that the purpose of schooling is to make a content expert out of each student. Holders of the "social efficiency" view would have students learning to become productive members of society and the economy, so that their beliefs about the purpose of education would be utilitarian. Those who favor "child centered" education, according to Schiro, focus on learning for the personal growth of the student, which is, therefore, the reason we send our children to school. Finally, "social reconstruction" advocates want students to learn in order to make changes in society, akin to critical theory. In their minds, nothing is more central to mandating education than to create "societal change agents" to ensure social justice. These philosophies, as could be expected, hold much impact on one's perception of the purpose of education (Schiro, 2008). (See also Appendices A and B for Schiro's four educational philosophies as they relate to perceptions about children and teachers, respectively.)

Themes

An analysis of the data sought themes that could give insight into the students' beliefs. A count of relevant words was a first step in this analysis, the results of which are depicted in Table 2.
The frequency of "skills" and "jobs" would indicate that many of these students were of the utilitarian or Social Efficiency mindset. The "social," "society," "citizen," "rules," "responsibility," and "college" would also support a belief in Social Efficiency philosophy's purpose of schooling. Some of these categories, it could be argued, would also align with the Child Centered views; in order to resolve this conundrum, the context in which the term was used was examined. For instance, "knowledge" could refer to basic knowledge or knowledge regarding how to become a better citizen or to foster the development of a more just society. This became problematic when the terms "think," "thinking," and "thinkers" were examined. In all of the 12 instances of their use, it could be argued that the students were referring to Child Centered, Scholar Academic, and Social Efficiency—and perhaps they were. The third column in Table 2 shows the probable philosophy and the number of times that term was used in reference to that philosophy's underpinnings.

Table 2. *Count of Relevant Words*

Word Category (Number of occurrences for selected words)	**Number of Occurrences for Word Category**	**Probable Philosophy Based on Context Within Data** (Number of times word was found within this context)
Skill or skills	40	Social Efficiency
Job, jobs (11), money (5), workforce (5), economy or economics (10), career (1)	32	Social Efficiency
Social, socialization, socialize, or socially	24	Social Efficiency
Society	20	Child Centered
Basic or basics	17	Social Efficiency
Citizen or citizenship	16	Social Efficiency
Thinker or thinking	12	Child Centered, Social Efficiency, Scholar Academic
Technology	12	Child Centered (3), Social Efficiency (9)
Knowledge or knowledgeable	10	Child Centered (2), Social Efficiency (5), Scholar Academic (3)
Culture or cultures, diverse or diversity:	10	Social Reconstruction
Democracy or democratic	9	Social Reconstruction (8), Child Centered (1)
Rules or behavior	8	Social Efficiency
Personal or individual	6	Child Centered
Equal or equality	5	Social Reconstruction
Responsibility	4	Social Efficiency
College	2	Social Efficiency

Discussion

From the analysis of the data, it can be surmised that the students in these courses believed the utilitarianism of Social Efficiency is the main determinant of why our society mandates formal schooling. According to Schiro (2008), the goal of Social Efficiency is to optimize the social utility of each member of society and, because public schools educate 90% of all children in the

U.S. (National Center for Education Statistics, 2008), they become the logical vehicle to do so. It appears from these data that Scholar Academic is not relevant in the students' perceptions for why the U.S. has compulsory schooling; P-12 educators are not to develop "little professors." Child Centered and Social Reconstruction philosophies do come into their considerations, but not nearly to the degree of Social Efficiency.

Implications for Teaching and Learning

The author's concern, that students were being indoctrinated with an ideological slant that would favor both Child Centered and Social Reconstruction philosophies, may have been unfounded. The predominant perception of why the U.S. mandates formal education for children between the ages of 6 to 16 (or 18) is for utilitarian purposes: a more efficient economy and social control. This perception can impact what curriculum is favored and how teachers instruct . For instance, Social Efficiency curriculum would focus on job skills, as the data from this study indicate. At risk is the loss of individual growth that accompanies a Child Centered curriculum and instructional approach. Lost, also, is a focus on the educated individual that is at the core of the Scholar Academic philosophy, which goes beyond Adler's Great Books and Hirsch's Core Knowledge beliefs that advocate for readings of the "classics" and, for Hirsch, a lock-step curriculum where all children learn the same content at the same time. The Scholar Academic supports each student to become an expert in a field (Schiro, 2008), not a "walking encyclopedia." It could be argued that having experts in the field would contribute to social efficiency, but the difference is that Social Efficiency's concern is with often low-level learning, narrowly focused on specific job skills. Seeking social justice by fostering every learner to be a public activist, as is the point of Social Reconstructivism, would be superseded by the belief that focusing on job skills will somehow further society's interests.

With a foundation of curriculum and instruction based on Social Efficiency, an overemphasis on easily assessable learning can occur (see Zhou, 2009). If schools exist to meet the needs of the economy, then they must be held accountable to the powers of the economy (business and, to a lesser degree, government in support of business interests). Child Centered curriculum is difficult to measure, as the growth of the individual's "soft skills" (Murnane & Levy, 1996; Partnership for 21st Century Skills, n.d.; and Sedlacek, 2004) is favored over knowledge (and sometimes skills) measured by standardized tests preferred by the "educate for jobs" advocates (Zhou, 2009). A narrow focus on what students should know, do, and be like may lead to a "dumbing down" of schooling (Gatto, 2005), which in turn may lead to an uneducated citizenry that cannot make informed decisions about their individual lives and the society as a whole (Goodlad, Mantle-Bromley, & Goodlad, 2004).

Further Research

The most glaring limitations to this research are the small and narrow population of participants, the lack of follow-up interviews to make sense of the data, the possibility of "group think," and "design after the fact." Class discussions allowed students to explain why certain elements were chosen, but these discussions were not recorded. Follow-up interviews with the groups and random individuals would lend greatly to the understanding of the data. The fact that the answers to these six questions were made in group settings, groups that were self-selected, creates an

extraneous variable: the possibility of "group think." Of course, the design of this research was not created beforehand; the research itself emanated from extant data only.

Conclusion

The author was concerned that he and his colleagues were indoctrinating their students with progressive ideology that embraces both the Child Centered and Social Reconstruction philosophies described by Schiro (2008). The data derived from the Why Schooling? activity, implemented in seven classes consisting of education majors at the graduate and undergraduate levels, would indicate that this was an unwarranted concern. The predominant philosophy was Social Efficiency, which reflects the prevalent U.S. education policy, focused on job skills and accountability. Perhaps the influence of predominant policy overrides the influence of educators in higher education institutions and can, as Social Reconstructivists lament, support social reproduction—the reproducing of past and present race and class injustices (Bourdieu, 1977; Giroux, 2003; McLaren, 2005).

References

Bourdieu, P. (1977). *Outline of a theory of practice.* Cambridge and New York: Cambridge University Press.

Gatto, J. T. (2005). *Dumbing us down: The hidden curriculum of compulsory schooling.* Gabriola Island, BC: New Society Publishers.

Giroux, H. A. (2003). *The abandoned generation: Democracy beyond the culture of fear.* New York: Palgrave Macmillan.

Goodlad, J. I., Mantle-Bromley, C., & Goodlad, S. J. (2004). *Education for everyone: An agenda for education in democracy.* San Francisco: John Wiley and Sons.

McLaren, P. (2005). *Capitalists and conquerors.* Boulder, CO: Rowman and Littlefield.

Murnane, R. J., & Levy, F. (1996). *Teaching the new basic skills: Principles of educating children to thrive in a changing economy.* New York: Free Press.

National Center for Education Statistics (2008). Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=6

Partnership for 21st Century Skills (n.d.). Retrieved from http://p21.org/

Schiro, M. S. (2008). Curriculum theory: Conflicting visions, enduring concerns. Thousand Oaks, CA: Sage.

Sedlacek, W. E. (2004). *Beyond the big test: Noncognitive assessment in higher education.* San Francisco: John Wiley and Sons.

Zhou, Y. (2009). *Catching up or leading the way: American education in the age of globalization.* Alexandria, VA: ASCD.

Appendix A
Schiro's Four Educational Philosophies:
Perceptions About Children

Children	Scholar Academic	Social Efficiency	Child Centered	Social Reconstruction
Are children treated as active or passive agents in their world?	Passive	Active	Active	Active
Are children viewed as having or missing something of worth?	Missing	Missing	Having	Having
Are educators' concerns with processes internal or external to children?	Internal	External	Internal	External
Are educators' concerns focused primarily on children's minds or behavior?	Minds	Behavior	Minds	Behavior
Are children viewed as integrated organisms or as atomizable organisms?	Atomizable	Atomizable	Integrated	Integrated
Do educators focus their efforts on children themselves or on the acts or attributes of children?	Attributes	Attributes	Children	Attributes
Is the concern with children as they are or as they ought to be?	As they ought to be	As they ought to be	As they are	As they ought to be
Are children thought to exist for themselves or to further ends external to themselves?	External	External	Themselves	External
Are children viewed as unique individuals or in relation as to standardized norms?	Norms	Norms	Individual	Norms
Are children viewed in a social context (and if so of what type) or outside of a social context?	In context (of the discipline)	In context (of the present society)	Outside of a social context	In context (of the future society)

Appendix B
Schiro's Four Educational Philosophies: Perceptions About Teachers

Teaching	Scholar Academic	Social Efficiency	Child Centered	Social Reconstruction
What are teachers' roles during instruction?	Transmitters	Managers	Facilitators	Colleagues
Are teachers transmitters of knowledge or preparers and supervisors of classrooms?	Transmitters	Preparers/ supervisors	Preparers/ supervisors	Preparers/ supervisors
What standards are used to measure teacher effectiveness?	Accuracy presenting discipline	Efficiency of student learning	Facilitating child growth	Effectiveness of fostering a didactic vision
Are teachers to stimulate student diversity or uniformity?	Uniformity	Uniformity	Diversity	Uniformity
Are teachers to directly implement curricula unchanged, or creatively adapt curricula to their situations?	Directly implement	Directly implement	Adapt (based on children's needs)	Adapt (based on social concerns)
Do teachers or developers plan for children's individual differences?	Neither	Teacher	Both	Teacher
What types of media are usually employed during teaching?	Didactic discourse	Programmed instruction	Child-environment interaction	Group dynamics
What is the intent of teaching?	Advance students in discipline	Prepare children to perform skills	Stimulate child growth	Acculturate into educators' vision
Are teachers to be concerned with the whole child?	No (cognitive)	No (skills)	Yes	Yes
Are teachers' attitudes, beliefs and visions considered important?	No	No	Yes	Yes
Are teachers expected to do classroom research?	No	No	Yes	Yes

About the Author

R. D. Nordgren
Ph.D., Professor
School of Education
National University
La Jolla, CA
rnordgren@nu.edu
Major research interests: 21st century skills, high-school-to-college transitions, school reform

Web-Based Learning

Improving Laboratory Effectiveness in Online and Onsite Engineering Courses at National University

Jodi Reeves, Mohammad Amin, Marcos Turqueti, and
Pradip Peter Dey

Abstract
Engineering educators face unique challenges when teaching online classes, especially when the course incorporates experimental activities. In this study, the effects have been investigated of using new laboratory activities in both onsite and online engineering classes. First class incorporated ELVIS (Educational Laboratory Virtual Instrumentation Suite) equipment to introduce online students to electrical circuit laboratory activities. Second class incorporated Emona DATEx (Digital Analog Telecommunications Experimenter) in new laboratory activities in onsite classes that previously did not use any labs. Qualitative and quantitative assessment data show that students like this system and rated it very highly as a new educational tool.

Key Words
Distance learning, instrumentation, laboratory, assessment, engineering

Introduction

Distance learning has become an important fabric of modern education since its introduction at the University of London in 1858. Back then, the delivery method of course materials and exams was regular mail correspondence (Power & Gould-Morven, 2011). This option of education grew in the last few decades with the additions of videocassette and television (Means, Toyama, Murphy, Bakia, & Jones, 2009).

With the help of Internet and other technologies, distance education has become a viable and valuable option for individuals who are unable to enroll either full time or part time in traditional learning institutions. Tyson Greer, Chief Executive Officer at Ambient Insight Research, recently stated that the worldwide market for self-paced elearning products and services reached $32.1 billion in 2010 and it is expected to grow to $49.9 billion by 2015. The U.S. market for self-paced elearning products and services reached $18.2 billion in 2010, and this will reach $24.2 billion by 2015 (Greer, 2011). It is predicted that if this trend continues, there will be more full-time online students than onsite students by 2018 (Neal, 2009; Coleman, 2005; Green, Jaschik, & Leddermann, 2011; Hung, Chou, Chen, & Own, 2010; Park & Choi, 2009; Roper, 2007). According to the Distance Education and Training Council, approximately 4 million students are completing online coursework at U.S. colleges and universities. In a recent research report, it has been mentioned that enrollment in online classes has been increasing by 30% annually, and now over 75% of U.S. colleges and universities are offering some sort of online classes and programs (Neal, 2009; Nagel, 2011). Another report mentions that about 25 million post-secondary students in the United States will be taking online classes in 2015. This rapid growth in numbers of online students will have a significant impact on onsite classes. In 2010, there were 14.4 million students taking onsite classes, and it is expected that this will go down to 4.1 million by 2015 because of rapid growth of online enrollments (Nagel, 2011).

Over the past 40 years, National University has established an excellent record, especially with adult learners, for its educational values and onsite traditional teaching. Currently, National University uses four different delivery modes of education, where courses are taught in a unique one-course-per-month format (*National University General Catalog,* 2012):

1. *Onsite classes:* These are the traditional face-to-face classes with instructors and students in one classroom at the same time.
2. *Online classes:* These are asynchronous classes where students can access course content at any time and from any place.
3. *Web-based classes:* These are synchronous classes where some students are in the onsite classroom and some are connected to the classroom at the same time via Internet. Classes at National University meet monthly, twice a week, from 5:30 p.m. to 10:00 p.m.
4. *Hybrid classes:* In these classes students receive 50% of their instruction from the onsite classroom and 50% from the online class website.

The university's goal is to provide the same standard and quality of education to all students, no matter which mode students choose for completing their courses. The university strives to provide its graduates with a high standard of education and training in cutting-edge technology. In 2002, National University founded the School of Engineering and Technology, and it started offering both graduate (Master's level) and undergraduate (Bachelor's level and certificates) onsite programs. Recently, the name of this school has been changed to the School of Engineering, Technology, and Media, and the school has added new programs, many of which are being offered in non-traditional modes. The faculty in the School of Engineering, Technology, and Media are continually exploring new types of instructional tools to provide high standards of education both in the classroom and in online classes.

This paper describes the exploration of new laboratory experiments in both onsite and online engineering courses. Assessment data were analyzed for teaching effectiveness and student learning. Plans for integration of more laboratory experiments in graduate and undergraduate engineering classes will also be discussed.

Experimental Procedure & Methodology

EGR 230 Course

EGR 230, Electric Circuits and Systems, is a required course for all undergraduate engineering students at National University. In 2008, this course was first taught to online students in an asynchronous manner. In the online, asynchronous mode, it can be quite difficult for instructors to analyze circuits step by step and to explain some important concepts for complete understanding. Stereotypically, engineers learn by doing, and that is difficult to incorporate into online classes. When the class is taught onsite, instructors can do simulations, conduct hands-on experiments, engage in face-to-face discussions, and perform demonstrations to make this course easier to conceptualize and understand. When the class is taught online in the asynchronous mode, it is more difficult to include hands-on materials to improve student learning.

In EGR 230, as well as in all other online courses at National University, online class material is delivered through the eCollege system using Microsoft PowerPoint slides, reading materials (in Microsoft Word and Adobe PDF), audio/video files, and other materials linked into the course website which students could access at the time and place of their choosing. During the class, online students use email, weekly synchronized chats, asynchronous threaded discussions, group meetings, and phone calls for interaction and engagement with the professor and other students in the class. All quizzes, exams, assignments, and projects are conducted and collected through the course website using eCollege.

One of the authors of this article has been teaching EGR 230 online using cutting-edge technologies and keeping track of all assessment records for improvements. In 2008, it was difficult to include many hands-on materials in EGR 230. In 2009 and 2010, the instructor attempted to improve online course learning using new technology available at that time. An HP Tablet with built in webcam, DyKnow software (for freehand writing on the tablet), and ClassLivePro (integrated audio and chat functions between students and teachers) were used in the online classes. During these periods the instructor gave actual lectures (twice weekly), drew circuits, analyzed circuits step by step, and explained all difficult topics in a logical way that students could understand better. In 2011, in addition to all these technologies, instructors used new laboratory demonstrations and circuit simulations by using the cutting-edge laboratory equipment described in the next section. All these activities were recorded and stored in the eCollege system, from which location students could then download anytime from anywhere for repeated use. The impact of this new technology was found to be positive, and more technology integration is planned in this class and other applied engineering classes.

The next section describes how instructors used state-of-the-art technology from National Instruments (NI) in EGR 230 to improve student learning and satisfaction.

NI ELVIS Equipment

ELVIS stands for Educational Laboratory Virtual Instrumentation Suite, and the equipment is shown on the left side of Figure 1. According to the NI website (www.ni.com), "ELVIS has 12 of the most commonly used laboratory instruments including an oscilloscope (scope), digital multimeter (DMM), function generator, variable power supply, dynamic signal analyzer (DSA), bode analyzer, 2- and 3-wire current-voltage analyzer, arbitrary waveform generator, digital reader/writer, and impedance analyzer in a single platform." The virtual instrumentation panel is shown in Figure 2, with dashed circles showing the instruments used in EGR 230 experiments: DMM, function generator, and oscilloscope.

Figure 1. ELVIS for EGR 213 online class (left) and DATEx for WCM 600 onsite class (right).

Figure 2. ELVIS virtual instrumentation panel.

NI ELVIS Experiments

Two new laboratory demonstrations were developed to illustrate two Course Learning Objectives (CLOs) related to series and parallel circuits in EGR 230. First, circuits were built on the ELVIS breadboard that were similar to the circuits given as homework assignments and discussed in the course textbook. Then a webcam was mounted over the ELVIS board so that students could watch the instructor conduct laboratory demonstrations during the scheduled synchronous session with the online students. The webcam and the ELVIS unit were connected via USB to a computer. Usually during synchronous sessions between the online students and the professor, another program, ClassLivePro, was used to share PowerPoint slides and provide mechanisms for student feedback—either using audio connection between instructor and students through ClassLivePro or using text-based chat windows incorporated into ClassLivePro. In this case, ClassLivePro was used to integrate the lab equipment demonstrations (broadcast via webcam) with the theory presented in the PowerPoint lectures, with Socratic questioning of the students to get them involved in the laboratory experiments.

In the first laboratory demonstration, voltage drops across resistors were compared in different configurations: series, parallel, and combination. The second laboratory demonstration began by exploring how a resistor works in an AC circuit compared to the behavior of a resistor in the previous DC circuit labs. To do this, the ELVIS virtual instrumentation was used to explain how the AC source, the function generator shown on the left in Figure 3, worked. Then another ELVIS virtual instrument, the oscilloscope shown on the right in Figure 3, was used to measure the output of various configurations: (a) AC source alone at fixed frequency; (b) resistor added in series at same fixed frequency; and (c) AC source and resistor together with varied frequencies. Before the instructor used ELVIS to show the output of the various configurations, students would be asked to predict the behavior based on what they learned from the textbook reading, lectures from the professor, and homework problems. This kept the students engaged in the laboratory demonstration rather than watching it passively. It also allowed the instructor to gauge the level of student knowledge; if all students predicted the output correctly, the instructor could quickly move on to the next concept. If many students made the wrong prediction, the instructor could explain the theory in more detail and do additional labs to make sure the students understood the concept before moving on.

WCM 600 Course

This is the beginning course for Master's-level students in WCM–Wireless Communications. Traditionally it has been taught as a theory-only class focused on signal processing. In September 2011, the instructor decided to add two laboratory demonstrations using DATEx equipment to show signal processing theory in action. If the DATEX laboratory demonstrations were successful in enhancing student learning, these laboratories would also be integrated into the online version of the course, scheduled to be offered for the first time in January 2012.

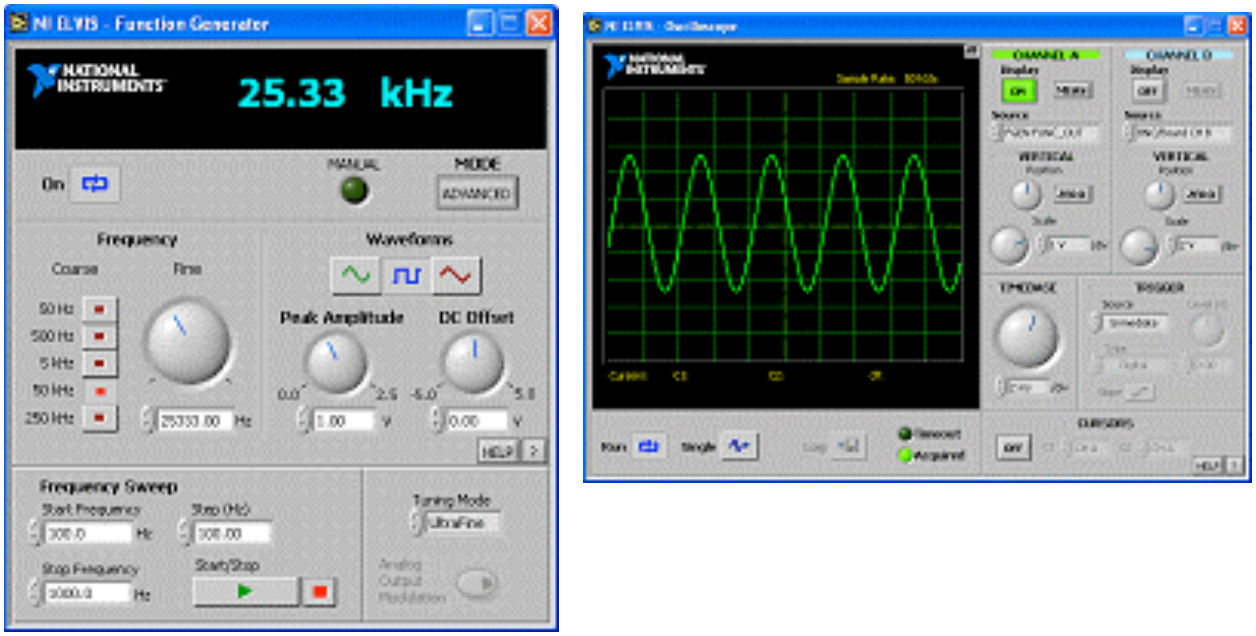

Figure 3. Virtual instrumentation displays for a function generator (left) and an oscilloscope (right).

Emona DATEx Equipment

The Emona DATEx (Digital Analog Telecommunications Experimenter) is a separate board that can be added to the NI ELVIS platform for telecommunications laboratories. In other words, the breadboard used for electrical circuits labs in the basic ELVIS unit is replaced by a different board designed for telecommunications. Figure 1 (right) is a picture of DATEx equipment that was used in the WCM 600 onsite class, and Figure 4 shows the telecommunications board. Both ELVIS and DATEx enable remote laboratory access by providing virtual instrumentation and controls by means of a USB connector from the ELVIS base unit to a computer. This instrumentation allows instructors to design demonstrations and laboratories that couple math fundamentals and telecommunications theory with a hands-on learning environment with real-world electrical signals.

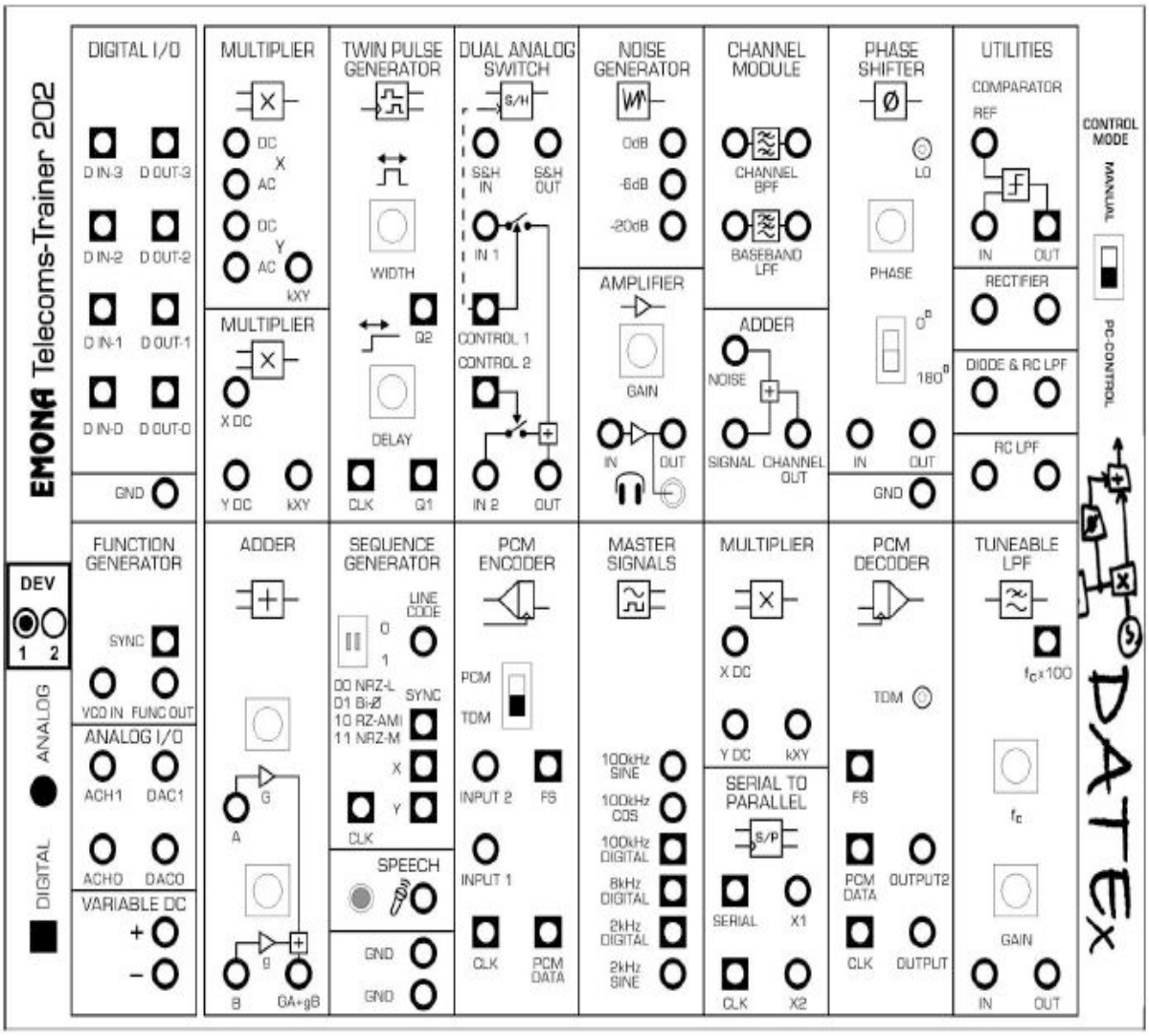

Figure 4. DATEx virtual instrumentation: telecommunications board.

EMONA DATEx Experiments

Two experiments were performed in class utilizing the Emona DATEx system. The objective of these experiments was to better illustrate basic concepts relevant to wireless communications and digital signal processing (DSP). Both experiments were conducted briefly after the theoretical concepts were introduced, so the students could have a practical demonstration of the mathematical concepts discussed in class.

The first experiment illustrated concepts such as signal multiplication, convolution, AM modulation, and demodulation.

Figure 5 shows the schematic of the experiment, where a voice signal is fed through a microphone integrated with the Emona DATEx hardware. *Figure 6* illustrates the actual implementation of this experiment.

The virtual oscilloscope was utilized for inspecting the time response. It was exchanged by the Bode Analyzer when the frequency characteristics of the output were needed. All the signals were monitored by virtual instruments utilizing Labview. The two basic virtual instruments for experiment 1 were the Digital Oscilloscope (scope) and the Bode Analyzer (bode), highlighted with red squares in Figure 2. The results of these experiments were also demonstrated with Matlab so the students could cross examine and gain confidence in the output of the experiments.

Experiment 1 used five hardware blocks of the Emona system: the speech block, the master signals block, the multiplier block, the amplifier block, and the tunable low pass filter. The speech block was used for capturing acoustic signals through a microphone. The master signals block was used for generating a 100 kHz sinusoidal signal. The multiplier block was used for multiplying the signals. The amplifier block was used to give a gain to the output of the multiplier block. Finally, the filter block was used to filter the output of the amplifier block.

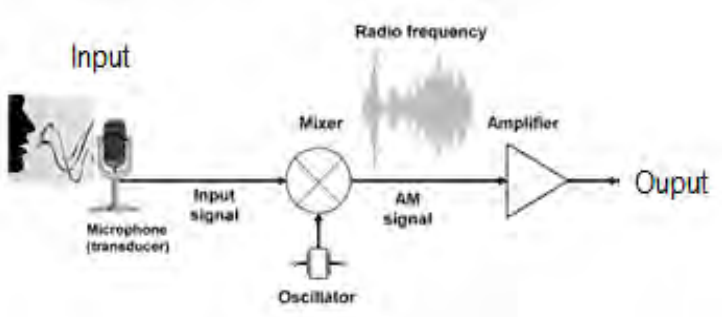

Figure 5. Basic setup of Emona DATEx experiment 1.

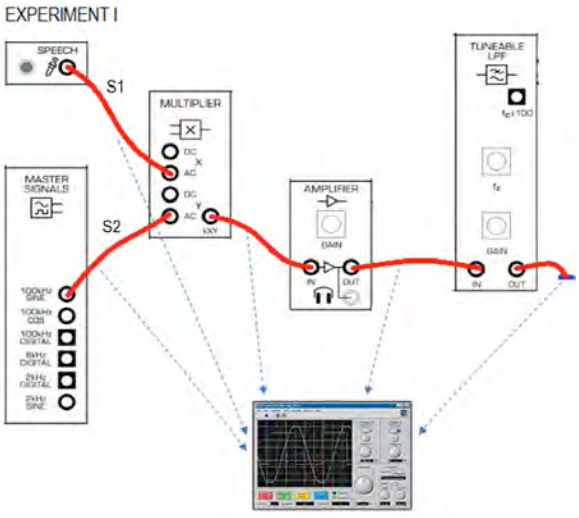

Figure 6. Actual implementation of the test setup for experiment 1 with the Emona Datex system and Labview software.

The first concept introduced by this experiment was the multiplication of two signals in time, where signal S1 was a voice signal, while signal S2 was a 100 kHz sine wave; the results of this multiplication were illustrated both in time and in frequency domain using the virtual instruments above mentioned. Since results were demonstrated both in time domain and in frequency domain, the concept of convolution was easily illustrated. For the actual multiplication of these signals, they were AC-coupled to the multiplier block, and the output of the block was then inspected by the virtual instruments. After the multiplication, the signal was fed to the amplifier block, and the signal before the amplifier was compared to the signal after the amplifier. Finally, the output of the amplifier was fed to a low pass filter in order to illustrate how the voice signal could be recovered after it was mixed with its carrier (100 kHz) wave. This experiment was especially advantageous to illustrate the concepts of convolution and modulation.

The purpose of experiment 2 was to explain how laser communication is implemented. It also introduced the concept of digital communications. As with experiment 1, the virtual instruments utilized were the Digital Oscilloscope (scope) and the Bode Analyzer (bode). Experiment 2 used two boards and six hardware blocks of the Emona system: the speech block, the digital I/O block, the adder block, the amplifier block, and the tunable low pass filter. The speech block was used for capturing acoustic signals through a microphone. The digital I/O block was used for generating digital data or simply a DC value. The adder block was used for encoding the signals. The amplifier block on board 1 was used as a driver for the laser diode, while in board 2 it was used as an amplifier for amplifying the output of the photodiode. Finally, the filter block was used to filter high frequency noise from the photodiode signal. In addition to the Emona kits, a laser diode and a photodiode have been used in this class. Figure 7 illustrates how these devices were connected.

In this case, open air transmission of voice signals utilizing a laser diode was demonstrated. The board on the left was used to build the transmitter, while the board on the right was for the receiver.

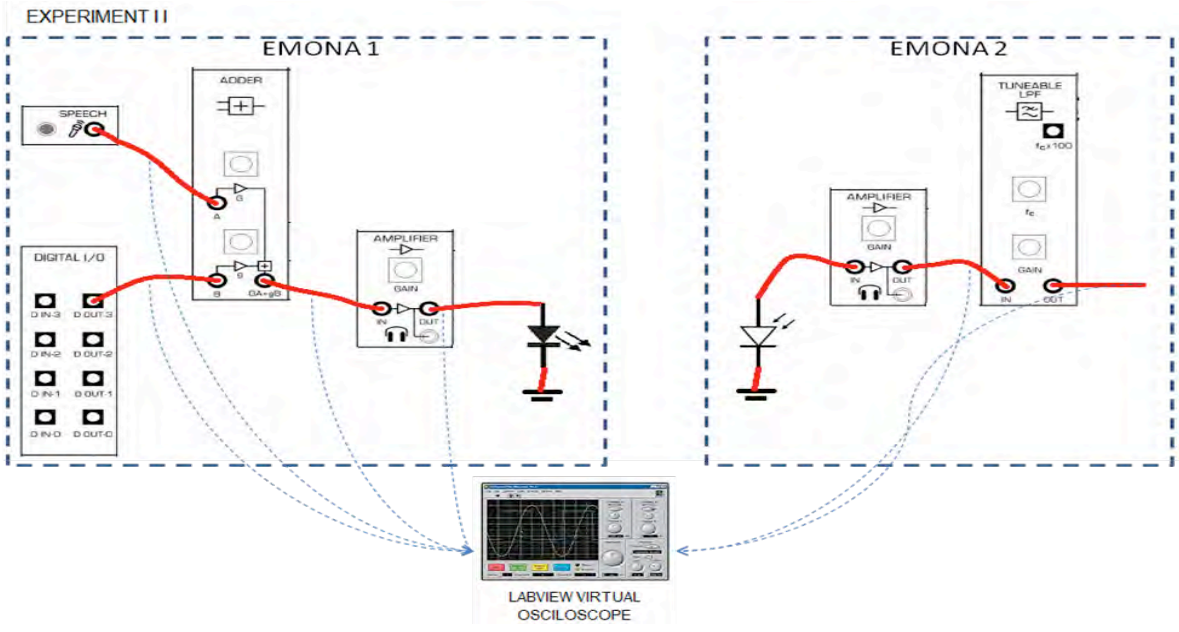

Figure 7. Actual implementation of the test setup for experiment 2 with the Emona DATEx system and Labview software.

Results and Discussion

At the end of each month-long class at National University, quantitative student assessment data are collected. The survey contains almost 30 different questions for gaining quantitative data: 7 questions for student self-assessment of learning; 16 questions for assessment of teaching; 3 questions for assessment of course content; and 3 questions for assessment of Web-based technology. Each question asks for a student response on a scale of 1 to 5, with 1 being lowest and 5 being highest.

EGR 230 Electrical Circuits and Systems

Quantitative survey data were compared from the EGR 230 class taught online without the ELVIS laboratory (December 2010), to the EGR 230 class taught online with the ELVIS laboratory (June 2011). Both classes were taught by the same instructor with similar numbers of students participating in the survey: 6 out of 18 students responded in December 2010; 8 out of 15 students responded in June 2011. Table 1 shows the comparison of the class taught with and without the ELVIS laboratory.

Table 1. *End of Month Course Assessment Results for EGR 230*

Reporting Method	Dec 2010 (without ELVIS lab)	June 2011 (with ELVIS lab)	% Change
GPA (4.0 scale)	2.67	2.88	+7.9%
Student learning (5.0 scale)	3.69	4.30	+16.5%
Teaching (5.0 scale)	3.84	4.35	+13.3%
Course content (5.0 scale)	3.37	4.32	+28.2%
Technology (5.0 scale)	3.53	4.16	+17.8%

While the number of students surveyed is small, the data show a very positive impact of the new laboratory demonstrations conducted with online students. Students' satisfaction with their learning, the teacher, course content, and technology is markedly higher, with improvements ranging from 13% to 28%. Also, student learning, as measured by the average GPA of the class, was almost 8% higher when the ELVIS laboratory demonstrations were used.

WCM 600 Signal Processing Theory

Table 2 shows the feedback from eight students about the promise of using DATEx in future WCM classes, both onsite and online. The students were asked to respond to six questions on a scale of 1 to 5, with 1 being the most negative review, and 5 the most positive.

Table 2. *Survey Conducted by the Instructor in WCM 600*

Question	Average (5.0 Scale)
Did you find useful the demonstrations performed with this system?	4.6
Did you learn new concepts with the system?	4.9
Would you like to have hands on experience with this system?	4.7
Would you like to have training to use the system?	4.7
Would you like more demonstrations with the system?	4.7
Would you recommend this system to be used in the next WCM 600 class?	4.7

Quantitative assessment data were also collected at the end of the course and are shown in Table 3. These data show good student performance, illustrated by the high GPA, and good assessment of learning, teaching, and course content.

Table 3. *End of Month Course Assessment Results for WCM 600*

Question	Average (5.0)
GPA (4.0 scale)	3.6
Student learning (5.0 scale)	4.3
Teaching (5.0 scale)	4.7
Course content (5.0 scale)	4.1

Additionally, six students provided these comments about the laboratory demonstration using Emona DATEx:

- "Easy operation."
- "System simplicity and user friendly."
- "The concept was better explained in practice utilizing the system."
- "It is really marvelous to see the signal live. This makes the class more realistic."
- "It is very practical, and it helps me accept new technology easily."
- "Access to practical implementation rather than having classroom lecture."

While the number of students in these classes was relatively small, the results are in agreement with other published articles (Sinha, 2007; Chang, Yeh, Change, & Pan, 2005; Ogot, Elliot, & Glumac, 2003; Hurley & Lee, 2005; Myka & Raubenheimer, 2005; Sivakumar, Robertson, Artimy, & Aslam, 2005; Spanias & Atti, 2005). The findings of all these studies clearly indicate that integration of laboratory hands-on activities in engineering courses (onsite, online, or hybrid) helps to increase student interest and learning, enhance teaching quality, and maintain higher retention and graduation rates.

Future Plans

Based on these promising results, it is planned to develop many more laboratory experiments, especially for online students taking Applied Engineering courses at National University. One step being taken is to integrate the ELVIS technology into the IT infrastructure in the classroom so that students will have direct, remote, individual access to the ELVIS lab equipment; in essence, students would be able to run the experiments from wherever they were located.

Another way to include more hands-on activities in online courses is to incorporate scaled-down versions of ELVIS, called myDAQ (my Data Acquisition), into the classes so that students would have the hardware and software in their possession to do the laboratories at home.

The department has recently acquired related laboratory equipment that could be integrated throughout online and onsite courses in the Applied Engineering Department and the Computer Science Department to improve student learning. First it is planned to incorporate Emona DATEx in more wireless communications classes—specifically WCM 601, Digital Wireless Fundamentals, in October 2011. Also National Instruments distributes another Emona product called Emona HELEx—a Green Engineering Bundle for NI ELVIS. Like Emona DATEx, Emona HELEx allows the user to swap out the electrical circuits breadboard for another plug-in board that can teach renewable energy concepts in our Environmental Engineering and Sustainability programs. Emona Helex can be used in classes to illustrate fundamentals of solar cells, electrolysis, and hydrogen fuel cells. Finally, there are plans to use ELVIS in computer science classes, specifically in the Digital Logic Design Lab, which currently uses Multisim simulation software to design digital logic circuits. ELVIS can be used in tandem with Multisim to bring simulations to life.

Conclusion

Quantitative student assessment of EGR 230, Electric Circuits and Systems, shows that integration of virtual laboratories (NI ELVIS) into this online engineering course enhances student learning and improves student assessment of teaching and course content. Qualitative student assessment of WCM 600, Signal Processing Theory, shows that integration of hands-on laboratories (Emona DATEx) improves student motivation and aids in understanding of the fundamental theories in the Wireless Communications subject area.

In the near future, more cutting-edge laboratory technologies will be added to online and onsite classes for further improvement. It is expected that this addition will allow students to be engaged in more hands-on activities for better understanding of the subject material and gain skills in applying the subject material in real world problem solving.

Acknowledgements

The authors are grateful to the students, faculty, and administration in the School of Engineering, Technology, and Media at National University for their support and encouragement, as well the companies that provided equipment for new laboratory development: National Instruments, Emona TIMS, and Hewlett-Packard HP.

References

Chang, G., Yeh, Z., Chang, H., & Pan, S. (2005). Teaching photonics laboratory using remote-control Web technologies*, IEEE Transactions on Education, 48*(4), 642–651.

Coleman, S. (2005, August). Why do students like online learning? *WorldWideLearn.* Retrieved September 10, 2011, from http://www.worldwidelearn.com/education-articles/benefits-of-online-learning.htm

Green, K., Jaschik, S., & Leddermann, D. (2011, March). The 2011 Inside Higher Ed Survey of College and University Presidents*, Inside Higher Ed.* Retrieved September 10, 2011, from http://www.insidehighered.com

Greer, T. (2011, July). Worldwide elearning market to reach $49.9 billion by 2015. *Ambient Insight Research.* Retrieved September 10, 2011, from http://www.ambientinsight.com/News/Ambient-Insight-2010-2015-Worldwide-eLearning-Market.aspx

Hung, M., Chou, C., Chen, C., & Own, Z. (2010). Learner readiness for online-learning: Scale development and student perceptions. *Computers & Education, 55*(3), 1080–1090.

Hurley, W., & Lee, C. (2005). Development, implementation, and assessment of a Web-based power electronics laboratory, *IEEE Transactions on Education, 48*(4), 567–573.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. US Department of Education, Office of Planning, Evaluation, and Policy Development Policy and Program Studies Services.* Retrieved September 8, 2011, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Myka, J., & Raubenheimer, C. (2005). Action research implemented to improve zoology laboratory activities in a freshman biology majors course, *Electronic Journal of Science Education, 9*(4), 1-27.

Nagel, D. (2011, January). Online learning set for explosive growth as traditional classrooms decline. *Campus Technology.* Retrieved September 10, 2011, from http://campustechnology.com/articles/2011/01/26/online-learning-set-for-explosive-growth-as-traditional-classrooms-decline.aspx

National University general catalog (2012). Retrieved September 5, 2011, from http://www.nu.edu/assets/resources/pageResources/Catalog751.pdf

Neal, R. (2009, February). Earning a degree online, *CBS News.* Retrieved September 10, 2011, from http://www.cbsnews.com/stories/2003/08/26/earlyshow/contributors/reginalewis/main570268.shtml

Ogot, M., Elliot, G., & Glumac, N. (2003). An assessment of in-person and remotely operated laboratories*. Journal of Engineering Education, 92,* 57–64.

Park, J., & Choi, H. (2009). Factors influencing adult learners' decision to drop out or persist in online learning. *Educational Technology and Society, 12*(4), 207–217.

Power, M., & Gould-Morven, A. (2011). Head of gold, feet of clay: The online learning paradox. *International Review of Research in Open and Distance Learning, 12*(2), 19–38.

Roper, A. (2007). How students develop online learning skills. *EDUCAUSE Quarterly, 1,* 62–65. Retrieved September 1, 2011, from http://net.educause.edu/ir/library/pdf/eqm07110.pdf

Sinha, A. (2007, June 24–27). Engineering laboratory experiments: an integrated approach of teaching the introductory engineering course. 2007 *ASSE Annual Conference,* Honolulu, Hawaii. Retrieved September 25, 2011, from http://www.icee.usm.edu/ICEE/conferences/asee2007/papers/189_ENGINEERING_LABORATORY_EXPERIMENTS___AN_.pdf

Sivakumar, S., Robertson, W., Artimy, M., & Aslam, N. (2005). A Web-based remote interactive laboratory for Internetworking education*. IEEE Transactions on Education, 48*(4), 586–598.

Spanias, A., & Atti, V. (2005). Interactive online undergraduate laboratories using J-DSP, *IEEE Transactions on Education, 48*(4), 735–749.

About the Authors

Jodi Reeves
Ph.D., Laboratory Manager and Adjunct Faculty
School of Engineering, Technology, and Media
National University
La Jolla, CA
jreeves@nu.edu
Major research interests: materials characterization and instrumentation.

Mohammad Amin
Ph.D., Professor
Lead faculty for the MS in Wireless Communications
School of Engineering, Technology, and Media
National University, La Jolla, CA
mamin@nu.edu
Major research interests: wireless communications database and sensors.

Marcos Turqueti
Ph.D., Adjunct Faculty
School of Engineering, Technology, and Media
National University, La Jolla, CA
Marcos.Turqueti@natuniv.edu
Major research interests: DSP algorithms, sensors and homeland security systems.

Pradip Peter Dey
Ph.D., Professor
Lead for the MS in Computer Science Program
School of Engineering, Technology, and Media
National University, La Jolla, CA
pdey@nu.edu
Major research interests: computation, database, software engineering and mobile apps.

Practical Lens for Teachers in Their High Tech Learning Environment

Lynne Anderson and John Cartafalsa

Abstract
Online delivery of instruction brought to bear a new dimension in teaching and learning. Research has reviewed effectiveness of technology-driven changes in teaching and learning. The quality of online communication and the degree of interaction with fellow students and instructor contribute to student satisfaction and correlate with instructor response time. Instructor communication lessened or increased distance between learners and instructor; lessening distance increased student learning. Two models for instructional quality preferences are reviewed and compared. Qualitative analysis has shown student satisfaction and performance relate to quality e-learning preferences and possibly to preferences for e-teaching strategies.

Key Words
Student performance, interactivity, e-learning, quality learning preferences, student satisfaction, online teaching

Introduction

Decades ago, as teachers became students of styles of learning and teaching, they discovered that styles of teaching had a profound impact on styles of learning and, in the midst of this discovery, realized that classroom relationships were essential components of meaningful teaching and learning. Teaching and learning became viewed as more complex, and teachers struggled to reach a comfort level when technology began to dominate the scene. Technology has taken learning and teaching into a new realm, from a set of tools to a medium through which instruction can be delivered. Styles had to change. Attitudes had to shift. A new breed of high tech students and teachers entered the learning setting. The twenty-first century has seen e-learning capturing the attention and imagination of teachers and students all over the world. Technology has altered the way information is acquired and distributed. A bounty of unfiltered information is available in real time, and sharing that information through technology not only is both instantaneous and convenient but serves to disrupt the content of the online course. Teachers are forced to acknowledge this unfiltered information and its impact on delivery systems for content. Content and methodology of teaching have changed dramatically with technology.

Body of Knowledge

Online delivery of instruction brought to bear a new dimension in teaching and learning—a far-reaching educational view. Grasha (1996) pioneered learner differences and related these differences to learning styles in his study of traditional face-to-face instruction. His work on learning styles appears to exist along the same dimension as Ehlers' (2006) study of online quality preferences. Ehlers (2010) found four major clusters of learning quality preferences for online learners similar to Grasha's six learning styles for face-to-face instructional delivery. Both Ehlers and Grasha postulated that learning activities, whether online or face to face, can be designed to interface with assessed learner differences. Ehlers further learned that student performance can be increased by an alignment designed with individual learning preferences in mind. The present authors surmise that a boost in student performance emerges when

considering online learner preferences. It could be hypothesized that learning might also be enhanced by a consideration of quality preferences of teachers.

As a teaching pioneer and researcher, Grasha (1996) found teaching and learning styles and their interaction affect classroom student learning. The face-to-face work of Grasha (1996) describes how understanding learning and teaching styles assists instructors to enhance and expand their teaching activities and thus increase student learning. Grasha identified five teaching styles: *expert, formal authority, personal model, facilitator,* and *delegator*—which he arranged into four clusters—*the expert, the personal, the facilitator,* and *the delegator*. Grasha stepped up his work by identifying and categorizing student learning style preferences—*avoidant, dependent, participant, independent, competitive,* and *collaborative.* In the following list of Grasha's learning styles and preferences, *independent* and *competitive* are combined for this article due to their similarity of attributes. Competitive and independent learning styles mirror each other with one exception: An independent learner may or may not be competitive, while a competitive learner consistently exhibits independence and self-reliance.

- *Dependent*—does not enjoy classroom activities; does not like to be called upon in class; does not like teachers who are enthusiastic.
- *Avoidant*—does not enjoy classroom activities; does not like to be called upon in class; does not like teachers who are enthusiastic
- *Independent*—likes choices and flexibility of instructor; likes to be in control of required assignments. Competitive—likes to be in control of assignments; likes an opportunity to excel and prefers to work alone; likes to be the best performer.
- *Participant*—likes to be a group leader in class discussions; likes to discuss presented material; likes to be part of any interactivity put forth by instructor.
- *Collaborative*—likes to share ideas and skills; likes group projects; likes lectures with group discussion.

Strong presence of technology has prompted a bounty of creativity in new teaching and learning techniques. Research has ventured to review the effectiveness of technology-driven changes in teaching and learning. Caywood and Duckett (2003) compared online and onsite delivery of instruction. They found that learners reported greater satisfaction with onsite interactive learning, yet more learning was reported with interactive online experiences.

Bandura (cited in Beihler & Snowman, 1993), a renowned pioneer in social learning theory, began with this supposition: Learning results from interactions among three factors—(a) personal characteristics, (b) behavioral patterns, and (c) their context, the social environment, such as interactions with others. Bandura elaborated that those three factors influence one another, although to what degree he did not ascertain. Anderson and Cartafalsa's (2002) initial study took one of Bandura's factors of context, the social environment, as described by Bandura, as interactions with others, implying its importance in any teaching/learning environment. Bandura used interactions; whereas Anderson and Cartafalsa described interactions as relationships within the teaching/learning community.

Relationships, in Anderson and Cartafalsa's studies, were specifically described by the direction of those interactions: as student to student, student to instructor, and instructor to student. Through qualitative analysis of narratives of what students and instructors wanted from their teaching/learning environment, three themes emerged:

- Theme One: Teaching/Learning Environment illustrated student desires for open, non-threatening, enjoyable and respectful attitudes in student-faculty relationships.
- Theme Two: Exchange of Information illustrated student desires to learn from the instructor and from one another, and to interact with one another more than with the instructor.
- Theme Three: Mentor/Peer Association illustrated student desire for developing networks among students to help with coursework, seek out jobs, and become friends; whereas faculty desired principles of effective teaching to help students learn (Anderson & Cartafalsa, 2010).

These attributes—respect, mentoring, friendship, and networking—supported the Social Learning Theory formally presented by Bandura.

Anderson and Cartafalsa's (2002) onsite study was subsequently replicated by the authors in the online setting (Anderson & Cartafalsa, 2010). The methodology and inquiry used the same survey questions of both graduate and undergraduate students as in their initial study, and results were compared from both teaching/learning settings. Effectiveness of teaching, whether online or onsite, had similar qualities of responsiveness, supportiveness, and relevance of learning which were valued in both instructional delivery systems (Anderson & Cartafalsa, 2010). Results showed that the same attributes, respect, mentoring, friendship and networking, appeared in student narratives in both learning settings. A strong, common response from student online learners, responsiveness of the instructor, replaced other attributes in being the most important relational value desired. Students agreed that response rate was an important factor in instructor-to-student relationships, and that relationship plays an important role in onsite teaching/learning settings as well as online ones and holds a similar relational value. In the online teaching and learning setting, there appears to be a new dimension to these three classroom relationships: technology. The relationships of instructor and student to technology seem of value.

Studies that compared onsite teaching/learning settings to online settings have tended to focus more upon student satisfaction than upon performance, unaware that student satisfaction and performance are linked to teaching/learning relationships or interactivity, as reported by the authors in two previous studies based on social learning theory (Anderson & Cartafalsa, 2002; Anderson & Cartafalsa, 2010). Student satisfaction surveys formulated best instructional practices that improved online learning and led to deepening research about e-learning (Bradford & Wyatt, 2010). Online interactive learning had a link with increased student performance and teacher presence in the online course. Ehlers (2003, 2006) in two major studies as reported on the referred web resource found student preferred quality preferences in online learning relate to student performance. Ehlers' student quality preferences were clustered around four major themes which he formed into groups. Figure 1 depicts Ehlers' four quality e-learners preference groups, describing the attributes of online learners' preference groups in online settings.

Bradford and Wyatt (2010) reported that the quality of online communication and the degree of interaction with fellow students and instructor contributed to the most significant barrier in course completion. Bolliger and Martindale (2004) found that student satisfaction was highly correlated with the instructor's availability and response time to student work, concerns and questions. Anderson and Cartafalsa (2010) found and agreed that instructor responsiveness was desired in online courses and was a part of the instructor-to-student relationship.

The Individualist ***Content Oriented***	**The Result-Oriented** ***Independent/Goal Oriented***
Content related	Individualization
Individualized learning scenarios	Work-integrated learning
Course material: didactics	Instrumental purpose orientation
Self-directed learning	Learn and media literacy
Presence courses	Presence courses
Interaction	Interaction
Communication	Communication
The Pragmatist ***Needs Oriented***	**The Avant-Gardist** ***Interaction Oriented***
Individualized offerings	Discussion/communication
Tutor support	Tutor support-learner oriented
Non-financial costs	Media/technology vanguard
Information and advice	Visual learning groups
Personalization of learner expectations	Information and advice
Didactic requirements	Rich didactic concept

Figure 1. Ehlers' four quality e-learners preference groups.

Swan (2001) reported a relationship between amounts of time allotted for class discussion and degree of interaction among and between students—the *more* discussion, the *higher* the interaction and the *greater* the learning and *satisfaction*. She reported that physical distance between communicators was determined by immediacy of response. Instructor verbal and nonverbal communication lessened or increased that distance; *lessening distance increased student learning.*

E-learning progressed beyond student satisfaction and performance to complexities of instructional delivery based upon the same complexities researched in onsite and online teaching and learning. Results were that teaching and learning style preferences exist along the same dimension, and effectiveness of teaching can be increased by an alignment designed with individual quality, keeping e-learning preferences in mind, which now can be connected with individual e-teaching styles. Qualitative analysis has shown to be the tool through which student satisfaction and performance are tied to quality e-learning preferences and effectively merge with individual preferences for e-teaching strategies.

In his more recent work, Ehlers (2006) focused on the online learner's perspective. He claimed that lifelong learning processes can no longer be standardized along the normal distribution, but rather can be customized along individual assessments and subsequent subjective preference profiles. Since individual needs vary and grow, programs of study might be designed to meet those changing needs, thus being flexible, adaptable, and customizable.

Acquiring, sharing, and applying knowledge with the ability to integrate generative process and communicate knowledge and information using technological tools—skills that need to be developed and grow with technological changes—is the reality of the 21st century. Perhaps recognizing and tailoring online instruction into four clusters of target groups of students, as presented in Ehlers' (show year here; is it 2003 or 2006?) model, is a beginning of acceptance of a more strongly based educational model for e-learning programs. Moreover, integrating teaching quality preferences might add to the enhancement of teaching performance and, consequently, student performance.

Quality Preferences Models

Assessing the learner in the development of quality learning clusters was the resounding conclusion of Ehlers' comprehensive studies (2003, 2006) of e-learning. He found four major clusters of e-learning quality preferences for online learners similar to Grasha's learning styles of traditional, onsite, face-to-face learners, and both researchers showed that learning activities can be designed to better meet the classroom preferences of Grasha and the quality e-learning preferences of Ehlers.

Distinctions in classroom preferences and quality e-learner preferences are attempted to focus course designers in providing multiple access points for e-learners while moving towards customizing e-learning activities.

Conclusions

Publishing houses are using technology to gain a foothold in interpreting content and thereby limiting the unfiltered information universally available. Technology companies promote their tablet and mobile devices in an environment of rapid change. Learning venues expand to include mobile technologies—online learning expands to include mobile technologies and new applications. Online learning captures an increasing market share on all levels of learning all around the world. Technologies advance through rigorous marketing and research efforts.

How do educators respond to high tech learning and the rapid pace of technology change and information gathering? Educators might respond to include effectiveness by an alignment that commingles individual e-learning quality preferences with course design. Qualitative analysis ties student satisfaction and performance to quality e-learning preferences and merges e-learning strategies in course design offering e-learning activity requirements with quality preferences in mind. Distinctions in quality e-learner preferences are attempted to focus course designers in providing multiple access points for e-learners and customizing e-learning activities. Quality preferences as choices in the e-learning environment might encourage students further to venture outside their comfort zones into other quality preference choices and enhance their learning perspectives.

With unfiltered information on the high tech scene, a bigger issue confronts teachers in e-environments. What about the content within course design? This could be grounds for future study, so like technological advances, rigorous marketing and research efforts will provide the tools for teaching in e-settings. The role of publishing houses might be similarly directed.

References

Anderson, L. E., & Cartafalsa, J. S. (2002). Factors that make faculty and student relationships effective. *The College Teacher, 50*(4), 134–138.

Anderson, L. E., & Cartafalsa, J. S. (2010). Virtual teaching/learning relationships. *International Journal for Digital Society, 1*(1), 10-11.

Beihler. R. E., & Snowman, J. (1993). *Psychology applied in teaching.* Boston: Houghton-Mifflin Co.

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online course. *International Journal of E-Learning, 3*(1), 61–67.

Bradford, G., & Wyatt, S. (2010). Online learning and student satisfaction: Academic standing, ethnicity and ther influence on facilitated learning, engagement, and information fluency. *The Internet and Higher Education, 13*(3), 108–114.

Caywood, K., & Duckett, J. (2003, spring). Online vs. on campus learning in teacher education, *Teacher Education and Special Education, 26*(2), 98–105.

Ehlers, U. (2003b). *Quality in E-Learning. The Learners Perspective.* Accepted for publication in: European Journal Vocational Training. CEDEFOP. Thessaloniki. Retrieved November 30, 2010, from http://www.changetraining .com/docs/eden/Ehlers.pdf

Ehlers, U. (2006). *Quality in e-learning from a learner's perspective.* Retrieved from http://www.changetraining .com/docs/eden/Ehlers.pdf

Grasha, A. (1996). *Teaching with style: A practical guide to enhancing learning by understanding teaching and learning styles.* San Bernardino, CA. Alliance Publishers

Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education, 22*(2), 306–319.

About the Authors

Lynne E. Anderson, Ph.D.
Professor, Teacher Education
School of Education
National University
La Jolla, CA
landerso@nu.edu
Major research interests: e-learning; effective learning relationships, online course design, interactivity in learning, and co-teaching

John S. Cartafalsa, Ph.D.
Professor, Early Childhood Education
School of Education
National University
La Jolla, CA
jcartafa@nu.edu
Major research interests: early childhood education; effective learning relationships, interactivity in learning, and co-teaching

Using Student Online Course Evaluations to Inform Pedagogy

Dee L. Fabry

Abstract
The purpose of this study was to explore student evaluations of online instructors specific to instructor-student interactions. In this study, 255 end-of-course evaluations for 23 online course sections and 17 instructors were examined to determine how students rated both the effectiveness of the teaching concerning interaction and the application of interaction course tools by their instructors. Results indicated that students highly valued instructors who were active participants and effectively used interactive communications tools, such as email and assignment feedback. While this is not new information, how we use this data to inform pedagogy is critical to improving online teaching.

Keywords
Online pedagogy, instructor-student interactions, student online evaluations

Using Student Online Course Evaluations to Inform Pedagogy

While distance education continues its exponential growth (Allen & Seaman, 2009), current research shows that interaction impacts student learning and satisfaction (Chang & Smith, 2008; Herbert, 2006; Wanstreet, 2006). Perez-Cereijo (2001) stated that students often report dissatisfaction due to the lack of personal interaction between the instructor and students and among students. Bollinger and Martindale (2004) suggested that student satisfaction with online courses is influenced by three major constructs: instructor variables, technical issues, and inter-activity. They also noted that the instructor is the main predictor of student satisfaction with online courses. Fish and Wickersham (2009) suggested that ongoing evaluation of online courses is a key element in developing quality courses, and collecting student feedback is an important part of that process. What is done with the data after it is collected is a question that needs to be addressed.

Background and Theoretical Framework

One obvious way to remedy the problem of low or infrequent interaction is by increasing personal interaction during the course. While this is an obvious solution, its implementation is the challenge. Course Management Systems (CMS) provide a variety of tools that, when utilized, have the potential to increase communication and learning. The research of Zemsky and Massey (2004) supports the impact of how the instructor delivers the course content. They found that although instructors were using online learning delivery methods, they were still using teacher-centered pedagogy. Mahle (2007) clearly stated that "Instructors need to be cognizant of incorporating a significant amount of interactivity into their courses" (p. 47). The question then becomes how to get course instructors to change their pedagogy and integrate more interaction in their online courses.

The importance of interactive, student-centered instruction has been a central theme in higher education since the original Chickering and Gamson (1987) study, *Seven Principles for Good Practice in Undergraduate Education.* Subsequently updated for distance education in 1996 by Chickering and Ehrmann, Implementing the *Seven Principles: Technology as Lever* has strongly

influenced the development of contemporary research related to best practices and effective virtual classroom instructional strategies for use in the online environment.

Research in best practices for online education has emphasized the importance of promoting interactivity, encouraging student-instructor and student-student interchanges, and building online learning communities (Bangert, 2005; Bannan-Ritland, 2002; Dennen, Darabi, & Smith, 2007; Kennedy, 2004). Recent contributions to the field of Web-based distance education have stated that interactivity and communication are key components required for successful online teaching and learning (Fabry & Schubert, 2009; Mahle, 2007; Moore, 2001; Tobin, 2004). Citing results from a recent study on the importance of interaction to student learning within Web-based online learning programs, Sher (2009) noted that "Student-instructor interaction and student-student interaction were found to be significant contributors of student learning and satisfaction" (p. 102).

The literature related to interactivity in online learning generally focuses on the traditional trilogy of interaction, which includes (a) learner-content, (b) learner-learner, and (c) learner-instructor (Chang & Smith 2008; Moore, 2001). Mahesh and McIsaac (1999) took a slightly different focus on the same theme of interaction, but focused more on communication. Their research study looked at the dynamic of instructor-student communication and the strategies the instructor implemented that encouraged communication within the virtual classroom, including regular feedback. Communication in online classes most frequently takes the form of asynchronous threaded discussions, announcements, virtual office, synchronous chats and email. Instructor feedback on course assignments also plays a crucial role in student success and can be regarded as a specific form of communication. Effective interaction and successful communication include the use of multiple strategies and activities where instructors provide feedback that is both immediate and frequent (Bollinger & Martindale, 2004; Dennen, Darabi, & Smith, 2007). Research related to interactivity in online instruction formed the basis for this study that focused on how students rated instructor interactivity and responsiveness using the course tools. The next logical question was what then should be done with the data to inform and improve pedagogy.

Method

Participants

Participants in the study consisted of graduate level students working towards a Master of Arts in Teaching (MAT) degree. The university focuses on the educational needs of non-traditional learners, and the courses are presented in a rigorous one-month format. The students were adults who were either currently teaching in public or private PK–12 schools or working in related fields. All MAT courses are offered online, and the students can enroll from any location worldwide. Students in this study were from the United States, predominately from California. Students typically enroll in the program to increase their knowledge and skills in order to be more effective educators.

Data Collection Process

At the end of each course, students are requested to complete the institutionally approved online evaluation of teaching instrument that is contained within the university's existing e-College platform. This is a voluntary activity. End-of-course student evaluations completed by 255 students were analyzed for 23 sections of one core MAT course and 17 instructors over a six-month period from January 2010 through June 2010 at a private, non-traditional, not-for-profit

university. The 255 out of 376 responses represented 68% of the student population taking the course over the time period in this study. This is a high return rate for online course evaluations, according to the Office of Institutional Research and Assessment (OIRA).

OIRA anonymously collect the data from each course. The Effectiveness of Teaching subset section of the instrument contains 16 items (see Appendix A), and students may also write comments to support their ratings. The Likert-scale 5-point survey ratings were averaged to provide an overall rating score.

Data Analysis

A descriptive analysis was conducted to examine the Likert-scale items and the student comments provided by the OIRA. The 16 items were ranked from lowest to highest ratings (see Appendix B) and categorized according to interactivity variables: instructor-student; student-student; and student-content (see Appendix C). The open-ended comments were coded and analyzed for common themes.

Results

This study examined the satisfaction ratings from students completing the end-of-course student evaluation. Appendix B presents the items from lowest to highest rankings. Instructors at this university are expected to maintain an overall average rating of 4.0 for the assessment of teaching score. After the monthly review of the end-of-course evaluations by the course lead, department chair, and dean, instructors who score below 4.0 on any of the 16 items are requested to provide an action plan for improving the low-score areas.

In this study period, the assessment-of-teaching section of the course evaluation revealed three major areas for improvement, which were selected because they fell below the expected 4.0 level:

Item 3. Chat sessions were useful.

Item 11. The instructor was an active participant in this class.

Item 14. Grades were posted to the gradebook in a timely manner.

Cross-analyzing these three items with the interactivity variables chart in Appendix C showed that Item 3 aligned with student-student interaction, while Items 11 and 13 aligned to student-instructor interaction.

The next five lowest scores, ranging from 4.05 to 4.19, were as follows:

Item 12. Threaded discussions were useful.

Item 9. Instructor provided timely feedback on my work.

Item 1. Instruction was well organized.

Item 4. Instructor gave clear explanations.

Item 10. Instructor provided useful comments on my work.

Four of these items aligned to the student-instructor interaction and one, Item 12, aligned with student-student interaction. The remaining eight items ranged from 4.21 to 4.30, with seven of the eight items aligning with the student-instructor interaction and Item 2 with student-content interaction.

Narrative comments supporting their evaluations were written by 78 students. Positive comments praised instructors who provided immediate, meaningful, and useful feedback and comments; gave clear directions; set clear expectations; showed passion for the content; were involved in course discussions and live chats; and used email, the Virtual Office, and Announcements regularly and effectively. Negative comments criticized instructors who made vague or generic comments on assignments; were not involved in the class or were perceived as being distant; did not grade in a timely manner; and were not readily available. While student comments overwhelmingly focused on student-instructor interaction, four students commented on their desire to have more live chats and greater depth in the discussion boards from their peers.

Discussion, Limitations, and Implications

Effective online courses require that instructors think differently about how they engage in this delivery modality (Fish & Wickersham, 2009). If the instructor is the main predictor of student satisfaction with online courses (Bollinger & Martindale, 2004), then an instructor who examines student evaluations of their pedagogy can improve their knowledge, skills, and proficiencies in this learning environment. Data from the end-of-course evaluations in this study clearly revealed that students want an instructor who is an active participant in the class, sets clear expectations, and provides timely and meaningful feedback on assignments. Students rated their need for feedback, responsiveness to questions, and communication strongly. Instructors who received positive comments or praise from students communicated clearly and often with their students; They set clear expectations, gave directions, and provided timely, meaningful, and thoughtful feedback. Students felt supported by these instructors. One student wrote, "Professor X has been an extremely effective instructor who provides immediate feedback and comments, which establishes a supportive environment." Another wrote, "She was involved in the class discussion; she was very clear about her expectations, assignment guidelines, and grading procedures."

While the desire for engaging, involved, and "present" instructors by students in the online environment is not new, the data from this study show that instructors still need to increase their proficiencies in these areas. One of the limitations of this study is the need for disaggregation of the data by individual instructor. The data provided a broad view of student evaluations of instructor engagement, interaction, and implementation of course tools such as email and assignment feedback. While the broad analysis supports the need for ongoing professional development to increase online teaching skills, it also supports the need for individual instructors to review their end-of-course evaluations, reflect on the information, and create an individualized improvement plan customized to their own areas of need.

All online instructors should review the student end-of-course teaching evaluations every time they teach. These data, along with peer and supervisor observations, should be used to inform pedagogy. We are in a time when we should be responsible for creating our own professional development agenda. Self-analysis and reflection, supported by meaningful feedback and input from peers and supervisors, can result in ongoing pedagogical improvements.

Multiple factors challenge increased instructor-student interaction in the online environment. These are areas of real concern and are ripe for research to investigate the impact of teaching in the online environment. Following are two of these areas:

- *Time*—increased time in both the preparation and delivery of online content; time to learn the new technology skills in order to effectively use all of the course tools; time to respond to each learner in classes having 45 to 100 students; time to review and reflect on student evaluations and create customized professional development plans.
- *Resistance*—the reluctance of faculty to enter this delivery modality; the lack of desire to learn new skills; the fears of failure by both faculty and students.

In order to use data to inform pedagogy, faculty need to understand that online learning has its own philosophy and pedagogy. Instructors must become comfortable with instructional design of the online course, including technology for teaching, and be provided with systematic and continued support (M. Avgerinou, personal communication, October 28, 2010). As Fish and Wickersham (2009) discuss, continuous evaluation is necessary for ongoing improvement. If the online delivery of courses and programs is to meet its full potential for engaging learners, informed pedagogy must be given attention.

References

Allen, I. E., & Seaman, J. (2009). *Learning on demand: Online education in the United States, 2009.* Needham, MA: Sloan Center for Online Education.

Bangert, A. (2005). Identifying factors underlying the quality of online teaching effectiveness: An exploratory study. *Journal of Computing in Higher Education, 17*(2), 79–99.

Bannan-Ritland, B. (2002). Computer-mediated communication, e-learning, and interactivity: A review of the research. *The Quarterly Review of Distance Education, 3*(2), 161–179.

Bollinger, D., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-Learning, 3,* 61–67.

Chang, S. H., & Smith, R. A. (2008). Effectiveness of personal interaction in a learner-centered paradigm distance education class based on student satisfaction. *Journal of Research in Technology in Education, 40*(4), 407–426.

Chickering, A., & Ehrmann, S. C. (1996). Implementing the seven principles: Technology as lever, *AAHE Bulletin, 49*(2), 3–6.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3–7.

Dennen, V. P., Darabi, A. A., & Smith, L. J. (2007). Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education, 28*(1), 65–79.

Fabry, D., & Schubert, C. (2009). Increasing interactivity in the online environment. In T. Bastianens et al. (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2009* (pp. 2562–2567). Chesapeake, VA: AACE.

Fish, W. W., & Wickersham, L. E. (2009). Best practices for online instructors: Reminders. *The Quarterly Review of Distance Education, 10*(3), 279–284.

Herbert, M. (2006, winter). Staying the course: A study in online student satisfaction and retention. *Online Journal of Distance Learning and Administration, 9*(4). Retrieved from http://www.westga.edu/~distance/ojdla /winter94/herbert94.htm

Kennedy, G. E. (2004). Promoting cognition in multimedia interactivity research. *The Journal of Interactive Learning Research, 15*(1), 43–62.

Mahesh, V., & McIsaac, M. S. (1999). Distance education: Learner-teacher interaction and time spent teaching. Paper presented at the National Convention of the Association for Educational Communications and Technology, Houston, TX. (ERIC Document Reproduction Service No. ED436154)

Mahle, M. (2007). Interactivity in distance education. Distance Learning 4(1), 47–51.

Moore, M. G. (2001). Three types of interaction. The American Journal of *Distance Education, 3*(2), 1–5.

Perez-Cereijo, M. V. (2001). Factors influencing how students value asynchronous Web-based courses. Unpublished doctoral dissertation, University of North Texas. (Dissertation Abstracts International, AAT 9989796)

Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in the Web-based learning environment. *Journal of Interactive Online Learning, 8*(2), 102–120.

Tobin, T. J. (2004). Best practices for administrative evaluation of online faculty. *Online Journal of Distance Learning Administration, 7*(2). Retrieved from http://www.westga.edu/%7Edistance/ojdla/summer72/tobin72.html

Wanstreet, C. E. (2006). Interaction in online learning environments: A review of the literature. *The Quarterly Review of Distance Education, 7*(4), 399–411.

Zemsky, R., & Massy, W. (2004). Thwarted innovation: What happened to e-learning and why? A final report for the weather station project of the learning alliance at the University of Pennsylvania. Retrieved from http://www.thelearningalliance.info/WeatherStation.html

Appendix A
Average Score Data from End-of-Course Evaluations

End-of-Course Evaluations Teaching Effectiveness Items MAT 641 – Education and Social Pluralism January 1 – June 30, 2010 Online Sections (23) Student Responses n = 255	**Avg. Score (1.0–5.0)**
1. Instruction was well organized.	4.12
2. Content areas described in the course outline were covered.	4.30
3. Method of assigning grades was clear.	4.23
4. Instructor gave clear explanations.	4.17
5. Instructor was receptive to questions.	4.29
6. Instructor stimulated critical thinking.	4.26
7. Instructor encouraged students to think independently.	4.28
8. Instructor was available for assistance.	4.21
9. Instructor provided timely feedback on my work.	4.05
10. Instructor provided useful comments on my work.	4.19
11. The instructor was an active participant in this class.	3.94
12. Threaded discussions were useful.	4.05
13. Chat sessions were useful.	3.71
14. Grades were posted to the gradebook in a timely manner.	3.98
15. Instructor responded promptly to emails and other communications.	4.23
16. Overall, the instructor was an effective teacher.	4.26

Source: Student Course Evaluations, Office of Institutional Research and Assessment (2010).

Appendix B
End-of-Course Evaluation Items,
Ranked Lowest to Highest

End-of-Course Evaluations **Teaching Effectiveness Items** **MAT 641 – Education and Social Pluralism** **January 1 – June 30, 2010** **Online Sections (23)** **Student Responses n = 255**	**Avg. Score** **(1.0 – 5.0)**
13. Chat sessions were useful.	3.71
11. The instructor was an active participant in this class.	3.94
14. Grades were posted to the gradebook in a timely manner.	3.98
12. Threaded discussions were useful.	4.05
9. Instructor provided timely feedback on my work.	4.05
1. Instruction was well organized.	4.12
4. Instructor gave clear explanations.	4.17
10. Instructor provided useful comments on my work.	4.19
8. Instructor was available for assistance.	4.21
3. Method of assigning grades was clear.	4.23
15. Instructor responded promptly to emails and other communications.	4.23
6. Instructor stimulated critical thinking.	4.26
16. Overall, the instructor was an effective teacher.	4.26
7. Instructor encouraged students to think independently.	4.28
5. Instructor was receptive to questions.	4.29
2. Content areas described in the course outline were covered.	4.30

Source: Student Course Evaluations, Office of Institutional Research and Assessment (2010).

Appendix C
End-of-Course Evaluation Items, Categorized by Interaction Variables

Interaction Variable	Item from End-of-Course Student Evaluation
Student-instructor interaction	1. Instruction was well organized.
	3. Method of assigning grades was clear.
	4. Instructor gave clear explanations.
	5. Instructor was receptive to questions.
	6. Instructor stimulated critical thinking.
	7. Instructor encouraged students to think independently.
	8. Instructor was available for assistance.
	9. Instructor provided timely feedback on my work.
	10. Instructor provided useful comments on my work.
	11. The instructor was an active participant in this class.
	14. Grades were posted to the gradebook in a timely manner.
	15. Instructor responded promptly to emails and other communications.
	16. Overall, the instructor was an effective teacher.
Student-content interaction	2. Content areas described in the course outline were covered.
Student-student interaction	12. Threaded discussions were useful.
	13. Chat sessions were useful.

Source: Student Course Evaluations, Office of Institutional Research and Assessment (2010).

About the Author

Dee L. Fabry
Ph.D., Assistant Professor
School of Education
National University
La Jolla, CA
dfabry@nu.edu
Major research interests: using assessment and evaluation to inform course and program improvement, and effective online teaching practices.

Use of Elluminate in Online Teaching of Statistics in the Health Sciences

Michael P. Myers and Patric M. Schiltz

Abstract
Distance learning at many universities is on the rise to meet the increasing demands of a changing student population that continues to choose online classes in greater numbers each year. The purpose of this study was to compare the effectiveness of teaching statistics in three different ways: onsite, online with live text chat, and online using Elluminate. Content assessments revealed that teaching online with Elluminate resulted in gains 16% above the other online class and 11.4% above the onsite class. Attitude assessments showed a similar finding, suggesting that students learn statistics better online with the right tools.

Keywords
Online teaching, student achievement, student attitudes, internet courses, Elluminate

Introduction

The number of students taking classes online has been on a steady increase over the last two decades. While the reasons for this transition vary throughout all levels of the educational spectrum (K–12, undergraduate and graduate levels), one thing is clear: Online education is here to stay, especially in higher education. Data are continually analyzed by the National Center for Education Statistics (2001, 2007, & 2011) and paint a clear picture of the trend. As early as the year 2000, more than half of all two- and four-year Title-IV–eligible institutions of higher education offered some type of online classes. By 2006, 66% of these institutions were offering classes online. This steady increase of online offerings has resulted in the fact that almost 30% of all university students now take at least one class online (The Sloan Consortium, 2010). This percentage is dramatic, given that only 16% of all university students took at least one class online in 2004. The trend is stronger for graduate students, as the same analysis revealed 9% of them took their entire program online, compared to 4% for undergraduates (National Center for Education Statistics, 2011).

The increase in the offering of online classes is being accelerated by the now widely accepted view that online learning is as effective as face-to-face learning. This view has been substantiated by analysis of hundreds of studies on distance education and is known as the "no significant difference phenomenon" (Russell, 2001).

Over the past decade, researchers continue to look at what the evidence tells us about teaching online versus traditional face-to-face teaching. As Swan (2003) states, "We know online learning is effective. What we need to know is what makes it good, and how can we make it better?" (p. 8). Research in online learning conducted since the year 2000 has made it clear that online education is not just equal to traditional face-to-face teaching; it is in many ways superior for the vast majority of learners. A meta-analysis of 50 studies by the U.S. Department of Education (2010) over the past 10 years compared online learning to traditional face-to-face teaching and revealed significant improvements in performance in online learners. The Department of Education found that the effects were higher when faculty collaboration was present, and increased effects were observed in older, adult learners. Gains were seen with all types of learning styles in students who took classes online. Clearly, the benefits of moving away from traditional teaching delivery methods are yielding more than just convenience for students

and financial benefits for budget-strapped schools. Online instruction is resulting in real academic gains.

Theoretical Framework

While the current research shows us that online learning can surpass the traditional classroom in terms of academic performance, it is not clear what exactly is driving the improvement in learning. The majority of online classes offer a wide variety of teaching tools, including notes, email, lectures, quizzes, assignments, discussion boards, and games. All these are asynchronous. While instructors can interact with their students using these tools, the recent advent of readily available and cost-effective virtual classroom products such as Elluminate now give instructors the ability to teach students remotely in real time.

These synchronous tools are being purchased and implemented by educational institutions around the world at an ever increasing rate (Clark, 2005). They create a familiar teaching environment for students: one with a virtual blackboard, real-time teacher voice and camera presence, hand raising, collaboration, and recording capability. The result is a near-seamless classroom experience that yields strong instructor presence with instant feedback that is organized and clear for students. This type of interaction has been found to translate into higher student satisfaction in online courses (Schubert-Irastorza & Fabry, 2011).

Formal research into the added effectiveness of synchronous online teaching tools such as Elluminate are not yet widely available. Most reports on these tools focus on student satisfaction and retention. Little data are available on the effects of using virtual classroom products on student performance and attitudes toward the subject matter and profession. There are reports that the use of Elluminate increases content gains in high school students taking physics online (Elluminate, 2009), but no evaluation of student perceptions was done on this group. And while the adoption of these tools escalates by universities, it is clear that they are often not used online because faculty need convincing that using these synchronous delivery tools enhances the online experience (Salmon, 2001).

The evaluation of innovative teaching tools such as Elluminate must involve looking at content gains (academic performance), as well as student perceptions. While content gains are easily measured with pre and post skill tests, student perceptions and attitudes are more difficult to access and quantify. They are often overlooked as an important indicator of student success (McCollum, 2006). Assessment of student perceptions in math and science courses has been demonstrated before (Voegel, Quashnock, & Heil, 2004) and has been used to evaluate innovative teaching practices in science courses (Myers & Gardner, 2004, Myers et al., 2007) using a constructivist assessment of student attitudes (Taylor & Fraser, 1991). This assessment was developed into what is known as the Student Assessment of their Learning Gains (SALG) instrument. It is an online survey instrument that provides information about the specific gains that students perceive they have made in any aspects of a course that instructors have identified as important to their learning. This instrument employs a Likert-type scale to quantify student perceptions of a course.

Description of the Study

This work was a quasi-experimental study that evaluated the pre-test/post-test content gains as well as a pre/post survey of student attitudes and perceptions in three different delivery modes (onsite, online with live text chat, and online using Elluminate) in a statistics class in the late fall of 2010. The onsite class met 10 times over a 4-week period for a total of nearly 50 hours of class time, which consisted primarily of the traditional lecture method of content delivery. The online classes met online once a week for two hours. One class used text over chat to meet with students online, and the other class used Elluminate software to meet with students online.

The course chosen was an introductory-level statistics course that is taught to all majors in the School of Health and Human Services (SHHS) at National University. The course has an annual enrollment of over 1,000 students each year and, in many cases, is the first course students encounter in the SHHS. The large enrollment of this course allowed three classes to run at the same time for simultaneous analysis of the three teaching methods.

Based on current research on the comparison of traditional teaching versus all variations of online teaching methods, it was hypothesized that the learning gains and changes in student attitudes would be the same for all groups (Russell, 2001). This study seeks to quantify the impact of using synchronous learning tools such as Elluminate on student attitudes and content gains.

Purpose of the Study

The goal of this study is to quantify the impact of using synchronous learning tools such as Elluminate on student attitudes and content gains. Results of this work should inform educators of the merits of teaching online and identify specific teaching methods that are most effective for teaching students online.

This study served three purposes:

1. To evaluate in an experimental way the students' learning gains of different teaching methods.
2. To evaluate in an experimental way the attitudes and perceptions of students subjected to different teaching methods.
3. To evaluate the effectiveness of using an advanced synchronous learning tool such as Elluminate in online teaching by comparing it to the more commonly used text-over-chat tool.

Methods

This work involved a quasi-experimental study with a comparison group pre-test/post-test design that looked at both content gain and changes in student attitudes and perceptions. The comparison group pre-test/post-test research design is the most common quasi-experimental design and substitutes statistical "controls" for the absence of a physical control of the experimental situation. Thus this design is the same as the classic controlled experimental design, except that the subjects are not randomly assigned to either the experimental or the control groups. Put more directly, participants do not all have the same chance of being in the control or the experimental groups. Despite its limitations, the quasi-experimental design has long been held as a valid

statistical approach, when properly set up and analyzed, to comparing non-randomized control and treatment groups (Kenny, 1975; Shadish, Cook, & Campbell, 2002).

In this study, three classes of the same course (with identical assignments, lecture notes, discussions, quizzes, and exams), taught by three different faculty members with similar backgrounds, were compared as to their method of delivery (onsite, online with live text chat, and online using Elluminate). The onsite class constituted the control group, as it represented the traditional teaching method. The online classes constituted the experimental or treatment groups.

The content-gains data were collected by the university's Learning Management System (LMS) with administration of a pre and post content test of basic statistical knowledge. These tests were administered and graded by the instructor for the onsite (control group) and deployed by the LMS for the online groups. All tests were "open book" and administered with the same time limit (one hour). The attitude assessments were collected via an online survey instrument. The survey was anonymous, to encourage honest responses, and therefore was considered an aggregate measure of self-reported gain. The survey site allows the researcher to know only that the student completed the survey. It does not allow the researcher to see how each student responded to each individual question about their attitudes and perceptions. Because the data collected involved normal educational practices (pre and post content testing, coupled with an anonymous survey), the research project was approved by the university's Institutional Review Board (IRB) before any data were collected.

Participant Characteristics

A total of 73 undergraduate students participated in the study. The majority were nursing majors, with the balance of students coming from public health and the health sciences. Their ages ranged from 26 to 39. The three classes of students were nearly evenly split: 26 were onsite, 25 were online with live text chat, and 22 were online using Elluminate. Most of the students were from the San Diego, California, area.

Instruments, Data Collection, and Analysis

Assessment of student learning was conducted with a pre and post content test. The pretest was administered at the first class meeting for the onsite class and by the third day of class for the online students. The test evaluated basic concepts covered in statistics and was matched to questions on the final exam. This was a course requirement, as students had to take the pretest to continue enrollment in the course. The post test was taken from the questions on the final exam that matched the pretest questions. The scores were then compared and expressed as a percentage change. The value of increase for each student score (to adjust for bias of starting values of content knowledge) was then analyzed for the three groups by a one-way analysis of variance (ANOVA) using SPSS software and Excel.

Assessment of student attitudes was achieved by having the students take an online survey of their opinions of the class. This was done at the beginning and end of the course. This again was a course requirement; and although the survey was anonymous, the survey website reported, based on the students' email addresses, that each student took the survey. Anonymity was assured by the fact that the survey site reports only that the student took the survey and does not link individual students to their responses once they have completed the instrument. The survey questions are shown in Table 1 and are answered using a 5-point Likert-type scale, where students choose the level of their agreement or disagreement with the statement.

Table 1. *Sample Content Assessment Questions*

Item #	***Presently I am…***
1	Enthusiastic about learning statistics.
2	Interested in discussing statistics with friends or family.
3	Frightened by statistics.
4	Interested in taking additional classes in statistics.
5	Really concerned that I will NOT understand this subject.
6	Taking statistics simply because my future plans require me to take it.
7	Confident that I can do well in statistics.
8	Looking forward to this statistics class with pain.
9	Thinking that a career as a statistician would NOT be for me.
10	Feeling that statistics is going to be one of my favorite subjects.
11	Thinking that statistics is too boring and dry for me.
12	Thinking that working a research job in statistics might be fun.

These opinion statements were designed using a constructivist assessment of student attitudes. This type of assessment has been used by educational researchers and validated for over 20 years (Falchikov & Boud, 1989). The SALG was developed as a measure of student learning gains (Taylor & Fraser, 1991). The SALG is best used as an aggregate, or group measure of self-reported gain. It cannot be used as a substitute for a direct measure like a content test because, although individual student responses are anonymous, students would most likely give an inflated estimate of their abilities if consequences such as grades were linked to their SALG ratings (Falchikov & Boud, 1989). To look at the overall opinion of the course using this test, the statements were assigned a value of between –2 and +2, depending on the positive or negative opinion in the statement; and the values were summed for each class. A further analysis of the converse results (strong disagreement with a positive statement or strong agreement with a negative statement) and expected results (strong agreement with a positive statement or strong disagreement with a negative statement) were also analyzed for how a course affects a student's opinions. This analysis has been done by others to look at innovative curriculum change in science courses (Voegel et al., 2004; Myers & Gardner, 2004; Myers et al., 2007).

Results and Discussion

Analysis of the pre and post content tests for statistical knowledge is shown in Figure 1. While all methods of teaching statistics resulted in content gains (students knew more about statistics after the class then before), the students who took the course online with the instructor who used Elluminate had the greatest overall content gain (49%). The onsite class had an overall content gain of 37.6%, and the online class that used text over chat had an overall content gain of 33%.

The paired individual changes in content scores for each class were analyzed as described in the methods section. The results were significant ($p < 0.05$) and thus support the alternative hypothesis that the type of delivery method in the teaching of statistics makes a difference in the content knowledge gained by students.

Figure 1. Percent gain in content knowledge of the three methods used to teach statistics.

The overall opinion scores of the survey of student attitudes are seen in Figure 2. The pre class opinions of statistics are quite negative for all the teaching methods studied. Students starting the class clearly did not like statistics. This result has been seen with chemistry students as well (Myers & Gardner, 2004; Myers et al., 2007). Students in the onsite class disliked statistics the least at the start, with a negative aggregate opinion score of –33. Students in the online classes disliked statistics more at the start, with a negative aggregate opinion score of –53 for the text-over-chat class and –57 for the Elluminate group.

Student opinions of the course after its completion became more positive in all the teaching methods studied, with the greatest change (54 points) seen in the online group using Elluminate. This was followed by a change of 39 for the onsite class and a change of 42 for the online class using text over chat. The onsite class ended with a positive attitude score toward the subject matter, even though it saw the least change in overall scores. The overall positive change in student opinions about statistics is a good sign for teaching. The students appeared to dislike statistics classes going in and to dislike them less after the classes were over. This was not seen in a similar study done with chemistry students, who appear to dislike chemistry going in and dislike it even more after taking the course (Myers & Gardner, 2004).

The opinion scores of the survey of student attitudes, analyzed by expected and converse responses, are summarized in Table 2. The percentage of students responding in the expected manner increases between the pre and post by 5.4%, 12.7%, and 19.6% for the onsite, the online text over chat, and the online with Elluminate groups, respectively. Note that the largest increase was seen in the online with Elluminate group.

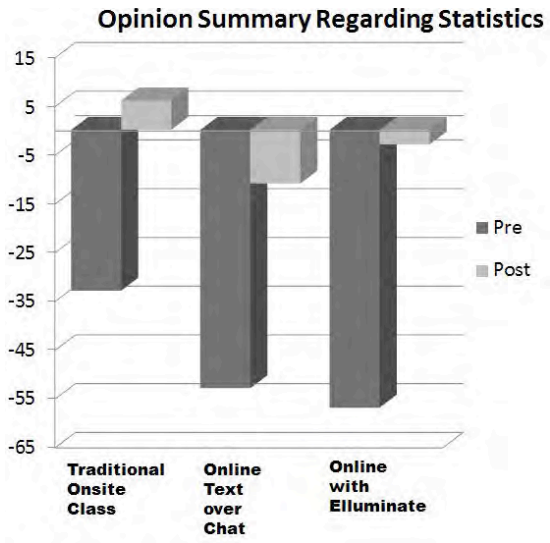

Figure 2. Change in student attitudes of the three methods used to teach statistics.

Table 2. *Student Attitude Results Analyzed by Percent of Expected and Converse Responses*

	Traditional Onsite Class		**Online Text Over Chat**		**Online with Elluminate**	
	Converse	***Expected***	***Converse***	***Expected***	***Converse***	***Expected***
Pre	41.7	19.5	40.0	17.5	38.4	25.8
Post	43.4	24.9	27.8	30.2	33.4	45.4
Change	1.7	5.4	–12.2	12.7	–5.0	19.6

The percentage of students responding in the converse manner actually increased by 1.7% for the onsite group, whereas the percentages decreased by 12.2% and 5% in the online text over chat and the online with Elluminate groups, respectively. Note that here the largest decrease was seen in the online text-over-chat group.

Summary of Findings

1. Content assessments reveal that teaching online with Elluminate resulted in statistically significant content gains 16% above the other online class and 11.4% above the onsite class.
2. Attitude assessments analyzed by overall opinion summations revealed that teaching online with Elluminate resulted in a total increase in general attitudes toward statistics that were 15% above the onsite class and 12% above the other online class.

3. Attitude assessments analyzed by expected results revealed that teaching online with Elluminate resulted in an increase in general positive attitudes toward statistics that were 14.2% above the onsite class and 12% above the other online class. (Converse results were reduced the most by the online class not using Elluminate, followed by teaching online with Elluminate.)

Conclusions and Recommendations for Future Research

The findings of this study are one of the first to document the effectiveness of using a synchronous teaching tool such as Elluminate to teach statistics online. While others have recently documented the effectiveness of using media tools to enhance the teaching of statistics online (DeVaney, 2009), this study quantifies the benefits of teaching online using Elluminate. Very few studies have looked at the effectiveness of using Elluminate to teach online. Gosmire, Morrison, and Van Osdel (2009) looked at student perception of using Elluminate in an education class and found a strong positive association similar to that of this study. This work goes a step further by documenting significant content gains using this synchronous online teaching tool.

This study and others make the case for more research into the benefits of teaching online with tools like Elluminate. As online instruction continues to grow, the need to document real benefits to students is critical. Faculty as well need convincing that investing their time in training with these tools is worthwhile (Salmon, 2001). Further research may reveal that the key is teacher persona online. The need to disseminate best practices with these online tools is crucial to continue to successfully reach and teach the "net" generation.

Educators need to follow the advice of Rossett (2011), who states that for too long the shift to e-learning has been driven by cost reduction. Now that shift must take place for substantive purposes. Educators must improve the learning process, distribute expertise to engage, and immerse students in the best learning environment possible.

Acknowledgements

This work was supported by the availability of professional faculty development funds to M. Myers that allowed for a work-in-progress presentation of findings at the *9th Annual Hawaii International Conference on Education* by the administration at National University. Our thanks for approval of these funds for this presentation, which garnered valuable feedback and support for the study, go to School of Health and Human Services Dean Michael Lacourse, Provost Eileen Heveron, and President Patricia Potter.

References

Clark, R. C. (2005). Harnessing the virtual classroom. *Business Training and Development, 59*(11), 40–45.

DeVaney, T. (2009). Impact of video tutorials in an online educational statistics course. *MERLOT Journal of Online Learning and Teaching, 5*(4). Retrieved from http://jolt.merlot.org/vol5no4/devaney_1209.htm

Elluminate (2009). The Impact of Synchronous Online Learning on Academic Institutions: Customer Experiences from K-12 and Higher Education. *Elluminate White Papers.* Retrieved from http://www.abac.edu/tips/online/Impact%20of%20Synchronous%20Online%20Learning%20in%20Academic%20Institutions.pdf

Falchikov, N., & Boud, D. (1989). Student self-assessment in higher education: A meta-analysis. *Review of Educational Research, 59*(4), 395–430.

Gosmire, D., Morrison, M., & Van Osdel, J. (2009). Perceptions of interactions in online courses. *MERLOT Journal of Online Learning and Teaching, 5*(4). Retrieved from http://jolt.merlot.org/vol5no4/gosmire_1209.htm

Kenny, D. (1975). A quasi-experimental approach to assessing treatment effects in the nonequivalent control group design. Psychological Bulletin, 82(3), 345–362.

McCollum, D. L. (2006, June 22). Student perceptions, beliefs, or attitudes. *The Free Library*. (2006). Retrieved from http://www.thefreelibrary.com/Student+perceptions%2c+beliefs%2c+or+attitudes.-a0149613296

Myers, M., Berryhill, S., Shankweiler, G., Vo, M., Zweier, L., Carey, T., & Nakayama, K. (2007). Increasing learning in organic chemistry using active/cooperative learning combined with actual observed student interaction [video]. *Proceedings of the 5th Annual Hawaii International Conference on Education.*

Myers, M., & Gardner, N. (2004). Inquiry based learning strategies for teaching chemistry: Chemistry education for pre-service elementary teachers. *Proceedings of the 2nd Annual Hawaii International Conference on Education.*

National Center for Education Statistics. (2001). *Distance education at degree-granting postsecondary institutions: 2000–2001.* Retrieved from http://nces.ed.gov/pubs2003/2003017.pdf

National Center for Education Statistics. (2007). *Distance education at degree-granting postsecondary institutions: 2006–2007.* Retrieved from http://nces.ed.gov/ pubsearch /pursinfo,asp?pubid=2009044

National Center for Education Statistics. (2011*). The condition of education 2011* (NCES 2011-033). Retrieved from http://nces.ed.gov/programs/coe/indicator_dhe.asp

Rossett, A. (2011, January). E-learning for the right reasons, please! *eLearn Magazine.* Retrieved from http://elearnmag.acm.org/featured.cfm?aid=1925057

Russell, T. (2001). The no significant difference phenomenon: A comparative research annotated bibliography on technology for distance education (5th ed.). Chicago: International Distance Education Certification Center.

Salmon, G. (2001, June). Masters or slaves to the technology? The role of the e-moderator in e-learning. *ELearn Magazine.* Retrieved from http://www.elearnmag.org/subpage.cfm?section=tutorials&article=1-1

Schubert-Irastorza, C., & Fabry, D. (2011). Improving Student Satisfaction with Online Faculty Performance. *Journal of Research in Innovative Teaching, 4*(1), 168–179.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston: Houghton Mifflin.

The Sloan Consortium. (2010). *Class differences: Online education in the United States, 2010.* Retrieved from http://sloanconsortium.org/publications/survey/index

Swan, K. (2003). Learning effectiveness: What the research tells us. In J. Bourne & J. C. Moore (Eds.), *Elements of quality online education: Practice and direction,* Vol. 4: Online Education (pp. 1–13). Needham, MA: The Sloan Consortium.

Taylor, P., & Fraser, B. (1991). Development of an instrument for assessing constructivist learning environments. *Annual meeting of the American Educational Research Association.*

Tremblay, R. (2006). Best practices and collaboration software in online teaching. International Review of Research in Open and Distance learning, 4(1), 1–5.

U.S. Department of Education. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Voegel, P. D., Quashnock, K. A., & Heil, K. M. (2004, May). The student-to-student chemistry initiative. *Journal of Chemical Education, 81,* 681.

About the Authors

Michael P. Myers
Ph.D., M.S.Ed., Associate Professor
Department of Health Sciences, School of Health and Human Services
National University
La Jolla, CA
mmyers@nu.edu
Major research interests: program assessment, e-learning, learning and memory, ion channel physiology

Patric M. Schiltz
Ph.D., Professor and Chair
Department of Health Sciences, School of Health and Human Services
National University
La Jolla, CA
pschiltz@nu.edu
Major research interests: program assessment, immunology

Effectiveness of Learning in Online Versus On-Campus Accounting Classes: A Comparative Analysis

Donald A. Schwartz

Abstract
Do students learn as effectively in an online accounting program as they do in a traditional on-campus classroom? This question is becoming increasingly relevant as more working adults opt for the flexibility of taking courses online. The study described in this article is based on data from 61 face-to-face sections and 70 online sections of accounting classes. Although the results show a lower level of achievement in the online sections, an analysis of the used four metrics provides clues to opportunities for making student learning in online accounting classes no less effective than in a traditional classroom environment.

Key Words
Face-to-face, on-campus, onsite, online, Web-based, synchronous, asynchronous

Introduction

National University is a private not-for-profit university that was founded in 1971 in San Diego, California. It has grown to be the second largest private not-for-profit university in the state. In recent years, its growth is attributed almost entirely to enrollment in online programs. The university's primary mission is to provide adult learners with affordable access to high quality undergraduate and graduate degree programs. The average age of the students is 32. Most are full-time students (12 semester hours) taking classes at night or online while working at full-time jobs during the day. Though standardized test scores such as SAT and GMAT are not used to screen for admission, students must maintain minimum GPAs of 2.0 for undergraduate and 3.0 for graduate courses. Of its 22,000 students, about 40% are in the San Diego County metropolitan area, and most of the remaining 60% are spread among more than a dozen campus locations throughout Northern and Southern California and Las Vegas, Nevada. A small percentage are out-of-state students taking courses online. Contact time in onsite classes ranges between 40 and 45 hours per course. Approximately 85% of the courses are taught by part-time faculty, most of whom are currently working in their profession. The part-time faculty are hired, mentored, and evaluated by full-time faculty who teach the other 15% of the courses.

In 1998, the university's College of Letters and Sciences and the School of Business and Management began to develop online versions of some of their programs, using Blackboard and later eCollege platforms. The business school's B.S. in Accountancy was one of the first of these programs. Unlike the university's other schools, the dean and faculty of the business school decided to include live chat sessions to supplement asynchronous threaded discussions. Until 2004, the chat sessions were limited to text messaging. In 2004, a voice-over IP (VoIP)-based system was adopted to enable voice interaction (students and the instructor use headsets with microphones) along with visual presentations using whiteboards, PowerPoint, spreadsheets, and the like. There are no significant demographic differences between students in online classes and their counterparts in onsite courses. (The term onsite is used rather than on-campus). On occasion, students will take some of their courses online and others onsite, but most students take all their courses in the same delivery mode.

Now, more than a decade after the start of online programs, all the business school's programs are offered online as well as onsite, and almost two-thirds of currently enrolled students are taking the online version of their course. The business school's policy is to include a minimum of 90 minutes of live chat sessions each week. Instructors of accounting courses are encouraged to offer two such sessions per week, and in many cases the sessions exceed two hours in length as students continue to pose questions or become engaged in discussion. To accommodate students who, because of work-related or personal commitments or because of time-zone differences, are unable to participate in the live discussions, the sessions are recorded and students are able to play the recording at their convenience. The recording also makes it possible for students to review portions of the lecture or discussion that they missed or found unclear at the time.

Though instructors have the freedom to use individualized teaching strategies, assignments, exams, and grading factors, all instructors of a given course are required to use a standardized syllabus, which includes a standard set of learning outcomes and specified textbook. The same learning outcomes and textbook are used in both the online and onsite classes of a given course.

The Literature

According to studies by the Sloan Consortium (Sloan-C) of institutions committed to high quality online education, nearly one in four students takes at least some courses online, up from one in ten in 2002. Two million students, most older than the traditional 18–22-year-old undergraduates, take all their courses online, and two million more take one or more courses online (Allen and Seaman, 2009).

In 2009, a report entitled *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* was prepared for the U.S. Department of Education (U.S. Department of Education, 2009). Four research questions were addressed:

1. How does the effectiveness of online learning compare to that of face-to-face instruction?
2. Does supplementing face-to-face instruction with online instruction enhance learning?
3. What practices are associated with more effective online learning?
4. What conditions influence the effectiveness of online learning?

The goal of the study was to provide policy-makers, administrators, and educators with research-based guidance about how to implement online learning for K–12 education and teacher preparation. However, of the 1,132 relevant articles found, there were sufficient data from only 46 studies to include 51 estimated *effect sizes* in the analysis. (*Effect size* is defined as the difference between the mean for the *treatment* or online group and the mean for the face-to-face or *control* group, divided by the pooled standard deviation.) Of the 51 estimated effect sizes, only seven involved K–12 learners. The types of learners in the remaining studies were split approximately evenly between college or community college students and graduate students or adults receiving professional training. The most common subjects among the latter were related to healthcare. Among the findings:

- On average, students who took all or part of their class online performed better than those who took the same course through traditional face-to-face instruction. [However, the authors point out that a number of factors other than the delivery mode might have contributed to this result.]

- Instruction combining online and face-to-face (blended) had a larger advantage relative to purely face-to-face instruction than did purely online instruction.
- Other than the amount of time spent by online learners, the variations in the way in which different studies implemented online learning did not affect student learning outcomes significantly.
- The effectiveness of online learning approaches appears quite broad across different content and learner types. [The tests for learner type and for subject matter as moderator variables were not significant.]

The study estimated the effect sizes for 51 face-to-face vs. online comparisons, of which 28 compared face-to-face with purely online conditions, and 23 compared face-to-face with a blend of face-to-face and online activity. For the purpose of this paper, only studies from the purely online group were considered. Studies that found purely online courses to be more effective than face-to-face were represented by positive effect sizes; those that found face-to-face courses to be more effective were represented by negative effect sizes. Though effect sizes ranged from a negative 0.796 to a positive 0.800, 22 of the 28 studies had positive effect sizes and the overall mean was a positive 0.14. Among the 28 studies, 24 involved fewer than 50 participants in each group.

With an effect size of 0.800, the study by Schoenfeld-Tacher, McConnell, and Graham (2001) involving a histology course at a 4-year university was the most positive in favor of online over face-to-face. In this course, 11 students enrolled in the online section of the course, and 33 enrolled in the onsite section. The results of a posttest were significantly different, with students in the online section outperforming their counterparts by an average of 7 percentage points. The online section also had a greater proportion of higher (per Bloom's Taxonomy) level of interactions (Schoenfeld-Tacher et al., 2001).

The Summers, Waigandt, and Whittaker (2005) study compared the achievement of 17 nursing students who elected to take the online section of a statistics course with 21 students who chose the face-to-face section. Achievement was measured by course grades. The same instructor taught both sections and the courses were equivalent in content and examinations. Interaction in the online section was in the form of asynchronous threaded discussions; there were no live chat sessions. The study found no significant difference in grades among the two groups and concluded that it is possible to teach a science course entirely online without any adverse effects on academic outcomes. However, students in the online course were "significantly less satisfied with the course than the traditional classroom students on several dimensions".

In the 2008 study by Beeckman, Schoonhoven, Boucque, VanMaele, and Defloor (effect size 0.187), 426 nursing students were randomly assigned to either a face-to-face or an e-learning program containing the same learning content. The nursing students achieved better results when using the e-learning program. It was concluded that while both methods are adequate to acquire the knowledge about the differences between moisture lesions and pressure ulcers, e-learning allows for repetition of the training, which the authors considered necessary for this type of training (Beeckman et al., 2008).

In 2005 and 2006, Benjamin et al. (2008) conducted a study (effect size 0.046) to determine if Web-based training is as effective as in-person training on improving basic nutrition and physical activity knowledge for promoting healthy weight in preschool children. The measure was performance on a 28-item multiple-choice test. The authors found no significant differences in post-training knowledge between in-person and Web training. Scores on the post-training knowledge test were within 0.5 percentage points for the in-person and Web trained groups,

demonstrating that Web-based instruction is as effective as in-person training (Benjamin et al., 2008).

The objective of a study by Campbell, Gibson, Hall, Richards, and Callery (2008) was to assess whether participation in face-to-face discussion seminars or online asynchronous discussion groups had different effects on educational attainment in a Web-based postgraduate research methods course. Results: Students choosing online discussions had a higher Core Methods assignment mark (mean 60.8/100) than students choosing face-to-face discussions (54.4); the difference was statistically significant ($t = 3.13$, $df = 102$, $p = 0.002$), although the authors acknowledged that these results ignore confounding variables. The authors concluded that a research methods course can be delivered to postgraduate healthcare students at least as successfully by an entirely online method as by a blended method in which students accessing Web-based teaching material attend face-to-face seminar discussions (Campbell et al., 2008).

Zhang (2005) hypothesized that given the same amount of learning time, students in an interactive multimedia-based learning environment can achieve higher test scores than those in a traditional classroom. His study involved two controlled experiments, one on the subject of relational algebra, and the other on Internet search engines. Individual learning performance was measured by the margin between posttest scores and pretest scores. In the first experiment, approximately 17 sophomore and junior students were randomly assigned to each of the e-learning and traditional groups. The second experiment had approximately 35 students in each group. The results of the two experiments showed that students in a "fully interactive" e-learning group as well as those in a "less interactive" group achieved significantly better performance and reported higher levels of satisfaction than those in the traditional classroom (Zhang, 2005).

The 2007 study by Cavus, Uzonboylu, and Ibrahim (0.466 effect size) was one of the few meta-analysis studies that tested for the effect of an online course enhanced by a synchronous collaborative tool. It involved 58 students studying the programming language Java. Students were each assigned, in approximately equal numbers, to one of three learning environments: a traditional face-to-face class, an online class with a standard collaborative learning tool, and an online class with an advanced collaborative tool. The results based on two different assessment measures indicated that students using a standard collaborative tool in conjunction with a Web-based learning system had approximately similar success rates as those using the traditional methods of learning, and a higher success rate when an advanced collaborative tool was used (Cavus, 2007).

Not among the studies included in the meta-analysis was the study by Aragon, Johnson, and Shaik (2002). Researchers assessed students enrolled in an online instructional design course and students in an equivalent face-to-face course to determine the students' preferences across the constructs of motivation maintenance, task engagement, and cognitive controls. While significant differences were found between the learning style preferences of the online students and those of the face-to-face students, these differences were not significant when success factors were controlled. The results of this study suggested that students can learn equally well in either delivery format, regardless of learning style, provided the course is developed around adult learning theory and sound instructional design guidelines (Aragon et al., 2002).

Though shown with a negative effect size of –0.106, the findings of the Schmeeckle (2003) study suggest a neutral position with respect to the comparative effectiveness of online versus classroom training. The purpose of the study was to evaluate both the effectiveness and the efficiencies of online training as compared to classroom training of Nebraska Jail Management trainees. Trainees were randomly assigned to receive either online or classroom training.

Learning, motivation, and attitudes were measured for instructional effectiveness, while instructional time and cost/benefit calculations were used as measures of efficiencies. Results indicated that online training is as effective an instructional method as classroom training, and more efficient than classroom training. No meaningful learning differences occurred between the two groups, but online training was completed in almost half the time of classroom instruction and at a lesser cost. However, the classroom group reported higher motivation and positive feelings concerning their instruction than did the online group. A second study experimentally examined learning, instructional time, motivation, and attitude advantages of multimedia included in the Jail Management online training courses. Although hypothesized that video would enhance learning, motivation, and attitude, there were no differences in University of Nebraska, Lincoln student participants' test scores or surveys scores, whether they received training with text only, audio with the text, or video with the text. Only instructional time differed among the groups (Schmeeckle, 2003).

Among the six studies with negative effect sizes was the Mentzer, Cryan, and Teclehaimanot (2007) study with an effect size of –0.281, in which a face-to-face section of an Early Childhood Education course with 18 traditional "right out of high school" students was compared with an equivalent number in an online section of the same course. The latter were randomly selected from a group of 36 students who had agreed to be assigned to either section. Both sections were taught in the same semester by the same instructor, who used the same assignments and exams in both. The online section included two 1-hour live chat sessions per week. (The article did not indicate whether the chat sessions were text-based or allowed for voice/visual interaction.) Indicators of student success included (a) midterm examination, (b) final examination, and (c) overall points earned for the semester, including points earned on assignments. Of the three, only the mean score for the overall course grade differed at a statistically significant level. Students in the face-to-face section averaged an A– letter grade, whereas those in the online section averaged a B. However, the author states that "a closer look at student records for the two sections revealed that students in the Web-based course did not earn lower grades on the assignments but merely failed to submit some of them, suggesting that learning outcomes were similar but that the personal contact of a face-to-face course positively influenced and motivated students to turn in assignments" (Mentzer, 2007, p. 243).

Theoretical Framework

The objective of this study was essentially the same as that of the studies contained in the meta-analysis: that is, to compare student learning in an online environment with learning in a traditional classroom environment. However, the meta-analysis studies were experimental in the sense that an online class was set up for the express purpose of comparing the achievement of its students with that of students taking the same course in a face-to-face classroom environment. Since the studies were pre-planned, controls could be employed, such as random selection of students for the onsite and online sections to ensure common demographics. But being a pre-arranged experiment, there is at least some chance that the researcher, albeit unconsciously, sets the stage in such a way as to influence a hoped-for outcome—for example, by making sure that the Web-based technology was thoroughly tested and the online instructors thoroughly trained to use it effectively. This study, on the other hand, uses the data from classes that were taught in the past, without awareness by students or teachers that student achievement data would later be

used in a comparative study. As a result, there could be no bias on the part of researchers, whether inadvertent or otherwise.

In addition to assessing the comparative effectiveness of online learning, this study had another, more purposeful objective: to pinpoint those areas in which the allocation of limited resources might have the greatest impact on the improvement of student learning in online accounting classes. To this end, the study's framework included a comparison of student ratings of their instructors: If the study were to show instructor ratings to be substantially lower in online classes, it would suggest that better training and mentoring of online instructors could have a substantial positive impact on student achievement. Another improvement-related aspect of the framework was the disaggregation of overall results into four major subject areas: financial accounting, tax accounting, cost/managerial accounting, and auditing. If the study were to show a substantially lower level of achievement in any of these individual subject areas, resources could be directed toward the improvement of online course content, pedagogy, and instructor effectiveness in those areas.

Methodology

The research question: *Is student learning in an online accounting program at a level equal to the learning that occurs in a traditional onsite classroom?* And the corollary: *If not, can online learning be brought up to the level of onsite learning, and if so, how?*
To respond to these questions, four metrics were used:

1. Student achievement of learning outcomes, as measured by internally generated standardized tests—the principal metric to measure learning.
2. Course grades, using class grade point averages.
3. Student self-assessment of their learning, as measured by student ratings on an end-of-course student evaluation form.
4. Student evaluation of instruction, also measured by ratings on an end-of-course student evaluation form—a principal metric for improving student learning in online courses.

Student Achievement of Learning Outcomes

As one direct method of assessing student achievement of program learning outcomes, since 2003 the business school has been administering standardized tests called the Standard Learning Outcome Achievement Test (SLOAT) for several (though not all) courses within each of its programs. The tests are prepared by department faculty and are sent to instructors a few weeks prior to the end of the course. Test scores from 19 onsite upper division accounting classes were compared with scores from an equivalent number of online classes during a 2-year period from July 2007 to June 2009. Tests in onsite accounting classes are generally closed book. By necessity, tests in online classes are open book, but there is a time limit that impedes students' ability to look up answers in the book; and, in fact, questions are designed to preclude the finding of answers in the textbook or lecture notes. Initially there was concern that since the instructors were given the exam questions in advance, they would be prone to teach to the exam and that the scores would not be representative of student achievement of the learning outcomes. However, since the questions generally call for critically thought-out application of concepts rather than memorized responses, teaching to the exam is not practicable. Also, the "C+" average exam

letter grades suggest that instructors do not focus on the same or similar questions, and that online students' access to textbooks and notes does not guarantee high scores.

Course Grades

Whereas SLOAT exams are administered for many but not all courses in the B.S. in Accountancy program, class mean GPA and course/instructor evaluation data are available for all sections of all National University courses. Letter grades with plus/minus intervals are converted to grade points on a traditional scale of 0 to 4, with an "A" providing 4.0 grade points, A– providing 3.7 grade points, and so on. As a way of countering a tendency toward grade inflation, the university has established class GPA targets of 2.75 for undergraduate courses and 3.25 for graduate courses.

Student Self-Assessment of Learning

Among the questions on the end-of-course evaluation survey is a group of seven questions that ask students to assess their learning experience on a 5-point Likert scale ranging from 1 = Strongly Disagree, to 5 = Strongly Agree. "NA" is used for questions not applicable to this course. Students are asked to rate the degree to which they improved their writing skills, oral communication skills, communication skills, research skills, and the like. Since significant improvement of all these skills would not be expected in every course, one general question was used rather than the mean of all seven questions. The general question considered applicable to all courses is "I gained significant knowledge about this subject."

Student Evaluation of Instruction

In addition to the questions relating to student self-assessment of their learning, the end-of-course evaluation survey contains a group of questions relating to teaching effectiveness. The resulting computer report for each class shows (a) the mean for each of the teaching-related questions, (b) the mean of those means (anathema for statisticians), and (c) the mean response to this general question: "Overall, the instructor was an effective teacher." At the time students complete the end-of-course survey, they cannot be certain what grade the instructor will award, but they are able to gauge the instructor's level of grading rigor from their scores on midterm exams, assignments, and other grading factors. Indeed, Feldman's (1976) review of prior studies cited evidence of a close correlation between actual and expected grades, and that in studies that used both, there was no substantial difference in results. Stumpf and Freedman (1979) found a similar close relationship between expected grades and actual grades.

Data Analysis and Discussion

Metric No. 1: Standard Learning Outcomes Assessment Test (SLOAT) Scores

The courses in which the SLOAT was administered included Financial Accounting (Intermediate), Federal Taxation, Cost/Managerial, and Auditing. The same Standard Learning Outcome Achievement Test for a given course was administered in both the onsite and online sections of the course. In the aggregate, 189 tests were administered in 19 onsite sections taught by nine different instructors. 372 tests were administered in an equal number of online classes taught by seven different instructors. As indicated by these numbers, the average size of the 19

onsite classes was 9.9 students, whereas the average size of online classes was 19.6 students. Since many of the students who took the Intermediate Accounting tests were the same students who took tests for the Tax, Cost/Managerial, and Auditing courses, the numbers 189 and 372 represent the number of tests administered, rather than the number of different students who took the tests. Since two to three onsite sequences and two online sequences of B.S. in Accountancy courses are offered each year, it is estimated that over the two-year period for which SLOAT scores were analyzed, the number of different students who took these tests was approximately one-quarter the number of tests administered.

SLOAT tests are graded on a scale of 0 to 4.0. As seen in Figure 1, the mean score achieved on the 189 tests in onsite classes was 2.93. The corresponding mean score for the 372 tests administered in online classes was 2.80, which was 4.4% lower than the onsite mean. As indicated in the SLOAT score row of Table 1, the null hypothesis of mean score equivalency is rejected, and as such, the online scores are considered significantly lower than the onsite scores.

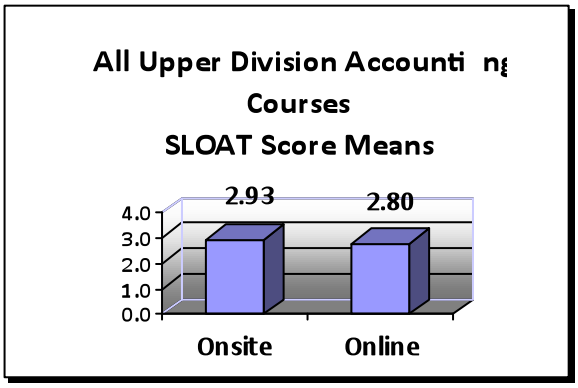

Figure 1. Aggregated mean SLOAT scores for all four subject areas of upper-division B.S. in Accountancy courses.

Table 1. t-*Test Results for Four Metrics Applied to the Aggregate of Major Subject Areas*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Signifi cant?	% Diff.
SLOAT score	0:4	189	372	2.93 / 0.04	2.80 / 0.03	2.3520	0.0191	Yes	4.4
Course grades (GPA)	0:4	61	70	3.00 / 0.05	2.86 / 0.04	2.3542	0.0203	Yes	4.7
Learning self-assessment	1:5	61	70	4.30 / 0.07	4.19 / 0.07	1.1503	0.2521	?	2.6
Teaching evaluations	1:5	61	70	4.40 / 0.06	4.01 / 0.08	3.9744	0.0001	Yes	8.9

Metric No. 2: Course Grades (GPA)

During the two-year period there were 61 onsite sections and 70 online sections of the twelve upper division accounting courses. The mean GPA for the 61 onsite classes was 3.00. The

corresponding mean GPA for the 70 online classes was 2.86, which was lower than the onsite mean by 4.7%. As indicated in the course grades (GPA) row of Table 1, the null hypothesis of mean score equivalency is rejected, and as such, the grades earned in online classes are considered significantly lower than the grades in onsite scores. It is interesting to note that the difference in GPA means is within 0.3 percentage points of the difference in SLOAT means, with almost identical *p* values resulting from the t-tests. While this might suggest that SLOAT scores, which make up a small percentage of a student's grade for the course, are highly correlated to course grades, the relationship is less clear when each of the major subject areas is viewed individually.

Metric No. 3: Self-Assessment of Learning

Data for the students' self-assessment of their learning were obtained from end-of-course surveys for the same classes as for class GPAs. Using a Likert scale of 1 to 5, the mean for onsite classes was 4.30. For online classes it was 4.19, less than 3% lower than for onsite classes. The high *p* value for this metric indicates insufficient evidence to reject the null hypothesis, leaving the reader to decide whether the approximately 3% difference is significant.

Metric No. 4: Teaching Evaluations

Student responses to end-of-course surveys from the same classes where their self-assessment of learning was done reflected their perception of their teacher's effectiveness. The mean for onsite classes was 4.40, and for online classes, 4.01, almost 9% lower. Here, the *t*-test clearly showed the difference to be statistically significant, and the percentage of difference was substantially greater than for the other measures. The relevance of this indicator is discussed in the Summary of Findings and Conclusion.

Disaggregation into Four Major Subject Areas

Since three of the four metrics indicated significantly lower results for the online classes, a disaggregation of the data was performed in order to determine if the overall results might be skewed by an extreme in one or more of the major subject areas, those areas being Financial Accounting (Intermediate and Advanced Accounting), Taxation (Individual and Business), Cost/Managerial Accounting, and Auditing.

Financial Accounting Courses

For the financial accounting courses (Intermediate Accounting), there were ten onsite classes with an average class size of just under 7 students, in which 69 SLOAT tests were administered by five different instructors; and nine online classes with an average class size of about 22 students, in which 194 SLOAT tests were administered by six different instructors. Financial accounting was the one category of courses in which student performance in online classes, as measured by SLOAT tests, was higher, if only by about 2%, than the performance of onsite students; see Figure 2. Since most of the students taking financial accounting courses are the same students as those taking classes in the other three subject areas, differentials in means cannot be attributed to differences in student populations among the four areas. Since *p* values exceeded 0.05 for all four metrics, as seen in Table 2, insufficient evidence exists to reject the

null hypothesis of mean equivalency, leaving it to the reader to judge the significance of the difference in means.

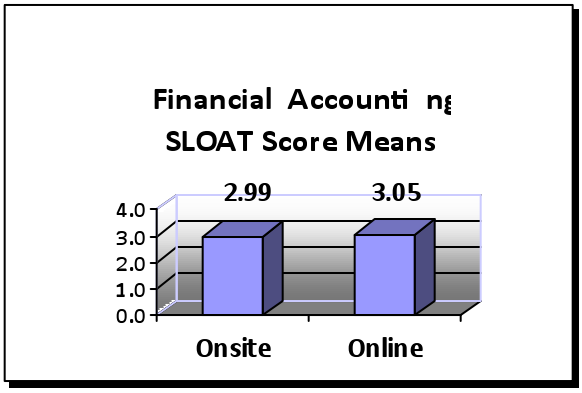

Figure 2. Mean SLOAT score for Financial Accounting courses.

Table 2. t-*Test Results for Four Metrics Applied to Financial Accounting Courses*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Signifi cant?	% Diff.
SLOAT score	0:4	69	194	2.99 / 0.07	3.05 / 0.04	–0.7696	0.4432	?	–2.1
Course grades (GPA)	0:4	22	27	2.82 / 0.08	2.75 / 0.06	0.7057	0.4845	?	2.4
Learning self-assessment	1:5	22	27	4.31 / 0.06	4.30 / 0.09	0.0594	0.9529	?	0.1
eaching evaluations	1:5	22	27	4.43 / 0.05	4.20 / 0.11	1.8927	0.0662	?	5.2

Income Tax Courses

SLOAT tests were administered to 20 students in three of the onsite tax classes taught by two different instructors, and to 75 students in five online classes taught by three different instructors. The average class sizes were 7 and 15, respectively. SLOAT scores were substantially lower in tax classes, both onsite and online, than for classes in the other three subject areas; See Figure 3. And with an online mean score more than 18% lower than the onsite mean score, the difference between the two was far greater than for the other three subject areas. (See Table 3.)

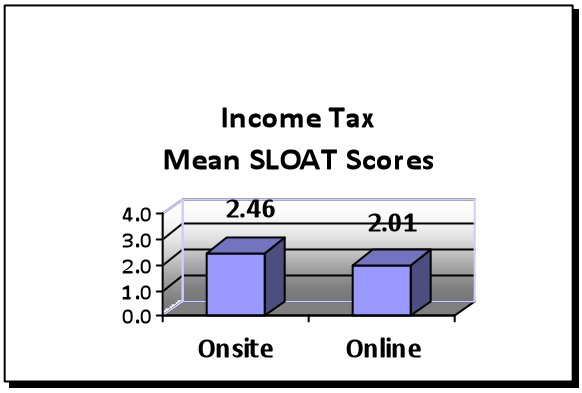

Figure 3. Mean SLOAT score for Income Tax courses.

Table 3. t-*Test Results for Four Metrics Applied to Income Tax Courses*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Signifi cant?	% Diff.
SLOAT score	0:4	20	75	2.46 / 0.16	2.01 / 0.07	2.5163	0.0184	Yes	18.3
Course grades (GPA)	0:4	10	11	3.25 / 0.12	2.78 / 0.08	3.2441	0.0051	Yes	14.4
Learning self-assessment	1:5	10	11	4.26 / 0.22	3.86 / 0.23	1.2771	0.2169	?	9.5
Teaching evaluations	1:5	10	11	4.32 / 0.23	3.56 / 0.20	2.4909	0.0114	Yes	17.5

Cost/Managerial Courses

SLOAT tests were administered to 45 students in five of the onsite cost/managerial classes taught by three different instructors, and to 54 students in two online classes taught by one instructor. The average class sizes were 9 and 27, respectively. The mean of the SLOAT scores for online students was approximately 3% lower than for onsite students (see Figure 4). Table 4 shows that, while mean GPAs were identical at 2.88, online students' self-assessment of their learning was higher by almost 9% than the corresponding assessment by onsite students in these cost/managerial classes. As with the financial accounting courses, *p* values exceeded 0.05 for all four metrics, suggesting insufficient evidence to reject the null hypothesis and leaving it to the reader to judge the significance of the difference in means.

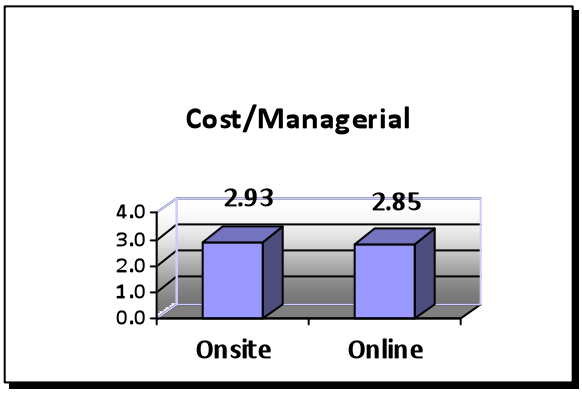

Figure 4. Mean SLOAT score for Cost/Managerial courses.

Table 4. t-*Test Results for Four Metrics Applied to Cost/Managerial Courses*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Signifi cant?	% Diff.
SLOAT score	0:4	45	54	2.93 / 0.10	2.85 / 0.07	0.6923	0.4907	?	2.8
Course grades (GPA)	0:4	11	8	2.88 / 0.14	2.88 / 0.05	0.0074	0.9942	?	0.0
Learning self-assessment	1:5	11	8	4.11 / 0.26	4.48 / 0.07	–1.3834	0.1940	?	–8.9
Teaching evaluations	1:5	11	8	4.46 / 0.14	4.43 / 0.05	0.1891	0.8532	?	0.6

Auditing Courses

SLOAT tests were administered to 55 students in four of the onsite auditing classes taught by three different instructors, and to 49 students in two online classes taught by two different instructors. The average class sizes were 13.9 and 24.5, respectively. As seen in Figure 5, the mean of the SLOAT scores of the online students was approximately 3% lower than the mean of the onsite students, very close to the overall percentage difference for all courses in the program, and close also to two of the other three major subject areas. As can be seen in Table 5, once again *p* values exceeded 0.05 for all four metrics, indicating insufficient evidence to reject the null hypothesis of mean equivalency.

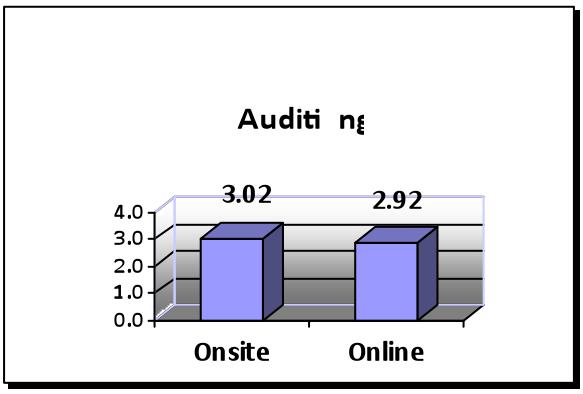

Figure 5. Mean SLOAT score for Auditing courses.

Table 5. t-*Test Results for Four Metrics Applied to Auditing Courses*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Signifi cant?	% Diff.
SLOAT score	0:4	55	49	3.02 / 0.06	2.92 / 0.07	1.0918	0.2775	?	3.2
Course grades (GPA)	0:4	7	9	3.12 / 0.05	2.98 / 0.12	1.0598	0.3202	?	4.3
Learning self-assessment	1:5	7	9	4.46 / 0.12	4.47 / 0.04	–0.1317	0.4489	?	–0.4
Teaching evaluations	1:5	7	9	4.46 / 0.11	4.34 / 0.08	0.8815	0.3940	?	2.6

Income Tax Courses: the Aberration

As noted within the preceding section on Income Tax Courses, and as illustrated in Figure 6, the difference in standard assessment test means between onsite and online was more than twice the average difference of the other three subject areas. But it is also important to note that the online scores for income tax courses were not the only ones that were well below those for the other three subject areas; scores in onsite classes were also well below those for the other areas, which suggests the need for a comprehensive review of course content, teaching strategies, and instructional quality of the onsite as well as the online tax classes.

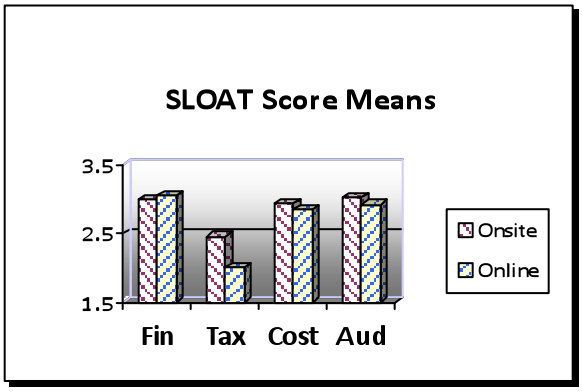

Figure 6. Mean SLOAT scores for each subject area.

All Courses Except Income Tax

Since the income tax courses showed a much greater difference between online and onsite student achievement than did the other three subject areas, an analysis was performed on aggregated data for all subject areas except the income tax courses, with results as seen in Figure 7 and Table 6. When income tax courses were excluded, aggregated mean scores on standard assessment tests for all other courses were almost identical at 2.98 for onsite and 2.99 for online classes. The one metric for which the online courses continued to show a statistically significant lower value was the student rating of instruction, i.e., teaching evaluations.

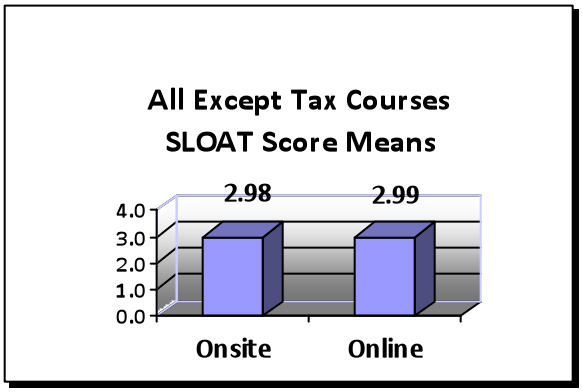

Figure 7. Mean SLOAT score for all courses except Income Tax.

Table 6. t-*Test Results for Four Metrics Applied to All Courses Except Income Tax*

	Scale	*n* Onsite	*n* Online	Mean / SE Onsite	Mean / SE Online	*t*-Stat	*p* Value	Significant?	% Diff.
SLOAT score	0:4	169	297	2.98 / 0.04	2.99 / 0.03	–0.1925	0.8475	?	–0.3
Course grades (GPA)	0:4	51	59	2.96 / 0.05	2.87 / 0.04	1.236	0.2196	?	2.7
Learning self-assessment	1:5	51	59	4.31 / 0.07	4.25 / 0.07	0.577	0.5652	?	1.3
Teaching evaluations	1:5	51	59	4.41 / 0.05	4.10 / 0.08	3.268	0.0015	Yes	7.1

Summary of Findings and Conclusion

Though there were inconsistencies among the four metrics, it is fair to conclude on the basis of student performance on standard assessment tests that the level of student learning in online accounting classes was significantly lower than the learning that occurred in traditional onsite classes. However, when the especially large difference in the income tax courses was excluded, the aggregate mean scores on the standard assessment tests for all other courses were virtually identical. This suggests that a comprehensive review of the course content and instructional design of the online tax courses, along with improved teaching strategies and teacher effectiveness, are likely to result in improved student learning in these courses.

A number of other factors could have contributed to an overall lower level of achievement in the online classes. For example, the average class size of the online classes was more than twice that of the onsite classes, suggesting that onsite students had more opportunity to interact and were more likely to get individual help from the instructor. Also, many students opt for online classes because they perceive (mistakenly) that online courses are less demanding of their time, which, for the working adults who comprise the majority of this university's student body, is in short supply. The almost 9% difference in student ratings of the instructor suggests that the instructors of online classes were considered by their students to be substantially less effective as teachers. This could be caused in part by online students' expecting, or at least desiring, the same lecturing and whiteboard solution-building as they have been accustomed to in a traditional classroom. However, this expectation appears to have diminished as students progressed through the program, since the differences in teaching evaluations were greater in the early financial accounting courses than for the auditing courses that came at the end of their program. It is likely that the factor that contributed more to the lower evaluations of the online instructors was (and is) the less-than-thorough training and monitoring of instructors on adjustments to teaching strategies and on ways to make effective use of the online functionality. Another likely factor is insufficient emphasis regarding online students' need for almost "24/7" interaction and responsiveness to their communications. Inadequate training and mentoring are correctable deficiencies, and to the extent that they contributed to the lower student achievement in online classes, an appropriate response to these instructor-related deficiencies is likely to have a significant positive impact on student learning in online accounting classes.

References

Allen, I., & Seaman, J. (2009). Learning on Demand: Online Education in the United States 2009. The Sloan Consortium. http://sloanconsortium.org/publications/survey/pdf/learningondemand.pdf

Aragon, S. R., Johnson, S. D., & Shaik, N. (2002). The influence of learning style preferences on student success in online versus face-to-face environments. *American Journal of Distance Education, 16*(4), 227–243.

Beeckman, D., Schoonhoven, L., Boucque, H., VanMaele, G., & Defloor, T. (2008). Pressure ulcers: E-learning to improve classification by nurses and nursing students. *Journal of Clinical Nursing, 17*(13), 1697–1707.

Benjamin, S. E., Tate, D. F., Bangdiwala, S. I., Neelon, B. H., Ammerman, A. S., Dodds, J. M., & Ward, D.S. (2008). Preparing child care health consultants to address childhood overweight: A randomized controlled trial comparing Web to in-person training. *Maternal and Child Health Journal, 12*(5), 662–669.

Campbell, M., Gibson, W., Hall, A., Richards, D., & Callery, P. (2008). Online vs. face-to-face discussion in a Web-based research methods course for postgraduate nursing students: A quasi-experimental study. *International Journal of Nursing Studies, 45*(5), 750–759.

Cavus, N., Uzonboylu, H., & Ibrahim, D. (2007). Assessing the success rate of students using a learning management system together with a collaborative tool in Web-based teaching of programming languages. *Journal of Educational Computing Research, 36*(3), 301–321.

Feldman, K. A. (1976). Grades and college students' evaluations of their courses and teachers. *Research in Higher Education, 4,* 69–111.

Mentzer, G. A., Cryan, J., & Teclehaimanot, B. (2007). A comparison of face-to-face and Web-based classrooms. *Journal of Technology and Teacher Education, 15*(2), 233–246.

Schmeeckle, J. M. (2003). Online training: An evaluation of the effectiveness and efficiency of training law enforcement personnel over the Internet. *Journal of Science Education and Technology, 12*(3), 205–260.

Schoenfeld-Tacher, R., McConnell, S., & Graham, M. (2001). Do no harm: A comparison of the effects of online vs. traditional delivery media on a science course. *Journal of Science Education and Technology, 10*(3), 257–265.

Stumpf, S.A. & Freedman, R.D. (1979) Expected grade covariation with student ratings of instruction: individual versus class effects. *Journal of Educational Psychology, 71,* 293–302.

Summers, J., Waigandt, A, & Whittaker, T. (2005). *A comparison of student achievement and satisfaction in an online versus a traditional face-to-face statistics class.* New York: Springer.

U.S. Department of Education, Office of Planning, Evaluation, and Policy Development. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Retrieved from www.ed.gov/about/offices/list/opepd/ppss/reports.html

Zhang, D. 2005. Interactive multimedia-based e-learning: A study of effectiveness. *American Journal of Distance Education 19*(3):149–62.

About the Author

Donald A. Schwartz
J.D., CPA, Professor of Accounting
School of Business and Management
National University
La Jolla, CA
dschwart@nu.edu

Major research interests: effectiveness of online learning, international accounting standards, U.S. GAAP for private companies

Connecting the Digital Dots with Social Media and Web 2.0 Technologies

Cynthia Sistek-Chandler

Abstract
The use of social media and social networks has fostered a spirit of collaboration, communication, and sharing. Web 2.0 technologies are embedded in our culture and in the curriculum. How does learning theory support and explain the practice of social networking and the development of the wide net of social media? This paper will explore key concepts of Web 2.0 technologies and apply learning theory to explain why this medium works in our contemporary society. The virtual community, applications of social learning theory, along with discussions of immediacy, recency, and connectivism, will be explored as a context for learning.

Key Words
Social media, social networking, social learning theory, Web 2.0

Introduction

In the twenty-first century, the use of social media and social networks (SN) has fostered a spirit of collaboration, communication, and sharing. This communication medium we call the Internet has sparked a resurgence of community and has inspired socialization, extending beyond barriers and connecting people in education and in business to a worldwide forum. It is through these social networks of Web 2.0 technologies that we are prompted to post a comment, a photo, or a video about our daily tasks. Whether engaged in connecting with friends, colleagues, professionals in organizations, or with a community of unknown individuals with similar likes and dislikes, communal websites such as Six Degrees, Friendster, LinkedIn, MySpace, and Facebook have changed the way the world interacts and connects.

Web 2.0 technologies, social media, and social networking are terms commonly used in public discourse. These terms are often used interchangeably to refer to the interconnectedness of cyber, online exchanges. While learning theory can be applied to computer-based instruction, social media generally is not grounded in social learning theory, connectivism, immediacy, recency, or other theoretical constructs. This paper examines possible theoretical applications to social media.

What is Social Media?

There are as many definitions for social media as there are interpretations of what social media is and how it functions on the Internet. Boyd and Ellison (2007) refer to social networking sites (SNS) as "web-based services that allow individuals to construct a public or semi-public profile within a bounded system" (p. 211). Wikipedia.org, a site that uses a Wiki-based technology for subject matter experts to collaboratively write and vet content, defines social media as "… primarily Internet and mobile-based tools for sharing and discussing information among human beings." In addition, the definition of social media also includes specific activities that help to integrate and share technology. Social media includes various forms of telecommunications and allows for the construction and sharing of words, pictures, videos, and audio. Most of the scholarly definitions of social media emphasize that the social network medium is highly interactive and that it is has "shared meaning" among online communities (Coe & Bunnell, 2003). Shirky (2003) defines social media as software that supports group interaction through a

variety of communication patterns. "The Internet supports lots of communication patterns, principally point-to-point and two-way, one-to-many outbound, and many-to-many two-way." (Shirky, 2003, n.p.). Much like the dynamics in an SNS, Wiley and Edwards (2002) refer to this online learning phenomenon as an example of self-organization; more specifically, to the online self-organizing social systems or (OSOSS). In a 2011 Slideshare presentation, Gruber refers to social media as, "digital media and technologies for social interaction, communication, and [for] the creation and exchange of user-generated content" (Slide 3). Interaction occurs in chat, both live via the synchronicity of real-time text on the SNS and asynchronous (Osman & Herring, 2007).

The practices of using social media and using Web 2.0 technologies "are at the core of education and training, as they promote the competencies needed for future jobs and enable new tools for educational institutions to transform themselves into places that support the competencies needed for participation in the 21st century" (Redecker, Ala-Mutka, Bacigalupo, Ferrari, & Punie, 2009, p. 14).

There is a long history of social media that is not restricted to the most popularized definition of digital media. Social media is not really new. While it has only recently become part of mainstream culture and the business world, people have been using digital media for networking, socializing, and information gathering for more than 40 years, with one of the earliest forms of social media being conversation via the telephone (Borders, 2009).

What Are Web 2.0 Tools?

Web 2.0 tools in general can be defined as tools that function almost completely through an online, Internet-based connection. With Web 2.0 tools, software and applications do not reside on the hard drive of a computer or device; rather, the main functionality of the tool resides on a server somewhere in cyberspace or in the cloud. Web 2.0 applications have the unique ability for the end user to publish, post, and share in an online environment. What these tools hold in common is that they are Web based and highly collaborative. The Web is no longer a read-only medium; the end user can now post, interact, and collaborate through the use of online tools. This modern Web is no longer passive; it is now highly active, interactive, and collaborative. In addition to being Web-based, Web 2.0 tools optimize the functionality of online collaborative learning theory (OCL). According to Harasim (2011), OCL is a new paradigm of collaboration, discourse, and knowledge building. This discourse has been studied by Scardamalia and Bereiter (2006) in their research on active learning.

> In education, most of the 20th century was occupied with the efforts to shift from a didactic approach focused on the transmission of knowledge and skills to what is popularly called active learning where the focus is [now] on students' interest-driven activities that are generative of knowledge and competence. (p.32)

In the 20th century, learning was based on behaviorist, cognitivist, and developmental constructivist theories of learning that emphasized learning as an individualistic pursuit (Harasim, 2011). From blogging to micro-blogging and immediate, synchronous discussion in instant chat mode, the tools that promote collaboration, discourse, and knowledge building continue to grow in numbers across the net. Text-based sharing through blogs, wikis and instant messaging is being replaced by other multimedia through the posting and sharing of photos, audio, and video, and even the posting of virtual avatars. We now know that email may be soon

become a thing of the past, and that the new communication medium is messaging through these social networks.

Social Networking Sites

Social networking sites (SNS) are extremely popular among all generations and age groups, although email is still the panacea for most users of the Internet. It is interesting to note that only email and search engines are used more frequently than social networking sites. According to the 2011 Pew Internet Report (Madden & Zickuhr, 2011) over 65% of online adults use social networking sites. Historically, social networking sites have been most popular with young adults ages 18 through 29. While the frequency of SNS use among younger adults has stabilized, surprisingly, there has been a dramatic increase in the use of SNS in older adults ages 30 through 64, and in groups 65 years and older. The use of SNS by older adults (age 65 and older) has grown 150% and, in some populations, almost 200%. This increase in the use of SNS by older populations may be due in part to the composition and design of these sites or the inherent need to make connections to a wider community. However, it is important to note that the act of socialization and community building in this participatory culture is not restricted by age.

The Online Community

Online social networking and community building is not a new phenomenon. Early virtual communities engaged in computer-mediated communication (CMC) and were evident as early as 1985. A community known as the WELL was an online database of users that began in the spring of 1985 in Sausalito, California. In its infancy, the WELL community grew to 3,000 users and members. Using a VAX computer and connected modems, this early community spawned a groundswell of a connected, online community. Rheingold (1993), an early adopter of the CMC technology and member of the WELL, named one of his first books The Virtual Community, in which he states the title might more accurately describes the virtual user as "people who use computers to communicate and to form friendships." Social interaction in an online environment has been deeply rooted in the spirit and spark of building community. Early communities of practice were engaged in social interaction to discuss common interests, ask questions, and learn from each other. In his reflection about CMC, Rheingold (1993) writes, "CMC is a way to meet people whether or not you feel a need to affiliate with them on a community level[,] it is a way of both making contact and maintaining a distance between each other" (p. 11).

In 1968, two research directors for the Department of Defense, Licklider and Taylor, predicted that the concept of online communities connected by computers would occur in the very near future. Licklider and Taylor (cited in Rheingold, 1993) wrote, "In most fields they will consist of geographically separated members, sometimes grouped in small clusters and sometimes working individually. They will be communities not of common location, but of common interest" (p. 10). As they predicted, modern day learning communities are not bound by geography; rather, they are tied to affinity, to an institution, a club, or uniquely individualized to build a connected community radiating from one sole user. Fast forwarding to the 21st century, we find the growth of these connected communities as unprecedented, spreading across age, gender, geography, and economics; there are no boundaries and no barriers to using social media tools. In August 2011, a blog site, Social Networking Watch, posted a report by Experian Simmons, stating, "98 percent of online 18 to 24 year-olds already use social media each month." A more astonishing fact is that the greatest growth sector of an online user is among

older Americans. Today, nearly 3 out of 4 seniors who are online use social media in a typical month, as do 82% of those adults ages 55 to 64.

The Virtual Community

"Virtual community is a term commonly used to describe various forms of computer-mediated communication, particularly long-term, textually mediated conversations among large groups" (Igbaria, 1999, p. 64). A virtual group of people may or may not meet one another face to face. The community exchanges words and ideas through the mediation of computer networks, which are now commonly referred to as Web 2.0 sites, or through the use of instant messaging. Are these modern virtual communities connected by affinity? One out of every six minutes spent online is spent on a social networking site, and one half of the total U.S. Internet audience visits a social networking site in any given day. Rheingold, as an early pioneer in this field, cautioned that forming virtual communities should not mistake the tool of engagement in a computer mediated communication environment (CMC); simply writing words on a screen is not the same thing as developing a real, virtual community.

Professional Learning Communities and Knowledge Communities

Professional Learning Communities (PLCs) have been studied extensively over the last decade. DuFour (2004) provides us guidance on how to form a PLC: "To create a professional learning community, focus on learning rather than [on] teaching, work collaboratively, and hold yourself accountable for results" (p. 6). Given this definition, one can postulate that learning communities and communities of practice may be created in an online environment and in the SNS, as long as collaboration takes place.

At the end of the 20th century, computer-mediated learning communities were studied and analyzed to determine the affect of conversation through computer-generated text on the Internet. One such analysis is the community of inquiry (CoI) framework (Garrison, Anderson, & Archer, 2000), which analyzes the interactions among and between online learners. In this model, CoI describes three elements essential to an educational transaction in the CMC: cognitive presence, social presence, and teaching presence. Through sustained communication, the community of inquiry is able to construct meaning. Cognitive presence, the first element in the model, "is a vital element in critical thinking, a process and outcome that is frequently presented as the ostensible goal of all higher education" (Garrison, Anderson, & Archer, 2000, p. 89).

The second core element, social presence, is highly applicable to the social learning network as it is today. Social presence is defined as "the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people'" (Garrison, Anderson, & Archer, 2000, p. 89). The researchers add that the social process and interactions of the group or cohort are enjoyable and fulfilling, in addition to being educational.

The third element of the model is teaching presence. How the teacher interacts with the students in both written and verbal formats is critical to student success in an educational setting. These three elements work together to create the dynamic of the learning community. The combination of the elements further supports the concept of social learning theory and the concept of building social presence.

Social Presence Learning Theory

While myriad reasons exist as to why communication through social media is popular in today's culture, two learning theories support the use of social media. One of these is social learning theory and another is the engagement of a learner through building a "social presence." Social learning theorists Bandura (1969, 1989) and Vygotsky (1978) have shown us that learning and development are social and highly collaborative activities. While neither of these theorists have personally engaged in a computer-mediated virtual community, it can be posited that they would find the reason learners explore this social medium to be primarily for the purpose of developing personal and social interactions. Social learning theory can also be applied to governance strategies, i.e., the ecology of how meaning and structure are negotiated in these communities (Paquet, 1999).

Downes (2006), in his studies of connectivism, offers discussion on e-learning technologies and on learning theory:

> Learning… occurs in communities, where the practice of learning is the participation in the community. A learning activity is, in essence, a conversation undertaken between the learner and other members of the community. This conversation, in the Web 2.0 era, consists not only of words, but of images, video, multimedia and more. This conversation forms a rich tapestry of resources, dynamic and interconnected, created not only by experts but by all members of the community, including learners. (Downes, 2006, ¶ "A Network Pedagogy").

Social presence can also explain why it is critical for the end-user or online learner to be compelled to navigate through a social media site. Social presence is defined as the ability for learners to project themselves socially and affectively into a community of inquiry (Rourke, Anderson, Garrison, & Archer, 1999). Communities of practice and learning communities have long been popularized in K–12 education, i.e., a learning community meets in a face-to-face environment to engage in conversation, to plan, and to solve problems. These activities have traditionally been conducted in a brick-and-mortar environment. While blogs, wikis, podcasts, and social bookmarking are receiving much attention, the real point of interest lies not in the tools themselves, but rather in what the growth of the tools represents, and what the tools enable. Primary affordances include (a) two-way flow and (b) activities reflective of the networked activities of individuals.

Connectivism

Siemens (2005) states that connectivism is "the integration of principles explored by chaos, network, and complexity and self-organization theories" (p. 4). Siemens defines the principles of connectivism in the context of learning. Learning may in fact reside in non-human appliances, within organizations, or in databases. Much like the connections made in a concept map, brainstorm, or in a thinking map, "learning is a process of connecting specialized nodes of information" (Siemens, p. 4).

In an Internet paper on Learning Networks and Knowledge, Downes (2006) shares thoughts about e-technologies:

> The theory of connectivism, asserts that knowledge—and therefore the learning of knowledge—is distributive, that is, not located in any given place (and therefore not "transferred" or "transacted" per se) but rather consists of the network of connections formed from

> experience and interactions with a knowing community… [albeit] the net generation, who is thinking and interacting in new ways. These trends combine to form what is sometimes called "e-learning 2.0" [also Web 2.0]—an approach to learning that is based on conversation and interaction, on sharing, creation, and participation, on learning not as a separate activity, but rather, as embedded in meaningful activities such as games or workflows. (p. 1, ¶1)

Downes also states that interactivity, or connectedness, could be derived from the knowledge being produced, as a product of an interaction between the members, or possibly the aggregation of the members and their perspectives (Downes, 2006). Connective knowledge therefore requires an interaction.

Interactive Learning Theory

Although social networking sites have not traditionally been used as tools for learning (although this is rapidly changing), interactive learning theory may be applied as a tool for analysis of content or posts on the SNS. The term interactive learning is described as the "decisive measure of engagement in an online or in an on-ground class" (Sistek-Chandler, Amber, & Tolbert 2010, p. 1). In the context of online learning, interactive learning is the dynamic relationship between teacher and students, between students and resources, and among students. Steinaker and Leavitt (2008) designed the Interactive Learning Taxonomy (ILT) as one of 17 taxonomies educators could employ while engaged in the act of teaching and learning. Interactive learning helps to describe the role and function of computer enhanced learning, as well as the level of interactivity for the teacher and learner. "Computer based instruction provides greater potential for truly interactive instruction than any mediated teaching device… excluding the human tutor (Jonassen, 1988, p. 97). To frame how digital content becomes "interactive," the ILT and its inquiry needs to include many of the contemporary digital construction tools such as blogs, wikis, learning and content management systems, and other Web 2.0 tools that allow for the easy construction of digital, multimedia-enhanced instruction. Hart (2010), an early advocate of social media, shares that the future of e-learning for education and for business is in social media. Companies that license learning management systems (LMS) have begun to integrate social learning elements such as profiles and presence to show who is online, have included synchronous chatting, and incorporated elements of wikis and blogs to support more interaction, the construction of knowledge, and more collaboration.

Two Additional Supporting Theories: Immediacy and Recency

Immediacy. The construct of immediacy was first introduced by Mehrabian (1969), who used the term to refer to communication behaviors, which he believed enhanced closeness and sometimes enhanced non-verbal behaviors. Later this was called the "immediacy principle," in which Mehrabian (1971) stated, "people are drawn toward persons and things they like and evaluate highly and prefer" (p. 1). Although this analysis of immediacy has been applied to online teaching and to Web-based courses (Lane, 2011), Sistek-Chandler et al. (2009), as the present author posits immediacy can also be applied to explain the construct used in many social media sites. Users of social media make affinity gestures to connect and post with others by "like" or "dislike" responses. LaRose and Whitten (2000), in their research, applied a construct of interaction and instructional immediacy for three Web-based courses. Immediacy was

identified as teacher to student, interactions between students, and computer immediacy. In their study they determined three possible sources of immediacy in the virtual classrooms of the Web:

> These sources [of immediacy] may create feelings of closeness: 1) the interactions between teacher and students (teacher immediacy), 2) interactions between students (student immediacy), and 3) interactions with the computer system that delivers the course (computer immediacy). Collectively, these sources constitute instructional immediacy. In each case, learning is motivated either through social incentives (e.g., approval for good behavior, expressions of interest in the student) or status incentives that recognize or enhance the status of the learner. (LaRose & Whitten, 2000, p. 336)

Based on LaRose and Whitten's three loci of interpersonal interactions, the interactions among the participants at a social media site may similarly create an atmosphere for gaining social reward from personal posts, from conversations with those who post, and by posting and messaging on the sites of others.

Recency. The exponential growth of social media sites such as Facebook, Twitter, LinkedIn, and others are grounded by market-driven needs. These sites are designed to optimize sales while also allowing their user base to socialize and connect. Using the Google technology and keyword search strategies, Facebook is driven by advertisements that are based on likes and recommendations through the posts of people on the site page. Today, much of the popular literature on social media makes a direct connection to marketing techniques used by these social media sites. Two marketing terms referred to in the literature are the concept of immediacy and "recency." The theory or practice of "recency" is a term derived from advertising that gives credence to how current and up-to-date posts and information are on the social media site. A recent addition to Facebook includes a running list of who said what as a stream of recent posts and conversations. Members of the digital generation, Gen Y, tend to rely on their network of friends and the recommendations, likes, and dislikes of their friends on social media sites, not on traditional ads (Perez, 2008). Palczynski, a retail analyst for Ladenburg Thalmann & Company, noted in a 2011 comment to Perez's blog post, that traditional print-based or online ads that "push a slogan, an image, and or elicit a feeling are not typically appealing to the younger consumer." Instead, Palczynski says that Gen Y'ers respond to "humor, irony, and the unvarnished truth." Facebook provides several new "Page Insights" by tracking metrics to marketers to help them gauge their reach on the social network (Constine, 2010). Along with total friends of fans and total weekly reach, "People Talking About This" shows the total number of stories published by Facebook users that mention a brand, including wall posts, comments, shares, and more. Why this works as marketing medium is that the average Internet user views more than 2,000 display ads on social networking sites each month (Social Networking Watch, 2011).

Social Media in Education

Social media is becoming an integral part of culture and education. However, some critics do not see the benefit of using social media in education. Still, Maranto and Barton (2010), in their study, concur that despite the politics, MySpace and Facebook offer much promise in the writing classroom. A recent case study conducted by Stansbury (2011), a writer for eSchool News, queried thousands of educators throughout the U.S. and asked them to provide examples of how they were using social media in an educational setting. The study was conducted in response to

concerns from the educational community about social networking being used to bully and to compromise teacher-student relationships. Respondents shared real-world examples for using social media in mathematics, using Twitter for lesson closure, and accessing blogs for professional growth and development; and they described shared messages from teachers, administrators, and students who are practicing sound strategies for engaging in social media, some by maximizing mobile devices in the classroom. Following, in no particular order, are 10 categories of responses relating to the use of social media in schools (Stansbury, 2011, adapted by the present author):

1. Integrating real-world applications into teaching
2. Networking with colleagues
3. Collaborative learning
4. Cross-cultural communication and language learning
5. Assessments, polls, and surveys
6. Distance learning
7. Parent communication
8. Course assignments, messages, announcements to students and parents
9. Community outreach
10. Personal and professional development

Conclusion and Future Inquiry

Social networking and the use of social media tools are beginning to change educational culture and practices. Evidence shows that engagement with social media is affecting the ways learners find, create, and share knowledge. It is through rich media opportunities that educators are engaging in social networks to collaborate, communicate, and construct new knowledge. Consequently, the application of learning theory helps to ground the evidence in support of the practice of social media and the engagement of community. Further inquiry is needed to determine if engagement in social networks leads to deep learning in the educational context.

References

Bandura, A. (1969). Social-learning theory of identificatory processes. In D. A. Goslin (Ed.), *Handbook of Socialization Theory and Research* (pp. 218–219). Retrieved from http://scholar.google.ca/scholar?cluster=11423662287548307080&hl=en&as_sdt=2005&sciodt=0,5

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44*(9), 1175–1184. doi: 10.1037/0003-066X.44.9.1175

Borders, B. (2009, June). A brief history of social media [Web log post]. Retrieved from http://copybrighter.com/history-of-social-media

Boyd, D., & Ellison, N. (2007). Social network sites: definition, history and scholarship, *Journal of Computer Mediated Communication, 13*(1), article 11. http://jcmc.indiana.edu/vol13/issue1/boyd.ellison.html

Coe, N. M., & Bunnell, T. G. (2003). "Spatializing" knowledge communities: Towards a conceptualization of transnational innovation networks. *Global Networks, 3,* 437–456. doi: 10.1111/1471-0374.00071

Constine, J. (2010, February). Facebook lets brands measure earned media with "People Talking About This" page metric. *Inside Facebook* [Web log post]. Retrieved from http://www.insidefacebook.com/2011/02/10/page-redesign-2011-guide/

Downes, S. (2006). Learning networks and connective knowledge. Paper presentation. Retrieved from http://it .coe.uga.edu/ itforum/paper92/paper92.html

DuFour, R., (2004, May). Schools as learning communities. *Educational Leadership, 61*(8), 6–11.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105.

Gruber, M. R. (2011). *How to use social software and web2.0 tools for teaching, and learning.* [PowerPoint slides]. Retrieved from http://www.eduhub.ch/events/webinars/11sept29-socialmedia/index.html.

Harasim, L. (2011). *Learning theory and online technologies.* New York and London: Routledge, Taylor & Francis Group.

Hart, J. (2010). The future of the learning management system. *The Centre for Learning and Performance Technologies.* Retrieved from http://janeknight.typepad.com/socialmedia/2010/05/what-is-the-future-of-the-lms.html

Igbaria, M. (1999, December). The virtual driving forces in the virtual society. *Communication of Association of Computer Machinery (ACM),* 42(12).

Jonassen, D.H. (1988). Integrating learning strategies into courseware to facilitate learning. In D.H. Jonassen (Ed.), *Instructional designs for microcomputer courseware* (pp. 151-182). Hillsdale, NJ: Lawrence Erlbaum.

Lane, C. A. (2011). Social presence impacting cognitive learning of adults in distanced education (DE). Dissertation Research, Athabasca University, CA. Retrieved from http://hdl.handle.net/10791/10

LaRose, R., & Whitten, P. (2000). Re-thinking instructional immediacy for Web courses: A social cognitive exploration. *Communication Education, 49,* 320–338.

Madden, M., & Zickuhr, K. (2011, August). Social networking sites. *Pew Internet & American Life Project.* Retrieved from http://pewinternet.org/Reports/2011/Social-Networking-Sites.aspx

Maranto, G., & Barton, M. (2010). Paradox and promise: MySpace, Facebook, and the sociopolitics of social networking in the writing classroom. *Computers and Composition, 27*(1), 36–47. Retrieved from http://www .sciencedirect.com/science/article/pii/S8755461509000838

Mehrabian, A. (1969). Some referents and measures of nonverbal behavior. *Behavioral Research Methods and Instrumentation, 1,* 213–217.

Mehrabian, A. (1971). *Silent messages.* Belmont, CA: Wadsworth.

Osman, G., & Herring, S. C. (2007). Interaction, facilitation, and deep learning in cross-cultural chat: A case study. *E-Journal of Internet and Higher Education, 10*(2), 125–141. doi: 10.1016/j.iheduc.2007.03.004

Palczynski, J. R. (2008, May 15). Re: Why Gen Y is going to change the Web. *ReadWriteWeb* [Web log comment]. Retrieved from http://www.readwriteweb.com/archives/why_gen_y_is_going_to_change_the_web.php

Paquet, G. (1999). *Governance through social learning.* [Ebrary Reader]. Retrieved from http://0-site.ebrary.com .aupac.lib.athabascau.ca/lib/athabasca/docDetail.action?docID=10132477

Perez, S. (2008, May 15). Why Gen Y is going to change the Web. *ReadWriteWeb* [Web log post]. Retrieved from http://www.readwriteweb.com/archives/why_gen_y_is_going_to_change_the_web.php

Redecker, C., Ala-Mutka, K., Bacigalupo, M., Ferrari, A., & Punie, Y. (2009, December). Learning 2.0: the impact of Web 2.0 innovations on education and training in Europe, *JRC Scientific and Technical Reports.* EUR number 24103 EN

Rheingold, H. (1993). *The virtual community: Homesteading on the electronic frontier.* [Electronic version] Retrieved from http://www.rheingold.com/vc/book/

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (1999). Assessing social presence in asynchronous text-based computer conferencing. *E-Journal of Distance Education, 14*(2), 50–71. Retrieved from http://www .jofde.ca/index.php/jde/article/view/153

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 97–118). New York: Cambridge University Press.

Shirky, C. (2003, April). A group is its own worst enemy. Speech at ETech. Published July 1, 2003, as *Networks, economics, and culture.* Retrieved from http://www.shirky.com/writings/group_enemy.html

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1). Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm

Sistek-Chandler, C., Amber, V. & Tolbert, D. (2009). Interactive Learning: Taxonomy for Application and Analysis in Online Environments. Retrieved from http://www.iste.org/Content/NavigationMenu/Research/NECC _Research_Paper_Archives/NECC2009/SistekChandler_NECC09.pdf

Social Networking Watch. (2011, August). 91% of online adults access social media in a typical month. Retrieved from http://www.socialnetworkingwatch.com/2011/10/91-of-online-adults-access-social-media-in-a-typical-month .html

Stansbury, M. (2011, October 21). Ten ways schools are using social media effectively. *eSchool News.* Retrieved from http://www.eschoolnews.com/2011/10/21/ten-ways-schools-are-using-social-media-effectively/3/?

Steinaker, N., & Leavitt, L. (2008). *Interactive learning: The art and science of teaching.* Dubuque, IA: Kendall Hunt.

Vygotsky, L. (1978). Mind in society: *The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wiley, D. A., & Edwards, E. K. (2002). Online self-organizing social systems: The decentralized future of online learning. *Quarterly Review of Distance Education, 31,* 33-46. Retrieved from http://www.oercommons.org /community/online-self-organizing-social-systems-the-decentralized-future-of-online-learning

About the Author

Cynthia Sistek-Chandler
Ed.D, Assistant Professor
Program Lead, Educational Technology
School of Education
National University
La Jolla, CA
cchandler@nu.edu
Major research interests: interactive and mobile technologies, interactive learning theory, educational and instructional technology, technology integration pre-K through college

Educational Technology Applications

A Structural Analysis of Agile Problem Driven Teaching

Pradip Peter Dey, Gordon W. Romney, Mohammad Amin, Bhaskar Raj Sinha,
Ronald F. Gonzales, and S. R. Subramanya

Abstract
Agile problem driven teaching (APDT) has dynamically changing features involving a wide range of interpretations that facilitate flexible and effective teaching methods adaptable to many environments. The central thesis is that major teaching activities are driven by a set of problems with agility for adaptation in a wide variety of teaching environments. Typical problem solutions are demonstrated by the instructor within the scope of the course learning outcomes. Problems could be based on realistic or abstract situations. This paper exhibits how APDT activities are easily included in course contents and correctly mapped to course learning outcomes. APDT is not the same as problem-based learning (PBL). A comparison of APDT and PBL reveals vital distinguishing features with pedagogically important consequences. PBL is highly popular in certain environments, but identification of its specific shortcomings in recent research motivated the search for a viable alternative as addressed in this paper.

Key Words
Direct instruction, problem-based learning, scaffolding

Introduction

Crouch (2011) states in a *Reader's Digest* article that "research universities are no place for undergraduates. Professors at big research universities are often more interested in doing research with graduate students than teaching your child. ... So, they tend to host huge lectures and then foist undergrads off on teaching assistants who may or may not be supervised." (p. 180). Additionally, other concerns about the quality and effectiveness of teaching in the U.S. are also registered. The U.S. is losing its leadership in science, technology, engineering, and math (STEM) education, according to a 2007 report, "Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future" (Committee on Prospering et al., 2007). Wallis (2008) concludes that "Recent test results show that US 10th-graders ranked just 17th in science among peers from 30 nations, while in math they placed in the bottom five" (p. 28). There is enough evidence that this educational trend is temporally coupled with a closely followed severe economic downturn. Undoubtedly, continuation of this trend is a danger to U.S. economic growth, security, standard of living, future technological development, and world leadership.

We live in a rapidly altering world, with a global job market, global educational competition, escalating energy problems, mounting trade imbalances, a globally integrated economy, and an unprecedented financial crisis. In order to compete in the global job market, the present student generation must acquire skills for solving current exigent problems via creatively advanced educational environments. The development of problem solving skills has provided critical advantage to individuals, humans, families and nations. Great nations are built by great problem solvers, and education is the most important system for developing and enhancing problem solving skills. Well-educated engineers, technologists and scientists are in demand due to global competition. In order to build a vigorous economy with sustainable growth, creative educated problem solvers are needed in the U.S. Unfortunately, colleges and universities are not succeeding in producing innovative problem solvers. Several recent strategies show increased improvement in student learning in specific environments (Borman, 2005). However, nationwide enhancements have not been realized despite these isolated successful cases. A new innovative

approach with a distinctive combination of agile teaching, problem solving, and direct instruction may initiate more immediate, rapid change to pedagogical processes.

Agile problem driven teaching (APDT) is closely related to problem-based learning (PBL). Barrows (1985) is given credit for the classic model of PBL, which has two key features: "a rich problem is used that affords free inquiry by students, and learning is student-centered" (Hmelo & Evensen, 2000, p. 2). PBL is the educational process by which problem solving activities and instructor's guidance facilitate learning. PBL is the pathway by which students "learn how to learn." It challenges students to think critically, analyze problems, be proactive, and discover and use pertinent learning resources (Barell, 2006; Duch, 2011; Savin-Baden, 2003). APDT is similar to PBL; however, it combines problem-based free inquiry with direct instruction (Gersten & Carnine, 1986) in order to achieve the course learning outcomes. Support mechanisms of scaffolding and metacognitive strategies (Holton & Clark, 2006) are also added to APDT in order to gain additional benefits for the learners. The remainder of the present paper offers important aspects of APDT, including a definition of APDT followed by a narrative account relating APDT to other popular methods such as PBL and scaffolding, a structural analysis of APDT, and an example application followed by concluding remarks. We emphasize a logical interpretation to the dynamic behavior of APDT that highlights the role agility plays in APDT by altering pre-planned activities and dynamically adjusting instructional activities to changing scenarios.

Defining Agile Problem Driven Teaching

APDT is primarily a teaching method, although it supports activities for promoting learning. The principal goal of APDT is to help instructors teach their very best so that students can optimally achieve the desired learning outcomes. A general definition of APDT is given below.

APDT has three components:

1. *A problem component*
   This is a set of problems with two subsets such that each subset satisfies the same class of learning objectives, defined as the course learning outcomes (CLOs). The first subset is referred to as the teacher's subset (T-Set) which is used by the instructor to demonstrate the CLOs. The second subset is referred to as the students' subset (S-Set), which is used by the students to practice problem solving.
2. *A teaching component*
   This is a set of interactive activities performed by one or more teachers and a group of students. The activities include the following:
   a. A process of specific instructions provided by one or more instructors using the T-Set,
   b. Comprehensive supervision and facilitation of students' problem solving activities utilizing the S-Set, and
   c. All aspects of problem solving, including initial problem analysis, derivation of learning needs, generation of ideas and topics, formulation of research questions, identification of resources, problem reanalysis, proposition of solutions, review and formative assessment, and selection of the best solution—all initially in this order.

Each teaching activity is driven by both the T-Set and S-Set in a plan; however, the plan may be changed dynamically by the third APDT component in this list.

3. *An agile process component*
   This is a set of guidelines for dynamically changing the plan and sequence of activities based on feedback and formative assessments. It is divided into the following two subcomponents:
   a. Support for the students' learning process
   b. Support for the instructor's teaching process.

The integration of the above three components in APDT synergistically produces comprehensive instruction with a wide variety of interactions. This synergistic relation is explained in the next section. Consider the APDT control flow, wherein the next step is decided by a set of problems; this is why the APDT process is problem driven. Each of the two subsets of the problem component, T-Set and S-Set, must satisfy the CLOs. One subset, the T-Set, is used by the instructor to demonstrate problem solving using appropriate supporting mechanisms. The other subset, the S-Set, is used by the students. Student teams investigate problems and generate learning topics among other activities in order to master the course learning outcomes. These topics are integrated into teaching by dynamically changing the teaching plan as problem solving continues. The changes are accommodated by the agile process component, which provides flexible adjustments to the teaching process based on feedback. One of the subcomponents of the agile process component is specially designed to provide support to the students, as in scaffolding (Holton & Clark, 2006; Simons & Klein, 2007).

APDT can be compared to other well-known pedagogical methods such as PBL and scaffolding. We are impressed with the support provided to learners by the scaffolding method (Holton & Clark, 2006; Simons & Klein, 2007) and consequently incorporate these support strategies in APDT. We are inspired by the achievements of PBL and immensely influenced by its rich mechanism. Like PBL, APDT emphasizes problem solving activities. However, unlike PBL, an important aspect of APDT is that the instructor plays an active role in teaching scenarios. This participation includes providing direct instruction, stimulating group discussion, and giving innovative guidance. In a PBL environment, the instructor is primarily a facilitator for students' problem solving activities. This is why some researchers identify PBL as one of the minimally guided approaches and criticize it for its deficiency in providing direct instruction (Kirschner, Sweller, & Clark, 2006).

In order to avoid this criticism, APDT is designed as a completely guided approach to have proper supervision of students' activities. In APDT, the instructor is more than a facilitator; the instructor takes complete responsibility for all academic activities although these activities are driven by two sets of problems, the T-Set and the S-Set. The use of the T-Set, in addition to the S-set, enables the instructor to cover all learning outcomes in a timely manner, in case students do not perform their work on schedule. Demonstration of problem solving with the T-set provides additional support needed by students for their problem solving activities which are advocated by the scaffolding method (Holton & Clark, 2006; Simons & Klein, 2007). In PBL, students are frequently divided into teams to work on problems, and the problems are expected to play a central role in the learning activities, a common practice in medical science (Schmidt, 1998; Schmidt, 2000). In this strategy the instruction of the topic is organized around problem solving tasks. Some of these tasks involve problem analysis followed by relevant information gathering. Students may continue the analysis phase by their discovery and identification of possible solutions in conjunction with the pros and cons surrounding each proposed solution (Adamowski, Frydecka, & Kiejna, 2007). Often, problems are complex and may not even be well defined. The discovery of new knowledge and its acquisition is made as students work

through a problem. The role of the instructors in the PBL environment is mainly to facilitate the students' efforts. Students take more responsibility for their own learning and are engaged in discovery learning in the sense that students discover and work with content that they selected to be necessary in order to solve the problem. It is assumed that by working through the problem, students are better able to internalize the problem and comprehend the underlying concepts and fundamental relationships needed to solve the problem.

Patel, Groen, and Norman (1993) argue that teaching basic science with the PBL approach in a clinical context may have the disadvantage that contextualized basic knowledge is difficult to separate from the clinical problems into which it has been integrated. This poses a difficulty in distinguishing the basic science knowledge components. Although PBL students generated more elaborate explanations, they had less coherent explanations and produced more errors (Patel et al., 1993). Another common criticism of the PBL method is that students may not recognize what might be important for them, hence the need for the facilitator to be extra careful to assess each student's prior knowledge. We introduce the model of APDT in which the instructor's role more closely approaches the traditional instructor role with complete responsibility for the CLOs. In APDT, the instructor's presentation is more dynamic and can easily diverge to cover a variety of relevant topics according to inquiries received from students and other sources. Similar to its PBL counterpart, each student team is given a complex problem to solve within the scope of the CLOs. However, unlike PBL, the role of the instructor in this approach is elevated to providing periodic coaching, proper guidance and direct instruction in order to accelerate the learning process. In particular, the instructor plays a key role contextualizing the problem, actively participating in the research and analysis, but also in generalizing the knowledge. The instructor becomes a facilitator once the initial body of knowledge needed to solve the problem is gathered. This gives students an opportunity to ingeniously construct the final solution in a comprehensive, well-defined approach.

In the APDT method, the open problem, along with student inquiries and the collective information gathering process, drives the lectures, discussions, and analytical reasoning. It is at this stage where the agility in instruction becomes apparent, possible, and critical. "When students cannot learn the way we teach them, we must teach them the way they learn" (Dunn, 1990, p. 18). What is more important is a willingness to make changes to the teaching plan dynamically—even during execution time, rather than strictly adhering to a fixed plan. The instructor must have extensive knowledge of the subject to efficiently process information and resolve students' questions and further suggest new directions for information gathering. In this approach, the new knowledge is shared among all teams in the form of a presentation by the instructor and the student teams. The flexibly open discussions provide an opportunity to further clarify issues, misrepresentations, and misinterpretation associated with the problem and the newly acquired information.

Agility in both teaching and learning helps to overcome a variety of challenges encountered in different environments, by different learners, and on different topics. According to Glickman (1991), "Effective teaching is not a set of generic practices, but instead is a set of context-driven decisions about teaching. Effective teachers do not use the same set of practices for every lesson... Instead, what effective teachers do is constantly reflect about their work, observe whether students are learning or not, and, then adjust their practice accordingly" (p. 6). Agility is the basis of APDT and consequently, it may combine a variety of teaching strategies and methods. In addition to PBL, other teaching and learning methods can be employed, including the following: lecture (Cashing 1990; Instructional Methods Information, 2010), technology-based learning

(Kearsley & Shneiderman, 1999), game-based learning (Prensky, 2004; Van, 2008), experience-based learning (Andresen, Boud, & Cohen, 2000), inquiry-based learning (Eick & Reed, 2002; Papert, 1980), thinking-based learning (Swartz, Costa, Beyer, Reagan, & Kallick, 2008), community-based learning (Owens & Wang, 1996); brain-based learning (Johnson & Lamb, 2007), work-based learning (Bailey 2003; Cunningham, Dawes & Bennett, 2004), project-based learning (Helic, Maurer, & Scerbakov, 2004), team-based learning (Michaelsen, Knight, & Fink 2002), Web-based learning (Chumley-Jones, Dobbie, & Alford, 2002; O'Neil & Perez, 2006), and participatory learning (Barab, Hay, Barnett, & Squire, 2001). There is no conflict between these methods and APDT, since it can easily incorporate each of these methods as agility might dictate. The main strategy in scaffolding is to provide adequate support to students when they attempt comparatively difficult problems. This strategy is found to be very useful for certain areas, including mathematics (Holton & Clark, 2006; Simons & Klein, 2007). APDT learns from the success of scaffolding and attempts to provide adequate support to students whenever needed. Scaffolding, in combination with metacognitive strategies, can enhance students' problem solving abilities.

Cognition about cognition is metacognition. Metacognitive strategies are processes that one uses to monitor and control one's cognitive activities to ensure that a goal, such as correct problem solving, is achieved (Brown, 1987). These processes help to regulate and oversee cognitive functions. Recent research demonstrates that metacognitive strategies are effective in reducing errors in problem solving tasks requiring analytic reasoning (Alter, Openheimer, Epley, & Eyre, 2007). APDT embraces metacognitive strategies and scaffolding for problem solving activities (Holton & Clark, 2006). One main goal of APDT is to take problem solving activities to an enhanced level and integrate them into course topics governed by CLOs in a modern curriculum. The resulting synergy produces an innovative combination of all major contributions of recent pedagogical approaches and will, hopefully, bring about inspiring changes not just to courses but to the educational system at large. Great educational changes may precipitate great societal changes with a positive impact on economical growth and an increased standard of living.

PBL is often characterized as one of the minimally guided approaches (Kirschner et al., 2006). After reviewing all major contributions, they conclude,

> Although unguided or minimally guided instructional approaches are very popular and intuitively appealing, the point is made that these approaches ignore both the structures that constitute human cognitive architecture and evidence from empirical studies over the past half-century that consistently indicate that minimally guided instruction is less effective and less efficient than instructional approaches that place a strong emphasis on guidance of the student learning process (p. 75).

In a recent study, direct instruction, combined with aspects of PBL, produced improved achievement of learning outcomes (Swartz et al., 2008). APDT creates a new structural pedagogical framework by synergistically incorporating agility, direct instruction, selective PBL features and the support strategies of Scaffolding.

Structure of Agile Problem Driven Teaching

The structural aspects of APDT framework are schematically shown in Figure 1. All major teaching activities are driven by a set of problems; in this instance, the problem set is specified at the top of Figure 1.

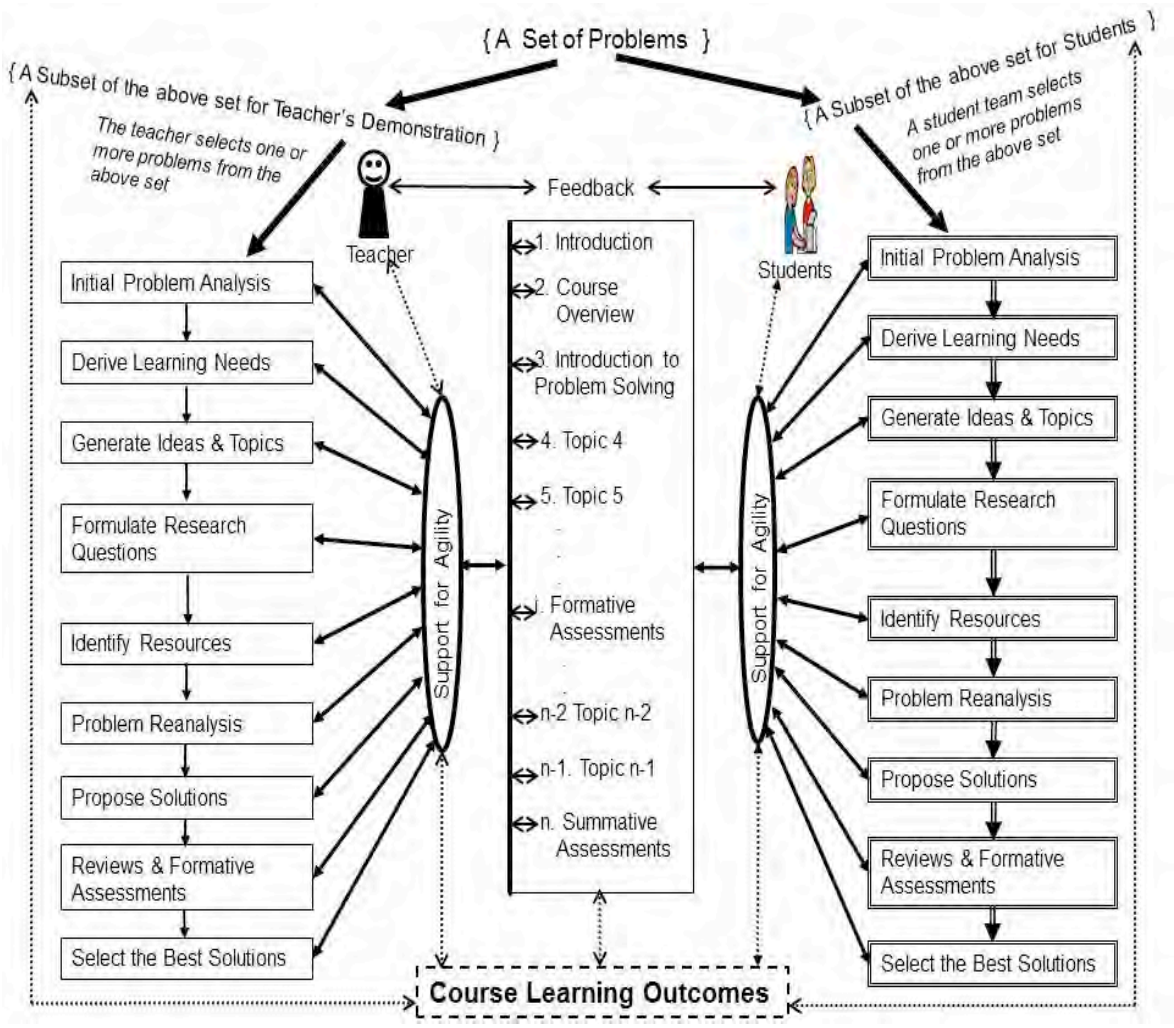

Figure 1. Structure of agile problem driven teaching.

A subset of this set of problems is selected by the instructor in order to demonstrate all the course learning outcomes. This subset is presented on the left side of Figure 1, and is referred to as the teacher's subset (T-Set). Another subset of problems is used by students for practicing problem solving and is referred to as the students' subset (S-Set). Based on interests, students form teams, and each team selects a problem or a subset of problems from the S-Set for analysis and solution. The boxes represent "activities" that lead to a problem solution. The typical control flow for problem solving is shown with unidirectional arrows between boxed activities. However, the process is agile and the control flow is very flexible in the sense that any problem

activity may be addressed at any step in the process. Therefore, bidirectional arrows in Figure 1 show how a problem solver can go back and forth from one activity to another. This flexibility of control flow significantly distinguishes APDT from PBL. In addition, all student activities are properly guided and supervised in APDT; this is indicated in Figure 1 by making the right side boxes and unidirectional arrows thicker (compound) compared to those of the left side. The central vertical column is drawn for the topics to be covered, based on the learning outcomes of the course. However, these topics can be changed due to the contributions of the problems being solved. According to Swartz et al. (2008), the "thinking strategy map" for "skillful problem solving" involves the following questions: "(a) What is the problem? (b) Why is there a problem? (c) What are some possible solutions? (d) What would result from these solutions? (e) What solution is best and why?" (p. 11). These questions help in getting started with the investigation of the problems, which may generate many follow-up questions and then map to the elements of the problem solving activities of Figure 1 through examination of consequences.

The implementation of the structural elements of APDT may be simplified by carefully using technological tools. In particular, in one scenario, students and the instructor each will have Tablet PCs in a networked environment, with a collaborative, interactive teaching tool such as Dyknow vision. In this networked environment, the instructor's display is broadcast to student's Tablets, allowing students to synchronously follow the instructor's perspectives and individually annotate discussions with their own stylus pen to their personal Tablet for a given problem solving task. The instructor can also permit a student to lead the class from his or her Tablet. This connectivity clearly facilitates a powerful medium for students to collaborate and share as they search for additional knowledge to solve the problem. Among useful features of Dyknow is a user friendly tool called "panel submission." Panel submission is most useful in APDT, for in this mode each team can anonymously submit its findings and request comments from the instructor. The instructor can quickly scan through all the student submissions and select one or more panels to share with the rest of the class. It is through this flexible sharing that the instructor can clarify misunderstandings, make additional comments or presentations, or provide new ideas for research and evaluation (Dey et al., 2009). The instructor can also opt to privately give comments to student submissions. This promotes meaningful interactions with students.

Many educators have reported an increase in student participation when Tablets are creatively used in the class. Panel submission and the follow-up discussions often clarify issues, misrepresentations, or misunderstandings without embarrassing a student. Additionally, the instructor can utilize panel submission to focus on problem analysis or new, relevant knowledge shared by students. Adjusting teaching methods based on learner feedback may play a vital role in multicultural learning environments (Dey et. al., 2009).

Mapping a Course onto Agile Problem Driven Teaching

The APDT structure easily maps to standard course content in a wide variety of subjects, since the interpretation of APDT is legitimately broad. As an example mapping exercise, a graduate course on mathematical foundations of computer science (National University course number CSC610) is considered for structural elements of APDT. National University course curricula are designed based on course learning outcomes; therefore, the majority of course-related activities must support accomplishing the CLOs. The CLOs for the mathematical foundations course are as follows:

(CLO_1) Construct a computational model for a given problem and examine its consequences.

(CLO_2) Describe properties of computational models.

(CLO_3) Prove: For every Non-deterministic Finite Automaton there is a regular expression.

(CLO_4) Prove that a given language is Context-Free.

(CLO_5) Construct a processor for a given Context-Free language.

(CLO_6) Construct a Turing Machine for a given computational problem.

(CLO_7) Prove results of union, concatenation, and complementation of various recursively enumerable sets.

A set of 17 problems drove the learning activities of the course. Out of the 17 problems, 9 were selected for the T-Set and were numbered T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, and T_9. The other eight were put into the S-Set and were numbered S_1, S_2, S_3, S_4, S_5, S_6, S_7, and S_8. The set of 17 problems is specified in Table 1, with the generated topics and the supporting CLOs listed in the order of importance with each problem.

Table 1. *A Set of 17 Problems for CSC610*

Problem Number and Description	CLOs	Generated Topics
T_1: Construct a Finite Automaton for ab*. Examine if the automaton accepts (1) abbb, (2) baba, (3) a, and (4) abab.	CLO_1	Finite Automata, sets representing Regular Expressions, a Language as a set of strings, Regular Languages, strings accepted by Finite Automata
T_2: Describe the closure properties of Regular Expressions.	CLO_2	Union, Concatenation and Kleene star properties of Regular Expressions.
T_3: Prove: For every Non-deterministic Finite Automaton there is a regular expression.	CLO_3	Proofs, Non-deterministic Finite Automata
T_4: Prove that L4 = $\{a^n bdc^n$: where n > 0$\}$ is Context-Free.	CLO_4, CLO_1, CLO_2	Pushdown Automata and Context-Free Grammars for Context-Free Languages
T_5: Construct a Pushdown Automaton for L_m = { $\{^n c\}^n$: where n >= 0 }.	CLO_5, CLO_1, CLO_2, CLO_4	Automata as Processors of sets of strings, programming language patterns, visualization

Problem Number and Description	CLOs	Generated Topics
T_6: Construct a Turing Machine (TM) for L6 = $\{c^n da^n db^n$: where n > 0 }.	CLO_6, CLO_1	Turing Machines as the class of most powerful processors, construction of Turing Machines for given problems
T_7: Construct a Turing Machine (TM) for L7 = $\{a^n b^n a^n$: where n > 0 }.	CLO_6, CLO_1	Turing Machines as the class of most powerful processors, construction of Turing Machines for given problems
T_8: If L_{81} and L_{82} are sets representing Context-Free languages, then prove that their union, L_{81} U L_{82}, is also Context-Free.	CLO_7, CLO_1, CLO_2, CLO_4	Proofs for union of certain sets
T_9: If L_{91} and L_{92} are sets representing Context-Free languages, then prove that their concatenation, $L_{91}L_{92}$, is also Context-Free.	CLO_7, CLO_1, CLO_2, CLO_4	Proofs for concatenation of certain sets
S_1: Construct a Finite Automaton for aba*. Examine if the automaton accepts (1) abaa, (2) baba, (3) ab, and (4) abab.	CLO_1	Finite Automata, sets representing Regular Expressions or Regular Languages, strings accepted by Finite Automata
S_2: If L_1 and L_2 are regular languages, then L_1 U L_2, L_1L_2, L_1* are also regular.	CLO_2	Union, Concatenation and Kleene star, properties of Regular Expressions.
S_3: Prove: For every Non-deterministic Finite Automaton there is a regular expression.	CLO_3	Proofs, Non-deterministic Finite Automaton
S_4: Prove that $L_4 = \{a^n dcb^n$: where n > 0} is Context-Free.	CLO_4, CLO_1, CLO_2	Pushdown Automata and Context-Free Grammars for Context-Free Languages
S_5: Construct a Pushdown Automaton for $L_4 = \{j^n bca^n$: where n >= 0}.	CLO_5, CLO_1, CLO_2, CLO_4	Automata as Processors of sets of strings
S_6: If L_{61} and L_{62} are sets representing Context-Free languages, then prove that their union, L_{61} U L_{62}, is also Context-Free.	CLO_7, CLO_1, CLO_2, CLO_4	Proofs for union of certain sets

Problem Number and Description	CLOs	Generated Topics
S_7: If L_{71} and L_{72} are sets representing Context-Free languages, then prove that their concatenation, $L_{71}L_{72}$, is also Context-Free.	CLO_7, CLO_1, CLO_2, CLO_4	Proofs for concatenation of certain sets
S_8: PART_1. Build the most powerful computing machine that you can think of. Your machine should be able to process complex languages such as $L_{12} = \{c^n dva^n dvj^n$: where $n > 0\}$. Demonstrate that a string like ccdvaadvjj would be accepted by the machine. You need to build the machine by defining its elements mathematically. You are not required to deliver the machine with hardware components. If you do not use standard notations provided in the textbook or discussed in the class, then you need to explain your notations. It is known that Finite State Machines or Finite Automata can accept regular expressions. However, Finite Automata cannot process a language like L_{12}, mentioned above, which requires a more powerful machine. You should be able to build such a machine. Explain how your machine will accept strings from L_{12}. PART_2. You are asked to complete the following three tasks: 1. In the first step, destroy the HALT state(s) or Final states and their incoming transitions of your machine of the assigned problem of PART_1 and examine the consequences. 2. In the second step, destroy the START state and the associated transitions of your machine (in addition to the destructions mentioned in Step 1 and examine the consequences. 3. In this step, reconstruct the machine so that it is distinct from the original machine of PART_1 (may have one or more additional states and/or transitions) and still processes the same language.	CLO_6, CLO_1, CLO_2	Turing Machines as the class of most powerful processors, construction of Turing Machines for given problems, properties of Turing Machines, Halt states, the Halting Problem, Decidability, Recursively enumerable sets

If the instructional aspects of CSC610 are mapped to the APDT structure, the result can be shown visually, as presented in Figure 2. Please note that all topics cannot be shown in the diagram of Figure 2; therefore, it should be assumed that the union of the generated topics given in Table 1 and the formative assessments should be placed in the middle column of Figure 2.

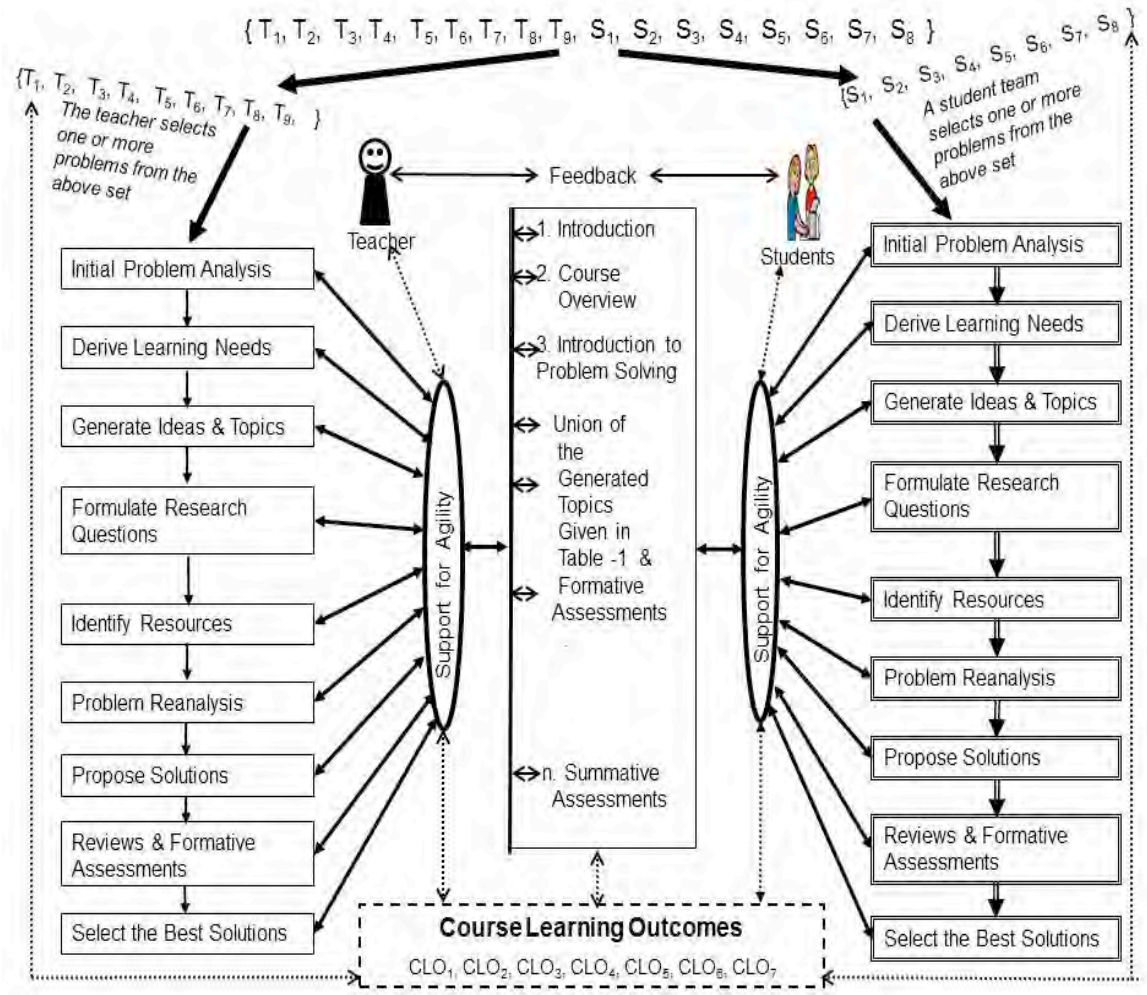

Figure 2. CSC610 aspects mapped to an APDT structure.

Students generated all major topics of the course while investigating their problems, and the learning outcomes were thoroughly studied. The teacher's subset of the problems included a Pushdown Automaton for L_m = {{nc}n : where n >=0} = {c, {c}, {{c}}, {{{c}}}, {{{{c}}}}, ...} as mentioned previously in T_5. Pushdown Automata are designed to process programming languages such as Java and strings that have similar patterns. That is, a Pushdown Automaton will accept strings like {c}, {{c}}, {{{c}}}, ... Pushdown Automata use a stack data structure for matching equal number of {'s and }'s without counting them. A stack is an interesting data-structure which allows operations such as push and pop and increases or decreases its stored contents in a last-in-first-out (LIFO) manner. Stacks are used for processing context-free languages as described in textbooks (Cohen 1997; Hopcroft, Motwani, & Ullman, 2007). One needs to consider multiple ways of presenting automata to students in order to highlight their formal and intuitive relations to other fields such as programming languages. Pushdown Automata can be presented in various ways including state diagrams. In the following example, a Pushdown Automaton for Lm is presented visually as a finite set of states connected with transitions based on the notations given in Hopcroft et al. (2007) with minor adjustments that show the stack explicitly with the bottom of the stack on the left, and define transitions with the pair: R,T/TP

where R is the symbol read from the input, T preceding the / is the topmost stack symbol before the transition is taken, TP following the / is the sequence of topmost stack symbol(s) after the transition is taken, and P is an optional symbol which appears only with "push transitions." The state diagrams for Pushdown Automata given in Hopcroft et al. (2007) do not explicitly show the stack.

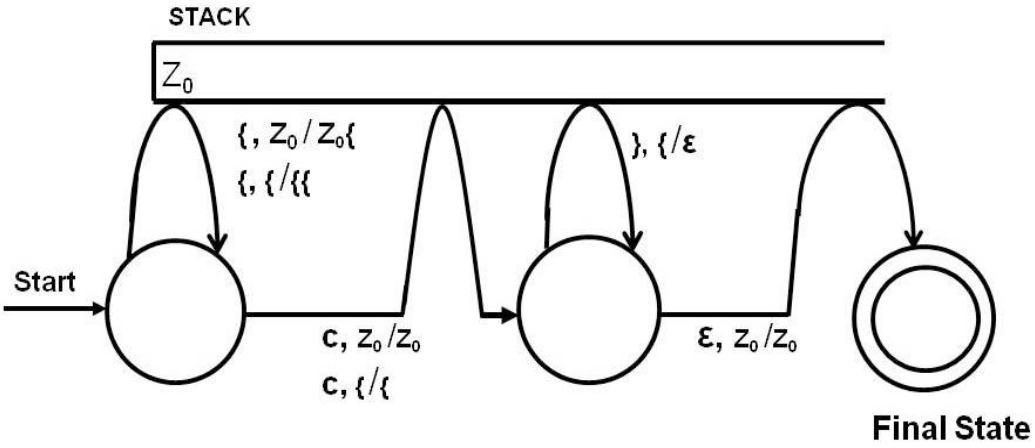

Figure 3. A Pushdown Automaton for Lm = {{nc}n : where n >= 0}.

Ordinarily, static visualizations of Pushdown Automata can be done with a sequence of state diagrams, such as the one given in Figure 3. Suppose a string like {{c}} is given as an input to the above Pushdown Automaton. Then, the machine starts at the start state and scans the first { from the input and pushes a { into the stack by taking the transition marked by { , Z0 / Z0{ . The meaning of this transition label is "when reading a { and the stack is empty (marked by Z0), push a { onto the empty stack (marked by Z0)". Then it consumes the next { from the input by taking the same loop with the transition marked by {, { /{{ . Next, it consumes the symbol c by taking the transition marked by c, { /{ which means "read a c from the input when there is a { on top of the stack and leave the stack unchanged". Next, it reads the fourth symbol, } , from the input and pops a } from the stack taking the transition marked by }, { /ε . Then, it scans the next } by taking the same transition marked by }, { /ε again. Then, it reaches the final state by taking the transition marked ε, Z0 /Z0. At that moment the stack is empty and the entire input is consumed, and therefore the input {{c}} is accepted by the machine. The preceding Pushdown Automata accepts any string with a sequence of {'s followed by a c followed a number of }'s that balance {'s. That is, strings such as c, {c}, {{c}}, {{{c}}}, ... are accepted by the machine. An input is accepted by a Pushdown Automaton if all of the following conditions are met simultaneously: (a) the input is entirely consumed, that is, no other symbols are left in the input, (b) the machine is in a final state, and (c) the stack is empty.

One type of dynamic visualization of Pushdown Automata is shown in the form of an animation on the following website: www.asethome.org/pda. This visualization is designed to provide supports to students at their initial stages of learning a new concept, as advocated in the scaffolding method (Holton & Clark, 2006; Simons & Klein, 2007). The visualization opens with the screen shown in Figure 4 and waits for the user to read and start the animation.

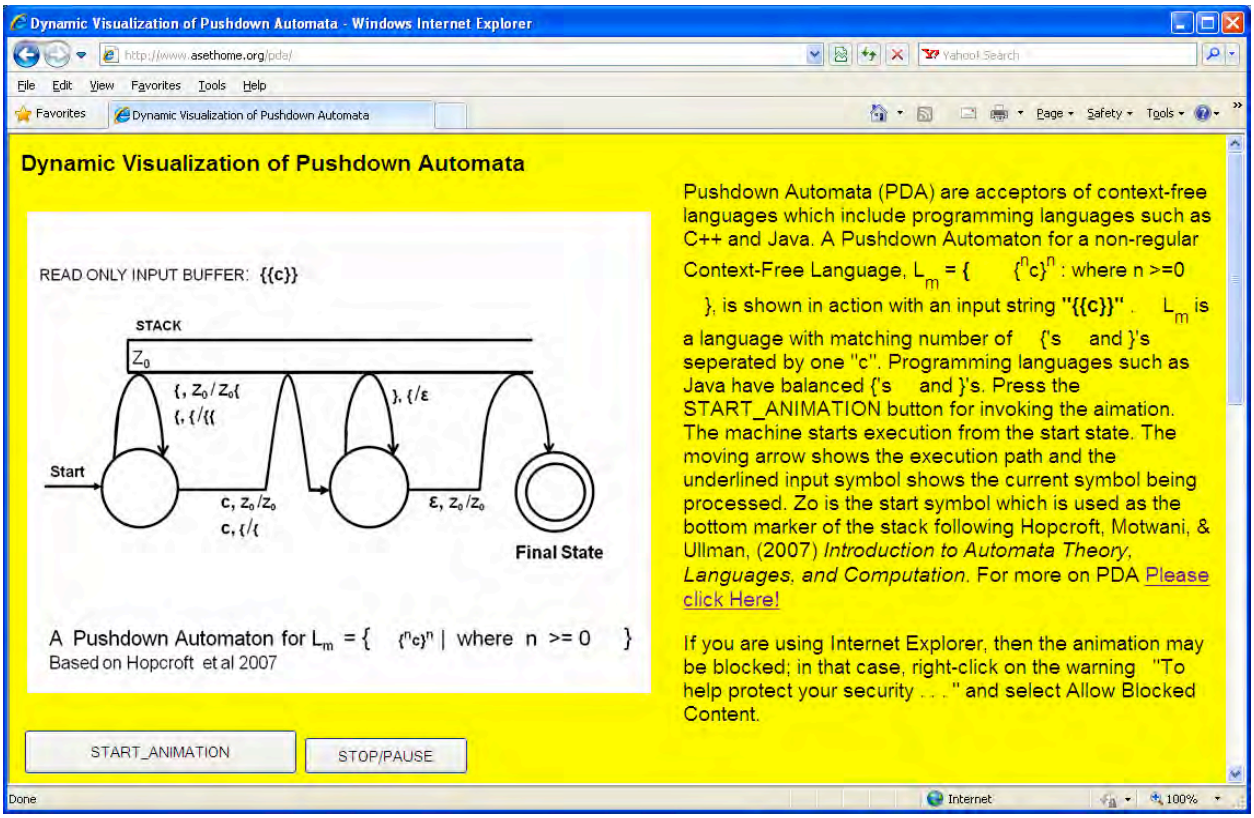

Figure 4. The opening screen for Dynamic Visualization of Pushdown Automata.

Whenever the user presses the START_ANIMATION button, the demonstration of processing the input string begins with a sound effect.

This visualization of Pushdown Automata is intended to be a demonstration of processing programming language structures without solving the problems assigned to the students. In addition to Pushdown Automata, visualization of a finite automaton was presented at the following website: http://www.asethome.org/fa/ (Dey et al., 2012). These visualizations provided support to students at their initial stages of learning. In addition to lectures, discussions, brainstorming, proofs, exams, and quizzes, some animations were used for demonstrating various problems of mathematical modeling of computation. Animations such as this often stimulate discussion on computational models, programming languages, and parsing.

APDT structure allows the integration of logical aspects of course content in a wide variety of subject areas (Dey et al., 2009). The most important aspect of mapping the APDT structure to the course is noting the frequency at which the activities are changed. In other words, switching back and forth from different activity boxes of the problems demonstrates agility. This reflects that the planned activities often are changed dynamically in order to accommodate learning events in a flexible or agile way. In the future, data should be collected for measuring the performance of the APDT method. At this time, however, only generic data on standard course evaluation are available for the four previous CSC610 course offerings presented in Table 2.

Table 2. *Course Assessment Data for CSC610*

	December 2008	March 2009	March 2010	September 2011
Class GPA (4.0 scale)	3.31	3.22	3.22	3.51
Student Learning (5.0 scale)	4.35	4.86	4.66	4.74
Teaching (5.0 scale)	4.70	4.81	4.92	4.88
Course Content (5.0 scale)	4.24	4.75	4.89	4.64
Number of responding students/ Out of total number of students	11/11	4/4	4/4	15/15

The mathematical foundations course, CSC610, was taught by one of the authors using the APDT method in March 2009, March 2010 and September 2011. It was taught using the classic PBL method in December 2008 by the same instructor. From the Table 2 data, no significant inferences can be made at this time, although teaching evaluation suggests slight improvements after adoption of APDT in March 2009. These data, in combination with the logical analysis of the APDT structure, may suggest that there were no major problems with the mapping of the course to the APDT structure. The students were generally satisfied with course. In future research, more focused data will be collected in an expanded study for measuring students' satisfaction and performance.

Concluding Remarks

A structural analysis of APDT, illustrated by its implementation in a National University graduate Computer Science course, CSC610, introduced a new pedagogical framework. APDT creates a new structural pedagogical framework by synergistically incorporating agility, direct instruction, selective problem-based learning (PBL) features, and the support strategies of scaffolding.

The logical structure of this pedagogical framework was mapped to a course on mathematical foundations, CSC610. APDT appears similar to PBL as it utilizes PBL's "best features"; but significant differences in two major respects are worth noting: (a) APDT places more importance on direct instruction and extensive guidance than the classic PBL method, and (b) APDT is designed to adjust its strategies dynamically, with agility, in order to achieve course learning outcomes. Plans have been formulated in the National University School of Engineering, Technology and Media for future experimental studies regarding APDT performance and course assessment. The authors posit that the current educational challenges in STEM education can be optimally solved by implementing agility in the teaching process by focusing creatively on the needs of the students and by providing adequate support for dynamically adjusting the teaching and learning process. Furthermore, the authors have confidence that knowledge will triumph, economies will grow, humans will innovate, peace and prosperity will return, and the coming generation will thrive in a new learning oriented society.

Acknowledgements

The authors are extremely grateful to anonymous reviewers of the Journal of Research in Innovative Teaching (JRIT) for their valuable suggestions and comments, which led to a thorough revision of the paper. Authors are also thankful to Ronald Uhlig, Ogun Tigli, Alireza Farahani, Albert Cruz, and many others for their help and suggestions on earlier versions of this paper and/or related topics.

References

Adamowski, T., Frydecka, D., & Kiejna, A. (2007). Problem-based learning (PBL)—possible adaptation in psychiatry. *Psychiatria Polska, 41*(2), 163–169.

Alter, A. L., Openheimer, D. M., Epley, N., & Eyre, R. (2007). Overcoming intuition: Metacognitive difficulty activates analytic reasoning, *Journal of Experimental Psychology, 136*(4), 569–576.

Andresen, L., Boud, D., & Cohen, R. (2000). Experience-based learning., In G. Foley (Ed.), *Understanding adult education and training* (2nd ed., pp. 225-239). Sydney, Australia: Allen & Unwin.

Bailey, T. R. (2003). *Working knowledge: Work-based learning and education reform.* New York: RoutledgeFalmer.

Barab, S. A., Hay, K. E., Barnett, M., & Squire, K. (2001). Constructing virtual worlds: Tracing the historical development of learner practices. *Cognition and Instruction, 19*(1), 47–94.

Barell, J. (2006). *Problem-based learning: An inquiry approach* (2nd ed.). Thousand Oaks, California: Corwin Press.

Barrows, H. S. (1985). *How to design a problem-based curriculum for the preclinical years.* New York: Springer.

Borman, K. M. (2005). *Meaningful urban education reform: Confronting the learning crisis in mathematics and science.* Buffalo: State University of New York Press.

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 65-116). Hillsdale, New Jersey: Lawrence Erlbaum Associates

Cashing, W. E. (1990). *Student ratings of teaching: Recommendations for use* (IDEA Paper No. 22). Manhattan: Kansas State University, Center for Faculty Evaluation and Development.

Chumley-Jones, H., Dobbie, A., & Alford, C. (2002). Web-based learning: Sound educational method or hype? A Review of the evaluation literature. *Academic Medicine, 77*(10), S86-S93.

Cohen, D. (1997). *Introduction to computer theory* (2nd ed.). New York: John Wiley & Sons.

Committee on Prospering in the Global Economy of the 21st Century et al. (2007). *Rising above the gathering storm: Energizing and employing America for a brighter economic future.* Washington, D.C.: National Academies Press.

Crouch, M. (2011, September). 10 Things every parent should know about college. *Reader's Digest,* 178-185.

Cunningham, I., Dawes, G., & Bennett, B. (2004). *The handbook of work-based learning.* Aldershot, Hants, England: Gower Publishing.

Dey, P. P., Gatton, T. M., Amin, M. N., Wyne, M. F., Romney, G. W., Farahani, A., et al. (2009, March 19–20). Agile problem driven teaching in engineering, science and technology. Pp. 197-212 in *American Society for Engineering Education–Pacific Southwest 2009 Conference ASEE-PSW 2009,* San Diego, CA.

Dey, P., Sinha, B., Romney, G., Amin, M., Badkoobehi, H., Subramanya, S. & Sukhija, K. (2012). Finite automata visualization. *International Journal of Algorithms, Computing and Mathematics, 5*(1), 6-11.

Duch, B. (2011). *Problem-based learning.* Retrieved from http://www.udel.edu/pbl/.

Dunn, R. (1990). Rita Dunn answers questions on learning style. *Educational Leadership, 48*(2), 15–19.

Eick, C. J., & Reed, C. J. (2002). What makes an inquiry oriented science teacher? The influence of learning histories on student teacher role identity and practice. *Science Teacher Education, 86,* 401–416.

Gersten, R., & Carnine, D. (1986). Direct instruction in reading comprehension. *Educational Leadership, 41*(7), 70–78.

Glickman, C. (1991). Pretending not to know what we know. *Educational Leadership. 48*(8), 4-10.

Helic, D., Maurer, H., & Scerbakov, N. (2004). Knowledge transfer processes in a modern WBT system. *Journal of Network and Computer Applications, 27*(3), 163–190.

Hmelo, C. E., & Evensen, D. H. (2000). Problem-based learning: Gaining insights on learning interactions through multiple methods of inquiry. In D. H. Evensen & C. E. Hmelo (Eds.), *Problem-based learning: A research perspective on learning interactions* (pp. 1-16). New Jersey: Lawrence Erlbaum Associates.

Holton, D., & Clark, D. (2006). Scaffolding and metacognition. *International Journal of Mathematical Education in Science and Technology, 37,* 127–143.
Hopcroft, J. E., Motwani, R., & Ullman, J. (2007). *Introduction to automata theory, languages, and computation.* Old Tappan, NJ: Pearson Education.
Instructional Methods Information (2010). Instructional methods—advantages and disadvantages. Retrieved from http://www.adprima.com/teachmeth.htm
Johnson, L., & Lamb, A. (2007). *Brain-based learning.* Retrieved from http://eduscapes .com/tap/topic70.htm
Kearsley, G., & Shneiderman, B. (1999, April 5). *Engagement Theory: A framework for technology-based teaching and learning.* Retrieved from http://home.sprynet.com/~gkearsley/engage.htm
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86.
Michaelsen, L., Knight, A., & Fink, L. (Eds.) (2002). *Team-based learning: A transformative use of small groups.* New York: Stylus Publishing.
O'Neil, H. F., & Perez, R. S. (2006). *Web-based learning: Theory, research, and practice.* Hillsdale, NJ: Erlbaum.
Owens, T. R., & Wang, C. (1996). Community-based learning: A foundation for meaningful educational reform. Retrieved from http://educationnorthwest.org/webfm_send/514.
Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas.* New York: Basic Books.
Patel, V. L., Groen, G. J., & Norman, G. R. (1993). Reasoning and instruction in medical curricula. *Cognition & Instruction, 10,* 335–378.
Prensky, M. (2004). *Digital game-based learning.* New York: McGraw-Hill.
Rosenshine, B. (1979). Content, time and direct instruction. In P. L. Peterson & H. Walberg (Eds.), *Research on teaching* (pp. 97–119). Berkeley, CA: McCutchen.
Savin-Baden, M. (2003). *Facilitating problem-based learning.* Philadelphia, PA: McGraw-Hill & Open University Press.
Schmidt, H. G. (1998). Problem-based learning: Does it prepare medical students to become better doctors? *The Medical Journal of Australia, 168,* 429–430.
Schmidt, H. G. (2000). Assumptions underlying self-directed learning may be false. *Medical Education, 34,* 243–245.
Simons, K. D., & Klein, J. D. (2007). The impact of scaffolding and student achievement levels in a problem-based learning environment. *Instructional Science, 35,* 41–72.
Swartz, R., Costa, A., Beyer, B., Reagan, R., & Kallick, B. (2008) *Thinking-based learning: Activating students' potential.* Norwood, MA: Christopher-Gordon.
Van, R. E. (2008). Game-based learning. *EDUCAUSE Review, 41*(2), 16–30.
Wallis, C. (2008, February 25). How to Make Great Teachers. *Time, 31,* 28–34. Retrieved from http://www.time .com/time/magazine/article/0,9171,1713473,00.html

About the Authors

Pradip Peter Dey
Ph.D., Professor
Lead faculty for the MS in Computer Science Program,
School of Engineering, Technology, and Media
National University, San Diego, CA
pdey@nu.edu
Major research interests: computational models, mathematical reasoning, visualizations, software engineering, user interface, education, and mobile apps

Gordon W. Romney
Ph.D., Professor
School of Engineering, Technology, and Media
National University, San Diego, CA
gromney@nu.edu
Major research interests: information assurance and cyber security, information integrity and confidentiality, 3D graphics, anonymization of data, virtual laboratory, secure cloud infrastructures, secure networks, and Ruby on Rails

Mohammad Amin
Ph.D., Professor
Lead faculty for the MS in Wireless Communications
School of Engineering, Technology, and Media
National University, San Diego, CA
mamin@nu.edu
Major research interests: wireless communications, database, sensors, and engineering education

Bhaskar Raj Sinha
Ph.D., Associate Professor
Lead faculty for BS in Information Technology Management
School of Engineering, Technology, and Media
National University, San Diego, CA
bsinha@nu.edu
Major research interests: computer architecture, digital systems, information technology management, security, database, and mobile apps

Ronald F. Gonzales
Ph.D., Professor
Lead faculty for the MS in Cyber Security and Information Assurance Program
School of Engineering, Technology, and Media
National University, San Diego, CA
rgonzales@nu.edu
Major research interests: information assurance and cyber security, digital systems, information technology, human factor elements, DMAIC best practices, organizational behavior, and engineering education

S. R. Subramanya
Ph.D., Associate Professor
School of Engineering, Technology, and Media
National University, San Diego, CA
ssubramanya@nu.edu
Major research interests: human factor elements of interaction, information assurance and cyber security, information integrity and confidentiality, website design graphics, virtualization architecture, database, project management, DMAIC best practices, and Visio graphical database interface

Enhancing Digital Educational Content Consumption Experience

S. R. Subramanya

Abstract
Technological advances leading to widespread availability of cost-effective audio/video devices, processors, storage, and communications have resulted in enormous growths in the generation, processing, storage, and sharing, respectively, of huge amounts of digital content. Trends indicate that in the near future, tremendous amounts of digital educational material will be developed, deployed, and used. However, the capabilities of human beings in "consuming" digital content remain almost constant and do not scale up. This necessitates the development of techniques and tools for leveraging content-consumption efficiency and effectiveness. This paper proposes a model and some metrics for the consumption experience of digital educational content.

Keywords
Digital educational content, content consumption, consumption model, consumption experience

Introduction

Rapid advances in computing, communications, and consumer electronics technologies have enabled the generation, storage, and distribution of explosive amounts of digital content (audio, images, graphics, and video, in addition to text). A few studies have been made regarding the growths of information. The earliest of such comprehensive studies were made in 2000 and 2003 (Lyman & Varian, 2003) and the most recent in 2009 (Bohn & Short, 2009). They provide a detailed breakdown of the various ways information is generated. Currently, the growths in both traditional and user-generated digital content, such as news, movies, cartoons, sports, educational content, blogs, music, pictures, and video, have been phenomenal and are expected to grow even further in the future. The amount of digital information created worldwide from a wide variety of sources has seen tenfold growth in the past 5 years as shown in Figure 1.

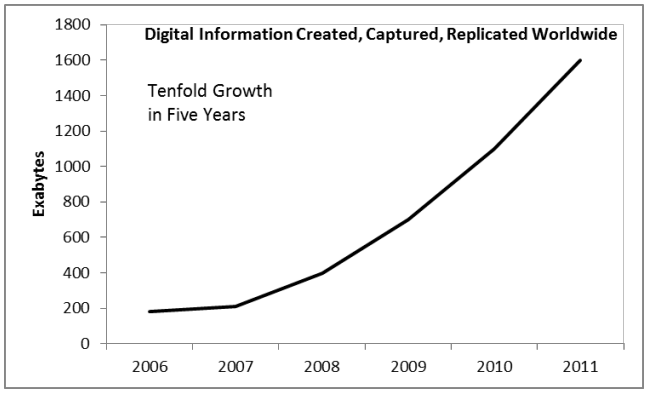

Figure 1. Growth of digital content (Adapted from J. F. Gantz et. al., 2008).

The incorporation of digital content in education at present has been relatively low, compared to the gamut of the available digital educational content. But the use of digital content in educa-

tion has been increasing, and this trend is expected to increase phenomenally in the future. Instead of the traditional linear exposition via going over chapters in a textbook, the material taught online as well as on-site would employ a combination of lectures, readings, problem solving, relevant videos, relevant audio clips, etc. It is expected that the amount of content, per se, delivered in a course would be much higher than the typical text and PowerPoint-based lectures of today.

Digital content will act as catalysts for education and learning by (a) enhancing traditional educational content by incorporating multiple media, (b) facilitating self-learning and continuous education by providing easy access (anytime, anywhere), (c) supporting various learning styles (self-paced, collaborative, team-oriented, etc.), and (d) enriching the static content with narratives, game-playing, hands-on activities, etc.

The Virginia Department of Education is implementing the small-scale pilot program *Beyond Textbooks* to explore the technical, social, and policy implications of textbook alternatives (Wright et al., 2010). Among the goals of *Beyond Textbooks* are (a) to understand how digital instructional materials can be used most effectively to increase student engagement and educational outcomes, and (b) to understand how digital instructional materials can be used most effectively to improve teacher practice. This project identifies cost-effective models that blend traditional textbook content with the engaging, dynamic, up-to-date content and resources afforded by the Web. Specifically, it examines new ways to access, organize, and deliver high-quality content using various platforms and tools, including the Apple iPad, and to understand the conditions necessary for successful implementation in schools (Wright et al., 2010).

In order for humans to make efficient and effective use of the huge repositories of digital educational content, appropriate techniques and tools must be developed, geared toward increasing the *consumption experience* of digital educational content. Toward this end, (a) the notion of consumption experience of digital educational content should be precisely defined, (b) the parameters related to the content-consumption experience should be identified, and (c) metrics should be developed that enable the measurement and improvement of parameters related to the content-consumption experience.

This paper proposes a model and some metrics for the consumption experience of digital educational content. It identifies and discusses several major factors related to the model and several major parameters related to each of the factors. The proposed model is expected to facilitate the designers and developers of digital educational content and service providers in the development and provisioning of content with enhanced content-consumption efficiency and effectiveness. This paper addresses only the aspects of digital content. In a future paper, the present authors will address the pedagogical aspects as well.

The rest of the paper is organized as follows. The Background section briefly discusses the issues involved in providing digital content. The Digital Content-Consumption Experience section presents the proposed model of content-consumption experience and discusses factors related to content-consumption effectiveness and efficiency. This is followed by the Conclusions section. In this paper the terms *digital content* and *educational content* are used interchangeably.

Background

Digital content has been growing at a rapid pace across many domains. The growth of digital content in education has not been rapid compared to several areas of user-generated content (UGC) such as YouTube videos, Picassa/Flicker pictures, podcast audios, and blog texts, but considerable growth is expected in the near future. In this section, we present some of the major characteristics of a digital content ecosystem.

Digital Content Ecosystem

There are many facets (layers or dimensions) in a *digital content ecosystem* such as (a) content production (creation, packaging), (b) storage, (c) analysis and indexing, (d) query, search, and retrieval, (e) communication (transmission, distribution), (f) presentation, and (g) consumption (usage) (Subramanya & Yi, 2005c; Subramanya & Yi, 2005b). These are shown in Figure 2.

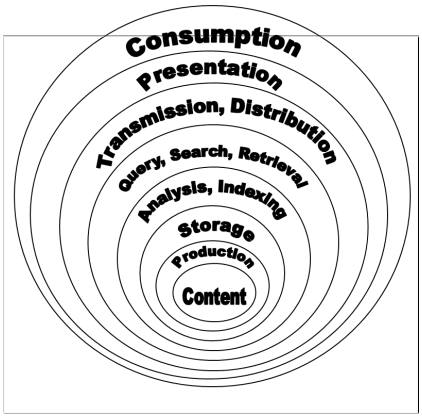

Figure 2. Major facets of digital content.

All the stages in the content ecosystem below the consumption layer have some effect, albeit to varying degrees, on the final content-consumption stage. However, the complexities of the various layers of the content ecosystem should be hidden from end users in order to provide an effective and enriching content-consumption experience. The issues in providing a rich consumption experience of digital content are quite varied and span several layers of the digital content ecosystem. In this paper, we focus on the effects of two of the dimensions—content production and content presentation—upon the content-consumption experience.

The production and presentation stages of newer and novel digital educational content should support several newer content-related features. A few samples are shown in Figure 3. For example, the content production should facilitate the customization of content (to some extent) by the end consumers, as opposed to a fixed look and feel of content determined by one person or a few people at the content-production stage. Customization of content over a reasonably large set of preferences is desirable (Subramanya & Yi, 2005a). In addition to various choices for the kinds of media (e.g., fonts for texts or the kind of voice for audio), even the proportions of different kinds of media (text, audio, images, video, etc.) in the content may need to be different to suit a wide range of preferences and situations. This caters to the different tastes and preferences of users.

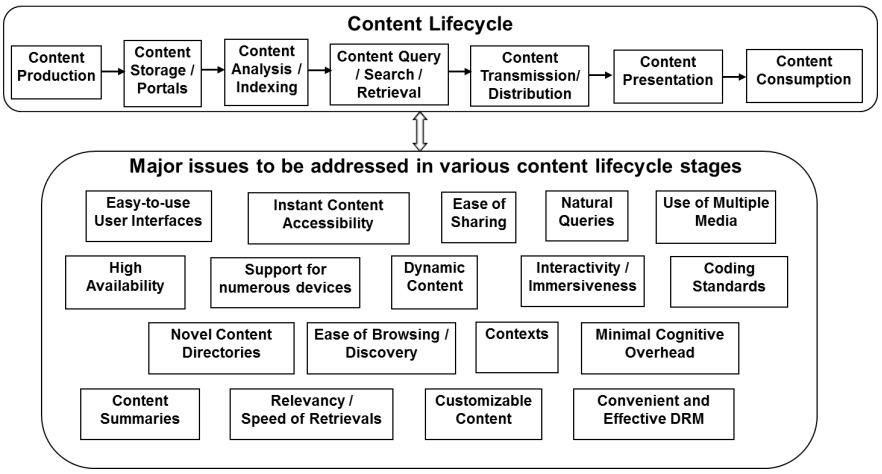

Figure 3. Some of the newer content-related features to be incorporated in the production and presentation stages.

The other new desirable feature of digital educational content is that it should support evolution and thus be dynamic. Similarly, the content presentation aspects such as support for high interactivity instead of passive consumption, and support for sharing of experiences instead of one-way presentation enhance the content consumption experience. There is a need to make the development and deployment of digital educational content applications and services from being *technology centric* to being *content centric* and *user centric* in order to make the content consumption experience very effective (Lombard, Grabe, Reich, Campanella, & Ditton, 1996; Reeves, Lang, Kim, & Tatar, 1999; Reeves & Nass, 1998).

Content consumption is the culmination stage in the lifecycle of content, starting with content production, through content storage and access, content distribution, and content presentations shown in Figure 4.

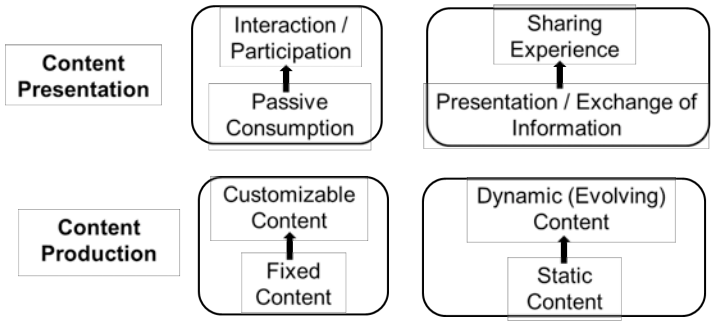

Figure 4. Digital content lifecycle and some of the major factors influencing the various stages.

All of these stages need to take into consideration a variety of factors as shown in the figure. For example, techniques for the effective summarization of content are critical to cater to the

mobile users, due to limited attention spans, together with limited transmission and device limitations of mobile systems. Effective content summarization facilitates the rapid assimilation of the gist (salient features) of huge amounts of content.

Newer models for content delivery and consumption are expected to give impetus to further growths in content (Subramanya, 2000; Subramanya & Yi, 2005c). With increased volumes of content and emergence of newer technologies, more effective ways of interacting with the content are required (Okada, Maeda, Ichikawaa, & Matsushita, 1994; Subramanya & Yi, 2006). A few representative technologies for the dissemination and use of content are discussed in Beaumont (2001), Hofmann and Beaumont (2005), and Turner, Magill and Marples (2004). However, the technologies for searching for relevant information (content) have not had the same rate of advancement as growths in digital content. For example, most of the information on the Web is searched, predominantly, using the Google search engine, and tools for searching for audio, images, and video have not been very sophisticated and are not in widespread use.

Although technologies that enable the users to look for and get the desired or relevant content onto their devices (desktops, laptops, tablets, mobile devices, etc.) have been maturing, there has been a paucity of technologies and tools that would enable the end users to consume the digital educational content. By consume we broadly mean to absorb, via our senses, the various digital media comprising the content and understanding (comprehending) of the material that is conveyed, whether by reading textual content, listening to audio or watching animations and video, or combinations of these.

The Problem of Effective Content Consumption

The net results of the aforementioned trends have been the following: (a) Rapid development of technologies and availabilities of cost-effective devices are enabling the generation of massive amounts of digital educational content; (b) tools and techniques of expressing the needs and searching for content of interest and relevance have not improved at the same rate of growth in content; (c) human capabilities for consuming the content have remained about the same since the time of arrival of digital media in our lives; and (d) an increasingly wide gap exists between available content and what human beings are able to consume and make use of.

This raises a fundamental question: Can technologies and techniques be developed that enhance the content consumption of human beings? These issues are summarized in Figure 5.

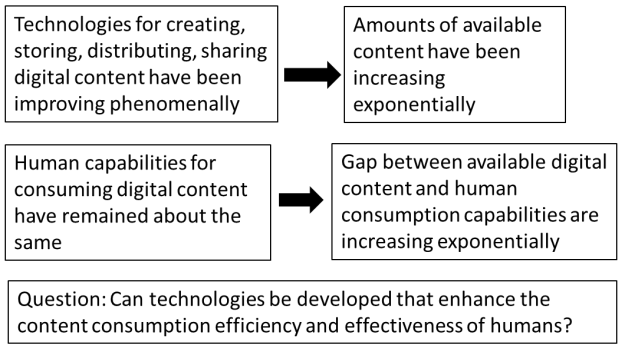

Figure 5. Increasing gap between available content and human consumption capabilities.

Digital Content-Consumption Experience

This section presents the proposed model for digital content consumption experience. The present researchers are not aware of any similar efforts in modeling and quantifying the content-consumption experience and of relating them to other stages in the content lifecycle. The objective of the model for the content-consumption experience is to develop and establish well-defined relationships between the parameters of content-consumption experience and the parameters of content production and content presentation. This is part of work in progress in the present research related to determining and quantifying the factors involved in providing a rich content-consumption experience by users. In the future, parameters of the other dimensions (aspects) of content, human cognition, pedagogy, etc., would be incorporated.

From a users' perspective, the objective of digital educational content is to provide the users with a rich and effective content-consumption experience in a convenient manner. This should enable the maximizing of consumption in a given time with high levels of comprehension and retention with minimal cognitive load or effort. Toward this end, (a) the notion of consumption experience of digital educational content should be precisely defined, (b) the parameters related to the content-consumption experience should be identified, and (c) metrics should be developed that enable the measurement and improvement of parameters related to the content-consumption experience. For example, the retention and recall of content or significant parts of it would be an indicator of the effectiveness of content consumption. It is then necessary to develop the relationships between the parameters of content production, presentation, and consumption.

Need for a Digital Content-Consumption Model

The existing and the proposed models of content consumption are shown in Figure 6.

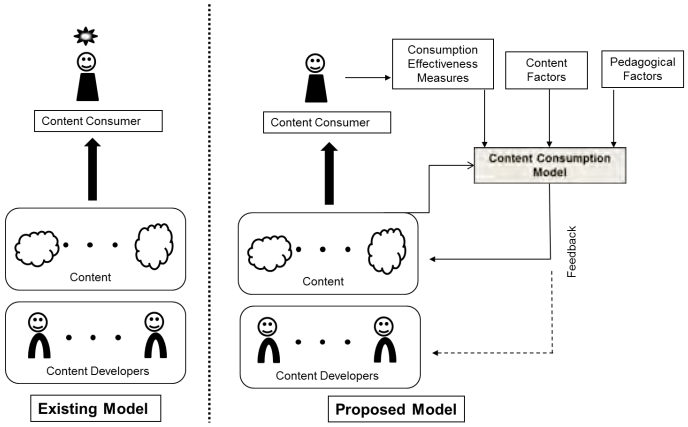

Figure 6. Existing and proposed models of content consumption.

In the existing model, the content is produced by content developers, and the content is either actively pushed to the content consumers or is placed on portals for them to be pulled by the consumers. In this case, the effectiveness of consumption is not considered, since there is no feedback from the content consumers. In the proposed model, a content-consumption model is incorporated into the system. This model has a feedback loop from consumers regarding content-consumption effectiveness onto the content-development (production) process. In addition, there

are inputs of content-related factors and pedagogy-related factors for content development. This takes into account several factors in the content-development process that would enhance the ultimate content-consumption effectiveness.

Digital Content Consumption Dashboard

The *content consumption experience dashboard*, as shown in Figure 7, is the front end of the content-consumption model. This enables "adjustments" in the parameters of content production and presentation, in order to provide a desired level of user experience. This provides a systematic means of controlling the content-consumption parameters based on the needs and several constraints, including cost, time, etc., using appropriate combinations of the independent parameters of content production and content presentation.

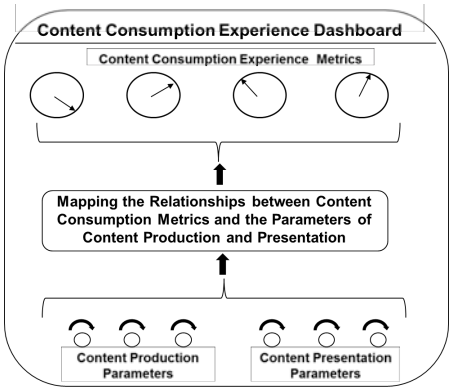

Figure 7. Content consumption experience dashboard.

Digital Content Consumption Model

The outline of the proposed content-consumption model is shown in Figure 8.

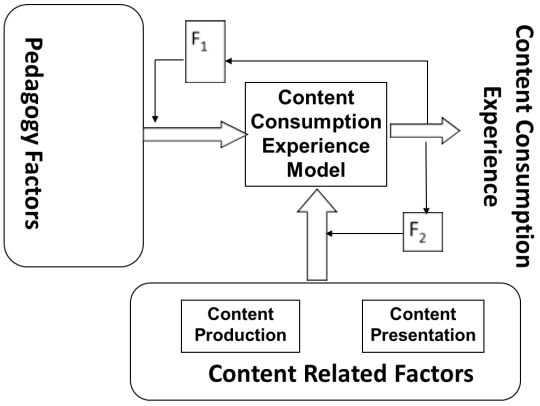

Figure 8. Proposed content consumption model.

The content-consumption experience is dependent on factors in two distinct dimensions, namely, content-related factors and pedagogy factors. This paper focuses on the content-related factors, and a future version of the paper will address the pedagogy factors. The model should capture the dependence of content-consumption experience factors with the factors related to content (production and presentation) and pedagogy.

Here is shown the relationship of content-consumption-experience parameters with the other parameters of content production and content presentation that influence the content-consumption experience. The content-consumption experience, X, is given by $X = AR + BS$, where

$X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_N \end{bmatrix}$ is a vector of *dependent parameters* related to the content-consumption experience. Typical parameters include (a) ease of reading (for text), (b) ease of perception (in case of multimedia), (c) ease of navigation and cross referencing, (d) level of immersion (involvement), (e) engagement (time spans of continuous viewing), (f) reuse of content, (g) the retention and recall of content or significant parts of it, (h) recommendation to others, (i) archival for later use, etc. We assume that these parameters can be quantified and their values determined using combinations of objective analysis and subjective measurements.

$R = \begin{bmatrix} r_1 \\ r_2 \\ \vdots \\ r_M \end{bmatrix}$ is a vector of M *independent parameters* related to the parameters of content production. The parameters in turn consist of a set of attributes, each of which has a defined range of values. Typical parameters include (a) provisions for varying proportions of different media, (b) customization, (c) content summaries, (d) feedback and ratings, etc. Similarly,

$S = \begin{bmatrix} s_1 \\ s_2 \\ \vdots \\ s_L \end{bmatrix}$ is a vector of L *independent parameters* related to parameters of content presentation. The elements of vector S, which are the major content presentation factors, are *minimalist approach* (display should not have extraneous data or objects), *contexts* (appropriate context for the content), *consistency* (uniform look and feel), *intuitiveness* (minimal effort in comprehension), *coherence* (meaningful relationships between items [data] on the display), *unambiguity,* and *display density* (information displayed should be neither too sparse nor too crowded).

$A = \begin{bmatrix} a_{1,1}a_{1,2}\cdots a_{1,M} \\ a_{2,1}a_{2,2}\cdots a_{2,M} \\ \vdots \\ a_{N,1}a_{N,2}\cdots a_{N,M} \end{bmatrix}$ is an $N \times M$ matrix whose elements are the "weights" that capture the dependencies between the content-production parameters of R and the consumption-experience parameters of X. For example, row k of A is a set of weights which are the relative impact

(importance) of the content-production parameters upon the k^{th} parameter of the content consumption experience vector *X*. Similarly,

$B = \begin{bmatrix} b_{1,1} b_{1,2} \cdots b_{1,L} \\ b_{2,1} b_{2,2} \cdots b_{2,L} \\ \vdots \\ b_{N,1} b_{N,2} \cdots b_{N,L} \end{bmatrix}$ is an $N \times L$ matrix whose elements are the "weights" that capture the dependencies between the content-presentation parameters of *S* and the consumption experience parameters of *X*. For example, row *l* of *A* is a set of weights which are the relative impact (importance) of the content-production parameters upon the l^{th} parameter of the content consumption experience vector *X*.

The sum *AR* + *BS* thus represents the effects of the parameters of both content production and content presentation upon the content-consumption experience.

Content Presentation Factors

This section presents the different layers and factors in the content presentation. *Content presentation* is driven by several factors and can be categorized into three major layers, as shown in Figure 9: (a) low-sensory level, which consists of font types, font sizes, colors, textures, contrast, etc.; (b) mid-sensory level, which consists of the screen layout structure—the relative positioning of screen objects, the presentation density, the proportions of text and graphics, the presence, if any, of extraneous or irrelevant objects, etc.; and (c) cognitive level, which consists of the use of appropriate contexts, intuitiveness of the presented content, the consistency of presentation, etc.

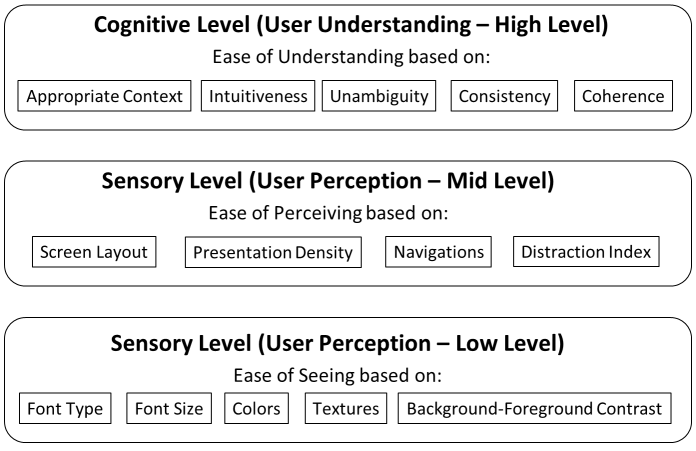

Figure 9. Layers and parameters related to content presentation.

Conclusions

Rapid advances in computing, communications, and consumer electronics technologies have enabled the generation, storage, and distribution of explosive amounts of digital content: text, audio, images, graphics, and video. In addition, mobile smart phones are becoming pervasive and

acting as conduits of enormous amounts of digital content. A few studies have been made regarding the growths of information. Schemes to define and enhance the consumption effectiveness of digital educational content are crucial to sustain the growths in data services and to advance innovations in related technologies. This paper has proposed a model for digital-content consumption and identified and discussed several major factors related to it. In a future version of this paper, the pedagogical factors that need to be incorporated into the content consumption model will be addressed. Incorporation of these factors in the design, development, and provisioning of digital educational content are expected to lead to better consumption experiences by users, and to the enhanced efficiency and effectiveness of content consumption.

References

Beaumont, L. R. (2001, April). *Meeting worldwide demand for your content.* Lucent Technologies white paper.

Bohn, R. E., & Short, J. E. (2009). How much information? 2009 report on American consumers. Retrieved from http://hmi.ucsd.edu/howmuchinfo.php.

Gantz, J.F., et. al. (2008). The Diverse and Exploding Digital Universe. *IDC White Paper,* March 2008.

Hofmann, M., & Beaumont, L. R. (2005*). Content networking: Architecture, protocols, and practice.* Amsterdam: Morgan Kaufmann Publishers (imprint of Elsevier).

Lombard, M., Grabe, M. E., Reich, R., Campanella, C., & Ditton, T. B. (1996). *Screen size and viewer responses to television: A review of research.* Paper presented in the Communication Theory and Methodology Division at the Association for Education in Journalism and Mass Communication annual meeting.

Lyman, P., & Varian, H. R. (2003). How much information? 2003 report on American consumers. Retrieved from http://www2.sims.berkeley.edu/research/projects/how-much-info-2003/

Okada, K. I., Maeda, F., Ichikawaa, Y., & Matsushita, Y. (1994). Multiparty videoconferencing at virtual social distance: MAJIC design. *CSCW '94 Proceedings of the 1994 ACM conference on computer supported cooperative work.* New York: ACM (pp. 385–393).

Reeves, B., Lang, A., Kim, E. Y., & Tatar, D. (1999). The effects of screen size and message content on attention and arousal. *Media Psychology, 1*(4), 49–67.

Reeves, B., & Nass, C. (1998). *The media equation: How people treat computers, television, and new media like real people and places.* University of Chicago Press.

Subramanya, S. R. (2000). Video containers: A system for the on-demand storage, delivery, and management of television programs. *IEEE International Conference on Multimedia and Expo, New York* (pp. 1245–1249).

Subramanya, S. R., & Yi, B. K. (2005a). Mobile Content Customization. *IEEE MultiMedia, 12*(4), 103–104.

Subramanya, S. R., & Yi, B. K. (2005b). *Mobile content provision—major issues.* Paper presented at Wireless World Research Forum 15–WG2, Paris.

Subramanya, S. R., & Yi, B. K. (2005c). Utility model for on-demand digital content. *IEEE Computer, 38*(6), 95–98.

Subramanya, S. R., & Yi, B. K. (2006). User interfaces for mobile content. *IEEE Computer, 37*(4), 101–103.

Turner, K. J., Magill, E. H., & Marples, D. J. (Eds.). (2004). *Service provision technologies for next generation communications.* New York: John Wiley.

Wright, P.I., et al. (2010). *Beyond textbooks.* Virginia Department of Education. Retrieved from http://lwbva .org/beyondtextbooks.cfm

About the Author

S. R. Subramanya
Associate Professor, School of Engineering, Technology and Media
National University
La Jolla, CA
ssubramanya@nu.edu
Major research interests: digital content services, mobile computing, and multimedia

Instructional Methodology

Active Learning and Innovation in Marketing Education: A Case Review

Patricia C. Skalnik and J. Robert Skalnik

Abstract
Course design may be a powerful driver of pedagogical innovation. Renewed attention has been paid to the application of "active learning" techniques to enhance student achievement. In this case, an empirical/applied class has been changed from a traditional course to one that combines software and Internet applications, in addition to collaborative team-based learning. Student enthusiasm and interest has "morphed" an Internet Marketing class into a hybrid of Internet Marketing, Community Service, Web Design and Social Media Marketing. As technology and student expectations move forward, faculty must be motivated to deliver integrative courses to educate students and prepare them for working environments.

Key Words
Web-based instruction, strategic Internet marketing, experiential learning, active learning, instructional design

Active Learning Drives Innovation

Innovation in course design evolves from numerous sources, not the least of which represent active and interactive learning techniques such as group and reflective activities designed to increase the quantity and quality of original, creative thinking. By involving all students in active learning processes, meaningful knowledge can be constructed, and students are motivated to "reframe" issues and consider problems from multiple perspectives. Such productive use of human capital—and the skills, productivity, and leadership associated with it—in a knowledge-based global environment may produce economic benefits as well as job creation. Instructing students in various software and Internet applications provides additional opportunities for personal and professional development.

As the discipline of marketing has evolved over the years, so too have techniques and methodologies in marketing education. While the core definition of marketing—identifying and meeting customer wants and needs—has endured the test of time, the concept of marketing has expanded to include a societal dimension; to support the delivery of higher standards of living. Corporate social responsibility, environmentalism, and customer relationship marketing have extended marketing theory and practice to include organizational performance and customer lifetime value (Kotler, 2012).

Changes in technologies have had a profound impact on marketing practice. For example, pressure from customers through social media has created global opportunities, which is forcing marketers to become increasingly sensitive to interactive possibilities from various customer bases and stakeholders.

Not surprisingly, significant adjustments in marketing education have been required to address these types of concerns. Rather than the traditional static delivery of course content, today's marketing courses are often augmented with technology, real-time information reporting, and active learning processes to stimulate student engagement. Internet marketing is now a standard part of the curriculum, including discussions of e-commerce business models, online security issues, online branding strategies, social networks, ethical issues in e-commerce, and collaborative commerce (Laudon & Traver, 2011).

With respect to strategies for effective technological integration, "Good Models for Teaching with Technology" (GMOTT) suggest that technology-enhanced lessons should reflect a variety

of learning strategies, including active learning, constructive learning, cooperative learning, and intentional/reflective learning (Knowledgeloom, 2011).

Theoretical Constructs

Revisions to Bloom's taxonomy reflect a more active form of thinking, the new domains being creating, evaluating, analyzing, applying, understanding, and remembering (Pohl, 2000). Active learning may be thought of as anything course-related that all students in a class session are called upon to do, other than simply watching, listening, and taking notes (Felder & Brent, 2009). Active learning involves providing opportunities for students to meaningfully talk, listen, write, read, and reflect on the content, ideas, issues, and concerns of an academic subject (Meyers & Jones, 1993). Common active learning techniques include visual-based instruction, in-class writing assignments, case study analyses, cooperative learning, role playing, subject-related simulations, and other ways of teaching with technology.

According to Bonwell and Eison (1991), such strategies can be effective in encouraging higher-order thinking tasks such as analysis, synthesis, and evaluation. Furthermore, students may prefer techniques that promote active learning to more traditional lectures. Many strategies promoting active learning may be similar to lectures in terms of promoting mastery of content, but superior to lectures in promoting the development of thinking and writing skills. Moreover, some cognitive research has suggested that a significant number of students have learning styles best suited to methodologies other than lectures (Bonwell & Eison, 1991).

Another factor in the success of active learning, according to Felder and Brent (1997), is that, while individual students may get stuck on a problem and give up, groups of students tend to collaborate to find an answer. In addition, from team activities students may be exposed to alternative problem-solving strategies. Experience may also be a factor: "As students begin to trust each other and develop a commitment to the goals and welfare of the group, they become a team. When they become a cohesive team, the team can do things that neither a single individual nor a newly formed group can do." (Stark, 2007).

Constructivism, a theory of learning and instruction that encompasses cognitive learning theories, seems appropriate for Web-based instructional environments. Bruner (1986) postulates that learning is an active process, during which learners construct new ideas based on their current understanding and perspectives. They do this by selecting and then transforming information by organization, elaboration, scaffolding and other cognitive strategies. During this process, the instructor engages students in conversations to help them build upon existing knowledge structures.

Bruner recommends that the curriculum be organized in a spiral so that this building process is facilitated and enhanced with each turn. Six conceptual frameworks are discussed:

1. Multiple representations of reality (an environment or context is created that may include text, video, virtual reality)
2. Authentic tasks (new information that resembles real life, which may include interactive multi-media, computer-based simulations and modeling, expert lectures or advice, and/or conferencing)
3. Real-world, case-based contexts, where a coach or mentor is integral in the process of real-life events, and examples are discussed (synchronous and asynchronous applications may be used)

4. Fostering reflective practice (requires higher-order thinking, shared work documents, study guides, and/or conferencing)
5. Knowledge construction (the learner shares mental models with peers and experts in the community; involves situational learning and/or simulated workplaces, and new products are created such as art, music, writing)
6. Collaborative learning (social interaction; involves sharing and valuing the perspectives of others, negotiation, interdependency; case studies, student portfolio development, simulations, 3D modeling)

Closely aligned with active learning, the experiential learning models introduced by Kolb (1984) consist of four elements: concrete experience, observation and reflection, the formation of abstract concepts, and testing in new situations. Kolb and Fry (1975) argue that the learning cycle can begin at any one of the four points, and that it should be approached as a continuous spiral.

Other research reveals that the more effective teachers demonstrate greater implementation of learner-centered domains of practice than the less effective teachers (Fasco, Grubb, & McCombs, 1993). Moreover, the quality and quantity of student involvement will favorably influence levels of student learning and involvement (Astin, 1984). And, not surprisingly, student learning improves when students engage with course material and actively participate in the learning experience.

According to Stark (2007), some guidelines for using active learning in the university classroom include the following:

1. Professor must be "student oriented."
2. Students participate in setting goals.
3. Climate is collegial and supportive.
4. Activities are problem-centered and student-driven.
5. Assessment is continuous and supportive.
6. Teaching is "developmental" rather than "directive" and "presentational."

Chickering and Gamson (1987) formulated "Seven Principles for Good Practice in Undergraduate Education":

1. Encourage contacts between students and faculty.
2. Develop reciprocity and cooperation among students.
3. Use active learning techniques.
4. Give prompt feedback.
5. Emphasize time on task.
6. Communicate high expectations.
7. Respect diverse talents and ways of learning.

Course Innovation

The Internet, as a forum for active learning, has been discussed widely and documented since the early 1990s. A model particularly relevant to computer applications was created by Schank and

Cleary (1995) identifying five teaching architectures and key cognitive strategies. In considering the Internet Marketing course, this model appears to be applicable. Examples are as follows:

1. *Simulation-based architecture,* where the key elements are "learning by doing" and "active engagement," is most applicable when the subject matter is experiential in nature. An example in this course would be demonstrated by students creating a website. Using Adobe Dreamweaver Creative Suite 5, students begin by designing and creating a personal website that includes several pages: the main page with operational features such as buttons, links and a simple layout; and subsequent pages including their résumé, personal interests, a marketing portfolio with examples of marketing projects from previous courses, and examples of community-based volunteer work. They can save this work to show potential employers, archive it for later updating, or publish and upload it as a website of their own. Next, students develop a website for a selected community-based organization, often a non-profit, that can be uploaded as a viable and working resource for that organization. They spend a significant amount of time building their website. While some students find this frustrating, they are encouraged in team settings by other students who may be more technologically savvy. Websites and marketing programs have been formulated for a wide range of organizations, including a non-profit group in California's San Gabriel Valley that provides assistance to women and children in times of need; one of the largest seafood providers in the United States; and a local family-owned construction company.
2. *Incidental architecture,* imparting rote information in the context of an interesting task or experience, is used when incidental information must be conveyed, or when the outcome based on the learning of a knowledge base is at a lower level of cognition. This would be utilized with typical pedagogical terms and definitions from the text are learned along with activities for reinforcement. One assignment, for example, is the introduction of different e-commerce business models where the students review and analyze websites that utilize each model. For example, Yahoo would be a "portal" business model offering an integrated package of content, content-search, and social network services. An "e-tailer" model would be either Amazon (as a virtual merchant) or JC Penney (a bricks-and-clicks merchandiser). Social media or non-profit organizations would use a "community provider" model. Also applicable for this architecture is a website evaluation exercise where students use specific design elements—such as backgrounds, text, graphics, links, navigation, and general design elements—to evaluate real websites. They compare and contrast effective design with ineffective design, based on identification of target market(s) and evaluation of the appropriateness of website content. Next, using a nominal rating system, operational issues are assessed, including page fit, consistency of font styles and sizes, simplicity of layout and design, and use of suitable graphics.
3. *Learning by reflection,* asking critical questions about one's own learning, is applied when interaction with a coach or expert is desirable, or when self-assessment is expected. During discussions of textbook materials, students are expected to have reviewed and critiqued current articles that relate to chapter materials. Student findings are discussed in a collaborative, "open forum" format. Students are encouraged to include empirical examples of how organizations utilize e-commerce technologies and the Internet to conduct effective marketing and business online. Current topics of interest include online privacy and designing for accessibility with Web 2.0.

4. *Case-based architecture,* including case analysis and "just-in-time" learning, is used when the learner is expected to make errors or experience failures, when new information is introduced as the task unfolds, or when learners would benefit from the presence of an expert who can relate practical, real-world experiences. A popular case study examines the online grocery delivery market. The cases of Fresh Direct, a successful online firm, and Web Van, a considerably less successful online company, are reviewed. Students, working in teams, compare and contrast various business and marketing strategies used by the companies and analyze why some were more successful than others. Other cases in different industries and markets are also discussed.
5. *Exploration architecture,* in which student questions are answered as they arise in a real-time environment, is appropriate when a running conversation with either peers or experts is planned. This approach may be best suited for team-based activities. An integral project in this course involves formulation of a strategic Internet marketing plan, where teams of 4–5 students develop a visionary plan and accompanying website for a local organization. The collaborative student groups, learning as they go, act as a "management group," making various strategic recommendations to the organization's executives. In most cases, company representatives actively participate in this process, providing immediate feedback and guidance. The completed plans then become part of the student marketing portfolio and are supplied to the organization for potential implementation.

Three primary textbooks are required for this 16-week traditional undergraduate semester course:

1. *E-Commerce Business, Technology, Society* (Laudon & Traver, 2011) covers foundational material required for the course, providing students with an excellent background reference source.
2. *The Non-Designer's Web Book* (Williams & Tollett, 2006) provides insight into basic Web design principles, as well as helpful technological tips to expedite improved site layouts and designs. Important techniques such as file naming, proper file formatting, preparation of image files for the Internet, site testing, and site uploading are also included.
3. *Dreamweaver CS5 Visual Quickstart Guide* (Negrino & Smith, 2010) is a "screen by screen" tutorial on the extensive capabilities of Dreamweaver, the software package most commonly used in website creation.

Central to classroom discussions are reviews and exploration of such topics as the consumer decision process and supported communications, clickstream behaviors, unique features of e-commerce technology on marketing, online marketing communications, search engine optimization and Web analytics (available as soon as a website is online), some social media marketing, and marketing metrics lexicon. Core issues such as moral and ethical dimensions of a global Internet society are emphasized as well.

Student input and participation are essential. Experience has shown that some students, notably those with non-marketing majors such as graphic arts or communications, exhibit high levels of knowledge with respect to software programs included in Adobe's Creative Suite. Frequently, the more technologically savvy students actively share their skills with other students in the class. For example, it is not unusual for these students to develop 30- to 60-minute "mini" tutorials to explain the basics of programs such as Dreamweaver, Photoshop, or Illustrator—

applications which assist the progress of other students in areas such as website creation, editing and re-sizing photos for the Web, designing logos, and general site layout. In effect, the process of students teaching each other adds to the construction of meaningful knowledge and thus stimulates student motivation. This cooperative collaboration can also be helpful to the instructor with respect to implementing appropriate course improvements.

Challenges

In collegial conversations, some concern has been expressed that this course features an excessive number of components; that it may, in reality, represent two courses combined into one. These comments may be valid in the context of traditional teaching protocols. However, today's technologically proficient college students have been able to adapt to the rigors of this course quite successfully, demonstrating advanced knowledge and skills in Web design and managerial reporting of Web analytics. While they may be limited in their overall experience, they are well versed in technical vocabulary and are able to dialogue effectively with potential employers. They exhibit familiarity with the tasks necessary to fully appreciate an integrative, solid, and comprehensive marketing approach.

Bonwell & Eison (1991) suggest that some faculty may resist embracing active learning due to specific factors such as limited class time, increased preparation time (most notably with respect to new software updates), potential difficulty in using active learning techniques in large classes, and a lack of needed materials, equipment, or other resources. The most significant barrier, though, may be that employing active learning involves some degree of risk that students will not participate, will not engage in higher-order thinking, and will not learn content material. Moreover, many faculty members are uncomfortable with the anxiety created by change.

Closing Thoughts

While the Internet Marketing course described is, by its very nature, a work in process, initial qualitative assessments have been both impressive and encouraging. Students have demonstrated improved levels of "online literacy" and increased sensitivity to the important role of online marketing in the overall success of many organizations. Interest level in the course has increased dramatically among the student body, and feedback from the professional community regarding the skills and competencies of those completing the course has been highly favorable. Most noteworthy, perhaps, is that employers have responded by placing graduates in responsible managerial positions within their firms.

As higher education moves to online environments, Salmon (2011) has proposed a five-stage model for computer-mediated instruction, which may effectively extend the evolution that has taken place in the case reviewed herein. Future success may depend on access and motivation (technical ease of use), online socialization (e-activities that encourage active participation), information exchange (interaction with Web links, databases, case studies, and fellow learners), and knowledge construction (building an online community focused on learning and the development of meaningful knowledge).

In the final analysis, perhaps, understanding of students and the nature and processes of improved learning will allow educators to create more successful learning environments (Bain, 2004). The meaning of learning within each discipline must be explored, along with optimal

techniques for recognizing and cultivating it. As Palmer (1998) noted, "to educate is to guide students on an inner journey toward more truthful ways of seeing and being in the world" (p. 6).

In our knowledge-based economy, innovative educators may be called upon to employ information technologies—in active, dynamic environments—to help produce economic benefits, as well as job creation. Accordingly, some "traditional" courses have been morphed into hybrid structures. In this case, student enthusiasm, combined with advanced technologies, has allowed the development and implementation of a course that combines Internet marketing, community service, Web design, and social media marketing. Given ongoing changes in both technological capabilities and student expectations, educators must be motivated to deliver integrative courses that not only educate students in specific subject matter but encourage higher-order critical thinking to prepare them for future professional environments.

References

Astin, A. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25,* 297–308.

Bain, K. (2004). *What the best college teachers do.* Cambridge: Harvard University Press.

Bonwell, C., & Eison, J. (1991, September). *Active learning: Creating excitement in the classroom.* (ERIC Digest No. ED340272). Washington, DC: ERIC Clearinghouse on Higher Education, George Washington University.

Bruner, J. (1986). *Actual minds, possible worlds.* Cambridge: Harvard University Press.

Bruner, J. (1990). *Acts of meaning.* Cambridge: Harvard University Press.

Chickering, A., & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *American Association for Higher Education Bulletin, 39*(7), 3–7.

Fasco, D., Grubb, D., & McCombs, B. (1993). *Use of* The Learner-Centered Principles Test Battery*: Implications for inservice and preservice professional development.* Washington, DC: American Psychological Association & Mid-Continent Regional Education Library.

Felder, R., & Brent, R. (1997). Effective Teaching Workshop. North Carolina State University.

Felder, R., & Brent, R. (2009, August). Active learning: An introduction. *ASQ Higher Education Brief, 2*(4), 1-5.

Knowledgeloom. (2011). *Practices evident in good models of teaching with technology (GMOTT).* Retrieved from http://knowledgeloom.org/September_2011.

Kolb, D.A. & Fry, R. (1975). Toward an applied theory of experiential learning. In C. Cooper (ed.) *Theories of group process.* London: John Wiley.

Kolb, D. A. (1984). *Experiential learning.* Englewood Cliffs: Prentice Hall.

Kotler, P. (2012). *Marketing management* (14th ed.). Upper Saddle River: Pearson, Prentice Hall.

Laudon, K., & Traver, C. (2011). *E-commerce business, technology, society* (7th ed.). Upper Saddle River: Prentice Hall.

Meyers, C., & Jones, T. (1993). *Promoting active learning: Strategies for the college classroom.* San Francisco: Jossey Bass.

Negrino, T., & Smith, D. (2010). *Dreamweaver CS5 visual quickstart guide.* Berkley: Peachpit Press.

Palmer, P. (1998). *The courage to teach: Exploring the inner landscape of a teacher's life.* San Francisco: Jossey Bass.

Pohl, M. (2000). *Learning to think, thinking to learn: Models and strategies to develop classroom culture of thinking.* Cheltenham, Victoria: Hawker Brownlow.

Salmon, G. (2011). E-moderating: *The key to online teaching and learning.* London: Taylor & Francis.

Schank, R. C., & Cleary, C. (1995). *Engines for education.* Hillsdale: Lawrence Elbaum Associates.

Stark, D. (2007). *Professional development module on active learning.* Texas Collaborative for Teaching Excellence. Retrieved from http://www.texascollaborative.org/activelearning/september_2011.

Williams, R., & Tollett, J. (2006). *The non-designer's Web book* (4th ed.). Berkeley: Peachpit Press.

About the Authors

Patricia C. Skalnik
DBA, Associate Professor
School of Business and Management
Azusa Pacific University
Azusa, CA
pskalnik@apu.edu
Major research interests: Internet marketing, strategic marketing management, business and marketing internships

J. Robert Skalnik
Ed.D., Associate Professor
School of Business and Management
Azusa Pacific University
Azusa, CA
rskalnik@apu.edu
Major research interests: marketing management, integrated marketing communications, business ethics

Experiential Learning of EFL for Professional Communication at Tertiary Educational Institutions

Oleg Tarnopolsky

Abstract
This article considers the experiential learning approach developed with the aim of teaching English for professional communication to students of Ukrainian tertiary educational institutions who major in different non-linguistic fields (Economics and Business, Technology, Psychology, etc.) but study English as a mandatory course at their universities so they may use the language for furthering their professional development and career opportunities. The suggested experiential learning approach is based on such structuring of a university EFL/ESP course that students' learning activities start to model their future professional activities and professional communication, these being conducted not in learners' first language but in English.

Key Words
Experiential learning, content-based instruction, principles of integrated experiential and content-based ESP instruction

Introduction

It has become widely recognized that language teaching pedagogies should be built depending on the local conditions rather than in the top-down way—from theoretical SLA constructs often adopting a center-based monolingualist framework to explain second language competence (Canagarajah, 2005; Canagarajah, 2006; Firth & Wagner, 1997). That is why English language learning outside English-speaking countries (EFL) can be successful only if specific (for those countries) performance strategies, situational resources, and social negotiations in fluid communicative contexts are adopted (Canagarajah, 2007). This is especially true of English-for-specific-purposes (ESP) teaching (i.e., teaching English for purposes of professional communication) that absolutely cannot be effective if it is organized without taking strict account of the conditions and local contexts in which it is taught.

ESP teaching at tertiary educational institutions of Ukraine is characterized by a number of specific features that require specific teaching approaches. Three such principal specific features are listed and discussed herein.

A Mandatory Course

The course of English is a mandatory one for students during at least the first two (sometimes three) years of their university studies, with 4 hours of English classes per week in every year. In the first year, it is mostly the course of General English, and students are supposed to reach the intermediate level of its command by the end of the year—level B2 (*independent user*), according to the *Common European Framework of Reference for Languages* (Council of Europe, 2001). On this basis, the second year is devoted to the course of English for professional communication (English for Science and Technology for technical students, Business English for students of Economics and Business, etc.). That course must be designed following the specific professional needs of a specialist in a given field. The aim of the course, just as in the first year, is to ensure students' attaining level B2 in the development of their English communicative competence, but already in the area of professional communication. It is following this

organizational framework and the aforementioned mandatory goals that ESP teaching in the second year of university studies must be structured.

A Course without Immediate Practical Use

Students learning English for professional communication in the second year of their university studies do not have any immediate need or use for it in their courses on professional subjects. That lowers their motivation for ESP learning and consequently lowers learning results, since the prospects of using English in future professional activities seem rather vague. On the other hand, such students are mostly enthusiastic about acquiring knowledge and practical skills directly related to that future profession. Therefore, to make ESP learning really successful, it is important not to make it an academic subject that is a thing apart in relation to professional training. ESP should be made an inextricable part of the professional training so that, while learning English, students at the same time enhance their professional knowledge and skills.

ESP Teachers Who Are Not Specialists in the Fields of Their Students' Majors

The teachers teaching ESP in the second year of students' studies at Ukrainian universities are practically never specialists in the fields of their students' majors. That creates a serious problem, because teaching English for professional communication—often knowing less about that profession than the students do—frequently leaves teachers at a loss concerning the subject matter of the teaching materials used in their ESP classes. Since students are not specialists in their future profession either, as yet, but are still being trained for it, they often ask their teachers questions about that subject matter; teachers can seldom answer these questions competently. The only way of solving this problem is to design an ESP course in a way that allows both students and teachers to explore the intricacies of the students' future profession jointly, using English as a medium for such an exploration.

The aim of this article is to discuss an approach to ESP teaching that effectively takes into account all the aforementioned conditions and circumstances in teaching English for professional communication to students of Ukrainian universities, thus ensuring considerable improvement in the teaching/learning process and its outcomes. The approach and its specific modifications for the conditions of Ukrainian tertiary schools, to be discussed further, are termed herein as *experiential teaching/learning.*

Experiential Teaching/Learning and Using It in University ESP Courses

The experiential approach in ESL/EFL teaching (Freeman, & Freeman, 1998; Jerald & Clark, 1994; Kolb, 1984) presupposes learners' acquisition of knowledge and skills not by way of studying theory but through the experience of practical activities where knowledge is used as the means for carrying out those activities.

The popularity of experiential approach in teaching/learning second/foreign languages is that it is *the most natural way of language acquisition and language communication.* Children acquire their mother tongue by using it for different activities in which they acquire their life experiences. In the same way, adult language communication is performed not for the sake of communication itself but for making different extra-linguistic activities possible. Therefore,

when the learning of a second/foreign language is implemented by using it for communication designed for ensuring extra-linguistic activities, the language itself is acquired subconsciously and with much less effort as a byproduct of those activities.

If the extra-linguistic activities are connected with the students' major, their learning the language for professional communication through the medium of professional subject matter is ensured. On the one hand, subjectively for students, it makes ESP learning an inextricable part of mastering their future profession, thus enhancing their language learning motivation and successfully solving the problem indicated in the second point addressed in this article's Introduction. On the other hand, this approach to the experiential learning of ESP at tertiary educational institutions makes such learning founded on content-based instruction.

In accordance with the definition by Brinton, Snow, & Wesche (1989), content-based instruction means the integration of content of some academic non-linguistic disciplines and language teaching goals. It presupposes (a) parallel acquisition of knowledge from certain non-linguistic disciplines as well as communication skills in the target language, (b) basing the target language syllabus on the syllabi of the courses on certain non-linguistic disciplines so that the language/communication content follows the requirements of acquiring the non-linguistic disciplines' subject matter content, and (c) focusing students' attention on the acquisition of the subject matter content of certain non-linguistic disciplines acquired through the target language, so that communication skills in that language are developed as a byproduct of the integrated content/language learning process. In this way, content-based instruction eliminates the separation of the language course from the courses included in students' major.

The preceding description of content-based instruction shows how close it is to experiential teaching/learning. If experiential learning requires learning a second/foreign language through using it for communication designed for ensuring extra-linguistic activities, the content-based instruction determines the objects and content of those activities for their integration into the total scheme of students' professional training. Moreover, if the experiential learning approach is chosen for teaching a foreign language for professional communication at a tertiary educational institution, then the teaching/learning process has to be content-based in professional disciplines, since there is no other way of making it both experiential and strictly profession-oriented.

Integrating experiential learning with the content-based approach has one more important advantage: It opens the doors to introducing English immersion in teaching professional courses, beginning from the third or the fourth year of students' university studies (after they finish their mandatory course of English). English immersion, i.e., teaching academic professional subjects (in the courses on those subjects and not in the course of English) in the target language and not in students' first language (L1) (Clark, 2000), is the highest form of integration of professional content matter with language teaching goals (Walker & Tedick, 2000). So it may be considered as the highest form of content-based language instruction. But at the same time, it is also the highest form of experiential learning, because in immersion students acquire their target language communication skills through experience in obtaining their professional knowledge and skills in courses on professional disciplines taught in English. Thus, the interrelations of experiential teaching/learning, content-based instruction, and English immersion at tertiary schools may be defined as shown in Figure 1.

From Figure 1 it follows that experiential teaching/learning, in principle, can be not always content-based (and it is such in courses of General English where there is no specific, profession-oriented content for the teacher and the students to follow). But content-based ESP instruction at Ukrainian tertiary schools must necessarily be experiential. Otherwise, it will be impossible to

meet the third of the aforementioned requirements to the content-based instruction, namely, focusing students' attention on the acquisition of the subject matter content of certain non-linguistic disciplines which is(are) acquired through the target language so that communication skills in that language are developed as a byproduct of the integrated content/language learning process. The same concerns English immersion, which is the highest form of content-based instruction. Content-based instruction can be considered as a generic term embracing both the ESP teaching in a university course of English and teaching ESP in courses on professional subjects taught in English (immersion proper).

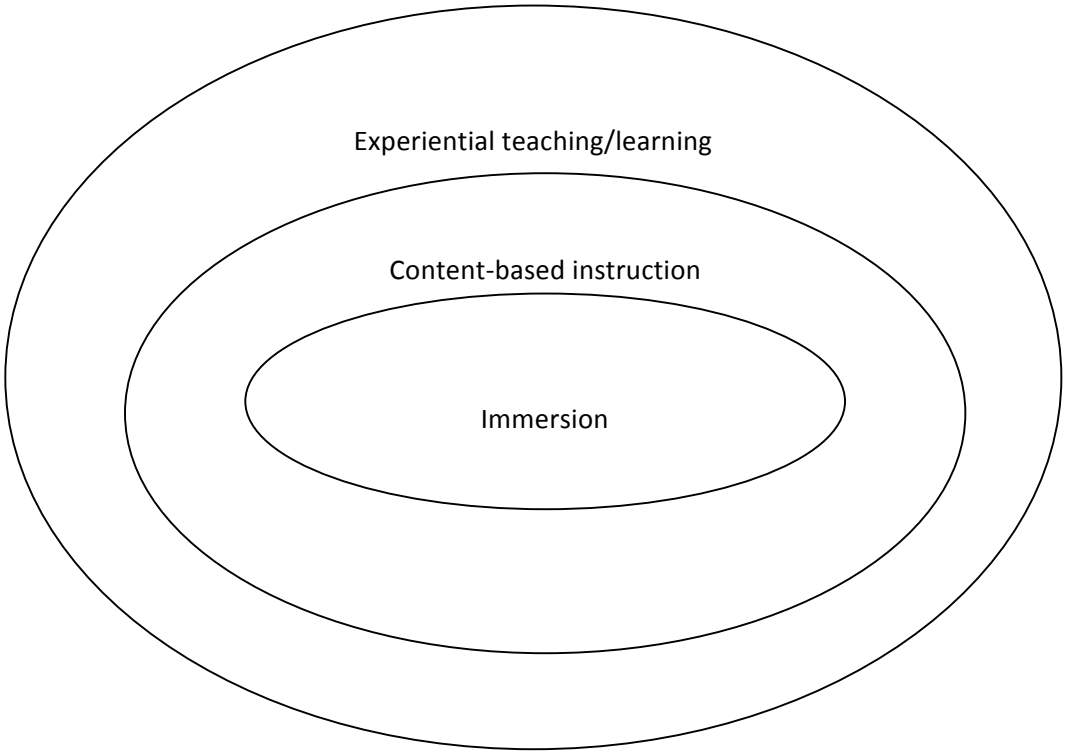

Figure 1. Interrelations of experiential teaching/learning, content-based instruction, and English immersion at Ukrainian tertiary schools.

Naturally, introducing English immersion requires fundamental students' preparation. From Figure 1 it follows that experiential teaching/learning, integrated with content-based instruction in the Ukrainian universities' second-year course of English for professional communication (ESP), is the best way to do so. This is true because, in this case, the transition is quite natural from a second-year ESP course to English immersion professional subjects' courses beginning from the third year of studies. In both cases, the approach to making students acquire the target language is the same, only the lower and the higher levels of such an acquisition. The lower level (experiential content-based ESP instruction in the second-year course of English) makes students psychologically and linguistically prepared for passing to the higher level (English immersion in courses on professional disciplines beginning from their third year of studies).

This article discusses only the integrated experiential and content-based ESP instruction in the second-year mandatory course of English for Ukrainian tertiary school students. Developing just such a kind of experiential teaching/learning meets the requirements and conditions of teaching/learning English for professional communication at Ukrainian universities indicated in the first point made in this article's Introduction. The issues of continued use of the developed approach at a higher English immersion level will not be analyzed—though it will be mentioned further as a perspective. It should be kept in mind that the suggested experiential approach for the second-year course of English for professional communication has been developed with the view of continuing that approach in English immersion courses on professional disciplines, beginning with the third year of students' university studies.

The integrated experiential and content-based ESP instruction in the second-year mandatory course of English for Ukrainian tertiary school students has been developed following several principles put forward to ensure its successful implementation in the specific conditions of Ukrainian universities.

The Principle of Providing Systematized Professional Information in an ESP Course

This principle presupposes designing the ESP course as a systematic theme-based (Brinton, Snow, & Wesche, 1989), profession-oriented course teaching students all the essentials of their future profession in a logical and systematized manner, but doing it through the medium of the target language. Thus, the course of English for professional communication is designed as a real academic professional course so that, after finishing it, students acquire systematized knowledge concerning some principal points of their future profession—a kind of synopsis in English of the majority of their majoring academic disciplines. If this principle is not followed and ESP is taught through introducing disparate and hardly logically interconnected professional topics (which occurs quite frequently at Ukrainian universities), students cannot get a "general picture" of their future profession "drawn" in the target language. So ESP classes are not intrinsically linked to professional studies and consequently cannot really be called content-based. As a result, students do not learn to communicate on professional matters in the target language in the same systematic, knowledge-based manner as they can do in their L1.

The Principle of Integrated Development in an ESP Course of All the Four Basic Target Language Communication Skills: Speaking, Listening, Reading, and Writing

This second principle is more target-language and target-language-communication oriented. (Naturally, only the skills of speaking, listening, reading, and writing for professional purposes are meant.) This principle, which is well known and followed in most modern language-teaching approaches (e.g., Byrne, 1987; Oxford, 2001), first presupposes organic and natural inter-connections of all the four basic communication skills in students' learning activities so that each of these skills is developed on the basis and with the support of the other three; reading and/or listening stimulate speaking and writing (for instance, to discuss the information obtained and to draw conclusions), such speaking and writing encourage further reading and/or listening (to obtain additional information, to confirm or negate one's own or other people's ideas), etc.

Second, it means that the interconnections of the four communication skills are raised to the level of their integration in the teaching/learning process so that most learning activities are designed to ensure the need to use all communication skills for completing different learning

tasks. For instance, such an experiential learning activity as project work discussed further requires reading and listening to obtain the initial information for doing the project task, discussing and deciding (on the basis of the information obtained) how the task needs to be done (speaking and listening), doing the task itself (mostly in writing), discussing the results (speaking and listening), additional reading and/or listening, as well as writing to improve the end product, etc. In this case, the task cannot be successfully completed if any one of these four forms of communication is excluded. It means that the learning activity integrates them all.

The importance of this principle is that professional communication (either in L1 or in the target language) always requires all four communication skills, that they are integrated in such communication, and that the same approach has to be followed in the ESP teaching/ learning process—with equal attention paid to developing speaking, listening, reading, and writing so that each of the skills makes the development of the other three skills necessary and supports their development.

The Principle of Using Only Authentic Profession-Related Materials in the Teaching/Learning Process

The requirement of using only authentic learning materials was postulated by Brinton, Snow, and Wesche (1989) as one of the principal features for every kind of content-based instruction. Authentic learning materials (texts for reading and listening) are those that were initially written or spoken by native speakers and for native speakers (Nuttal, 1996) and, in the case of professional communication, were also produced by specialists in the given field. Using only such written and spoken learning materials in content-based ESP instruction is necessary; otherwise, students will lack truly authentic models of target language professional communication. When written and spoken texts are specially compiled for use in the ESP teaching/learning process by producers of learning materials who are not specialists in the field of the students' major and often are not even native speakers of the target language (which is frequently the case with ESP learning materials in ESP classes at Ukrainian universities), learning cannot be really experiential, since students cannot access, or experience, samples of genuine professional target language communication.

Of course, for teaching/learning purposes, authentic written or spoken texts can be abridged, parts of different authentic texts can be combined in one text, etc. It means that the so called synthesized texts (Trimble, 1992), i.e., texts synthesized from different authentic sources to make them better adapted for learning purposes, can and should be used in experiential teaching/ learning insofar as they do not lose their authenticity. But because of the preceding requirement of authentic models for teaching professional target language communication, losing that quality makes learning materials unsuitable for experiential learning. Fortunately, nowadays there is no problem with finding authentic (in the present sense), genuine, or synthesized learning materials in required quantities for the ESP teaching/ learning process; professional Internet sites in English possess practically inexhaustible resources of them.

The Principle of Authenticity of Students' Profession-Related Learning Activities and Learning Communication in the Target Language

This last principle is probably the most important for organizing genuinely experiential content-based learning of English for professional communication at Ukrainian tertiary schools. It has already been explained that experiential teaching/learning of a second/foreign language is implemented through organizing target-language communication designed to ensure extra-

linguistic activities, while content-based instruction, combined with experiential teaching/ learning, presupposes acquiring the target language through the content very closely related (in a systematized manner) to the content matter of students' future professional activities and professional communication. A combined experiential content-based teaching/ learning approach for tertiary schools becomes feasible only if learning activities in the ESP course closely (authentically) model professional activities and professional communication in which students (future specialists) will need English for solving their professional tasks.

If this requirement is not met (and it often is not met in Ukrainian ESP courses), students will be learning professional communication in English through learning activities that do not bear resemblance to the activities and situations in which they will really need to communicate in English for professional purposes when they start practicing their profession. As a result, they will not get sufficient preparation for future professional reality requiring the use of the target language, since in their ESP course they could not get the experience of target language communication in situations resembling (modeling) that future reality. This eliminates all the advantages of experiential learning—depriving students of the opportunity of learning professional communication in English through actual participation in such (modeled) professional communication.

Therefore, for practically implementing the experiential teaching/learning approach, it is vital to select properly the principal learning activities for the course of ESP—selecting only such activities that authentically model professional activities and professional communication in which students (future specialists) will need English for solving their professional tasks. Besides, as follows from everything said previously in this paper, those activities should also be of content-based character and meet the requirements of the first three principles just formulated.

Learning Activities and Learning Content for Experiential ESP Courses at Ukrainian Tertiary Schools

The principal learning activities selected in the process of developing the experiential teaching/learning approach to designing ESP courses at tertiary schools in Ukraine included the following types:

1. Simulating (role-playing) professional activities requiring communication in the target language (for instance, simulating negotiations with foreign business partners—an activity for students preparing for a career in business).
2. Brainstorming professional issues in the target language.
3. Case-studies done in the target language.
4. Group discussions on professional issues in the target language.
5. Project work (developing profession-oriented projects in the target language).
6. Students' presentations on professional issues in the target language.
7. Library and Internet search for professional information in the target language for using that information when doing profession-oriented learning tasks (such as project work).

These types of learning activities can be considered as the principal ones for an experiential ESP course at a Ukrainian university because they fully meet the requirements to such activities as formulated earlier. They faithfully model those professional activities, professional communication, and professional communication situations where Ukrainian specialists will, with a

high degree of probability, need English for completing their professional tasks. All these activities can easily be based on professional content matter, the learning materials required for doing them can be taken from the students' majoring disciplines (content-based instruction), systematized in accordance with the requirements of such disciplines (following the principle of providing systematized professional information in an ESP course) and can be selected from authentic profession-related sources only (following the principle of using authentic materials in the teaching/learning process).

Though the learning activities under discussion are mostly oriented at speech production (speaking in simulations, brainstorming, case studies, discussions; speaking and writing in project work and when preparing and delivering presentations), doing them is impossible without speech reception. It concerns not only library and Internet search, which are entirely reception based; in fact, no project work, discussion, simulation, presentation, etc. is possible without first collecting information through reading and/or listening. Such work connected with collecting information through reading and/or listening for doing any of the learning tasks described often needs to be repeated several times in the process of completing every individual task, for instance, when doing project work or a case study, or preparing for a presentation or discussion. On the other hand, such a purely speech-reception type of learning activity as library and Internet search will always and necessarily have speech production as its outcome, because the information found needs to be used in speaking or writing to perform the task for the completion of which the library or Internet sources have been searched.

Finally, all the activities under consideration (not only project work and presentations) require writing. A natural assignment after a professional case has been discussed orally by students would be their writing its summary with relevant professional recommendations. A simulation, brainstorming, discussion, or Internet search can be followed by students' writing an essay or an abstract on the subject matter of that simulation, brainstorming, discussion, or search. Thus, the selected principal types of learning activities, probably like no others, ensure the integrated development in the ESP course of all the four basic target language communication skills: speaking, listening, reading, and writing.

In accordance with these selected principal learning activities, the following specific learning activities were designed for developing all these four basic target language communication skills in experiential ESP courses for second-year students of Ukrainian universities.

For teaching reading:

- Information search (library search is optional, if the university's library possesses sufficient number of authentic sources in English from the fields of students' majors; but Internet search is obligatory) as a foundation for students' completing different profession-related speaking and writing learning tasks in English.
- Reading various authentic printed profession-related English texts (in the ESP course book and from other printed sources) on theoretical and practical issues of students' majoring disciplines for doing, on the basis of the information obtained, different tasks connected with the analysis of that information, completing various creative tasks such as presentations, projects, development of cases, etc.
- Reading various authentic electronic profession-related English texts (found on the Internet) on theoretical and practical issues of students' majoring disciplines for doing, on the basis of the information obtained, different tasks connected with the analysis of that information and for completing various creative tasks.

For teaching speaking:

- Students' preparing and delivering in English different kinds of presentations, talks, and reports on the issues of their future professional activities.
- Discussing cases when students are requested to give professional recommendations on the basis of initial information supplied to them.
- Brainstorming and professional discussions on theoretical and practical profession-related issues.
- Simulating (role-playing) different situations of professional communication in English, that communication being the means for completing various kinds of modeled profession-related activities.

For teaching listening:

- Listening to authentic short professional lectures, presentations, talks, and reports in English on different profession-related theoretical and practical issues; completing, on the basis of the information obtained, different profession-related tasks connected with the analysis of that information.
- Listening to fragments and passages from authentic professional communications in English (discussions, negotiations, consultations, etc.) where different professional issues are negotiated. Listening is done for obtaining information with the purpose of completing, on the basis of that information, various information-analysis tasks, as well as other creative tasks in speaking and writing.
- Listening (with the same purpose as just described) to authentic professional information in English found in the process of Internet-search (e.g., using YouTube video materials on professional Internet sites in English).

For teaching writing:

- Writing abstracts and essays on theoretical and practical issues of students' future professional activities.
- Writing summaries of professional texts in English that students have read.
- Writing articles on professional issues, especially in the framework of students' project work.
- Writing professional cases by students themselves—those cases to be discussed in the process of class work.
- Writing texts and notes for students' own oral presentations, talks and reports to be delivered in the framework of doing different learning tasks.

The greatest advantage of the kinds of learning activities just listed is that they make students search for, find, and process professional knowledge in their ESP course, i.e., *construct such knowledge themselves through the medium of the target language* (Jonassen, 1995). That not only meets the requirements of the experiential subject-based approach but also solves the problem indicated in the third point made in this article's Introduction. There the contradiction between the necessity of teaching English for professional use at Ukrainian tertiary schools and the ESP teachers' lack of knowledge in the fields of their students' majors was pinpointed. With the learning activities just described, the teachers' roles are mostly limited to what they can do best: organizing language instruction, while the professional content matter of such instruction is mastered through learners' own constructive efforts.

Besides selecting and designing learning activities, the development of an experiential approach to ESP teaching at Ukrainian tertiary schools also required the selection of teaching/learning content to be used when implementing that approach in practice. The content selection was done following a definite procedure to ensure the requirements of content-based instruction; in particular, to ensure the implementation of the principle of providing systematized professional information in an ESP course and the principle of using only authentic profession-related materials in the teaching/learning process.

Following the first of these principles was ensured through the theme-based approach to organizing content-based instruction (Brinton, Snow, & Wesche, 1989). According to that approach, first the professional themes to be studied in an ESP course were selected and systematized following the logical order of their study in professional majoring disciplines. Second, those professional communication situations were selected in which future specialists will, with the greatest probability, need professional communication in the target language on the professional subject matter embodied in the selected themes. The selections of themes and situations, and their systemizing and arranging in consecutive order were done with the aid of specialists (professionals) in every given field to ensure basing the target language syllabus on the syllabi of the courses of certain non-linguistic disciplines so that the language/communication content followed the requirements of acquiring the non-linguistic disciplines' subject matter content.

That allowed proceeding (also with the aid of professionals in the given field) to the third stage—selecting the corpus of authentic professional written and oral texts in English meant to serve as authentic profession-related learning materials in the teaching/learning process of an ESP course. Those materials were selected so as to represent typical samples of written and oral professional communication on pre-selected professional themes in pre-selected professional communication situations. The principal sources of selecting such materials were professional Internet resources, as well as some authentic professional printed resources. Most selected materials were processed (to produce synthesized texts—see earlier description) to make them better adjusted to teaching/learning purposes. Those processed materials were used from which to select the target language vocabulary and grammar and to definite professional, cultural, and pragmatic information to be used and taught in the course. Finally, on the basis of everything selected before, particular and specific professional communication skills in reading, speaking, listening, and writing were defined—those skills that students were supposed to develop using all the previously listed selected materials and through the learning activities designed for the course.

The selection of all learning materials, as well as selecting and designing the learning activities for experiential content-based ESP courses to be taught to second-year students at Ukrainian universities, created the foundation for developing relevant textbooks and practically implementing the suggested approach in the teaching practice of those universities.

Practical Implementation of the Experiential Content-Based Approach in ESP Courses at Ukrainian Tertiary Schools

Practical implementation of the experiential content-based approach has been organized through developing two practical versions (modifications) of the approach—one for students whose major was connected with Business Studies, and the other for students majoring in Psychology.

Each version was embodied in a relevant textbook developed specifically for ESP teaching in each particular area of students' major.

The first version and the textbook *Business Projects* (Tarnopolsky, Kozhushko, et al., 2002) was the foundation for introducing an experiential ESP course designed for second-year students majoring in Business Studies. The version itself, the textbook, and the course based upon it were designed following all the underlying features of the approach discussed previously, with one more specific feature: the concept of continuous simulation in Business English teaching (Tarnopolsky, 2000). Continuous simulation was structured as such an organization of the Business English course when learning developed as continuous modeling and enacting of business activities and communication in class. The enactment was done in the framework of almost life-size functioning of an imaginary company organized and run by students themselves. Such an approach united the course and all learning activities in it with one single plot, and it enhanced the experiential character of learning the language for professional communication.

That ESP course was first introduced in 2002 at Dnipropetrovsk Alfred Nobel University of Economics and Law and proved to be an indubitable success as to students' learning outcomes. The success was demonstrated in special experimental studies (see Tarnopolsky & Kozhushko, 2003, and other publications both in Ukraine and in English-speaking countries). It was experimentally confirmed that, in the development of target-language professional communication skills, the students not only attained the B2 level, which is goal of ESP teaching in a tertiary school (see the Introduction), but even surpassed that level, approaching the level C1, according to the *Common European Framework of Reference for Languages* (Council of Europe, 2001).

The experimental studies also demonstrated considerable increase in students' positive learning motivation and in their self-assessment in what concerns the learning outcomes, as well as both students and teachers' highly positive emotional reactions to the developed approach in teaching/learning (Tarnopolsky, Kozhushko, & Zhevaga, 2006a & 2006b). That practical success of the particular version of the approach, the textbook, and the course based upon it, as well as the aforementioned numerous publications in Ukraine discussing them, led to their introduction in a number of Ukrainian universities, the leading ones (such as the National Technical University of Ukraine in Kiev) among them.

One of the most prominent successful features of that particular version of the approach proved to be the emergence of an opportunity for introducing English immersion teaching after such an ESP course. As already said, it means the possibility of teaching academic professional subjects (in the courses on those subjects and not in the course of English) in the target language and not in students' L1, beginning from the third year of their university studies. That possibility, also proved experimentally (Tarnopolsky, Momot, Kozhushko, Kornieva, Vysselko, Zhevaga, 2008), fully confirmed the assumption formulated in this article that experiential content-based teaching/learning in university ESP courses can successfully prepare students for English immersion in their courses on majoring disciplines.

It should be emphasized that the suggested experiential content-based approach requires the development of specific versions (modifications) of it and specific textbooks for every particular field of students' major, as has been made clear from everything said before. That is why the version just discussed was good for only one category of students—those majoring in Business Studies. Other categories of students need different practical versions (modifications) of the approach and different textbooks. The second practical version (modification) of the approach chosen for development was for students majoring in Psychology. It is for that category of students that the textbook *Psychological Matters* (Tarnopolsky, Kozhushko, Degtiariova,

Bespalova, 2001) was prepared. Developing a new version (modification) of the approach specifically for future psychologists had been undertaken because just for that category of students there are practically no ESP learning materials on the Ukrainian book market. (Plans are in place for developing in the near future other versions of the approach and new course books for students majoring in quite a number of different fields.)

The version for future psychologists and the textbook *Psychological Matters* do not require a detailed analysis because they have been already discussed in a lengthy publication (Tarnopolsky, 2009). What should be noted is that, methodologically, the second version differs from the first in two principal features: (a) Continuous simulation that had been used for students majoring in Business Studies could not be used for ESP teaching to future psychologists, because no single plot uniting all classes in the ESP course (like establishing and running students' own imaginary company) could be developed due to the peculiarities of the psychology profession, and (b) there was much greater focusing on students' work on the Internet (Internet search on professional Internet sites in English), since it is just for future psychologists that the Internet opens up especially broad opportunities of constructing for themselves their professional knowledge through the medium of the target language.

The developed second version of the approach and the textbook *Psychological Matters* are now undergoing the process of longitudinal experimental verification at Dnipropetrovsk Alfred Nobel University of Economics and Law to determine their practical efficiency. Since the experimental study is not yet finished, it is too early to speak definitively about the results. However, observations and preliminary results give sufficient grounds to expect that the final results will be no worse (and perhaps will be better) than when the first version of the approach and the textbook *Business Projects* had been experimentally tried out. And that means that the second version of the approach, just like the first one, may open up prospects of introducing English immersion into classes on professional disciplines for students of Psychology beginning from the third year of their university studies. (The experimental research of that issue is planned for the 2012/2013 academic year).

Everything just described allows making a conclusion that the suggested experiential content-based approach to ESP teaching in mandatory courses of English in the second year of study at Ukrainian tertiary schools can substantially raise the level of students' command of English being learned for professional purposes.

Conclusion

The suggested approach to ESP teaching/learning at tertiary educational institutions in Ukraine (the second year of students' learning English in a mandatory course of English for professional communication) is characterized by several specific features. It is totally experiential, so that learning the target language for professional purposes is organized through using it for professional communication in learning activities that authentically model extra-linguistic professional activities; the language itself is acquired subconsciously as a byproduct of those authentic extra-linguistic profession-related learning activities.

Content-based instruction is implemented within such an experiential approach so that the learning materials and students' learning activities are inextricably connected with the students' majoring disciplines. Both the learning materials and the learning activities are authentic from the point of view of students' future profession and ensure their acquisition (through the medium of the target language) of systematized professional knowledge inside the ESP course.

That makes such a course an integral part of students' professional training instead of being the separate language course that it usually is. ESP courses developed in accordance with the requirements of the suggested approach are designed to provide students with opportunities of constructing, through their own creative efforts, their professional knowledge through the medium of the target language, while ESP teachers are responsible for the language aspects of the course only. However, for successfully introducing and teaching such courses, ESP teachers also need the help of their colleagues, the professors and teachers of students' majoring disciplines. Those specialists can render assistance with procuring the required content materials, developing the content-based curriculum, and monitoring if the content was actually followed in the ESP course.

Mandatory ESP courses developed in accordance with the requirements of the suggested approach are designed to ensure the balanced and integrated development of all the four basic skills in professional target-language communication: speaking, listening, reading, and writing.

Finally, such courses are designed to give students sufficient language and psychological preparation for proceeding to English immersion classes, beginning from the third year of their university studies, i.e., to improve their English professional communication skills in classes on professional academic subjects taught in English and not in their L1.

The practical success of the suggested approach (not only in what concerns the learning outcomes but also in what concerns the motivational and emotional aspects of the teaching/ learning process) confirms that the approach in question fully meets the local requirements and conditions at Ukrainian tertiary schools; the conditions and goals of mandatory courses of English at Ukrainian universities; the needs, requirements, and motivational peculiarities of students studying in such courses; and the peculiarities of teachers' qualifications teaching such courses (see the Introduction). It may even be asserted that the success of the approach can be ascribed to that full accordance with the local conditions and context. This supplies one more proof for the assumption postulated at the beginning of this article—that language teaching pedagogies should be built depending on the local conditions rather than on theoretical SLA constructs.

Yet it should be emphasized that, though the approach was developed for Ukraine, it can be adapted to whatever contexts when English is taught for professional communication. It is so because the approach is based on the universal principles of constructivism, when students construct the meanings from their future profession through the medium of the target language—experiential learning with students' constructing meanings from their personal experiences in modeled professional activities, those modeled activities being done in the conditions of target language professional communication in the ESP classroom.

References

Brinton, D. M., Snow, M. A., & Wesche, M. B. (1989). *Content-based second language instruction.* New York: Newbury House Publishers.

Byrne, D. (1987). Integrating skills. In K. Johnson & K. Morrow (Eds.), *Communication in the classroom: Applications and methods for the communicative approach* (pp. 108–114). Harlow, Essex: Longman.

Canagarajah, A. S. (2005). Reconstructing local knowledge, reconfiguring language studies. In A. S. Canagarajah (Ed.), *Reclaiming the local in language policy and practice* (pp. 3–24). Mahwah, NJ: Lawrence Erlbaum.

Canagarajah, A. S. (2006). TESOL at forty: What are the issues? *TESOL Quarterly, 40,* 9–34.

Canagarajah, S. (2007). Lingua franca English, multilingual communities, and language acquisition. *Modern Language Journal, 91*(5), 923–939.

Clark, K. (2000). *The ABC's of English immersion: A teachers' guide*. Washington, DC: Center for Equal Opportunity.
Council of Europe (2001). *Common European framework of reference for languages: Learning, teaching and assessment.* Strasbourg, France.
Firth, A., & Wagner, J. (1997). On discourse, communication, and (some) fundamental concepts in SLA research. *Modern Language Journal, 81,* 285–300.
Freeman, Y. S., & Freeman, D. E. (1998). *ESL/EFL teaching: Principles for success.* Portsmouth, NH: Heinemann.
Jerald, M., & Clark, R. C. (1994). *Experiential language teaching techniques: Out-of-class activities for learning the language and culture of the United States. Issue 3 of Resource handbook* (2nd rev. ed.). Bratleboro, VT: Pro Lingua Associates.
Jonassen, D. H. (1995). *Supporting communities of learners with technology: A vision for integrating technology with learning in schools*. Retrieved from http://www.itd.depaul.edu/website/pages/TrainingEvents /CourseMaterials/jonassen.asp
Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.
Nuttal, C. (1996). *Teaching reading skills in a foreign language.* Oxford: Macmillan Heinemann.
Oxford, R. (2001). Integrated skills in the ESL/EFL classroom. *ERIC Digest, EDO-FL-01-05*. Retrieved from http://www/cal.org/ericcll/0105oxford.html
Tarnopolsky, O. (2000). Business English teaching: Imaginative continuous simulations and critical analysis tasks. *Business Issues, 2,* 12–14.
Tarnopolsky, O. (2009). Content-based Internet-assisted ESP teaching to Ukrainian university students majoring in psychology. *Reading Matrix: An International Online Journal, 9*(2), 184–197. Retrieved from http://www .readingmatrix.com/journal.html
Tarnopolsky, O., & Kozhushko, S. (2003). Acquiring Business English in a quasi-natural business environment: A method of teaching Business English to students of Business and Economics. *Working Papers in Educational Linguistics, 18*(2), 55–88.
Tarnopolsky, O., Kozhushko, S., Degtiariova, Y., Bespalova, N.. (2001). *Psychological matters.* Kyiv: INKOS.
Tarnopolsky, O., Kozhushko, S., Bezugla, R., Degtiariova, Y., Gibson, P. (2002). *Business projects.* Kyiv: INKOS.
Tarnopolsky, O., Kozhushko, S., & Zhevaga, V. (2006a). Teaching/learning Business English by doing business in English: Self-assessment and emotional aspects. Part 1. *Business Issues, 1,* 11–16.
Tarnopolsky, O., Kozhushko, S., & Zhevaga, V. (2006b). Teaching/learning Business English by doing business in English: Self-assessment and emotional aspects. Part 2. Business Issues, 2, 8–11.
Tarnopolsky, O., Momot, E., Kozhushko, S., Kornieva, Z., Vysselko, A.. ,Zhevaga, V. (2008). *Method of English immersion in teaching English and professional subjects to students of tertiary economic schools.* Dnipropetrovsk: DUEL. (Book published in Russian)
Trimble, L. (1992). *English for science and technology. A discourse approach.* New York: Cambridge University Press.
Walker, C. L., & Tedick, D. J. (2000). The complexity of immersion education: Teachers, addresses and issues. *Modern Language Journal, 1*(84), 931–940

About the Author

Oleg Tarnopolsky
Doctor of Pedagogy, Ph.D.
Professor, Chair
Department of Applied Linguistics and Methods in Foreign Language Teaching
Alfred Nobel University
Dnipropetrovsk, Ukraine
otarnopolsky@mail.ru
Major research interests: EFL and ESP teaching, English immersion programs, and programs of teaching academic writing in English

A Comparison of Self-Paced and Lecture/Discussion Methods in an Accelerate Learning Format

B. Charles Tatum and Julia C. Lenel

Abstract
This study compared self-paced to traditional lecture/discussion instruction in an accelerated course. The results revealed that the self-paced students performed better on the unit tests. No differences were found, however, between the two methods with respect to performance on the final exam, one-year retention, or average course grade. The results further revealed that the students were more satisfied with the self-paced courses than with the lecture/discussion courses. It appears that the self-paced course is, in some ways, a better way to learn, and students are more satisfied with the self-paced format than with the lecture/ discussion style.

Keywords
Mastery learning, personalized system of instruction, self-paced learning, accelerated learning, instructional design, learning processes

How fast can students learn? Traditional higher education bundles course content in 3- or 4-month classes using a quarter or semester calendar. It is not done this way because research shows these to be optimal units of time for students to absorb the complex concepts that are taught at the college level. No, it is done this way because of tradition. It has always been done this way, and there has always been resistance to changing this format. These traditional academic calendars are also "leader led" systems of instruction: the teacher controls the pace of the learning (Smith, 1980). Leader-led instruction presumes that all students learn at the same rate and in much the same way. Is it possible to accelerate learning by allowing students, rather than instructors, to control the pace of instruction?

The purpose of the present article was to demonstrate that students can master college-level material in less time and with higher levels of achievement with self-paced instruction compared to a more traditional form of teaching. Moreover, the present study attempted to demonstrate these accelerated learning effects with an academic calendar that compresses classes into month-long modules. If the research shows that a more efficient and effective learning environment can be created, the benefits to students and the educational system could be profound. Students could complete their education more quickly, and educators could ensure a higher-quality learning experience.

Brief History and Review of Self-Paced Instruction

The concept of self-paced learning is not new. Keller (1968) made one of the strongest cases for self-paced, mastery learning in his influential article entitled "'Good-Bye, Teacher.…'" Since Keller's article appeared, much has been published on what Keller referred to as the Personalized System of Instruction (PSI). Unfortunately, recently there has been little interest in PSI (sometimes referred to as mastery learning or self-paced learning). Most of the research dates back 20 to 40 years ago. This is a pity, because there is still much to be learned about the effects of PSI, especially today with education focusing on accelerated and online instruction. This section will review some of the more critical studies on self-paced instruction. These studies did not always employ the most robust research designs. The present study, therefore, uses a

randomized, controlled design, which allows for more definitive conclusions, compared to past research.

Many variations and modifications of Keller's original system have been studied, but they all have some combination of the following elements: (a) small instructional units, (b) mastery of units to an established criterion, (c) frequent testing, (d) immediate feedback of test results, (e) student proctors, (f) heavy reliance on reading materials to achieve instructional goals, (g) lectures and discussions as enrichment materials and motivational devices rather than instructional tools, and, of course, (h) student pacing. These components and their relative importance have been discussed at length elsewhere (e.g., Johnson & Ruskin, 1977; Kulik, Jaksa & Kulik, 1978; Kulik, Kulik, & Cohen, 1980; Simon & Werner, 1996). The general conclusion of the many studies of PSI is that students learning under self-paced instruction perform as well as, or better than, students learning under the more traditional instructional methods. In fact, some research suggests that students can learn the same amount of material in 20% to 50% percent less time when the instruction is student paced rather than instructor paced (e.g., Kulik, Kulik, & Cohen, 1980).

How much time do students need to master the material in a typical college course? Is it possible to accelerate the learning process beyond the typical 10-week quarter or 15-week semester systems? Many studies have demonstrated that students can learn just as well, and sometimes better, in shorter periods of time. (For reviews, see Scott & Conrad, 1992; Tatum, 2009.) Of course, students have different styles of learning, and some learn faster than others (Diaz & Cartnal, 1999; Glick & Semb, 1978; Johnson & Ruskin, 1977), but the literature consistently demonstrates that learning can occur at a much faster rate for most students than has normally been assumed.

Purpose of the Study

The motivation to conduct this study came from a desire to take advantage of the instructional-research possibilities that exist under the unusual academic calendar at the host institution. Each month, the school offers a different set of courses, and the students take only one course. The next month, a new set of courses is offered, and again the students take only one course. This calendar is well suited for instructional research, because two sections of the same course can be offered by different instructors, and their different instructional methods can be compared. Because the timeframe is compressed, there are fewer opportunities for contamination (e.g., students sharing information across the two courses, unusual events that affect one group of students differently than the other). Because a new set of courses is offered each month, these "mini-semesters" can be repeated several times during the year, which creates a series of systematic replications.

The present study compared a modified Keller (PSI) plan (hereafter referred to as the self-paced plan) with a fairly traditional lecture/discussion course. The self-paced plan was a modification of Keller's approach that incorporated the self-paced component along with small instructional units, frequent testing, and lectures/discussions as enrichment rather than instruction. Not using student proctors was the primary deviation from the traditional Keller plan. The traditional lecture/discussion course did not allow for student pacing, used large instructional units, had infrequent testing, and devoted a larger portion of class time to lectures and discussions as instructional devices. Both approaches used unit mastery and immediate feedback. For both courses the interest was in course performance (scores on chapter tests and

final-exam performance) and student course evaluation (results of course evaluation questions). Half the study was conducted during the month of December, when two sections of General Psychology were offered (one section as self-paced, the other section as lecture/discussion). The December arrangement was then partially replicated in May.

Research Proposition

Based on earlier research (e.g., Atkins & Lockhart, 1976; Glick and Semb, 1978; Johnson & Ruskin, 1977; Kulik, Jaksa & Kulik, 1978; Minke & Carlson, 1973; Robin & Graham, 1974) showing that self-paced courses had several beneficial effects (e.g., improved performance and increase satisfaction), the following hypotheses were tested.

Hypothesis 1: The self-paced plan will lead to improved course performance compared to the lecture/discussion plan.

Hypothesis 2: The self-paced plan will be evaluated more favorably than the lecture/ discussion plan.

Method

Participants

The subjects were 90 students enrolled in four separate sections of a General Psychology course at a small, liberal arts college in the American Midwest. The students consisted of 42 females and 48 males. The composition by class rank was 68% freshmen, 19% sophomores, 10% juniors, and 3% seniors.

Materials

Materials for the courses consisted of a textbook (Braun & Linder, 1979), the student study guide that accompanied the textbook, and a set of multiple-choice questions in sufficient number to generate three 20-item tests for each of 28 chapters. Among these 28 chapters in the text, 18 were defined as core chapters and were required of all students. The remaining 10 chapters were optional and could be used to accumulate additional points in the course. An anonymous course evaluation was administered to all students at the completion of each course. (See Appendix.)

Procedure

All sections of General Psychology were offered in a one-month format during December and May. Two sections were offered in December, and two additional sections were offered in May. During both December and May, one section was offered under the lecture/discussion format, and another section was offered as a self-paced course. The assignment of instructors was not completely counterbalanced; that is, the two instructors for the December courses did not reverse roles in the May courses. However, the instructor who taught the lecture/discussion class in December also taught the self-paced class in May. Consequently, instructor was not completely confounded with class format. If there were an effect due to the instructor variable, it would turn up as an interaction between method of instruction (self-paced vs. lecture/discussion) and time of year (December versus May).

Student proctors were not used in any of these sections. Of the 47 students who registered for General Psychology during December, 24 were randomly assigned to the lecture/discussion section and 23 were randomly assigned to the self-paced section. Likewise, for the 43 students who registered for May, 22 were randomly assigned to the lecture/discussion section and 21 were randomly assigned to the self-paced section. Students were not allowed to switch sections after these assignments were made.

On the first day of class, all students present were given a 20-item sample test that served as a pretest to check for any initial inequalities in the experimental groups. At the completion of the course, all students were required to take a comprehensive final exam over the core chapters. Approximately one year after the students completed the course, those who were available and willing were given the final exam again, to test for retention of the material. Students were not given the exact final exam that they had received a year earlier, but were given a comparable form of the exam.

Lecture/Discussion Sections

The students in the lecture/discussion sections were told that they would be given three major exams plus a final exam. Each of the three major exams covered a portion (six chapters) of the core chapters. Each major exam contained 20 items on each of the six chapters covered, for a total of 120 items per exam. The final exam contained 100 test items that did not duplicate any of the items on the major exams. The 10 optional chapters could be read, and exams covering this material could be taken on a chapter-by-chapter basis at the same time as the major exams. Scores on the optional chapters were used to improve the student's grade in the course, and the student was in no way penalized by attempting an exam over an optional chapter. In addition to optional chapter tests, students could improve their course grade by earning points for class attendance (approximately 2 hours per day for 17 days) and by participating in research projects conducted by advanced psychology students.

All students in the lecture/discussion sections had the opportunity to retake each major exam twice. Each major exam was administered on Monday afternoon, and the students could return on the next Tuesday and Wednesday afternoons to attempt the exam a second or third time. The retake exams were alternative but comparable forms of the original exam. Retaking the exam was at the student's discretion, and each student was told that only the best exam score would be used to compute the final course grade. As an incentive to study for all exams and to encourage retaking the exams, the students were told that they would get full credit for an exam if at any point they received 90% or better. If the students failed to receive 90% or better, their scores were computed based on the percentage of possible points earned. Students were not given the opportunity to retake the final exam, and the 90% rule did not apply for the final exam.

Self-Paced Sections

The students in the self-paced sections were told that they could progress through the course at their own rate. They were told that they were responsible for completing the 18 core chapters in a particular, predetermined sequence. As with the lecture/discussion sections, for each chapter test on which they received a score of 90% or better, they were given full credit for that test. Again, as with the lecture/discussion sections, if a student failed to achieve 90% or better on any test, the student's score was based on the percentage of possible points for that chapter. Each chapter test consisted of 20 items, and three comparable sets of tests were available for each chapter. As with the lecture/discussion section, the self-paced students were allowed to retake the chapter

tests if they desired to improve their scores, and only the highest of the three scores was used to determine the course grade. One hour in the morning and one hour in the afternoon of each class day (17 days in all) was made available for the purpose of chapter testing. Students in the self-paced and the lecture/discussion sections were exposed to exactly the same core reading material. Furthermore, the exam items for the major exams in the lecture/discussion sections were exactly the same as the items used in the self-paced sections. Moreover, the self-paced and the lecture/discussion sections were exposed to the same number of items (20 items per chapter per test).

All students in the self-paced sections were required to take the final exam after completing the core chapters, and the final could be taken any time after the student completed the core chapters. The final exam was the same test given to the lecture/discussion students and contributed the same weight to their final course grade as it did in the lecture/discussion sections.

Students in the self-paced section were allowed to earn additional points toward their final course grade by taking and retaking optional chapter tests. These optional chapter tests could only be taken after the core chapters were completed. As was true of the lecture/discussion classes, the self-paced students could also earn points through attendance at "enrichment sessions" (one-hour lectures, discussions, films, demonstrations, etc.) and participation in student research projects. These additional sources of points were comparable to those offered to the lecture/discussion students.

Results

The results of this study fall into two broad categories: course performance and course evaluation. In general, the study found evidence for improved course performance with the self-paced style of instruction, and the course evaluations were better for the self-paced format than for the lecture/discussion format.

Performance

Several measures of course performance were taken. These dependent measures were examined as a function of the two primary independent variables of the study: Method of Instruction (Self-Paced vs. Lecture/Discussion) and Time of Year (December vs. May). Of these two variables, Method of Instruction is the more important.

Sample Test

The average score on the 20-item sample test for all of the groups was 42.05%. Neither the main effect for Method of Instruction, $F(1, 69) < 1.00$, nor Time of Year, $F(1, 69) < 1.00$, was significant. The interaction between these two variables also failed to reach statistical significance, $F(1, 69) < 1.00$. These findings simply reveal that there were no initial differences among the groups.

Chapter Tests

Discounting the optional chapters for the moment, the lecture/discussion sections took a total of three chapter tests and the self-paced sections took a total of 18 chapter tests. For purposes of comparison, the 18 chapter tests for the self-paced students were combined into three sets of six

chapters each. These three sets of chapters corresponded to the three major exams taken by the lecture/discussion students and contained the same combination of chapters as did the major exams. Table 1 shows the average test performance for the three test sets as a function of Method of Instruction and Time of Year. Because students were allowed to retake the chapter tests, each student had as many as three scores per chapter. Performance for the three sets of chapter tests shown in Table 1 was computed by selecting the highest test score for each chapter and then averaging these high scores. For the purposes of assigning a grade for each student, scores of 90% and 95% were converted to 100%. However, for the purposes of this research, all scores were the actual percentages and not converted scores. Table 1 shows that, in general, test performance is consistently better for the self-paced sections than for the lecture/discussion sections. Also, there is a tendency for the May students to perform better than December students.

Table 1. *Average Test Performance (Percent Correct) on Core Chapters for Self-Paced and Lecture/Discussion Courses during December and May*

Method	**Month**	
	December	**May**
	Test 1 (6 Chapters)	
Self-paced	84.04	85.31
Lecture/discussion	82.92	81.90
	Test 2 (6 Chapters)	
Self-paced	84.96	86.25
Lecture/discussion	74.21	77.88
	Test 3 (6 Chapters)	
Self-paced	83.71	85.35
Lecture/discussion	75.68	82.24

A 2 x 2 factorial analysis of variance was performed on each test set. The only significant comparisons were the differences between self-paced and lecture/discussion groups on the second and third test sets, $F(1, 69) = 20.43$, $p < .05$ and $F(1, 73) = 7.72$, $p < .05$, respectively. None of the differences between December and May and none of the interactions were significant.

Optional Tests

Figure 1 shows the outcome for the optional chapter test performance. The figure shows the average performance for all 10 optional tests combined as a function of Method of Instruction and Time of Year. As with the chapter tests, the average performance is the average of the tests on which the students achieved their highest percentage. Figure 1 shows a pattern quite similar to Table 1. In the case of the optional chapters, both the Method of Instruction and the Time of Year variables were significant, $F(1, 73) = 13.05$, $p < .05$ and $F(1, 73) = 4.37$, $p < .05$, respectively. Again, the interaction failed to reach significance, $F(1, 73) = 1.03$, $p > .05$. These

results show that the self-paced students performed better than the lecture/discussion students, and the May students performed better than the December students on the optional chapters.

Final Exam

The average final exam performance for all of the groups was 74.5%. There was no statistically significant difference between the two methods of instruction, $F(1, 69) < 1.00$, or for the two months (December vs. May), $F(1, 69) < 1.00$. The interaction also failed to reach significance, $F(1, 69) < 1.00$.

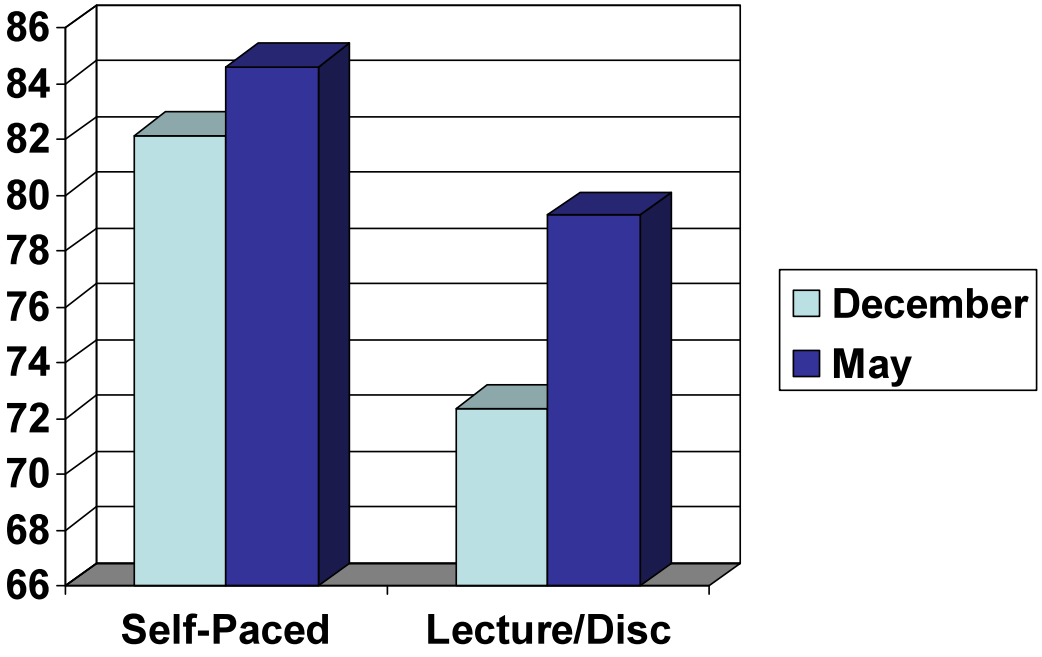

Figure 1. Average test performance (percent correct) for optional chapters for self-paced and lecture/discussion courses during December and May.

Retention

Not surprisingly, it was difficult to find students after one year's time. Some of the students were seniors who graduated, and others withdrew from the college. Those who remained were disinclined to subject themselves to another final exam and resisted both monetary and humanitarian appeals. Nonetheless, a total of 24 students (ten from the lecture/discussion sections and 14 from the self-paced sections) were induced to take the final exam one year later. The results showed that the self-paced students answered 52.64% of the questions correctly and the lecture/discussion students answered 50.39% correctly. This difference was not statistically significant, $t(23) = .049$, $p > .05$.

Because so few students were available for the retention test, a difference score was computed between the final exam and the retention test for those students who did take the retention test. For the self-paced students, the average percentage difference between their final exam performance and the retention test performance was 19.93%. For the lecture/discussion students,

the percentage difference was 25.5%. These difference scores for the self-paced and lecture/discussion students were not significantly different from each other, $t(23) = 1.17$, $p > .05$.

Course Grades

Table 2 shows the distribution of course grades for the self-paced classes for December and May. Table 3 shows the distribution of course grades for the lecture/discussion classes, also for December and May. The two tables, taken together, fail to reveal any obvious differences among these groups. A two-factor analysis of variance, performed on the letter grades converted into numerical form, supported this conclusion by showing that the average course grade did not differ for the self-paced group (2.63) compared to the lecture/discussion group (2.45), $F(1, 72) < 1.00$. There were no significant differences between the December and May classes, $F(1, 72) < 1.00$, and the interaction between Method of Instruction and Time of Year failed to reach significance, $F(1, 72) < 1.00$.

Table 2. *Frequency Distribution of Grades for Self-Paced Courses During December and May*

Grade	Month	
	December	**May**
A	5	4
B	6	10
C	9	5
D	1	0
F	2	1
Withdrawal	0	1
Incomplete	0	0

Table 3. *Frequency Distribution of Grades for Lecture/Discussion Courses During December and May*

Grade	Month	
	December	May
A	3	4
B	4	5
C	14	5
D	0	1
F	0	2
Withdrawal	3	4
Incomplete	0	1

Course Evaluation

At the end of each course, the students were given an anonymous course evaluation (a copy of which is reproduced in the Appendix). As shown in Table 4, students taking the self-paced course were more satisfied with their experience than were students in the lecture/discussion sections. This was revealed by the question, "Should this course be replaced by a lecture/ discussion [self-paced] course?" (Item 4 in the Appendix). For the self-paced group, only 21% answered "yes" to this question, but 50% answered "yes" in the lecture/discussion group. This difference was significant, $\chi^2(1, N = 90) = 5.24, p < .05$.

Table 4. *Responses to Selected Items on Course Evaluation for Self-Paced and Lecture/Discussion Course*

Grade	Method of Instruction	
	% Self-Paced	% Lecture/Discussion
Course should be replaced	21.1	50.0
Relative evaluation	4.72	4.11
Absolute evaluation	3.97	3.43
Hours of study per chapter	2.20	2.80
Hours of study for final	4.37	4.16
Class sessions were not worthwhile	7.5	21.6

Other evidence that self-paced students were more satisfied than the lecture/discussion students came from an analysis of overall course ratings. On a question that presented a relative measure of satisfaction ("Relative to all the courses you have taken at this school, rate this course…" [Item 7C in the Appendix]), the self-paced students gave the course a rating of 4.72 on a 7-point scale, whereas the lecture/discussion students gave the course a rating of 4.11. This difference between self-paced and lecture/discussion approached statistical significance, $F(1, 73) = 3.23$, $p < .08$. On another question that presented an absolute measure of satisfaction ("All things considered, how would you rate this course?" [Item 8 in the Appendix]), the self-paced students gave the course a 3.97 rating (reverse scored on a 5-point scale), and the lecture/discussion students gave the course a 3.43 rating. This difference between self-paced and lecture/discussion was statistically significant, $F(1, 73) = 4.49$, $p < .05$.

A complete description of all the items in the course evaluation is beyond the scope of this article, but a few other findings are of interest. For one thing, students in the lecture/discussion sections reported that they studied significantly more hours ($M = 2.77$) for each chapter than did the students in the self-paced sections ($M = 2.24$); $F(1, 59) = 4.38$, $p < .05$. (Item 1 in the Appendix). Another interesting finding was that the reported average amount of time spent studying for the final exam [Item 11 in the Appendix] was approximately equal for all sections ($M = 4.26$ hours). Because the average amount of time spent studying for the final was equal for the lecture/discussion group and the self-paced group, $F(1, 69) < 1.00$, it is not too surprising that their performance on the final exam was not different. Finally, it should be noted that there were no significant differences between self-paced and lecture/discussion students concerning their perceptions of how worthwhile the class sessions were, $\chi^2(4) = 7.12$, $p > .05$. (Item 2 in the Appendix). This lack of significance also held when choices 1, 2, and 3 (all types of class sessions combined, see Appendix) were combined and this combined score was compared with choice 4, $\chi^2(1) = 2.67$, $p > .05$. Despite this lack of significance, the direction of the difference did favor the self-paced students; that is, the self-paced students tended to value the sessions more than did the lecture/discussion students.

Discussion

The purpose of the present study was to investigate the effects of two methods of instruction on both course performance and course evaluation. The two methods of instruction were (a) a fairly traditional lecture/discussion method, with a few modifications, and (b) a fairly standard self-paced (PSI) method, again with a few minor modifications. The study tested two hypotheses: (a) the self-paced instructional method would produce better course performance than the lecture/discussion method, and (b) students would prefer the self-paced method to the lecture/discussion method. Both hypotheses achieved some, but not full, support.

The performance measures consisted of (a) average scores on tests over the chapter material, (b) average performance on the final exam, (c) average performance on a retention test one year following the course, and (d) grade distributions for both methods of instruction. The results showed that, in general, test performance for the chapter material was significantly better for the self-paced students, but there were no significant differences for any of the other measures.

The effects of the two instructional methods were examined with respect to several questions on an anonymous course evaluation. In general, those questions relating to student satisfaction with the course favored the self-paced course. Other questions that asked the students to estimate their study time either showed no difference or slightly favored the lecture/discussion sections.

What is the general conclusion regarding self-paced versus lecture/discussion methods? Based on these results, the conclusion is that there is some difference between the methods in terms of objective course performance (i.e., examinations on chapters). There is an advantage to taking many exams, each covering a small unit of information (self-paced method), as opposed to taking fewer exams over larger units of information. But this advantage is short-lived, because there was no difference between these two conditions on the final exam performance, or for the retention test one year later.

The results for the final exam performance may be a bit misleading, however, because of differential withdrawal rates. Seven students withdrew from the lecture/discussion sections, whereas only one student withdrew from the self-paced sections. If the weaker students withdrew from the lecture/discussion sections, then the final exam scores for these sections might be artificially high. In other words, the differential withdrawal rate may have disguised the fact that the self-paced students actually performed better on the final exam.

This study revealed that students like the self-paced courses better than the lecture/discussion courses, based on their answers to the course evaluation survey. These findings are consistent with other studies that have shown that self-pacing will result in positive attitudes toward the course, even when there is little evidence for improved course performance (e.g., Atkins & Lockhart, 1976; Glick & Semb, 1978; Robin & Graham, 1974).

Several possible reasons exist for this greater satisfaction with the self-paced method. First, students can work at their own pace, and this may give them a greater sense of autonomy. Perhaps more important is the fact that students who work hard can finish the course early and then move on to other important things. In fact, 87.5% of the self-paced students said they liked the early completion option. Because only about a third of the students actually did finish early, many students liked the option even though they failed to benefit from it.

Second, although students studying under both methods had the opportunity to retake tests and achieve mastery of the material, students in the self-paced courses had more of this opportunity. Because students in the self-paced courses took more individual tests than the students in the lecture/discussion courses, there was obviously a greater opportunity to master tests. These successes were probably very reinforcing for the self-paced student. The higher frequency of reinforcement for the self-paced students did not affect their ultimate grade, but it may have increased their liking for the course.

Third, the students had more personal contact with the instructor during the self-paced courses. The amount of total contact with the instructor was roughly equal for both instructional methods, but much of the time spent with the instructor in the self-paced course was one-on-one (e.g., discussing test questions, asking questions about difficult reading material, talking with the instructor while waiting to have a test scored). This more personal contact time may have resulted in a more satisfying experience for the self-paced students.

Finally, it is possible that students simply don't like lectures and discussions and would rather learn the material on their own, provided someone is there to help them if they have difficulties. If it is true that students generally do not like lectures and discussions, then one would expect the students in the lecture/discussion sections to be less satisfied with their class sessions than were the self-paced students. The results do not entirely support this view, however, because the question, "If you attended class sessions, were they worthwhile?" (Item 2 in the Appendix) from the course evaluation showed no significant differences between the self-paced and the lecture/discussion classes. Although the difference was not significant, the direction of the findings did favor the self-paced classes; that is, students in the self-paced classes

tended to value the classes more than did the lecture/discussion students. These negative findings in the present study notwithstanding, other researchers have found a general lack of interest in lectures and discussions (e.g., Calhoun, 1976; Edwards, 1976; Lloyd, et al., 1972; Minke & Carlson, 1973).

Limitations

A couple of limitations of the study should be noted. First, the self-paced and lecture/discussion courses were not "pure" examples of each type of instructional method. The self-paced course was a modified Keller (PSI) plan, as noted above, because it did not employ student proctors. However, the instructor assumed the role of proctor, so this component was represented, in a fashion. The lecture/discussion course allowed students to retake tests to achieve mastery. This feature is different from the typical lecture/discussion course, but other features conformed to tradition (e.g., no self-pacing, large instructional units, class time primarily devoted to lectures and discussions). Despite these minor deviations, however, it is clear the two courses were very different from each other and represent reasonable approximations to the two instructional approaches.

Some readers might be tempted to argue that the research design has confounded several variables. For example, aside from student versus instructor pacing, it might appear that the difference between the self-paced and the lecture/discussion methods is due to the size of instructional unit. (Self paced students were tested on smaller units—single chapters—than were the lecture/discussion students.) Or it might appear that the difference was due to amount of lecture time. (Lecture/discussion students spent more time with lectures.) Self-paced and lecture/discussion classes did indeed differ in these ways. Part of what is required to create a self-paced course is to break the material into smaller units and spend more time testing than in formal classroom sessions. But this in no way represents a "confounding." *Confounding* means that the effects of two or more variables cannot be separated by the research design. This study only has one variable: instructional method (self-paced versus lecture/discussion). These two instructional methods differ along several dimensions (e.g., size of instructional unit, amount of lecture time, student control of the pace), but that does not mean that the study is confounded; it simply means that instructional method is a multi-dimensional variable. This study was not designed to separate the component dimensions and determine which was most influential. The purpose of the study was to determine whether, in general, there is a difference between the two methods; and the results show that there was. Future research can address the issue of which components are the most critical to the difference. The fact that the design of this study does not permit the analysis of these components is not equivalent to confounding different variables.

A second limitation relates to the external validity of the study. The study was conducted under a system in which courses were only one month in duration. It is possible that the findings from this study do not generalize to regular quarter or semester schedules in which courses extend for several months. Perhaps the reason no differences were found between the instructional methods on the final exam and course grades is due to a ceiling effect related to the brief length of the courses. Maybe students can absorb and retain much more information when it is packed into to short period of time, and improvements are difficult to achieve beyond this ceiling. Future research should be conducted at other colleges and universities that have more traditional semester and quarter systems.

Implications

Self-paced learning has the potential of increasing mastery of course material, accelerating the pace of learning, and leading to a more satisfying learning experience. In this study, the self-paced method led to better course performance and higher levels of student satisfaction compared to the lecture/discussion method. The lecture/discussion method (especially lecturing) is considered to be "…one of the least effective instructional approaches…" (Rorinson, 1992, p. 123). Other researchers have also reported that the self-pace method is superior to lecture/discussion in terms of performance and satisfaction (DesLauriers, Hohn, & Clark, 1980; Johnson & Ruskin, 1977; Kulik, Jaksa, & Kulik, 1978; Robin & Graham, 1974; Twarog & Garrison, 1981). Given these findings, it makes sense to design more courses using a self-paced format.

Many colleges and universities are adopting online instruction. In many cases, this online learning simply mirrors traditional instructional techniques (Szabo & Montgomerie, 1992). This is unfortunate, because online classes present an ideal opportunity to implement self-paced learning (i.e., students can be given smaller instructional units and be allowed to proceeded at their own pace, with little or no lecture). Assuming students respond to online classes similarly to students in on-campus classes, the self-paced features should lead to better performance and higher satisfaction. Self-pacing should appeal to the online student because students who enroll in online classes tend to favor an independent learning style (Diaz & Cartnal, 1999).

Some critics have questioned whether self-paced instruction is effective at teaching complex material and higher order cognitive skills (Hursh, 1976; Meek, 1977; Perreco, 1980). This is an important issue, because much of what is learned in higher education is not just course content or practical skills. Students must learn to resolve dilemmas, analyze problems, and think critically. Fortunately, this issue has been addressed, and studies show that self-paced instruction has been successful at teaching courses that require higher-order skills such as physics, biochemistry, and philosophy (Reboy & Semb, 1991). Also, when students were measured on "critical thinking skills," research demonstrated that the self-paced students actually performed better than the conventionally taught students (Reboy, 1987; Watson & Glaser, 1964).

Future Directions

One direction for future research should focus on the interaction between self-paced learning and accelerated learning. The present research showed that self-paced instruction is effective when the course is compressed to one month. How much more can courses be compressed and still maintain student learning under a self-paced format? Certainly there is a point at which the timeframes are too abbreviated to allow for adequate self-pacing. It is unknown what those timeframes are, or whether they are different for self-paced versus leader-led courses.

Another direction for future research is to explore the possibilities of self-paced courses in an online format. As noted above, online education presents an ideal setting for self-paced learning, but we know little about how best to implement self-paced instructtion in this environment. Studies need to be designed to investigate how small the learning modules should be, how frequently testing should be employed, how best to provide feedback, and other issues that may improve our understanding of self-paced learning in the cyber world.

Summary and General Conclusions

It is clear that schools can accelerate student learning far more than most educators have been willing to admit or attempt. In this study, students were able to master course material in a highly abbreviated time span. First, the students completed the course in one month rather than the traditional three to four months required in a traditional quarter or semester system. Second, many of the students were able to accelerate their learning even more by completing a self-paced class in less than the maximum four-week class session. This accelerated pace does not seem to diminish course performance, and indeed it is often welcomed by students who grow frustrated by the slow tempo of their classes. How much more can the educational system accelerate student learning? This is an open question, but clearly some students are capable of accomplishing much more with their education if they are not held back by the sometimes-arbitrary time constraints imposed by the more traditional educational system. This is clearly beneficial to both students and educational institutions.

References

Atkins, J. A., & Lockhart, K. (1976). Flexible vs. instructor paced college quizzing: A behavioral analysis of preference and performance. In L. E. Farley & E. A. Vargas (Eds.), *Proceedings of the Third National Conference on Behavior Research and Technology in Higher Education* (pp. 43–54). Gainesville, FL: Society for Behavioral Technology and Engineering, University of Florida.

Braun, J. J., & Linder, D. E. (1979). *Psychology today: An introduction.* (4th ed.). New York: Random House.

Calhoun, J. F. (1976). The combination of elements in the personalized system of instruction. *Teaching of Psychology, 3,* 73–76.

DesLauriers, M. P., Hohn, R. L., & Clark, G. M. (1980). Learner characteristics and performance effects in self-paced instruction for community college students. *Teaching of Psychology, 7*, 161–163.

Diaz, D. P., & Cartnal, R. B. (1999). Student's learning styles in two classes. *College Teaching, 47,* 130–135.

Edwards, K. A. (1976, April). *Attendance at lectures and films in self-paced courses.* Paper presented at the meeting of the Midwestern Association of Behavior Analysis, Chicago.

Glick, D. M., & Semb, G. (1978). Effects of pacing contingencies in personalized instruction: A review of the literature. *Journal of Personalized Instruction, 3,* 36–42.

Hursh, D. E. (1976). Personalized systems of instruction: What do the data indicate? *Journal of Personalized Instruction, 1,* 91–105.

Johnson, K., & Ruskin, R. (1977). *Behavioral instruction: An evaluative review.* Washington DC: American Psychological Association.

Keller, F. S. (1968). "Good-bye, teacher...." *Journal of Applied Behavior Analysis, 1,* 79–89.

Kulik, J. A., Jaksa, P., & Kulik, C. C. (1978). Research on component features of Keller's personalized system of instruction. *Journal of Personalized Instruction, 3,* 2–14.

Kulik, J. A., Kulik, C. C., & Cohen, P. A. (1980). Effectiveness of computer-based college teaching: A meta-analysis of findings. *Review of Educational Research, 50,* 525–544.

Lloyd, K. E., Garlington, W. K., Lowry, D., Burgess, H., Euler, H. A., & Knowlton, W. R. (1972). A note on some reinforcing properties of university lectures. *Journal of Applied Behavior Analysis, 5,* 151–156.

Meek, R. L. (1977). The traditional in non-traditional learning methods. *Journal of Personalized Instruction, 2,* 114–118.

Minke, K. A., & Carlson, J. G. (1973, August). *A comparison of two lecture systems in unit mastery instruction.* Paper presented at the meeting of the American Psychological Association, Montreal.

Perreco, R. (1980). Remarks on PSI and P4C. *Proceedings of the South Atlantic Philosophy of Education Society, 24,* 132–134.

Reboy, L. M. (1987). *Teaching critical thinking across the curriculum* (Unpublished master's thesis). University of Kansas, Lawrence.

Reboy, L. M., & Semb, G. B. (1991). PSI and critical thinking: Compatibility or irreconcilable differences? *Teaching of Psychology, 18,* 212–215.

Robin, A. L., & Graham, M. Q. (1974). Academic responses and attitudes engendered by teacher pacing versus student pacing in a personalized instruction course. In R. S. Ruskin & S. F. Bono (Eds.), *Personalized Instruction in Higher Education: Proceedings of the First National Conference.* (pp. 81–90). Washington DC: Center for Personalized Instruction.

Rorinson, M. A. (1992). Mastery learning in public schools: Some areas of restructuring. *Education, 113,* 121–127.

Scott, P. A., & Conrad, C. F. (1992). A critique of intensive courses and an agenda for research. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 8). New York: Agathon Press.

Simon, S. J., & Werner, J. M. (1996). Computer training through behavior modeling, self-paced, and instructional approaches: A field experiment. *Journal of Applied Psychology, 81*(6), 648–659.

Smith, M. E. (1980, February). Self-paced or leader-led instruction? *Training and Development Journal, 34*(2), 14–18.

Szabo, M., & Montgomerie, T. C. (1992). Two decades of research on computer-managed instruction. *Journal of Research on Computer Education, 25,* 113–134.

Tatum, B. C. (2009). Accelerated education: Learning on the fast track. *Journal of Innovative Teaching and Learning, 3*(1), 35–51.

Twarog, L. I., & Garrison, W. (1981). Mastery-based, self-paced instruction in foreign language at Ohio State University. *Modern Language Journal, 65,* 1–23.

Watson, G., & Glaser, E. (1964). *The Watson-Glaser critical thinking appraisal manual.* New York: Harcourt, Brace, and World.

Appendix
End of Course Questionnaire

Course Evaluation for General Psychology

Note. Questions with an asterisk show a significant difference ($p < .05$) between self-paced and lecture/discussion courses.

***1. On the average, about how many hours of study did it take you to master each of the chapters?**

(1) Less than an hour.
(2) 1-2 hours.
(3) 2-3 hours.
(4) 3-4 hours.
(5) Over 5 hours.

Type of Instruction	Self-Paced	Lecture/Discussion
Average	2.2	2.8

2. If you attended class sessions, were they worthwhile?

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes, especially the lectures and discussions.	10.0%	16.2%
(2) Yes, especially the films.	20.0%	10.8%
(3) Yes, both the films and lecture/discussions.	55.0%	51.4%
(4) No.	7.5%	21.6%
(5) Did not attend enough to judge.	7.5%	0.0%

3. **Would you prefer more courses such as this one with a (lecture/discussion) (self-paced) format?** (Note: Students saw "lecture/discussion" if they were in the lecture/discussion classes; they saw "self-paced" if they were in the self-paced classes.)

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes	64.1%	55.9%
(2) No	35.9%	44.1%

***4. Should this course be replaced by a ([self-paced] [lecture/discussion]) course?** (Note: students saw "lecture/discussion" if they were in the lecture/discussion classes; they saw "self-paced" if they were in the self-paced classes.)

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes	21.1%	50.0%
(2) No	78.9%	50.0%

5. **Do you believe you learned as much under this plan as you would under a ([self-paced] [lecture/discussion]) format?** (Note: Students saw "lecture/discussion" if they were in the self-paced classes; they saw "self-paced" if they were in the lecture/discussion classes.)

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes	73.7%	70.6%
(2) No	26.3%	29.4%

6. **How much of what you learned in this class do you think you will retain one year from today (honestly)?**

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Over 75%	4.9%	8.1%
(2) Between 50%-75%	39.0%	40.5%
(3) Between 25%-50%	48.8%	45.9%
(4) Less than 25%	7.3%	5.4%

7. **Relative to all the other courses you have taken at this school, rate this course on the following characteristics (circle one number only).**

A. Difficulty

1	2	3	4	5	6	7
One of the easiest courses I have taken	Well below average	Slightly below average	Average	Slightly above average	Well above average in difficulty	One of the most diff. courses taken

B. Interest

1	2	3	4	5	6	7
One of the least interesting and boring courses I have taken	Well below average	Slightly below average	Average	Slightly above average	Well above average	One of the most interesting and fascinating courses I have taken

C. Overall Evaluation

1	2	3	4	5	6	7
One of the worst courses I have taken	Well below average	Slightly below average	Average	Slightly above average	Well above average	One of the best courses I have taken

Type of Instruction	Self-Paced	Lecture/Discussion
Average Difficulty	4.22	4.16
Average Interest	5.20	5.14
Average Overall	4.72	4.11

***8. All things considered, how would you rate this course?**

1	2	3	4	5
Excellent	Good	Satisfactory	Fair	Poor

Type of Instruction	Self-Paced	Lecture/Discussion
Average Rating	3.97 (reverse coded)	3.43 (reverse coded)

9. Would you recommend this course to another student who was a friend?

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes	90.2%	73.5%
(2) No	9.8%	26.5%

10. Do you plan to take one or more psychology courses in the future?

(1) None.
(2) One.
(3) Two.
(4) Three or more.

Type of Instruction	Self-Paced	Lecture/Discussion
Average	2.21	2.39

11. How much time did you spend studying for the final exam?

(1) Less than one hour.
(2) 1–2 hours.
(3) 2–3 hours.
(4) 3–4 hours.
(5) 4–5 hours.
(6) Over 5 hours (how many hours?_____)

Type of Instruction	Self-Paced	Lecture/Discussion
Average	4.37	4.16

12. Do you like the fact that students in this course have the option of finishing the course early? (Note: Asked of self-paced students only.)

Type of Instruction	Self-Paced	Lecture/Discussion
(1) Yes	87.5%	
(2) No	12.5%	

About the Authors

B. Charles Tatum
Ph.D., Professor of Psychology
Department of Psychology
National University
La Jolla, CA
ctatum@nu.edu
Major research interests: adult learning, instructional design, accelerated learning, research design, statistics

Julia C. Lenel
Ph.D. (retired), Researcher
American College Testing
Iowa City, IA
Jlenel@mchsi.com
Major research interests: tests and measurement, instructional design

Note to the Authors

Journal of Research in Innovative Teaching

An Annual Peer-Reviewed Publication of National University

The journal's mission is to collect and disseminate advanced research-based information on teaching and learning, particularly focusing on innovative methodologies and technologies applied primarily but not exclusively in higher education, to enhance student learning outcomes.

The Journal of Research in Innovative Teaching (JRIT) publishes carefully selected, original articles describing original research on the following topics:

- New pedagogic theories and approaches in teaching and learning
- Innovative educational technologies and their applications
- Knowledge management
- Accelerated, short-term, and intensive pedagogy
- Effective instructional methodologies
- Specific methodology of teaching particular subjects
- Online/distance/hybrid education
- Adult learning
- Curriculum development and instructional design
- Psychology of learning, of the learner, and of the group
- Time- and cost-efficiency of education
- Best practices

Submission of Manuscripts

The Journal of Research in Innovative Teaching invites authors to submit their research for publication in the 2013 issue. Submissions must be innovative and original, demonstrate a valid contribution to educational science and teaching, and be formatted according to JRIT guidelines based on the style described in the Sixth Edition of the *Publication Manual of the American Psychological Association* (APA). Articles on topics outside the aforementioned JRIT focus will not be considered.

Every submitted paper will be acknowledged and refereed.

A manuscript is to be submitted in electronic form to the Editor-in-Chief in a camera-ready form (e.g., single spaced and with tables and figures properly placed within the manuscript.) Manuscripts are accepted for review with the understanding that the same work has not been published, that it is not under consideration for publication elsewhere, and that its submission for publication has been approved by all authors and by the institution where the work was carried out; further, that any person cited as a source of personal communications has approved such citation. Written authorization may be required at the editor's discretion. Articles and any other material published in JRIT represent the opinions of the author(s) and should not be construed to reflect the opinions of the editor(s) and the publisher.

Copyright

Upon acceptance of an article, authors will be asked to transfer copyright to National University. This transfer will ensure the widest possible dissemination of information. By submitting the

article, the authors agree to this condition. A letter will be sent to the corresponding author confirming receipt of the manuscript.

If substantial material from other copyrighted works is included, authors must obtain written permission from the copyright owners and credit the source(s) in the article. The APA manual offers guidelines regarding what is considered "fair use" under copyright law and when written permission is appropriate. Authors do not have to request written permission when they are paraphrasing another author's work or when they are directly quoting brief passages.

Form of Manuscript

Manuscripts should be prepared using Microsoft Word (.doc or .rtf format). The text should be set in 12 point Times New Roman, and the manuscript should not exceed 12 to 15 single-spaced pages (6000-7500 words), not counting the references and about the author information. The manuscript will be edited according to the style of the journal, and authors must read the proofs carefully.

Please do not number the pages or apply headers or footers to your file. ***Also, refrain from applying style formats to your text.*** The manuscript should be prepared in "Normal" mode. Paragraph formatting should not have any extra space added above or below headings or other elements except as described in the Formatting Guidelines.

Manuscripts must be submitted with the following information shown for each author: full name, degree(s), position in the author's department, school, name of institution, full address, telephone and fax numbers, and email address.

The manuscript, including the abstract, references, tables, figures, and figure captions, should be prepared to fit on letter-size paper, single-spaced, with one-inch (1") margins on top, bottom, left, and right. The first page should contain the article title, author and co-author names, abstract, and key words.

Abstracts must not exceed 100 words.

Key words should be listed immediately after the abstract, in lowercase type. Provide 6 to 8 keywords.

Notations (if required) should be legible and compact and conform to current practice. Each symbol must be clear and properly aligned so that superscripts and subscripts are easily distinguishable. Numerical fractions should preferably be put on one line—e.g., ½ or 1/2.

Equation numbers should be placed in parentheses at the right margin. References to equations should use the form "Eq. (3)" or simply "(3)."

In-text citations should follow APA style. Example: (Smith & Jones, 2008; Thomas, Adams, & Schumann, 2006). Be careful to spell authors' last names accurately and show the same publication year as listed in the references.

Footnotes, if necessary, should be indicated in the text with superscript numbers (1, 2, 3, etc.), using Microsoft Word's Footnoting feature.

References should be listed in Microsoft Word's hanging-indent (first-line indent) style; whereby the Enter key is struck only at the end of each reference listing, and the Tab key is never

used to force an indent. List all references in alphabetical order by author's last name. The format for each reference should correspond to APA style. Here are examples of a book entry, Web-based text, and a journal article, respectively:

Miller, R. I. (1972). *Evaluating faculty performance.* San Francisco: Jossey-Bass.

Nation, P. (2003). The role of the first language in FL learning. *Asian EFL Journal, 33*(2), 63–66. Retrieved from www.asian-efijournal.com/june_2003_pn.pdf

Stapleton, R. J., & Murkison, G. (2001). Optimizing the fairness of student evaluations: A study of correlations between instructor excellence, study production, learning production, and expected grades. *Journal of Management Education, 25*(3), 269–291.

References should be listed at the end of the text material. When including URLs, please remove the hotlinks (hypertext links); there should be no hotlinks in the article or in the References.

Figures should be numbered with Arabic numerals in the order of mention in the text and should be inserted at the nearest convenient location following that mention. Figures must be horizontally centered between the margins. The Figure number and caption should be horizontally centered on separate lines below the figure, and the caption should use sentence-style capitalization and punctuation for titles, for example:

Figure 1. Comparison of online and onsite enrollments.

Tables should be numbered with Arabic numerals in the order of mention in the text and should be inserted at the nearest convenient location following that mention. Every table must be horizontally centered between the margins, and every table must have a title, which should be horizontally centered above the table, using title-case capitalization, for example:

Table 1. *Results of Survey Respondents*

About the Author will appear at the end of your article. List each author in the same sequence as shown below your article title. For each author, provide full name, degree(s), title(s), department/school, college/institution, email address, and a brief list of major research interests.

Submission deadline. Submissions for the next, 6th issue will be accepted until October 1, 2012. Please email your manuscript to Peter Serdyukov at pserdyuk@nu.edu.

Formatting Guidelines

Title (14pt bold, followed by 1 blank line)

Author 1 Name (no degree or title), Author 2 Name (no degree or title), Etc.
(12pt regular, followed by 1 blank line)

Abstract (10pt bold)
Contents (10pt regular, maximum 100 words), full justified, followed by 1 blank line).

Key Words (10pt bold)
Contents (10pt regular, maximum 6 to 8 key words), full justified, sentence case (but no period), followed by 2 blank lines)

Level 1 Subheading

(Centered, 12pt bold, followed by 1 blank line)

First paragraph not indented; full justified; no blank line between paragraphs.

Subsequent paragraphs indented 0.25"; last paragraph followed by 1 blank line if next subheading is Level 2, or 2 blank lines if the next item is a table, figure, Level 1 subheading, or References.

Level 2 Subheading (followed by 1 blank line)

First paragraph not indented, full justified, no blank line between paragraphs.

Subsequent paragraphs indented 0.25”; last paragraph followed by 1 blank line if next subheading is Level 2 or 3, or 2 blank lines if the next item is a table, figure, Level 1 subheading, or References.

This is a Level 3 subheading, which is shown in sentence case. Note that there is no first-line indent, and the subheading is run-in with the first paragraph.

However, subsequent paragraphs within this Level 3 subheading section will have first-line indents, as usual; and the last such paragraph will be followed by 1 blank line if next subheading is Level 2 or 3, or 2 blank lines if the next item is a table, figure, Level 1 subheading, or References.

Tables. In general, lacking more sophisticated and attractive formatting you may have selected, delete all interior cell borders except the one appearing below the header row; leave the table’s outer border (all four edges) in place.. Strive for 12pt type if possible, but as small as 10pt type is acceptable if needed; use boldface for column headers. Table should begin in the nearest convenient location following its first mention in the text, bearing in mind that entire table should be kept on same page, unless table is longer than a page; in that case, you may either start table at the top of a page and finish on next page, or else start partway down the page (e.g., after first mention), as long as the remainder of the table fully occupies the next page; use repeating header row when table is longer than a page. Separate table from surrounding text with 2 blank lines preceding table caption and 2 blank lines following table.

Table 1. *Italicized Title in Centered, Single-Spaced, Reverse-Pyramid Style, Using Title Case (initial capital letters)*
(Followed by 1 blank line)

Centered Column Header	Centered Column Header	Centered Column Header
Make judicious use of vertical line spacing in body. No vertical lines are used between columns. No horizontal lines are used between individual entries.	Decimal-align numbers.	Don't artificially widen table if contents of columns don't warrant it; just horizontally center the table.

Figures. Keep entire figure on same page. Separate figure from surrounding text with 2 blank lines preceding figure and 2 blank lines following figure caption.

Figure 1. Figure name and number are italicized; title is shown in sentence case, using reverse-pyramid style, and ending in a period.

References (10pt bold, followed by 1 blank line; full-justified contents have 0.25" hanging indent)

All entries in this section are also 10pt, and there are no blank lines between entries. Follow the last reference entry with 2 blank lines, If necessary to achieve a visually pleasing effect for fully justified entries, URLs may be divided between lines prior to a punctuation mark such as a period or forward slash; just insert a space in that position—not a hyphen—so the rest of the URL will move to the next line. If taking this action still is insufficient to assure full justification, then expanded or condensed character spacing may be applied to one line of the URL. Also, never add punctuation at the end of the URL.

Here are three examples of reference entries; note that the third line of the third reference has character spacing condensed by 0.5pt so the line will be more nearly full justified:

Bernhardt, E., & Hammadou, J. (1987). A decade of research in foreign language teacher education. Modern Language Journal, 71(3), 289-299.

Brown, H. (2007). Principles of language teaching and learning. White Plains, NY: Pearson Longman.

European University Association. (2010, May 26). A global crisis: New report looks at the effects of the economic recession on European universities. Education Insider. Retrieved from http://education-portal.com/articles /A_Global_Crisis_New_Report_Looks_at_the_Effects_of_the_Economic_Recession_on_European_Universities .html

Appendix A (12pt bold, centered)
Title (12pt bold, centered, followed by 1 blank line)

Text of appendix in 12pt, full justified (unless repeating a survey instrument, for example, that was originally left justified), followed by 2 blank lines before next appendix or About the Author(s).

About the Author (10pt bold, left justified, followed by 1 blank line; separate multiple authors with 1 blank line; all type in this section is also 10pt)

Shelley G. Ashdown
Ph.D. Adjunct Professor
School of Education
Amazing University
Dallas, TX
Eshelley_ashdown@gial.edu
Major research interests: cognitive anthropology, world view, and African Studies

Next author, etc.