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Editor's Column

We are offering to our readers the 6th issue of the Journal of Research in Innovative Teaching (JRIT), which was first published in 2008 by and for the faculty of National University, as well as scholars from outside of the institution, as a forum for publishing and sharing their research innovative teaching and learning. It is a double-peer reviewed journal distributed through NU website and by EBSCO. This year we launch a new, independent website which will make access to it easy and straightforward.

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 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. This journal 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 students at large. The Editorial Board is composed of top scholars and administrators from National University and several internationally acclaimed scholars. The Review Board includes both internal and external reviewers.

This volume offers 12 articles on different topics. Among the authors you will find National university faculty, joint authorship of the 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
- Psychology
- Online and Hybrid Learning
- Instructional Methodology
- Teacher Education

The first section, **General Issues,** of the current issue opens with a persuasive article by R.D. Nordgren, *Finding Common Ground in School Reform: The "Soft Skills" Shared by Human Capital Theory and Critical Theory* In this article, the author uses Pink's principles of autonomy, master, and purpose to examine education reform and its impact on school leaders. Intrinsic motivation, according to Pink (2009), is a key to success in the 21st century/global economy and society, and Pink's motivation 3.0 must replace the Industrial-Age relic of Motivation 2.0 in our schools, as well as in our workplaces. The author argues it is crucial for educators to ensure that our schools are purposeful in order to foster mastery.

In the second article, *A Case Study Regarding the Purpose and Process of Public Schooling and Possible Indoctrination of Education Students*, Myrtice Irish, David Kurth, Nancy Falsetto, and James Mbuva determine whether university faculty perceive that accepted models of corporate research would be effective when applied in educational research. The study's findings indicate that a collaborative approach often provides a more powerful model for effective research than does an individual approach.

Ron Germaine, Gary Barton, and Terry Bustillos in their article *Program Review: Opportunity for Innovation and Change* discuss program review as the procedure which gathers

and analyzes assessment data the purpose of which is to ensure program's educational effectiveness. They describe the process of program review at a large university in California, and report examples of innovative change and improvement change that came about as the program review result.

The second section, **Online and Hybrid Learning**, offers four articles. Joan Van Tassel and Joseph Schmitz write about *Enhancing Learning in the Virtual Classroom.* The authors found that meeting adult students' communication expectations and employing shared student-instructor locus of instructional control led to much higher student interaction satisfaction and student ratings of overall learning. Results of their study indicate that universities could improve educational outcomes by (a) facilitating shared student-instructor locus of instructional control, (b) helping instructors co-create students' interaction expectations, and (c) encouraging instructor-student interaction.

Peter Serdyukov and Robyn A. Hill in their article *Student Independence as a Factor of Effectiveness in Online Learning* explore students' attitudes towards independence and autonomy in their online college classes. They argue that the rigid structure and requirements of online classes are often in conflict with students' desire for greater independence in learning and their ability to become autonomous, lifelong learners. Colleges, instructors, and students are ultimately responsible for transforming online learning into a more flexible, learner-driven and effective learning environment through better course design, instructor diligence, and improved student preparation for academic success. They offer an insight into this problem and offer ways to enhance students' autonomy.

Jan Richards and Cynthia Schubert-Irastorza in the article *Valuing Creativity in Online Teaching* focus on the need for integrating creativity into higher education online teaching environments. They present a review of current research and suggest best practices for developing student creativity as part of the educational experience. The authors offer several useful suggestions for increasing instructors' own creativity and enjoyment of teaching while encouraging the creativity, learning, and motivation of their students.

In their article *Moving from Online to Hybrid Course Delivery: Increasing Positive Student Outcomes* Paul VanPortfliet and Michael Anderson compared student outcomes of a school psychology action research course delivered in online and hybrid instructional formats. Descriptive statistics analysis of student outcomes indicated that hybrid-format instruction facilitated positive outcomes at a rate 14% higher than online-only instruction. Based on these results the authors lend support to the utilization of hybrid instructional strategies by university educators.

In the next section **Instructional Methodology** Michail Lysenko, Anatoliy Lutai, and Nataliya Serdyukova present their *Interpretation of the Concept of Photon in College Physics Course* where they explore scientific literacy as one of the key elements in understanding a particular science. They discuss one of the major concepts of Physics, a photon, historically interpreted differently from corpuscular and wave theory views, which affects the teaching of this concept. A consistent theoretical and methodological interpretation of the concept is critical for understanding such parts of Physics as Light and Optics, Relativity, Quantum Physics, and Physics of Elementary Particles, and explaining experimental data. A new instructional application using an Iterative Instructional Model can be instrumental for achieving better learning outcomes.

Amber Lo and Velma Lee propose a paper *Negative Experience as a Means of Effective Learning: An Exploratory Study.* In this exploratory study they apply the Deep Smarts Theory to

learning structured programming principles and proper program code formatting practices in an undergraduate course. The results indicate that a negative experience can alter learners' pre-existing beliefs and enhance their acceptance of structured programming principles and practices.

Nelson Altamirano and James Jaurez in their article *Student Built Games in Economic Courses: Applying the Game Design Methodology as Another Approach to Deeper Learning* state that experiments in classrooms enhance engagement and help students understand economics. The authors tried to go even further by requesting students create their own games in a very fast and intensive term and evaluate its effect on deeper learning. It was found that adult students benefit from games played in class to understand technical economics concepts directly related to the game, but the games have no effect on other subsequent subjects. Game assignments, on the contrary, not only increase students' general economics understanding but, also very important, diminish the gap between high- and low-GPA students.

Brenda L. Shook, Jan Parker and Susan L. Williams in their article *Assessing Counseling Students' Knowledge about Sexual Compulsivity: Implications for Training Curricula* address the need to educate potential clinicians about the assessment and treatment of sexual compulsivity. A survey completed with marriage and family therapy students in their clinical practicum showed a serious lack of ability to both accurately assess and choose effective treatment options for clinical vignettes depicting clients with sexual compulsivity. The authors discuss potential curricula options for teaching these skills in graduate psychotherapist education programs.

The last article in the section **Teacher Education** by Maureen Spelman and Ruth Rohlwing, *An Examination of Adult Learning: Three Illustrative Case Studies of Urban Teachers in a Long-Term Professional Development Program,* explores the impact of a three-year tandem professional development and coaching model on levels of teacher knowledge. Illustrative case vignettes described how this model for change unfolded in classroom practices of three urban elementary teachers. Results of adult learning ranged from resistance to changes in instruction to deep integration of new knowledge into everyday classroom practice. Measures examined whether or not teachers learned and taught more effectively, a first step in measuring the effectiveness of professional development and coaching interventions. However, sustainable change in teacher practice also depended on the critical elements of leadership, climate, and school culture.

A Note to the Author 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, 7th issue, to be published in 2014.

Peter Serdyukov
March 1, 2013

General Issues

Pink's "Motivation 3.0" and Student-Centered Schooling: Creating Life-Long Learners for the 21st Century

R. D. Nordgren

Abstract
Daniel Pink, in *Drive: The Surprising Truth about What Motivates Us* introduces "Motivation 3.0"; that is, essentially, what most will recognize as intrinsic motivation. In this article, the author uses Pink's principles of autonomy, master, and purpose to examine education reform and its impact on school leaders while relating experiences in Sweden where the present author has been and is studying federally mandated student-centered practices and environments.

Key Words
Intrinsic motivation, life-long learning, education reform, student empowerment

Introduction

"Our schools are about control, control, control; theirs are about relax, relax, relax." This is what a Florida middle school principal stated several years ago after visiting schools in Sweden. His point was that Swedish students had much more freedom in their educational environments as compared to his school and to U.S. schools in general. Whereas the primary concern of many U.S. school administrators is controlling student behavior, the Swedes had relatively little adult supervision of students, freeing up personnel for more important pedagogical purposes and allowing students to concentrate on learning, not on who was or wasn't watching them (Nordgren, 2006; School Management Institute, 1999). Daniel Pink, in his latest book *Drive: The Surprising Truth about What Motivates Us* (2009), suggested that leaders need to use a different type of motivational theory in 21st century organizations, eschewing the old "carrot and stick" approach—or "Motivation 2.0"—that was (and too often still is) the norm in the Industrial Age and utilizing "Motivation 3.0" which embraces intrinsic motivation. From my own experiences in Sweden, this theory of motivation is in use and widespread, resulting, perhaps, in a citizenship that is better prepared to thrive in the post-industrial world. As school leaders, we can greatly benefit from the application of Pink's ideas into our practice, ensuring that we prepare our students for an unpredictable future.

Pink's 2006 bestseller, *A Whole New Mind,* advocates for the fostering of creativity in all organizations, including schools. Pink proffered that creativity will be the cornerstone of progress in business and other entities in the global village. This view is supported by the scholarship in "21st Century Skills," where soft skills such as creativity, problem-solving, and teamwork are deemed to be the most essential objectives of education. (See Partnership for 21st Century at http://www.p21.org/) When studying a "feeder" system of schools in one Swedish community, the present author examined the following[1]:

- Trust within the schools and for schools by the general public
- Democracy as found in shared governance and as a value
- Student responsibility in a learning environment that supports self-direction
- "Global Workforce Competence" (teamwork, critical thinking, technology literacy, and entrepreneurship—creativity and risk-taking).

[1] The author will re-examine these variables in the same Swedish schools in early 2013.

My hypothesis was that the schools would be fostering the aforementioned factors due to the contents of the Swedish National Curricula: one for pre-school and mandatory schools, one for non-compulsory and adult education. I concluded that my hypothesis was correct (Nordgren, 2003; Nordgren, 2006). The Swedes, at least in this one community, were following the principles behind their values-laden national curricula, the seminal piece of the 1994 reforms. (See http://www.skolverket.se/sb/d/493). As a frame of reference, Table 1 lists key information on Swedish schools.

Table 1. *Swedish and U.S. Schools: A Comparison*

	Sweden	**U.S.**
Ages of students at various school levels	Elementary (compulsory): 7–13 Middle (compulsory): 13–16 Upper Secondary School (non-compulsory): 16–19 (usually 3 years but can be completed in 4)	Elementary: 5–10 (includes kindergarten) Middle: 11–13 High School: 14–18
Number of years of post-secondary education for beginning teachers	3.5 *Source:* http://education.stateuniversity.com/pages/1466/Sweden-TEACHING-PROFESSION.html	4
Compulsory school completion	73.2% (High School, typically age 18) *Source:* National Center for Educational Statistics	98% (Middle School, typically age 16) 72% (Upper Secondary, typically age 20, non-compulsory)
Number of school districts	278 (one per municipality)	13,600 *Source:* National Center for Educational Statistics
Population in 2008 *Source:* United Nations Economic Commission)	9.2 million	304 million
Number of students in K–12 (public and private)	1.3 million or 14% of total population	69.9 million, or 23% of total population *Source:* National Center for Educational Statistics
Percentage of children living in poverty in 2002 *Source:* Canadian Council on Social Development	2.6%	22.4%
Percentage of children in schools whose parents are immigrants	16.8% (2008)	15.5% (2007) *Source:* U.S. Census Bureau

Source (unless otherwise noted): Swedish National Agency for Education (*Skolverket*), http://www.skolverket.se/2.3894/in_english

When reading *Drive,* I was taken back to my experiences in Swedish schools; experiences I had thought about often but had given up all hope in replicating on a large scale in the U.S. I recalled asking several high school (or "upper secondary") students at a school not included in my study regarding why they bothered attending, since they weren't compelled by law to do so (Motivation 2.0), as compulsory schooling typically ends at age 16. To a one, the answer was to the effect of "It's my responsibility to learn" (Motivation 3.0). From the viewpoint of a then–high-school assistant principal and former teacher, this reply was astounding. In the U.S., we too often deem education as something that is done to us, not something we do for ourselves. The concept of engaged learners will allow us to better examine the premises behind Motivation 3.0.

Intrinsic motivation comes from within, and is not "other directed" (Deci, Koestner, & Ryan, 2001). In order to cultivate a system where people are intrinsically motivated and will become life-long learners, we must adhere to the three principles of Pink's Motivation 3.0:

- Autonomy
- Mastery
- Purpose

Pink insisted that ineffective, if not damaging, management practices have produced a "state of passive inertia" (2009, p. 89) where workers believe that they should not have to produce unless there is a tangible reward involved—or a punishment for not producing. People have a natural sense for autonomy that is sapped from them by those in power who feel the need to control. When a group of Swedish principals and superintendents visited several Florida schools 10 years ago, they reported to us administrators at those schools that there was a system of control that prevailed throughout our schools and school systems, as William Glasser has noted. (See http://wglasser.com/) The teachers strived to control the students, principals worked diligently at controlling both teachers and students, district administrators systematically controlled schools, and the state attempted to control all components through a system of accountability. (This was pre-NCLB and "Race to the Top," so they would now add the federal government to the "those who control" list.) This report upset us, even though it was delivered in a kind, gentle fashion. We knew of no other way to conduct our schools.

The following year, most of us who hosted the Swedes had the fortune to tour a dozen or so Swedish schools, where we quickly understood what our visitors had meant about control. Our group found that control was not at the forefront of educators' minds in Sweden. The Swedes had been disconcerted, while visiting our schools, to find U.S. administrators roaming campuses with radios in hand, in constant contact with each other and the central school office. We were, in essence, on patrol, acting as police who ensured that students (and, by extension, teachers) were in line. The schools we visited in Sweden seemed orderly, but we did not see teachers and administrators shouting at students to hurry to class or watch their every move in the cafeterias. In fact, the only adults in the middle and high school cafeterias were the food servers.

When telling a fellow administrator about this a couple of years later while in the midst of our two-hour lunch duty at our large, Florida high school, she said that our students did not need us there, either. I said, "Watch this." I grabbed her arm and we walked around a corner, leaving our half of the 800-seat cafeteria unattended. We positioned ourselves behind a planter that allowed us to peak through without being noticed. Sure enough, several students looked around for us a bit bewildered. Within 60 seconds some students began throwing grapes at one another. I told my colleague that the more you are watched, the more you need to be watched. The more we control, the more we need to control because we deny the controlled the freedom necessary to foster responsibility. More and more jobs in the new global economy require workers to be

autonomous (Kohn, 2004; Reich, 2004; Wagner, 2008); if we are to truly prepare our students to succeed in this new economy, then freedom linked with responsibility is key. According to Finnish educator Partanan (2011), "Accountability is something that is left when responsibility has been subtracted."

Autonomy

Many of my U.S. colleagues have been critical of the concept of autonomy, deeming it to be akin to hyper individualism or perhaps leading to an overreliance on independence, negatively affecting collaboration. Autonomy significantly differs from independence, according to Pink (2009, p. 90). We can be both autonomous and interdependent. Pink (2009) wrote about "grouplets" as an example of both interdependence and autonomy. These are "a small, self-organized team that has almost no budget and even less authority, but that tries to change something within the [organization]" (p. 105). Pink believed that working in grouplets is more satisfying than working in inherited teams or teams with a designed membership. The Swedes used similar teams in their granting of freedom to teachers wishing to make changes in their practice.

As noted in Figure 1, the school day was structured in such a way that teachers had nearly 50% of their 8-hour day designated for planning. (A one-hour lunch was also included.) During this non-instructional time, teachers interacted with each other, not by design, but by virtue of their having the time to converse about their work—and their lives. Principals did not appear, nor was it evidenced in my interviews with them that they micro-managed the teachers; they did not feel compelled to check to see if teachers were even on campus during these times. The same was true for high school students: I found that teachers did not take strict attendance. In one class only 10 students were present, but I had been told that the teacher had over 30 on the roll. When asked about this, the teacher responded that he knew where most were—at least he thought. Some were at the public library, some were working at home, and some were meeting with other students throughout the campus. The proof, he asserted was in the product: The projects and other assignments in their negotiated individualized educational plan would prove how hard they were working. Time on task, as the superintendent of the community's compulsory schools told me, was becoming irrelevant. Why should he and the community worry about how many hours each student spent in class? What is important is learning.

In the graduate-level principal-preparation courses I teach, I often show the first several minutes of Charlie Chaplin's *Modern Times* in which the "little tramp" works in a factory where time is of the essence and where he is supervised by a boss who uses a kind of Orwellian tele-vision monitoring system. (This was only 1939!) The boss, his line supervisor, and the monotonous work eventually send the tramp to an asylum. U.S. schools, I submit, are modeled after this Fordist type of organization, where time and control are key elements. Figure 1 depicts a Swedish Upper Secondary School teacher's weekly schedule. Note the blank spaces for planning. In this example, the teacher has 3.5 hours' planning on Monday, 3 on Tuesday, 4 on Wednesday, 2 on Thursday, and 3.5 on Friday, for a total of 16 hours of planning in her 40-hour work week. Also notable but not germane to the topic of time is that she teaches English, Math, and Swedish—Swedish teachers are not licensed to teach certain subjects but can teach any subject at which they and their principals believe them to be effective.

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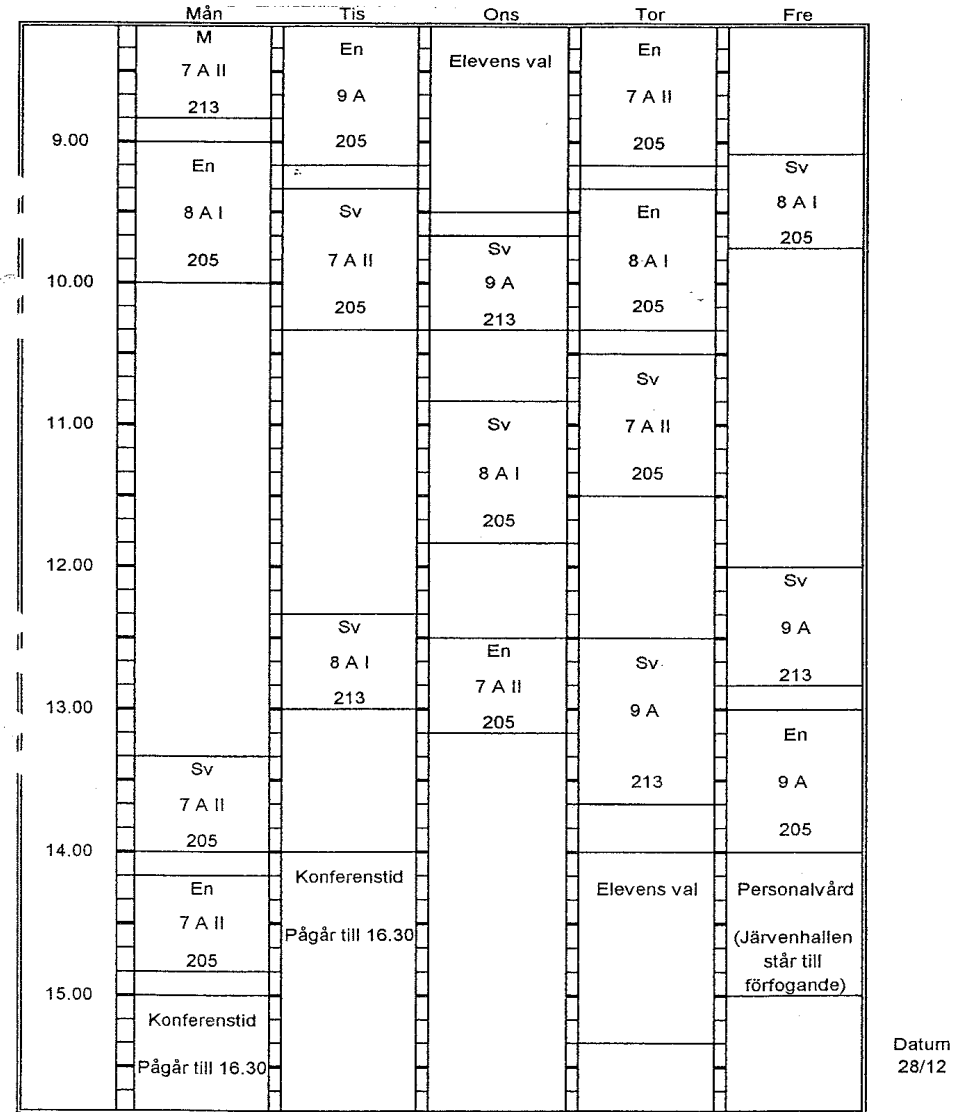

Key: *Man, Tis, Ons, Tor, Fre*..... Monday, Tuesday, Wednesday, Thursday, Friday
M ..... Math
En ..... English
Sv ..... Swedish
Konferenstid ..... Conference period
Elevens val and Personalvard ... Committee meeting
Blank spaces ..... Planning time

Figure 1. Example of upper secondary teacher's schedule.

Pink (2009_) cited a study conducted by researchers at Cornell of 320 businesses, half emphasizing autonomy and the other half using top-down management practice. The results

suggested businesses stressing autonomy grew at four times the rate of the others (p. 91). Pink also postulated that by utilizing the need for autonomy inherent in every individual, we can staunch the off-shoring of jobs and, perhaps, "home shore" some jobs, bringing back those that had been sent overseas. A meta-analysis of management studies (Dobbins & Boychuk, 1999) compared companies in the U.S., Canada, and Australia with those in Norway, Sweden, and Denmark. The analysis determined that the Nordic countries were losing few jobs to lower-wage nations. The authors suggested that the practice of internalization of motivation due to collaborative management styles made it difficult or even unnecessary to outsource jobs as labor had ownership in the organization and would collaborate with management to resolve financial issues rather than management's taking the drastic step of outsourcing jobs overseas.

Before leaving the subject of autonomy and control, I wish to relate two other stories from Sweden. During an informal focus group interview, I was delighted to see that one of the upper secondary students was an American and a graduate of a Seattle-area high school. She had opted to postpone her entrance into University of California–Berkeley to attend school in Northern Sweden. (Swedes generally start and leave high school one year older than U.S. students, so she was with students her own age in Sweden.) When asked what the biggest difference was between her U.S. schooling and Sweden, she was quick to reply, "They treat us like adults here. Back home, the teachers treat us like little kids." During another trip to Sweden, I ran into a mother of two at a community concert. She recognized my U.S. accent and introduced herself as an American married to a Swede. When I told her of my interest in Swedish schools, she told me that she had sent her older daughter to live with her aunt in southern California, as the child desperately wanted to experience life in the U.S. After two weeks the girl pleaded to come back home—which she did—because the teachers "treated her like a baby." The woman admitted that she had forgotten how controlling U.S. schools were, and that her own child would—and should—rebel against this control.

Mastery and Purpose

Mastery, Pink's second principle of Motivation 3.0, is "the desire to get better and better at something that matters" (Pink, 2009, p. 111). The "something that matters" relates to Pink's third principle: purpose. To work hard at something that doesn't matter to us is not only unreasonable but foolish. How many of us have been assigned a task (or project) at work or school that seemed to us inane, meaningless? If we're good employees (or students), we will do what it takes to finish the task so that it is acceptable to our supervisor (or teacher). It is highly unlikely we will go beyond the acceptable range in quality; we'll probably quit when we feel we have reached the minimum range, when we have done just enough.

High-level learning (analysis, synthesis, and evaluation—remember, Bloom's taxonomy) requires intrinsic motivation. We can simply go through the motions in school and memorize enough to regurgitate facts onto a test or present them in a paper or project; some refer to this as "studenting." But to tap into deep understanding, we must be curious about the topic—it must be meaningful, purposeful. Pink (2009) states mastery is "the desire to get better and better at something that matters . . . without direction from the top" (p. 111). If we can instill a sense of curiosity, as well as the desire to improve, in our students (and in our teachers), then this desire may come automatically. Then again, this cannot be expected from our students if they are confronted with a task and topic that are deemed irrelevant to their lives. To just get by, or "to student," they merely need to comply with authority, not intellectually engage in meaningful

work. But do we not want our students to comply with authority? Is this not what we ask of them? Yes, but compliance does not lead to productivity, according to Pink. He noted that 50% of U.S. workers are not engaged on the job, while 20% are actively disengaged, resulting in an estimated $300 billion annual loss in the nation's productivity (Pink, 2009).

So how do we get our students engaged in their school work? Several school reformers advocate more relevancy in the curricula and instruction (Brady, 2011; Darling-Hammond, 2010; Wagner, 2008; Wolk, 2011; see also Knowledgeworks Foundation at http://www.knowledgeworks.org/sites/default/files/kw_fedpolicy_fnl.pdf). Connecting content to a student's life requires knowing something about the students, of course. This knowledge requires creating a relationship with each of them. When we ask the right questions, treat them with respect, show empathy (and sometimes sympathy) for their concerns, then can we create a bond that will allow us to almost intuitively know how to make each of our lessons relevant to our students' lives. Of course, we're aware of Problem-Based Learning and other ways in which we can bring content to life and push students to use high-level thinking. Daggett (http://daggett .com/rrr.html) proffered that rigor cannot be reached without relevance and challenged us to teach toward high levels of understanding while demanding the students use real-life situations that are both predictable and unpredictable. Challenging our students to reach high levels of understanding and application can change their beliefs about themselves, leading to a self-fulfilling prophecy of success. Pink pointed out that this is the crux of Dweck's Incremental Theory: Effort can change intelligence; and intelligence, contrary to what some may think, is malleable. The more students are inspired to go beyond the mundane, to expend the effort required for mastery (which Pink insisted can never actually be attained), the more intelligent they become . . . and more productive. Intelligent, productive, inspired students lead to intelligent, productive, inspired workers; that is, if the workplace environment allows for it. But Pink contended that a generation accustomed to seeking the elusive mastery and purpose in their schoolwork will not allow their work environments to be "systematically routinized" as Robert Reich (1991) described mindless work that can be done by interchangeable parts (think fast food industry). The Millennial Generation, according to Pink, will not put up with work that doesn't fit a higher purpose. Purposeful organizations, when describing objectives, use words such as honor, truth, love, justice, and beauty, instead of efficiency, advantage, value, superiority, and focus. The former are better at motivating and are more humanizing (p. 134). The Millennials will thrive in a purposeful organization; it would be unethical[2] of us not to demand that our schools are purposeful so that they're relevant to the world that is and will be.

Conclusion

What can we take away from Pink's Motivation 3.0 and the Swedish system of schooling, and how can we use this in our practice as school leaders? Intrinsic motivation, according to Pink (2009), is a key to success in the 21st century/global economy and society (p. 146). It is essential to seek mastery and purpose in our work for us to be more productive and gain a better sense of self. Intrinsic motivation is increased in our schools by making the content relevant to our students' lives and interests, pushing them to go beyond the mundane, to become curious about

[2]On the topic of ethics, Pink asks: "Want employees to be ethical? Don't give them standards to meet [as they do 2.0 organizations]… [they will be] ethical because it's the right thing to do. People would meet the minimal ethical standards in [organizations that operate in] 2.0 if given standards or a checklist" (p. 133).

the world around them (Wagner, 2008; Wolk, 2011; Zimmerman, 2001). Life-long learning depends on intrinsic motivation, according to Pink. Our society and economy's future depends on citizens and workers who can think beyond the inane tasks that are often set in front of them by employers stuck in the Industrial Age—employers who are outsourcing jobs or who offer low wages and few benefits (Hochschild & Scovronick, 2003; Kohn, 2004; Reich, 2004). Most of today's real problems have no set resolutions; it will take those seeking mastery in a purposeful environment to find these resolutions (Hochschild & Scovronick, 2003; Lang, 1998). It is crucial for us to ensure that our schools are purposeful in order to foster mastery. Pink's motivation 3.0 must replace the Industrial-Age relic of Motivation 2.0 in our schools, as it will in our workplaces. It is unethical for us to continue to lead schools that are not congruent to the needs of the 21st century, using a model that is irrelevant to the future and, for that matter, the present.

Note. The author has agreed to conduct a follow-up study in the Swedish community at the request of the school superintendent. With major political changes in Sweden, beginning in 2006 and bolstered in 2010, it is feared that many of the values-laden features of Swedish education have been replaced by a teach-to-the-test philosophy.

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Investigating Corporate Research Culture and How It Might Be Adapted for Higher Education: A Pilot Study

Myrtice Irish
David Kurth
Nancy Falsetto
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Abstract
The purpose of this study was to determine whether university faculties perceive that accepted models of corporate research would be effective when applied in educational research. Because this study focused on education research and data was scarce, we began with a pilot study. The study's findings indicate that a collaborative approach often provides a more powerful model for doing effective research than does an individual approach. Moreover, the study shows that National University's School of Education faculties perceive that the nature of educational research is more closely aligned to business research than to research done by other university faculty.

Key Words
Corporate research, faculty perceptions, partnerships, collaboration, corporations, school of education

Introduction

The goal of this study was to determine whether university faculty perceive that accepted models of corporate research would be effective when applied in educational research. Because this study focused on education research and data is scarce, we began with a pilot study (Mertens, 2010). Based on the fact that a literature review advances collective understanding, the literature was reviewed to ascertain what data were pertinent to the study. The key research questions to determine faculty perceptions included the following:

1. To what degree do the National University School of Education faculty perceive their organizational structure mirrors that of a large research corporation at the present time?
2. To what degree do the National University School of Education faculty perceive their organizational structure should mirror that of a large research corporation?
3. To what degree do the National University School of Education faculty perceive their research needs as being similar to those of a large research corporation?
4. To what degree do the National University School of Education faculty believe that applied research is more important than theoretical research for the educational setting?
5. To what degree do the National University School of Education faculty perceive a collaborative model of research to be a powerful educational research model?
6. To what degree do the National University School of Education faculty perceive a collaborative research model should be an important part of the promotion cycle?

Furthermore, the methodology, discussions and results, conclusions, and recommendations of the study will be explained.

Theoretical Basis of the Study

The research connection between universities and corporations, particularly in the sciences, has become increasingly popular. Owen-Smith (2003) reported that many scholars in this area believe that universities and industry are converging into some sort of new order where the differences are becoming blurred between the scholarly researches usually associated with universities and the applied research that characterizes corporations. According to Lach and Schankerman (2008) and Link and Siegel (2005), these types of unions are being encouraged by governments and subsidized through large government and corporate grants. Generally such relationships take form on university campuses as university-industry centers, partnerships, or science parks. Though technically not part of the university or the corporation, they can be accessed through university websites. They have rules and codes governing the relationships that have been written up by the combined legal expertise of the university and the corporation. These rules and codes are readily available to anyone viewing the partnership details.

According to Feller (1990), universities are increasingly being asked by government to contribute to economic development and competiveness. Moreover, Etzkowitz (1998) showed that some universities have become so involved in these partnerships that the university appears to have appended economic and social development missions to the traditional university goals of teaching and learning. According to Feller (1990) and Florida and Cohen (1999), those who favor the concept of a union of university and corporate interests claim that universities are being transformed from ivory towers to engines of economic growth.

Such partnerships appeared in the beginning to be a flexible arrangement, whereby universities continued to do theoretical research as they had before, but sometimes with a view toward the type of theoretical research being sought by the corporation, while corporations continued to do the applied research necessary in order to develop products and programs to meet the needs of their markets. According to the Committee on the Next Decade in Operations Research, or CONDOR (1998), business must invest in basic and applied research aimed at solving difficult problems in all the varied disciplines that apply. The bottom line is that corporate profits depend on it. Corporations must have the following research priorities:

- Building intellectual capital in the form of basic theoretical knowledge.
- Stimulating the development of new subfields.
- Responding to the needs of the field's many application contexts and to those of society at large.
- Improving practice.

The university's theoretical research contribution enriches corporate research by adding a stimulating intellectual environment for new discoveries by contributing fundamental new knowledge to the field's intellectual core, and by indicating fresh, practical applications. If theory does not stimulate practice, it can become stale and fail to contribute to societal needs. Therefore, the partnership concept allows the corporation to use theoretical research to facilitate addressing problems of practical importance. All aspects of research are needed for the field's continued vitality. In other words, what is required is a blend of deep intellectual content with a firm mandate for practice.

What the corporate world wants from the university is not practical application such as product development, but the underlying science, i.e., new understandings (Likins, 2004). Most

of the innovation that ultimately manifests itself in commercial applications comes from within industry rather than from the university. To create products that work in the marketplace requires a deep understanding of market demands and trends; this knowledge is not commonly found in the university. However, the type of research the corporate world needs from the university is increasingly collaborative, as it may involve the expertise of many disciplines to work together to solve complex problems.

Likins (2004) coined the term "technology transfer" to describe the relationship between the university and the corporate world. He suggested that the type of research being undertaken has the following characteristics:

- What emanates from university research is neither technology nor product development, but the underlying science, and new understandings.
- Flow of information between the partners is much more interactive than the term implies.
- Most of the innovation that manifests in commercial applications comes from within industry, not from the university (p. 1).

Therefore, a conclusion can be drawn that what we are witnessing is the creation of a personal cross-communication between creative people on both sides, which is resulting in a multi-disciplinary approach to research, or what is now called collaborative research (Likins, 2004).

In the university corporate partnerships, an increasing emphasis on collaborative research is emerging. According to Rosenberg (1982), interaction between the producers of scientific knowledge and the producers of technology underlies the progress of both science and technology. D'Este and Patel (2007) claimed that by far the most frequent research engaged in by the partnerships is collaborative joint research, i.e., focused Research and Development research done in teams from both the university and the corporation. Partnerships have affected the nature of research, in that much of it involves a multidisciplinary collaboration that is required by the complex nature of the research needed (Farrell, 2010). According to Van Looy, Ranga, Callaert, Debackere, and Zimmerman (2004), as well as Perkmann and Walsh (2008), collaborative research generally is one of three types:

- ***Pre-competitive***—research that is most often funded by public funds.
- ***Contract***—research which is commercially relevant to firms and is ineligible for public support so is often funded by the participating corporation that will accrue the benefits of the research.
- ***Consulting***—research or advisory services provided by individual or groups of academic researchers to their industry clients. Income from consulting can go directly to the experts providing the consulting, or it is often funneled back through the partnership to further support research.

It is little wonder that academics regard their collaboration with industry or business as beneficial to their research when it is evident that industry/business pays for most of the research interaction. However, it is safe to assume that industry/business is willing to pay because it, too, sees the collaboration as useful (D'Este & Patel, 2007).

Collaboration between university and industry appears to have its greatest utility when it facilitates or contributes to both industry applications and academic research. Such collaboration retains the distinctiveness of the realms of scholarship and industry, but enables connections via

interactive links that allow academic input to commercial problems and promotion of new ideas and new problems for university research (D'Este & Patel, 2007, p. 25).

The issue confronting education is that, while there is educational research, there is no particular corporation working with education faculties. Collaborative research is not the norm, and there is little input in terms of products and programs that enter the field of education from faculties of education. Instead, the corporate entity appears to be a plethora of publishers and education writers, most of whom are not education faculty members. However, faculties of education are not without influence. In fact, according to Carnine (2002), university professors of education have a great deal of influence. For example, they typically control:

- Pre-service teacher preparation.
- Continued professional development of experienced teachers.
- Curricular content and pedagogy used in schools.
- Instructional philosophy and methods employed in the classroom.
- Policies espoused by state and national curriculum organizations (p. 1).

However, according to both Carnine (2002) and Slavin (2002), the results of education research have had only minimal impact on the practices utilized by teachers, administrators, school districts, and state and federal government policy. For example,

> At the dawn of the 21st century, education is finally being dragged kicking and screaming into the 20th century . . . . The applications of the findings of educational research remain haphazard and that evidence is respected only occasionally and only if it happens to correspond to current educational or political fashion. (Slavin, 2002, p. 16)

Given this degree of control and influence, it is surprising that education is often unaffected by objective research. Instead, the 20th century in education is characterized by an adoption of a series of unproven methods that have education "endlessly flitting from one fad to another" (Carnine, 2002, p. 1). One of the most vivid examples cited by Carnine (2002) is the issue of reading and whole language. Support for whole language appeared to have come from an enclosed community of devotees, including teachers, education school professors, textbook publishers, bilingual educators, and teacher trainers. However, an exhaustive research study in the 1970s titled "Project Follow Through" (Grossen, 1995) clearly showed that whole language is an ineffective method of reading instruction. In fact, this study supported the explicit teaching of phonemic awareness, the alphabetic principle, and phonics combined with extensive practice with phonic readers. In the face of overwhelming research evidence, the whole-language-only approach to reading was adopted in California. By the 1980s and 1990s, many states, including California, ultimately had to drop the whole-language-only approach to reading because it not only failed to improve reading but often worsened reading achievement.

Part of the problem appears to be that education is not doing the collaborative applied research to turn out the books, textbooks, and programs based on the research evidence. It would seem that some of what is appearing to work well in the sciences could ultimately foster the development of products and strategies that emerge from university and corporate collaborative research.

Methodology

Research Type and Design

This study used a descriptive method of research as it investigated perceptions of university faculty. "The descriptive research design allowed the gathering of the baseline data necessary for training evaluation without any manipulation of the research context. It is non-intrusive" (Henrichsen, Smith, & Baker, 1997, p. 29). According to Isaac and Michael (1997),

> Descriptive research is used in the literal sense of describing situations or events. It is the accumulation of a data base that is solely descriptive—it does not necessarily seek or explain relationships, test hypotheses, make predictions, or get at meanings and implications, although research aimed at these more powerful purposes may incorporate descriptive methods." (p. 50)

It can only describe the who, what, when, where, and how of a situation, not the cause. Consequently, this study's research focus was on the dependent variable, the educators' perceptions of the utility of collegial research models, as there was no research control over the independent variable, the perceived success of the collegial model.

Descriptive research can be well served by the survey format and may be successfully completed over the telephone. In fact, telephone surveys have several advantages over face-to-face interviews. "They can be conducted daytime or evenings, the format allows unlimited call-backs, the respondent is at ease in their own home and tends to be more candid, and the possible geographical coverage is expanded" (Isaac & Michael, 1997, p. 139). "In addition, the format avoids the potential of an influential rapport between the interviewer and interviewee which can lead to possible personal bias and problems with subjectivity" (p. 45).

As the "over the phone" interview has been demonstrated to be effective for data gathering in descriptive research, it does not take a great leap of faith to imply data gathered using Survey Monkey surveying software is similarly appropriate for use in a pilot study such as the one presented here. However, it must be noted that some of the advantages of face-to-face interviews, including visual impressions and personalization, are absent in the phone interview and Survey Monkey processes.

There are three major cautions in conducting descriptive research. Ary, Jacobs and Razaveih (1990), in their text, *Introduction to Research in Education,* describe them as (a) inability to manipulate the independent variables, (b) lack of subject randomization, (c) lack of a no control group, and (d) risk of improper interpretation. For this study, the cautions were germane. First, the independent variables were not manipulable, as the perceptions were already in place. Second, the researchers did demonstrate randomization of the population as the respondents were randomly invited to complete the survey by The Office of Institutional Research and Assessment (OIRA). Third, no control group was employed for comparison. Finally, it was acknowledged that the interpretation of results is a major barrier for any researcher, as several plausible explanations for the behaviors observed are always possible. The researcher must acknowledge that the key to understanding and applying this study's findings is to recognize that the survey process can be less precise than other research approaches and that suggestion of a cause-and-effect relationship must not be inferred.

The descriptive design of research was appropriate for this study. Even though the literature identified areas for caution, a descriptive design does systematically and accurately yield the facts and characteristics of a given population or area of interest (Isaac & Michael, 1997, p. 50).

Population and Sample

The population of this study consisted of a randomly selected group of School of Education faculty at National University who were sent an access code to go online to take the survey. The participants were free to choose to take the survey or decline.

Instrumentation

A survey instrument was developed so that the research content could be coded on a six-point Likert-type scale. The scale asked the interviewee to place his or her reaction into one of six categories. The categories were valued and designated as follows:

1 = Not at All
2 = To a Small Degree
3 = Somewhat
4 = To a Large Degree
5 = Almost Completely
6 = Completely

Validity

The validity of the instrument, the assurance that the outcome is a function of the variables that are measured, controlled or manipulated in the study, was addressed involving three expert reviewers: an assistant superintendent in the Riverside County Office of Education and two university assistant professors who read the survey and provided feedback. An important revision was made as a result of this feedback. Another survey was developed that measured respondent perception of what "Ought to Be" as opposed to "What Currently Exists."

One can expect a reasonable measure of external validity by the very nature of the study. The research used a single survey format to measure the perceptions of clearly identified participants. Thus, reactive effects of testing, interaction effects of selection biases, and multiple treatment interference effects were not an issue. As long as the inquiry was limited to university faculty researchers, there was a valid expectation of generalizeability.

Field Testing

The instrument was field tested by administering it to university faculty researchers who were not part of the study. Participants reviewed the clarity of the directions, and relevance of the questions, convenience of use, and content validity of the items. All participants felt no changes were needed in the aforementioned areas.

However, one concern from the review group led to changes in questions 1, 2, and 3. The group suggested that the original survey provided insufficient detail. Thus, the questions were reworded to focus on gathering sufficient detail.

Data Collection Procedures

The survey was posted on Survey Monkey software and left online for one month. Randomly selected University of Education faculty were sent an email invitation to log in and participate in the survey. OIRA provided a data sheet with responses from the survey.

Data Analysis

The raw data from each respondent were simply tallied on the computer and organized under the identified headings. Upon completion of the tallying process, descriptive statistics were applied to the data collected to answer the research questions in this study. Where appropriate, the researchers analyzed the frequencies, percentages, and ranges that described participant response as a function of each research question. The mean and the mode were calculated and were then individually presented in a table in rank order.

Limitations

The limitations of this study were threefold:

1. Data for the study represented the self-perceptions of the survey respondents. There was no direct observation by the researchers to corroborate data.
2. No data were available to describe the knowledge and intentions of survey respondents. We could infer only positive and honest responses.
3. *N* for this pilot study was very small. Though random sampling was used, the sample size was too small to allow generalizability of the study.

Presentation of Data

The first survey assessed the current research characteristics of the National University School of Education and its resemblance, or lack thereof, to the research needs and agendas of corporate entities.

Table 1 reveals the responses to the first survey, rank-ordered by mean. As the data clearly reveals, School of Education faculty see little current resemblance between the research being done by faculty members and the research needs of the faculty to those that characterize corporate entities. The overall mean is 3.0, which barely places the response to the entire questionnaire into the "Somewhat" category. The top 5 items are difficult to contest as characteristic of faculties of the school of education and their research needs. The Faculties do have different departments with different research needs; education does require basic and applied research aimed at solving real problems. Collaborative research in education, while required, certainly should have a place, as many educational problems are multifaceted, and schools of education must be aware of the needs of society at large. Yet these top five barely make it into the "Somewhat" category. The rest of the items are found in "To a Small Degree," or "Not at All." (See complete questionnaire response in Appendix A.) The only possible rationale for such a low ranking of all items is the negative reaction faculty members have experienced when they have proposed or done the types of research identified as characteristic of the corporate research structure.

When the emphasis shifted in Survey 2 to what education research and faculty of education research agendas should be, the results were dramatically different.

Table 1. *Responses to Survey 1—Current Status of School of Education Research, Rank Ordered by Means (*N = *15)*

Item No.	Description	Mean
1	Corporations have many different departments with differing needs and attitudes toward research. To what extent does the school of education mirror this structure?	3.3
2	Corporations must invest in basic and applied research aimed at solving difficult problems. To what extent does the effective research model for the School of Education mirror this need?	3.1
3	Research in the corporate world is almost always collaborative. To what extent does an effective research model for School of Education research mirror this requirement?	3.1
4	Corporate research must constantly keep the organization aware of the characteristics and needs of society at large. To what extent does an effective research model for the School of Education mirror this need?	3.1
5	Corporate research must inform practice in the society at large. To what extent does an effective research model for School of Education mirror this requirement?	3.1
6	Corporations expect their research arms to maximize financial benefit while the corporation itself operates within societal constraints. To what extent does an effective research model for School of Education Research reflect this requirement?	2.9
7	Corporate research is aimed at producing merchandise, programs, and products needed by the population (field). To what extent does an effective research model for School of Education research mirror this aim?	2.9
8	In order for research to be developed into products that work in the marketplace, corporations require a deep understanding of demands and trends in the society at large. To what extent does an effective research model for School of Education research mirror this requirement?	2.8
9	Corporations require multidisciplinary research collaborations because of the complex nature of the research needed. To what extent does an effective research model for School of Education research reflect this requirement?	2.7
10	Because corporate research needs are so expensive, the research is often funded by outside agencies. To what extent does an effective research model for School of Education research mirror this requirement?	2.3

The data in Table 2 tell a completely different story. The overall mean in table 2 is 4.0, “To a Large Degree.” The top four items have means in this category, and the remaining scores fall into the high end of the adjacent category labeled “Somewhat.” Individual research is currently the university standard for promotion. Our survey shows that faculty members feel that a business model collaborative-type approach may well be more productive for educational research. Given this perception, there is a need to provide institutional support for a more collaborative approach. See complete response to Survey 2 in Appendix B. In sum, the National University School of Education faculty strongly believes that a collaborative research model should be an important consideration in the promotion process.

Table 2. *Responses to Survey 2—Desired Characteristics of Educational Research and School of Education Research Agendas, Rank Ordered by Means (N =15)*

Item No.	Description	Mean
1	Corporate research must inform practice in their market audience. Informed practice is defined as the integration of experience, judgment and expertise with the best available external evidence from systematic research. To what extent should effective research for University Schools of Education inform practice in education?	4.8
2	Research in the corporate world is almost always collaborative. To what extent should collaborative research done in the University Schools of Education be recognized as an effective model for promotion?	4.6
3	In order for research to be developed into successful products for the marketplace, corporations require a deep understanding of demands and trends in the society at large. To what extent should research for the University Schools of Education focus on the demands and trends in society at large?	4.4
4	To survive, corporations must invest in applied research aimed at solving problems. To what extent should the research done in the University Schools of Education be focused on applied research?	4.0
5	Corporations expect their research arms to generate products that have application, and thus marketability in the real world. To what extent should research done in the University Schools of Education focus on classroom application as opposed to educational theory?	3.9
6	Corporations often require multidisciplinary research collaborations because of the complex nature of the research needed. To what extent should research conducted in Schools of Education focus on multidisciplinary research collaborations?	3.7
7	Corporations have many different departments with differing needs and attitudes toward research. To what extent do University Schools of Education have departments with differing needs and attitudes toward research?	3.6
8	Because corporate research needs are so expensive, the research is often funded by outside agencies. To what extent should University Schools of Education consider the generation of outside resources to conduct research as a criterion for promotion?	3.4
9	Corporate research is aimed at producing the products and programs needed by their customers. To what extent should research done in the University Schools of Education focus on the products and programs needed by our customers (students and field)?	3.1
10	Corporate research must constantly keep the organization aware of the characteristics and needs of their market audience to maintain success. To what extent should research done in Schools of Education keep University Administrations aware of the characteristics and needs of the educational community?	3.1

Results by Research Questions and Responses

Research Question 1. To what degree does the National University School of Education faculty perceive their organizational structure mirrors that of a large research corporation at the present time? *Answer:* It probably does not, as the score indicates the organizational structure was mirrored, "Somewhat." The mean score for survey was 2.9.

Research Question 2. To what degree does the National University School of Education faculty perceive their organizational structure should mirror that of a large research corporation? *Answer:* Yes, they feel the School of Education organizational structure should mirror that of a large research corporation, "To a large degree." The mean score for survey was 4.2.

Research Question 3. To what degree does the National University School of Education faculty perceive their research needs as being similar to those of a large research corporation? *Answer:* Yes, their research needs are similar to those of a large research corporation, "To a large degree." The mean for the survey was 4.1.

Research Question 4. To what degree does the National University School of Education believe that applied research is more important than theoretical research for the educational setting? *Answer:* Yes, "To a large degree." The mean for the survey was 4.1.

Research Question 5. To what degree does the National University School of Education faculty perceive a collaborative model of research to be a powerful educational research model? *Answer:* Yes, "To a large degree." The mean for Survey 2, questions 7 and 9, was 4.2.

Research Question 6. To what degree does the National University School of Education faculty perceive a collaborative research model should be an important part of the promotion cycle? *Answer:* A resounding yes, midway between "To a large degree" and "Almost completely." The mean score was 4.6.

Discussion

Three main observations emerged from the research questions. First, there appeared to be agreement regarding the utility of the collaborative research model for educational research. However, faculty perceived at the present time that we are far from recognizing the usefulness of this model for educational research. Furthermore, it appeared faculty strongly believes that collaborative research should be given the same weight as individual research in the reappointment, promotion, and merit process.

Conclusions and Recommendations

Even though the number of participants was small, the study pointed to the fact that the National University School of Education faculty perceives that the nature of educational research is closely aligned to business research. From our review of literature and the results of the pilot study, it was reasonable to conclude that a collaborative approach often provides a more powerful model for doing effective research than an individual approach. The data gathered for this study made it reasonable to request that, for the purposes of professional advancement, the university recognize that collaborative research in the School of Education is, at minimum, on par with individual research.

The study indicated a definite sense of direction. For future studies, it is recommended that the current study be replicated with a much larger data base. The larger study would gain richer

and greater depth of data by including in the sample representatives from the schools of education nationwide. A further study could include information from other departments and schools for comparison with the School of Education data.

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Appendix A
Survey 1: Total Responses by Ranking Choice to Survey 1—
Current Status of School of Education Research (*N* = 15)

Ranking Categories:

1 – Not at All
2 – To a Small Degree
3 – Somewhat
4 – To a Large Degree
5 – Almost Completely
6 – Completely

*It should be noted that not all of the respondents answered every question on the individual surveys.

Questionnaire Item	Quantity by Ranking						Mean
	1	2	3	4	5	6	
1 Corporations have many different departments with differing needs and attitudes toward research. To what extent does the School of Education mirror this structure?	2	1	5	5	2	0	3.3
2 Corporations must invest in basic and applied research aimed at solving difficult problems. To what extent does the effective research model for the School of Education mirror this need?	2	5	1	4	2	1	3.1
3 Corporate research is aimed at producing merchandise, programs, and products needed by the population (field). To what extent does an effective research model for the School of Education research mirror this aim?	4	2	5	1	2	1	2.9
4 Corporate research must constantly keep the organization aware of the characteristics and needs of society at large. To what extent does an effective research model for the School of Education research mirror this requirement?	3	1	5	4	1	1	3.1
5 Corporate research must inform practice in the society at large. To what extent does an effective research model for the School of Education mirror this requirement?	1	3	4	4	1	1	3.1

Questionnaire Item	Quantity by Ranking						Mean
	1	2	3	4	5	6	
6 In order for research to be developed into products that work in the marketplace, corporations require a deep understanding of demands and trends in the society at large. To what extent does an effective research model for School of Education research mirror this requirement?	3	4	5	1	0	2	2.8
7 Research in the corporate world is almost always collaborative. To what extent does an effective research model for School of Education research mirror this requirement?	2	4	5	1	1	2	3.1
8 Corporations expect their research arms to maximize financial benefit while the corporation itself operates within societal constraints. To what extent does an effective research model for School of Education research reflect this requirement?	2	5	3	3	1	0	2.9
9 Corporations require multidisciplinary research collaborations because of the complex nature of the research needed. To what extent does an effective research model for School of Education research mirror this requirement?	2	7	3	1	1	1	2.7
10 Because corporate research needs are so expensive, the research is often funded by outside agencies. To what extent does an effective research model for School of Education research mirror this requirement?	3	6	4	2	0	0	2.3

Appendix B
Survey 2: Total Response by Category to Survey 2
Desired Characteristics of Educational Research and
School of Education Research Agendas (*N* = 19)

Ranking Categories:

1 – Not at All
2 – To a Small Degree
3 – Somewhat
4 – To a Large Degree
5 – Almost Completely
6 – Completely

*It should be noted that not all of the respondents answered every question on the individual surveys.

	Questionnaire Item	Quantity by Ranking						Mean
		1	2	3	4	5	6	
1	Corporations have many different departments with differing needs and attitudes toward research. To what extent do University Schools of Education have departments with differing needs and attitudes toward research?	1	2	4	10	1	1	3.6
2	To survive, corporations must invest in applied research aimed at solving difficult problems. To what extent should the research done in the University Schools of Education be focused on applied research?	0	0	2	16	0	1	4.0
3	Corporate research is aimed at producing the products and programs needed by their customers. To what extent should research done in University Schools of Education focus on the products and programs needed by our customers (students)?	0	0	5	4	1	1	3.1
4	Corporate research must constantly keep the organization aware of the characteristics and needs of their market audience to maintain success. To what extent should research for Schools of Education keep University Administrations aware of the characteristics and needs of the educational community?	0	0	5	4	1	1	3.1

	Questionnaire Item	Quantity by Ranking						Mean
		1	2	3	4	5	6	
5	Corporate research must inform practice in their market audience. Informed practice is defined as the integration of experience, judgment, and expertise with the best available external evidence from systematic research. To what extent should effective research done in University Schools of Education inform practice in education?	0	0	0	7	8	4	4.8
6	In order for research to be developed into successful products for the marketplace, corporations require a deep understanding of demands and trends in the society at large. To what extent should research for the University Schools of Education focus on the demands and trends in society at large?	0	0	4	8	2	5	4.4
7	Research in the corporate world is almost always collaborative. To what extent should collaborative research done in University Schools of Education be recognized as an effective model for promotion?	0	0	2	7	7	3	4.6
8	Corporations expect their research arms to generate products that have application, and thus marketability, in the real world. To what extent should research done in University Schools of Education focus on classroom application as opposed to educational theory?	0	1	4	10	3	1	3.9
9	Corporations often require multidisciplinary research collaborations because of the complex nature of the research needed. To what extent should an effective research model for Schools of Education research focus on multidisciplinary research collaborations?	0	2	6	8	2	1	3.7
10	Because corporate research needs are so expensive, the research is often funded by outside agencies. To what extent does an effective research model for School of Education research mirror this requirement?	2	2	4	9	1	1	3.4

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Program Review:
Opportunity for Innovation and Change

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Abstract
In order to ensure educational effectiveness, institutions of higher education carry out program review. Program review gathers and analyzes assessment data with the aim of improving teaching and learning. This paper describes the process of program review at one large university in California, and reports examples of innovative change and improvement change that came about as the result of program review.

Key Words
Program review, program improvement, learning outcomes, data analysis, change, reflection, purpose

Program Review: Opportunity for Innovation and Change

Program review is a focused, systematic, in-depth self-study completed by faculty in which data from measures of student learning and various other sources are summarized, analyzed, and used to inform program improvement and innovation (Bok, 2006; Kornuta, 2007). Program review provides evidence in response to such questions as these: How do we know students are learning what we say we are teaching? Are the measures we use valid? Do the measures align with standards of the profession? Do they align with the mission of the university? Is there reliability in assessing the measures? This article describes the importance and process of program review and reports examples of improvement and innovative change informed by program review at National University.

National University was established in 1971 as an independent institution of higher education, designed to address the unique needs of the adult and nontraditional learner. The administration and faculty of the university created a distinctive, intensive, one-course-per-month format, within a four-quarter academic year. The National University System Administrative Headquarters is in the city of La Jolla, in San Diego County, California. The university maintains multiple academic centers throughout California and Nevada. The university "is dedicated to making lifelong learning opportunities accessible, challenging, and relevant to a diverse student population" (National University, 2012, p. 14).

Program review is a critical component of reflection, self-examination, and continuous improvement. One of the university's many programs within the School of Education is the Master of Arts in Teaching (MAT) Program. The MAT Program affords opportunities for practicing teachers to enhance skills through a ten-course program. Each course has learning outcomes aligned to the overall program learning outcomes (PLOs).

The MAT Program has an annual review. From Fiscal Year (FY) 2006 through 2011, significant program changes were made based upon findings and recommendations in the annual review. Included in the program review are data from an Exit Survey administered to all MAT students upon completion of the Capstone Course. Program review provides evidence for informed, purposeful decisions about a program. Program review also provides evidence of accountability to constituents and compliance with expectations of external accreditors.

National University's focus on academic rigor, standards, and expectations has been affirmed through internal and external audits. In 2011, the Western Association of Schools and Colleges (WASC) granted the University accreditation for a ten-year period to 2021.

Objections to Program Review

One objection to program review is that it does not meet the most rigorous scholarly standards of research. President Emeritus Bok (2006) of Harvard University countered that argument with the statement, "Though the process of program review may not be perfect . . . program review, when thoughtfully carried out, is more reliable than hunches or personal opinions" (p. 320).

According to Bok, others object to program review on the basis that some forms of learning, such as self-knowledge or changes in values and beliefs, are difficult to measure (Bok, 2006). The fact remains that while some forms of learning may not be easily measured, learning outcomes are deliberately created and stated in ways that are both observable and measurable. Review of such measures can clearly inform us about our practice.

A third objection to program review centers on the tension between time and effort needed to carry out program review and the value that accompanies the findings. It is true that sometimes the change resulting from program review is small; however, as Bok (2006) noted, "An accumulation of small improvements over time will eventually yield impressive results" (pp. 321–322). Collins (2001) identified the need for discipline to expend effort that leads to discovery and acting upon evidence, stating, "When you combine a culture of discipline with an ethic of entrepreneurship, you get the magical alchemy of great performance" (p. 13).

Providing a Context for Informed Change

Program review provides feedback about teaching and learning, contributing to a context for informed change. Wheatley and Rogers (2007) pointed out that "all life thrives on feedback, and dies without it" (p. 9). Feedback about what we do is important, whether we want to drive safely, improve our golf swing, or grow as professional educators. In the context of higher education, Bok (2006) wrote that organizations produce excellence only when they assess their own performance and make use of the findings to improve and innovate.

This article provides examples of how program review has brought a fresh perspective to programs and contributed to changes in policy, planning, and practice. When meaningful change of that nature occurs, faculty feel more connected to their work and to each other (Wheatley & Rogers, 2007).

Connecting with Purpose

Effective program review must go beyond compliance with the expectations of external accreditors in order to serve the need we have for purpose in our work. When we connect with program review at the level of purpose, program review takes on value, and we willingly contribute (Wheatley & Rogers, 2007). Program review affords insight to the results of teaching, providing opportunities to learn, contribute, and feel empowered (Johnson, 2008). Within the School of Education, program review models what is expected of candidates in their own practice: to assess the extent of student learning, to reflect on teaching, and to use the insights to enhance the teaching/learning process.

Program review provides evidence that learning outcomes are connected with institutional purposes and institutional learning outcomes, as well as with the conceptual framework of the school or college. In the School of Education at National University, for example, mapping of the conceptual framework with program learning outcomes and assessments provides evidence of validity about claims that we teach what we value and believe. In addition, the findings from program review give insight about resources needed and thus connect capacity and purpose.

Providing Evidence for Accountability and Compliance

We live in a time when accountability is expected—often demanded—by government, the public, and accrediting agencies. The recent denial by WASC of accreditation for Ashford University underlines the critical importance of providing accountability to the public, external accrediting agencies, and ultimately to the students themselves (Fain, 2012).

Evidence that provides accountability and transparency is needed for all aspects of a university's operations to show that institutional operations are in harmony with purpose; educational objectives are met through core functions; operations of the university are sustainable; and there is an ongoing commitment to learning and improvement (WASC, 2008).

What to Measure in a Program Review

Four principles should be used to guide the gathering of evidence for assessing a program (Accrediting Commission for Senior Colleges and Universities, 2002; Breslow, 2007; National Council for Accreditation of Teacher Education, 2012). Evidence should:

1. Be drawn from knowledge and skills taught throughout the program,
2. Be triangulated by gathering data from multiple judgments of student performance,
3. Provide information on multiple dimensions of student performance, and
4. Provide direct evidence of student performance and, where appropriate, indirect evidence through surveys or self-reports of learning.

Qualities that make evidence of learning compelling include evidence that is relevant, verifiable, representative, cumulative, and actionable (ACSCU, 2002, pp. 9-12). Data that are relevant to program review may be from direct measures of student work or indirect measures of perceptions of their learning.

Direct Measures

Direct evidence of student learning comes from work students complete. Students earn grades based on their progress in a class, and those grades are usually based on an "an analysis of assignments designed to test conceptual understanding," and/or an "analysis of student work products (e.g., exams, essays, oral presentations)" (Breslow, 2007, p. 1). Other direct measures might include portfolios of student work, writing samples, threaded or written discussions, internships or service learning experiences, and other assessment products or processes that can be measured in a uniform way. These direct measures are most convincing when they are judged against a rubric or scoring key that ensures all such measures are evaluated using a standard set of criteria (Cleveland State University, 2012). Breslow (2007) stated, "The validity of grades as an assessment measure is dependent upon how systematically and rigorously [they] . . . are analyzed for evidence of student learning" (p. 4).

Validity of direct measures. Assessments must measure what we intend for students to be learning (Zikmund, 2003). Thus, assessments for a particular program will measure students' learning in ways that evenly reflect program learning outcomes and the knowledge and skills required of a profession (Springer, 2010). When programs are taught in geographically dispersed locations or have both online and onsite delivery, assessments used for program evaluation must be consistently the same. To address the varied delivery of programs at National University, faculty standardized syllabi for each class with a particular emphasis on identifying signature assessments that all students must complete no matter how or where they take the course. For each course, at least two signature assignments were identified. Reliable grading of signature assessments thus became an integral part of accurate measures of student learning and program review.

Reliability of direct measures. Reliability refers to consistency in measurement. For example, evaluation of an assessment would be considered reliable if different instructors graded the same assignment independently, and their scores for the assignment showed a high correlation. Thus, for written assignments requiring subjective judgment of responses, the reliability can be increased in two ways: using rubrics that clearly, precisely, and accurately describe the qualities expected in an assignment; and calibrating assessors to establish consistency in judgment.

Indirect Measures

Indirect evidence for program review usually comes from survey responses in which students are asked to respond to questions about their learning or other aspects of the program, such as perceptions of the value of a textbook or perceptions of an instructor's teaching (Breslow, 2007, p. 1). Indirect survey measures can be helpful because themes or patterns emerge in the responses (Heath, DeHoek, & Locatelli, 2012, p. 2). Findings from indirect measures complement and enrich the findings from direct measures of student learning.

Although survey data do not provide direct evidence of student learning, instructional effectiveness, or program quality, the information gleaned from a survey can act as a valuable tool for determining student perception of their educational experience in a program as well as their program specific needs (Selim, Pet-Armacost, Albert, & Krist, 2008). Valuable data can also be added to program review from surveys of employers, from graduates who have completed the program and are working in the field, and, in the case of teachers, from measures of graduates' effectiveness in making a difference in students' learning (NCATE, 2012).

Validity of exit surveys can be established by asking questions about learning outcomes from the program students completed, or by asking questions about courses students have completed. The challenge to validity comes from the use of approximate indicators such as agree/disagree or strongly agree/strongly disagree. Such indicators do not give precise insight into respondents' real feelings. Adding an option for open-ended responses may lend additional insight, but such options must be used judiciously to avoid survey fatigue. The standardized nature of a survey makes reliability of surveys a non-issue.

Examples of Innovative Change and Improvement as a Result of Program Review

Improvement is doing things better. Innovation is doing things differently (Vander Ark, 2012). Program review can lead to both kinds of change. In this section, we provide examples from the Master of Arts in Teaching programs in the National University School of Education.

Innovative Change

An example of innovative change came as a result of completing the process of program review and reflecting on it. Reflection led to questions about the program learning outcomes themselves: Do they really reflect the competencies expected in the profession? Are they appropriate for the program? Is the number of program learning outcomes (PLOs) too great? Can some be combined? Are some PLOs more appropriate as course learning outcomes? We looked closely at the learning outcomes and noticed that some were so specific that they would be more appropriate as course learning outcomes. Other learning outcomes expressed similar ideas and could be combined. The first iterations of program review assessed 10 learning outcomes. When we reflected on the process, we saw a need for fewer learning outcomes. Some learning outcomes expressed similar themes and could be combined, while others were too narrow and served better as course learning outcomes. Consequently, the number of program learning outcomes was reduced from 10 to 3. Mapping the 10 "old" learning outcomes with the 3 "new" learning outcomes validated the change. The Graduate Council further validated the change through peer review. The reduced number of learning outcomes expressed with greater clarity and precision what was expected of students and made the process of program review more manageable.

A second example of innovative change came as a result of findings in a program exit survey. Respondents expressed a high degree of dissatisfaction with a text used in a particular course, and faculty found an alternative text that supported course and program learning outcomes and was much more well received by students.

A third example of innovative change came from analysis of scores derived using a rubric for a Master's capstone project. Two of seven categories averaged less than a score of 9.0, which is the threshold of an acceptable target of 90% for the overall grade in the class. One of the categories in which students scored below 9.0 was "Clarity, Accuracy, and Precision" of writing, and the other was "Depth and Breadth" of writing about the topic. The finding of low scores in these two areas led faculty to recognize that candidates are being stretched to show clear thinking and depth and breadth of knowledge of their topic. A solution for this particular insight was to introduce mini-literature reviews earlier in the program so that students could practice writing skills and start earlier in their involvement with a topic they would later write about in greater depth.

Improvement Change

An example of improvement change came from the same analysis of rubric scores on a capstone project. Findings showed variations in scores on elements of the rubric, indicating there might be differences in the way instructors interpreted and scored each element; therefore, a recommendation was made to calibrate instructors to increase inter-rater reliability. Ten instructors reviewed one capstone project using the rubric, and then they discussed the resulting scores. The outcome was that the rubric was improved to make descriptors more clear and precise. Additional improvements were made by identifying course and program learning outcomes within the rubric and by adding numeric values to categories that had previously been described only with words such as outstanding, commendable, and marginal.

A further example of improvement change comes from analysis of data from a survey of students who completed a Master's specialization in reading. Program faculty found two particularly interesting points. First, most respondents rated the classes and their learning as either "positive" or "highly positive," with only one of 26 responses being negative. Program faculty concluded that students were well satisfied with the content of the Reading Program, and thus

programmatic change was not needed. The second interesting point, though, came from analysis of open-ended responses in the survey, which made two themes evident: Respondents expressed concern about the need to hear sooner in the program about the paperwork required by the California Commission on Teacher Credentialing (CCTC) to apply for their reading certificate; and respondents expressed a feeling of confusion regarding how to construct a portfolio.

From these findings, program faculty crafted announcements with detailed information about procedures needed to complete and file paperwork with the CCTC so that students had a clear understanding of how to apply for the certificate. Faculty also wrote more specific instructions for completing the ePortfolio. Procedures and instructions for the certificate and ePortfolio were added in several places within the online courses so they were easy to find. Additionally, faculty included both issues as topics for online and onsite discussions with students.

Keeping Program Review Relevant

In addition to the formal processes involved in program review, informal processes are also important. One informal process involves discussion among program faculty about feedback received from students during class sessions. For example, one instructor recently found that his students wanted information about the new Common Core State Standards being adopted by school districts. Other program instructors spoke of similar requests, and all came to agree that resources for Common Core State Standards be added to all classes, with specific work on Common Core State Standards added to a specific course. Such improvement change need not wait for annual program review.

Program review will be relevant when faculty see clear connections to purpose, when program review is evidence based, when learning outcomes and assignments are aligned, and when the process is reflective. Collegiality, transparency, and connection to purpose bring meaning and buy-in of program review from simple compliance to willing participation. In the end, students, faculty, and administrators benefit from program review because it informs change to raise the quality of teaching and learning.

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Online and Hybrid Learning

Enhancing Learning in the Virtual Classroom

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Abstract
The present study found that meeting adult students' communication expectations and employing shared student-instructor locus of instructional control led to much higher student interaction satisfaction and student ratings of overall learning. Although the sample size was small ($N = 63$), effect sizes were large and statistically significant. Results indicate that universities could improve educational outcomes by (a) facilitating shared student-instructor locus of instructional control, (b) helping instructors co-create students' interaction expectations, and (c) encouraging instructor-student interaction.

Key Words
higher education, online learning, communication, interaction expectations, locus of instructional control, online course design

Enhancing Virtual Learning

Increasingly, universities depend upon online information and communication technology (ICT) to educate students and thus transform the delivery of higher education in the twenty-first century. The Sloan Consortium found that two-thirds of higher education chief academic officers viewed online learning as a critical part of their long-term strategy (Allen & Seaman, 2011). Elite universities, such as Stanford and MIT, have created impressive (and popular) online programs, while many for-profit universities now center their business models upon online instruction. To reap maximum benefits from the new ICT landscape, we must discover how this technology can foster learning, how it impacts learning processes in online classes, and how to determine which instructional strategies best leverage these new online learning capabilities.

Failing to understand core online learning processes greatly compromises our ability to deliver effective learning for present and future students. According to Ashwin (2009), present online instruction research remains deeply flawed and incomplete, because:

> . . . the current literature tends to separate the experiences and practices of academics from those of students within teaching-learning processes. This has meant that this research does not support an examination of the dynamic and shifting aspects of teaching-learning interactions in higher education. (p. 7)

Whether higher education is delivered face to face or through multimedia online instruction, core educational processes remain intensely communicative. Thus, the present research examines adult learners' communication and interaction expectations, contrasts these learners' expectations with their actual online classroom experiences, and analyzes the effects of meeting (or not meeting) their expectations on students' satisfaction with interaction in online courses, perceptions of locus of instructional control, and self-reports of their online course learning.

Van Tassel and Schmitz (2011) proposed that, just as the nature of student-instructor interaction influences student learning, the extent to which these interactions meet students' expectations also shapes online learning outcomes. The authors modeled how students' personal characteristics, communication-interaction expectations, and actual interaction experiences influenced their course satisfaction and overall learning. The present research provides a partial empirical assessment of that model, as Figure 1 illustrates.

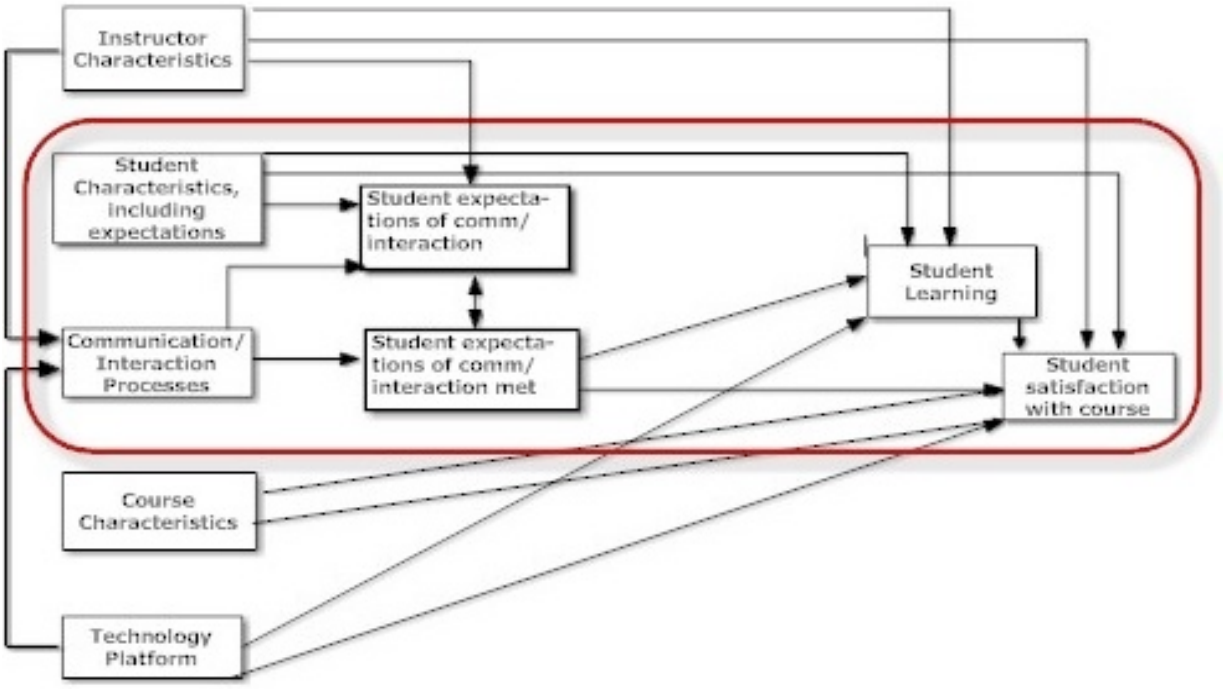

Figure 1. Multivariate factors in online learning.

Nontraditional Students

The term "nontraditional" typically refers to students in higher educational institutions who are defined by such criteria as age, ethnicity and socioeconomic status, and propensity to leave higher education before completing their educational program (Ely, 1997; Hazzard, 1993; Kim, 2002; Nora, Kraemer, & Itzen, 1997). The present study focuses on such nontraditional learners.

The age difference between traditional and nontraditional students is particularly important. Knowles and Associates (1984) recognized adult learners as independent, self-directed, and highly motivated students. Holmes (2000) found that adults engaged in education programs primarily to advance their careers and improve their life situations. Subsequent research established that adult learners have distinctive demographic and cognitive characteristics, and thus require tailoring of instructional models to address these attributes (Hill, Song, & West, 2009). Additionally, older students often had high levels of anxiety that could be eased by active instructional methods such as collaborative learning, participation, and more informal learning environments (Harrell, 2003; Harrison, 2002). Adults bring significant life experiences and prior knowledge to educational settings (Kasworm, 2003). Thus, we should anticipate that they also bring different expectations about key aspects of their education than do traditional students, such as course content and presentation, instructor behaviors, and the role of peers in learning. Yet, we should be mindful that demographic changes, coupled with recent changes in higher education student population composition, may blur many previously held distinctions between traditional and nontraditional students for online and onsite higher education (Fawson, 2012).

Learner Interaction in Online Environments

Moore (1989) observed three types of interactions in online educational settings: learner-instructor, learner-learner, and learner-content. Additionally, Reisetter, LaPointe, and Korcuska, (2007) found a fourth interaction type in online environments: learner-venue interaction, thus addressing differences in online and onsite settings. Reisetter et al. provide valuable insights into the increasingly sophisticated features of online course software, combined with the increasing familiarity of potential students with computer technologies and online learning.

Reisetter et al. (2007) found no significant differences between traditional and online students in their course satisfaction and learning. However, they did find important differences in how students viewed the learning experience. Traditional students taking onsite courses valued different types of interactions, learning skills, and strategies than did online students. Traditional students defined accessibility as physical access to instructors and gave high ratings to face-to-face interactions with instructors and peers. For them, course material interaction was mediated by human interaction. In contrast, online learners defined accessibility as having contact with course materials. Nontraditional students enrolled in online courses ranked interaction with course content as most important, interaction with instructors as less important, and interaction with peers as least important. This primacy of content for online nontraditional students' interaction was also supported by Kuo (2011), who included learner-instructor interaction and course-level variables in a multi-level model of student satisfaction for distance learners.

Although nontraditional online students considered their interaction with course material of greatest importance (Kuo, 2011), much research indicates that instructors play key roles in both online and onsite environments (Sher, 2009). For example, Mayzer and DeJong (2003) found that instructor participation in online courses not only shaped educational environments where quality learning could take place but also constituted a central component of learner satisfaction. Reisetter et al. (2007) also emphasized the importance of the online instructor: "Materials should include a good deal of teacher voice material, whether audible or written, to engage the learner in content beyond academic materials" (p. 74). In addition, Livingston and Condie (2006) found that if an instructor did not guide self-directed students through course material, overall learning was lowered. They noted that instructor failure to monitor and engage in follow-up discussion "resulted in a missed opportunity to add depth to the learning experience by creating a bridge between classroom and independent study" (p. 252).

To summarize, much online learning literature presumes that instructors interact with students to facilitate student engagement with course material and help frame learning processes. The current authors argue that the failure of instructors to participate actively in online classes lowers students' satisfaction with their courses and compromises their learning. Thus, the current authors strongly agree with the Schubert-Irastorza and Fabry (2011) findings that the instructor must be perceived as a "present and an active participant in the course" (p. 175).

Communication among learners may also play an important part in online education. For example, Knupfer, Gram, and Larsen (1997) found that instructors could create effective online communities of learners by establishing study groups early and by modeling and reinforcing effective communication. Meta-research investigating online learner interaction by Tallent-Runnels et al. (2006) reviewed 76 studies of online interactions among students and found that students most frequently used e-mail, listservs, and chat to communicate.

Online instructors also have key roles to play in shaping this online peer communication (Gorham, 1999). Daroszewski's (2004) study of nursing students found that when teachers encouraged students to share learning experiences through weekly online journals and discussion

forums, student learning improved. Post-course evaluation reported that these nursing students believed their shared clinic experiences had enhanced student learning, promoted mentoring, fostered critical thinking, and promoted socialization.

Although peer interaction aided most learners in online environments, instructor communication had more impact than did peer-to-peer interaction (Sher, 2009; Sheridan & Kelly, 2010). Indeed, just as in traditional classrooms, learner-instructor interaction remains crucial to online students. Greene and Land (2000) found that "guiding questions" developed by instructors provided procedural scaffolding and helped students to focus and develop their projects. Thus, students benefited from real-time, two-way discussion with their instructors. Similarly, Blignaut and Trollip (2003) observed the importance of instructor presence in the online environment in their analysis of faculty discussion postings across three online business courses. Blignaut and Trollip also concluded that instructor presence was important—in spite of broad differences in the ways that instructors engaged their students.

However, some of these findings may not extend to adult learners, given that most past research studies typically sampled populations of traditional college students, aged between 18 and 23, who were enrolled in onsite courses. To test for differences between traditional and adult students, Houser (2005) surveyed the expectations and actual experiences of more than 300 students. Houser asked students about instructor communication behaviors, valued learning processes, and preferences for classroom activities. The study found no significant differences between traditional and nontraditional students' expectations of verbal and nonverbal immediacy and clarity. However, Houser did find that traditional students had higher expectations of instructor affinity-seeking behaviors, such as empathetic understanding and friendliness, than did adult learners. Not only were adults unimpressed by instructor bids for affinity, but they "expressed a desire for instructors to recognize them as students who take ownership of their own learning, respect their knowledge and experiences, and treat them as adults" (p. 215).

These studies underscore that differences exist in the interaction expectations and experiences encountered by learners, depending on their age and life situations. Moreover, research indicates that all three types of interactions—learner-instructor, learner-content, and learner-learner—affect student satisfaction and learning in online venues. Of the three interaction types, the preponderance of literature indicates that learner-instructor interactions are most important (Reisetter et al, 2007; Sheridan & Kelly, 2010).

The literature also points to conflicting roles for online instructors of nontraditional students. One strand of literature finds that nontraditional online students behave relatively autonomously, seek interaction with content, and value interaction with instructors less than do traditional on-site students. Yet other research finds that the online student-instructor relationship, expressed by the instructor's active presence, remains an essential prerequisite for valued student outcomes.

Locus of Instructional Control

The construct, "locus of instructional control"—defined as the source of direction for students' interaction with course content (Hannafin, 1984; Lowe & Holton, 2005)—may help disentangle the conflicting findings reported earlier. Locus of instructional control was used in early computer-based instruction research. The current authors propose it as a theoretical construct to classify online student-instructor dynamics. Locus of instructional control can measure the source of guidance and direction that students first expect and later experience; it can be conceptualized as self-directed, shared, or instructor-directed content interaction. In this way, locus of instructional control may provide insight into how online instructors influence students'

satisfaction with their instructors, course communication, course content interaction, and overall course learning.

Research Questions

- Research Question 1: How do students' age, gender, and life situations impact their communication and interaction expectations and experiences, course interaction satisfaction, and learning in online courses?
- Research Question 2: How do students' expectations of locus of instructional control and subsequent course experiences impact course interaction satisfaction and learning in online courses?
- Research Question 3: Which communication factors most influence students' course interaction satisfaction and overall student learning in online courses?

Methods

Students enrolled in 27 undergraduate and graduate online courses at National University were invited to participate in an online survey. Instructors were asked to consider offering their students extra credit for their survey participation. All respondents were anonymous, and their courses of origin were unknown. As a result of the invitation, 63 students completed the survey.

Research Instrument

The survey asked five demographic questions: age, sex, marital status, number of children in residence, and number of hours worked per week. The survey also asked about respondents' education: years of college, total number of National University courses, and number of National University online courses taken.

Students were asked how many email communications and telephone interactions with their instructor they expected; later, they were asked how many email communications and telephone calls they actually experienced. Additional questions asked how many live chats were scheduled, how many chats respondents attended, and how much students expected to interact with (a) instructors, (c) course material, and (c) peers. Later, the survey asked students how they actually interacted with their instructors, course material, and peers. Students were also asked if actual interaction experiences exceeded, met, or failed to meet their pre-course interaction expectations.

Two questions asked respondents about their locus-of-instructional-control expectations for online course content, and the actual locus of instructional control experienced. Respondents selected one of four options to classify their locus of instructional control: (a) self-directed study, (b) direction shared with instructor, (c) strong instructor direction, and (d) peer-guided direction. Finally, five-point Likert-type scales rated students' satisfaction with course interaction and learning.

Analysis

Data analysis employed SPSS 17.0 software for Windows. The data were analyzed using descriptive and inferential statistics, including *t*-tests, correlation, ANOVA, and multiple linear regression modeling. Only findings with probabilities of .05 or less were considered statistically significant.

Results

The demographic profile showed that most respondents were female (68%), likely to be married (60%), and 25 years or older (85%). Respondents typically worked full time; more than 80% of them reported working 40 or more hours per week, while only 5% of respondents worked 10 or fewer hours per week. Besides having extensive work responsibilities, more than 60% of respondents lived with one or more children. Clearly, this sample of online learners disproportionally represented nontraditional students—consistent with the authors' theoretical goals.

The sample was evenly split between undergraduate and graduate students. Almost one-third of the undergraduates were first-year students, while almost half had completed three or more years of college. On average, undergraduate students had taken almost 5 National University courses, of which slightly more than 3 were online courses. In contrast, graduate students had taken an average of 7 National University courses, with an average of 4.4 online courses.

Research Question 1: Demographic Factors, Student Expectations, and Course Outcomes

Research Question 1 asked how online students' age, gender, and life situations impacted their interaction expectations and experiences, course interaction satisfaction, and overall student learning. Analysis of demographic variables' effects was complicated by the conflation of males and undergraduates within the sample. Undergraduate students tended more often to be male, while graduate students tended to be female. Thus, both males and undergraduates reported considerably higher levels with interaction satisfaction and course learning than did graduate students and females. There was little association between the number of respondents' children or work hours with any of the communication-interaction or course-outcome variables.

Sex differences. As Table 1 demonstrates, males were more likely than females to have their expectations of instructor interaction met. Males were also more likely than females to have their expectations of interaction with syllabus, assignments, and schedule information met. Finally, males reported greater satisfaction with instructor interaction than did females. While males reported that they learned more in their classes than did females, this difference was not statistically significant. The patterns of males' expectations of interactions, interactions experienced, and course outcomes suggests that males found online learning courses and instructors' communication behaviors more involving, satisfying, and effective.

Table 1. *Subgroup Comparison: Sex Differences*

	Gender				
	Males	**Females**	***t***	***p***	***df***
Scheduled live chats	0.40	0.60	.86	ns	61
Actual live chats	0.30	0.60	1.20	ns	61
Student-instructor interaction expectations met	4.35	3.56	–3.01	.004**	58.76

(continued)

Table 1. *Subgroup Comparison: Sex Differences* (continued)

	Gender				
	Males	**Females**	***t***	***p***	***df***
Student's syllabus, assignment, and schedule info interaction expectations met	4.30	3.63	–2.35	.022*	61
Content interaction expectations met	4.25	3.77	–1.87	.065	61
Student-instructor interaction locus-of-control expectations	1.84	1.80	–0.28	ns	58
Student-instructor interaction locus-of-control experienced	1.84	1.65	–1.01	ns	60
Peer-interaction expectations met	3.85	3.51	–1.19	ns	61
Student-interaction satisfaction	4.45	3.49	–3.63	.001***	58.33
Overall student learning	4.35	3.93	–1.52	.130	61

Notes: *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Graduate vs. undergraduate students. Undergraduates' responses were far more positive and extended to more interaction process and course outcome variables than did those of graduates, as shown by Table 2. Graduate students expected only slightly more instructor interaction than did undergraduates, but graduate students' expectations of interaction were more often unmet; they were far less satisfied with course interaction levels, had much lower interaction satisfaction with their courses, and—most importantly—reported learning much less in their classes.

While undergraduates expected fewer interactions with instructors and peers than graduates, these differences were neither statistically significant nor practically important. Yet, while interaction expectations differed slightly, actual interaction experiences differed dramatically. Thus, undergraduates reported markedly higher levels of interaction, including scheduled live chats and actual live chats. Their expectations were also more often met in (a) student-instructor interactions, (b) interactions with such content as student syllabus, assignments, and schedule information, (c) overall interaction with content, (d) peer interaction, and (e) instructor-centered locus of instructional control.

Undergraduates reported far more positive ratings of the course-outcome measures than did graduate students. Undergraduate students were more satisfied with course interaction than were graduate students. Most important, they reported learning more in their courses than did graduate students. When the differences between males and females were compared to those of undergraduate and graduate students, given the great differences in undergraduates' interaction experiences, the most important differences almost surely stemmed from respondents' undergraduate status rather than their gender.

Table 2. *Subgroup Comparison: Undergraduate and Graduate Students*

	Program Level				
	Under-grads	**Grads**	***t***	***p***	***df***
Scheduled live chats	.88	.19	3.36	.002**	43.82
Actual live chats	.78	.23	2.37	.02*	61
Student-instructor interaction expectations met	4.28	3.32	3.31	.002**	47.85
Student's syllabus, assignment, and schedule info interaction expectations met	4.31	3.35	3.81	.000***	52.06
Content interaction expectations met	4.19	3.77	2.27	.03*	51.91
Student-instructor interaction locus-of-control expectations	1.90	1.73	1.39	ns	58
Student-instructor interaction locus-of-control experienced	2.06	1.35	4.72	.000***	60
Peer-interaction expectations met	4.13	3.10	4.37	.000***	44.94
Student interaction satisfaction	4.44	3.13	4.80	.000***	38.86
Overall student learning	4.44	3.68	3.11	.003***	49.51

Note: *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Research Question 2:
Locus of Instructional Control and Online Learning

Most (75%) respondents reported that they anticipated sharing the locus of instructional control for content interaction with their instructors. However, almost half of the respondents reported their actual content interaction was largely self-directed, in contrast to their expectations. Students' anticipated locus of instructional control was not strongly associated with interaction or communication process and outcomes, course-interaction satisfaction, or student learning outcomes. In stark contrast, actual locus of instructional control predicted (a) whether students' interaction expectations had been met, and (b) greater satisfaction with course outcomes.

As Table 3 shows, a one-way ANOVA demonstrated potent effects of actual locus of instructional control. Greater shared student-instructor control led to (a) student-instructor interaction expectations met; (b) students syllabus, assignments, and schedule information

interaction expectations met; (c) peer-interaction expectations met; (d) overall satisfaction with interaction level; and (e) overall student learning. Students who expected that they would share locus of instructional control but later experienced self-directed locus of instructional control, reported much poorer course outcomes than did students who experienced shared or instructor-centered locus of instructional control.

Table 3. *Locus of Instructional Locus of Control Experienced and Online Course Outcomes*

	Actual Instructional Locus of Control				
Variable	**Mostly self-directed**	**Self-instructor directed**	**Instructor Guided**	***F***	***p***
Student-instructor interaction expectations met	3.12_a	4.21_b	4.75_b	10.36	.000***
Student syllabus, assignment, and schedule information interaction expectations met	3.15_a	4.21_b	4.75_b	13.03	.000***
Peer-interaction expectations met	3.00_a	3.96_b	4.25_b	9.62	.000***
Overall satisfaction with course interaction	3.00_a	4.25_b	4.63_b	11.83	.000***
Overall student learning	3.46_a	4.36_b	4.88_b	10.56	.000***

Note: $N = 62$. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$. Means with different subscripts are significantly different at the $p \leq .05$ based on the Tukey harmonic means test.

The direction of locus of instructional control experienced by students yielded strikingly different student ratings of overall learning. The average rating of overall course learning by respondents who reported mostly self-directed learning was 3.5 (neither agreed nor disagreed with "I learned a lot . . ."), while the average overall course learning reported by respondents with shared locus of control was 4.4 (agreed or strongly agreed with "I learned a lot . . ."). The average of overall course learning by respondents who reported instructor-directed learning was 4.9 (strongly agreed that "I learned a lot . . .").

Research Question 3:
Students' Interaction Satisfaction and Online Course Learning

Most student expectations of overall course interaction were met, as Table 4 shows. More than two-thirds of respondents reported that their instructor-interaction expectations were met, while only one-fifth of respondents reported unmet instructor-interaction expectations. Students' expectations of course-content interaction were met to an even greater degree than were students' expectations of instructor interaction.

Table 4. *Predictors of Student Satisfaction with Course Interaction*

R	***R²***	**Adjusted *R²* Square**	**Std. Error of the Estimate**	***df***	***F***	***Sig.***
.87	.76	.75	.634	62	46.72	.000***
Student satisfaction with course interaction:						
Variables				***B***	***t***	***Sig.***
Constant				–.61	–1.64	.100
Student instructor interactions met				.37	3.71	.000***
Student syllabus, assignment, and schedule-information interaction expectations met				.20	1.95	.060
Content-interaction expectations met				.08	.89	.380
Peer-interaction expectations met				.38	4.69	.000***

Notes. $N = 62$. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Regression analysis shows the effects of met/unmet expectations of interaction with instructors, course content, and peers upon overall satisfaction with course interactions. The model employed four independent variables: (a) students' instructor-interaction expectations (met); (b) students' instructor syllabus, assignment, and schedule-information expectations (met); (c) students' content-interaction expectations (met); and (d) students' peer-interaction expectations (met) to predict overall course interaction satisfaction. These variables predicted three-fourths of the variance in course interaction satisfaction ($R^2 = .76$, $F = 46.7$, $p < .000$). While the variable "students' content interaction expectations" was included in the model, it was not a significant predictor of interaction satisfaction ($t = .89$, $p < .38$), a point to be addressed in the following overall learning regression model and later in the discussion section.

Predicting Overall Online Course Learning

Respondents' assessments of overall course learning were quite high. Four-fifths of respondents either agreed or strongly agreed that they had learned a lot in their classes. Regression was used to model the consequences of effective communication and interaction upon overall course

learning. Three variables—(a) content interaction expectations (met), (b) overall satisfaction with interaction level, and (c) actual locus of instructional control—predicted more than half of the variance in student learning (R^2=.57, F=25.4, p<.000). Although students' content interaction satisfaction did not predict overall course interaction satisfaction (see Table 4), when considered with the effects of instructional locus of control, students' content interaction did predict course learning (see Table 5).

Actual locus of instructional control was included in the model's independent variables, even though its contribution was above $p < .05$, ($t = 1.8$, $p < .075$). Given that the actual locus of instructional control (greater shared student-instructor control as experienced by students) also predicted positive student experiences regarding instructor and course interaction, the separate impact of locus of instructional control on course learning further illustrated the importance of the instructor for online learners.

Table 5. *Predictors of Overall Student Learning*

R	***R²***	**Adjusted *R²* Square**	**Std. Error of the Estimate**	***df***	***F***	***Sig.***
.75	.57	.55	.70	61	25.36	.000***
Overall student learning:						
Variables				***B***	***t***	***Sig.***
Constant				.999	2.63	.010**
Content interaction expectations met				.360	3.15	.003**
Overall interaction satisfaction				.310	3.28	.002**
Locus of instructional control				.280	1.81	.075

Notes. $N = 62$. *$p \leq .05$, **$p \leq .01$, $p \leq .001$.

Discussion

The present research findings demonstrate that the communicative relationships between instructors and their students, including locus of instructional control, shape important course outcomes. Further, the observed pattern of results strongly indicates that students with "met" interaction expectations were far more likely to report satisfaction with their course instructional processes. Critically, these respondents reported that they learned much more in their online courses. Demographic variables played relatively minor roles in instructional and course outcomes.

Student Expectations Matter More than Communication Behavior

It is noteworthy that, except for the number of live chats attended, the effects of actual interaction were very small compared to the effects of students' met interaction expectations. Students with met interaction expectations reported higher satisfaction with their instructor interaction and, most importantly, greater course learning than did respondents with unmet interaction expectations. The literature the current authors reviewed privileged actual student-instructor communication behaviors and postulated that students' ability to access course content would be more important to nontraditional students' learning. However, the current authors found that interaction satisfaction and, indeed, overall course learning depended far more on met (or unmet) student interaction expectations than on actual interactions. In short, this research indicated that student expectations frame student experience and shape their assessments of overall course learning.

Locus of Instructional Control in Student-Content Interaction

The online education literature reinforces common stereotypes of online learners and nontraditional students as being more self-directed than students in traditional classrooms. Even though most respondents anticipated shared student-instructor–directed locus of instructional control, only half the respondents reported that their actual locus of instructional control was shared with instructors, while the other half of respondents reported that they had directed their own interaction with content. Contrary to stereotypes of nontraditional online students, respondents who directed their own learning (self-directed locus of instructional control) reported dramatically lower satisfaction with their course material interaction, instructor interaction, and even peer interaction. Importantly, these learners reported substantially lower learning in their courses. Perhaps equally important, as one of the present manuscript reviewers has noted, rapid demographic changes may have converged with exponential technological changes to impact all educational realms. One intriguing implication of this logic suggests that the present study findings also might be relevant to hybrid, onsite higher education.

The power of the locus-of-instructional-control construct to illuminate online learning processes represents a noteworthy finding. By including locus of instructional control as a variable in online learning models, it can be better understood how instructors shape students' learning in positive (or negative) ways that would otherwise remain masked. The present results demonstrate that online instructors are less effective when they play passive roles with students—even with nontraditional undergraduate and graduate students. It was found that reduced instructor direction results in lower levels of student satisfaction with the level of interaction, peer interaction, and course learning.

Thus, the present study indicates that online education researchers should include locus of instructional control—as experienced by students—in models of online learning. Failing to consider this theoretical construct risks misspecification of models intended to represent how nontraditional students actually learn in online environments. Most important, to omit locus of instructional control when modeling how online students learn underestimates the importance and multiple roles of effective online instructors.

Interaction Expectation Effects on Course Outcomes

The regression results demonstrate that if students' interaction expectations are met, their satisfaction with online interaction and their overall learning increases. Of the three types of

interaction expectations, two "met" expectations—(a) student-instructor expectations and (b) student syllabus, assignments, and schedule information expectations—increased students' course communication satisfaction significantly. These effect sizes were statistically significant and practically important. This finding underlines a practice most educators find essential: providing complete, concise, and clear course information to students. Although students' course interaction expectations did not directly influence students' interaction satisfaction, course interaction expectation did indirectly influence overall course learning, as Tables 4 and 5 in the present manuscript demonstrated.

This research has important implications for online course designers and instructors. Coupled with the positive impact of shared student-instructor locus of instructional control on course learning, the finding that "met course interaction expectations" improves overall student learning clearly indicates that we should design online courses to maximize ongoing, vibrant, and interactive triadic relationships that include (a) students, (b) active, not laissez-faire, instructors, and (c) course content that is tailored for dynamic access by learners and instructors.

Limitations and Strengths

The present study has four primary limitations. First, the sample, although composed of anonymous respondents from the theoretical research population, was a convenience sample. Second, even though effect sizes were large and statistically significant, the sample size was small. Further, since the sample included undergraduate and graduate students, subgroup analysis had less statistical power. Third, as is common for Internet/online samples (Jones, 1999), low response rates increased the number of threats to internal and external validity. Because the respondents' course origins are unknown, respondents' communication process or course outcome ratings may reflect differential response rates from atypical classes. Low survey response rates, usually exacerbated in online surveys, have become increasingly problematic in recent times, yet online education researchers who would gather quantitative data from many respondents have few alternatives to the use of online surveys. Fourth, the present study derived conclusions about social processes that unfold over time from data gathered at a single point in time. This is particularly problematic when asking subjects, at the end of their course, to retroactively assess their expectations at the beginning of the course. While cross-sectional strategies typify the vast majority of quantitative educational or communication survey research (Baxter & Babbie, 2004), optimal research designs for ongoing social processes require longitudinal methodologies that utilize repeated measures over time.

Just as the present study has limitations, it has several strengths. It gathered data from nontraditional online students in a natural context, employing relatively nonreactive methods. The present study addressed three important gaps in the literature about online university education. First, it showed that previous researchers had given inadequate attention to the importance of students' expectations. Discovering that communication-interaction expectations shape online course outcomes represented an important finding. Second, the incorporation of locus of instructional control yielded new insights into how students thrive (or fail to thrive) in online education. Third, by distinguishing content interaction from instructor-student interaction, the present research helped to disentangle different (and important) aspects of the student-instructor relationship. This distinction between students' interaction with content and instructors highlighted course developers' roles in "setting the table" for online learners and their instructors.

Further Research

The present study provides strong evidence that a comprehensive model of online learning processes requires the inclusion of interaction/communication expectations (both met and unmet), coupled with locus of instructional control. While these research findings provide support for the importance of these constructs, the present study would have benefitted from a larger sample size and measurement of additional constructs shown to be important to online, deemed by Ashwin (2009) and others as worthy of consideration.

Future research must employ longitudinal designs that link anonymous instructor data, course-design information, and anonymous student-grade information to anonymous undergraduate respondents. (See Schuler, Schmitz and North [2006] and Van Tassel and Schmitz [2011] for IRB-acceptable data collection strategies.) Researchers should offer respondents substantial participation incentives to increase survey response rates. Such longitudinal strategies could greatly increase internal and external validity, because these research designs would incorporate pre-course and post-course data and thus could draw valid conclusions about how online learning processes unfold. These data should be modeled with structural equation modeling (SEM) to examine simultaneous causal relationships.

Theoretical Implications

This research provides clear evidence that online learning scholars should afford prominence to the communication/interaction processes between learners and instructors, as well as interaction between learners and course content. While modeling actual communication within online courses remains essential, more attention should be paid to understanding and setting students' expectations, considering the significant effects of students' expectations upon online learning processes and course outcomes. Additionally, locus of instructional control for nontraditional online students clearly matters in ways that were previously unanticipated. The present study highlights how the locus of instructional control, as experienced by students, moderates online students' course communication, interaction satisfaction, and overall student learning.

Practical Implications

The current authors believe that university decision makers, online course designers, and online faculty should draw three conclusions from this research. First, online programs should clearly and unambiguously co-create students and instructors' expectations regarding the nature, scope, and intensity of students' interactions with their instructors and with the course content. Previous communication studies of online education often emphasized actual student and instructor interaction behaviors. This research highlights the importance of assessing communication activities within the context of co-created student expectations. Thus, online instructors must be empowered and challenged—and must be furnished with the intensive institutional support that instructors need—to successfully enact rich, interactive environments with online learners.

Second, the impact of students' course-interaction expectations on overall student learning implies that course designers must emphasize clear, interesting, vibrant, and interactive course-content linkages with learners. The importance of meeting students' course-interaction expectations honors course design expertise that is grounded in subject-matter knowledge as a basis for effective collaborative online learning. Equally important, instructors must guide their students through rich, coherent course material in interactive and student-centered ways.

Third, the importance of the instructor's roles in online learning must be stressed and redefined. The present study finding that locus of instructional control shapes students' learning outcomes requires a rethinking of the stereotype of nontraditional online students as somewhat self-directed "tourists" who explore the content of their online courses on their own. While best practices for online educators may still downplay the traditional instructor role of "sage on the stage," the present locus of instructional control results strongly suggest that effective instructors must play a far more prominent and interactive role than "guide on the side," if they hope to foster effective student learning within world-class, online educational environments.

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Authors' Notes

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Flying with Clipped Wings: Are Students Independent in Online College Classes?

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Abstract
Although online education offers exciting prospects for increased learning opportunities, the rigid structure and requirements of online classes are often in conflict with students' desire for greater independence in learning and their ability to become autonomous, lifelong learners. Colleges, instructors, and students all contribute to this tension but are also ultimately responsible for transforming online learning into a more flexible, learner-driven and effective learning environment through better course design, instructor diligence, and improved student preparation for academic success.

Key Words
Autonomous learner, learner independence, self-directed learning, online learning

Introduction

Online or web-based distance education opens unique, varied and continuously expanding prospects for superior ubiquitous learning. A growing number of people now engage every day in educational ventures, immersing themselves in a rich ICT (Information and Communication Technology) environment. Education has been transformed into technology-mediated knowledge sharing and has become a part and a vehicle of the knowledge society (Harasim, 2012; Bates & Sangra, 2010; Scardamalia & Bereiter, 2006; Jonassen, 1996; Moore & Kearsley, 1996).

Along with unlocking an open and infinite access to knowledge, which inspires a rapidly escalating trend of self-directed and self-sustained learning, new technology-based educational formats have brought about a new paradigm of organized (institutionalized) learning. This paradigm has two major vectors: instructor facilitated group learning and individual achievement of the desired learning outcomes. These vectors hardly ever coincide, yet an ideal system of education tries to bring them as close together as possible for optimal learning. As noted by Buchler (2003), "Technology has introduced a new dimension to self-learning and independent study via online learning." Despite increased learning opportunities offered by colleges through online classes, a conflict arises between strictly organized and controlled coursework and students' understandable yearning for independence in learning to exercise freedom of choice and maximize their outcomes.

Institutions of higher learning, their instructors, and the students themselves are caught in a dilemma: To abide by the rigid standards, program and course requirements, or to liberate students' individual intellectual, emotional, and social potential to become effective autonomous learners? This dichotomy does not have to become a quandary, however. Instead proactive ways ought to be found to balance both venues to achieve the desired learning outcomes and, at the same time, build a learning environment that would sustain the growth of student initiative, creativity, and independence to transform them into self-sufficient, efficient autonomous learners.

Conventional wisdom would suggest that students are always striving to be more independent and self-directed in their learning activities, even when remaining within traditional academic settings (especially online classes). True, online learning environments offer students

many opportunities and freedoms unheard of in traditional classroom-based education. Nevertheless, the often rigid format of technology-based college courses constrains their initiative and does not allow them to enjoy all the benefits of increased independence and a larger choice of what, when, and how to learn; and it may even discourage them from seeking greater independence in their studies. This conflict leads to student dissatisfaction, low motivation, and limited efficiency; sometimes it instigates their migration to non-conventional, informal practices of education (Cross 2007), particularly those emerging in rapidly developing social networks (Educational Networking 2012). As a result, colleges risk losing a substantial part of their student body unless they adopt innovative formats that appeal to students' longing for less formal and more personally driven engagement with learning.

Moreover, in view of the growing challenges for the work force, it is critical for society that educational systems cultivate autonomous, life-long learners capable of independently constructing knowledge and developing skills to effectively adapt to changing markets and compete in a global environment. The knowledge economy of the 21st century is based on innovation, initiative, creativity, risk-taking, and leadership qualities. According to Hargreaves (2003) "The things most prized in a knowledge economy [are] creativity, spontaneity, deep understanding, critical thinking and the development of multiple forms of collective intelligence" (p. 65). To develop these qualities, colleges and universities must provide students with more opportunities for independence in learning and for developing their learner autonomy, while recognizing that some students, depending on their field of study, may still require a high degree of structure until they have attained certain levels of content expertise. This would be particularly true in mathematics and hard sciences.

Creating conditions for nurturing such independent, self-directed, self-sufficient, autonomous learners in Web-based knowledge environments, including online college courses, requires a change in pedagogic perceptions, certain methodological modifications in teaching and learning, new understanding of the instructors' and learners' roles and responsibilities, superior dispositions from the students, and, consequently, a particular design of online courses (Cercone, 2008). Those include accountability for their own learning, capability to reflect on and critically assess their own learning, and confidence in their abilities, which is supported by their strong learning habits and experiences. Also vital for personal success is students' basic readiness, which includes effective learning, reading, writing, information-processing, critical thinking, research, quantitative literacy, reflective, self-evaluation, and time management skills. It is crucial as well to place the formation of an autonomous learner in the context of collaborative learning within today's constructivist pedagogic approach, as an individual does not develop independently of others or function alone outside of society (Vygotsky, 1962; Harasim, 2006). This article presents the current authors' findings, both theoretical and practical, on this issue based on research conducted in postgraduate teacher preparation programs at National University in 2011–2012, and offers some insights into the art of teaching for independent, autonomous learners.

Autonomous Learner

One of the ultimate goals of any educational system is to develop autonomous, life-long learners who are capable of both independently and collaboratively resolving life and job problems (Hargreaves, 2003). Such a goal can be achieved through cultivating learner autonomy, which Moore (1984) defined as "the extent to which in the teaching-learning relationship, it is the

learner rather than the teacher who determines the goals, the learning procedures and resources, and the evaluation decisions of the learning program" (p. 85). Autonomous learners are more successful learners who achieve their learning outcomes with the best efficacy (Albert, 2007; Luke 2006). Independent learners are more likely to ask questions and engage in communication and collaboration (Jones, Valdez, Nowakowski, & Rasmussen, 1995). They become more productive workers. Hargreaves (2003) argued, in particular, that teacher autonomy is a precondition for effective teaching.

Independence in learning is immediately related to innovation, creativity, and self-efficacy. Buvoltz, Powell, Solan, & Longbotham (2008) argued that promoting student autonomy is pedagogically sound, especially with regard to adult learners who "learn much more when they are consulted about dimensions of their own learning, and… can feel more secure in their learning when they are involved in making choices and decisions about [their] program or course of study" (p. 4).

Such an approach requires a new vision of teaching and learning where the focus will be on helping students develop such independence. This leads to the idea of learner-centered education directly related to the principles originating from the views of Dewey, Piaget, and Vygotsky, and to the concept of independent or self-directed learning (Hiemstra, 1982). When we talk about learner-centered education, we clearly mean we want to meet the needs and aspirations of our students at all levels, from elementary to post-graduate and throughout their lives, in developing their cognition, emotions, behaviors, life skills, and citizenship qualities.

Students do strive for independence and self-management. It is driven by a natural human desire to be in control of one's own destiny. Adult learners, who make up the majority of online classes, have a special need and considerable motivation for independence (Merriam, 2001). Due to their busy lifestyles and growing demands on their time, they want flexibility, adaptability and convenience in learning (Arabasz & Pirani, 2003). Knowles (1975) suggested that adults are intrinsically motivated. They are motivated by internal incentives and curiosity, rather than external rewards. They are also motivated by the usefulness of the material to be learned and learn better when material is related to their own needs and interests. Intrinsic motivation is the key to independent learning (Gagne & Deci, 2005). Therefore, adults more than any other category of learners deserve more freedom in online classes. Independence of learning is also essential to the development of responsibility for one's learning.

According to Cross (1981), about 70% of adult learning is self-directed learning. Self-directed learning has been described as a process in which individuals take the initiative, with or without the help of others (Knowles, 1975), to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes. In his later work, Cross (2010) opposed traditional, top-down, mandated institutional learning and self-directed, demand-driven, intrinsically motivated, independent learning. He acceded, nevertheless, that there is a place for both. Therefore, the primary mission of college educators now is to find ways to open new opportunities for student independence and autonomy within the context of contemporary college-based online learning.

Online learning is by definition a form of independent study, even if it is delivered by an institution. Online learning promotes self-directed learning by its nature. Even though higher education is normally offered in a structured and organized format with strong academic support, students must exercise their independence in both selecting courses and in accomplishing the preset learning outcomes. As the online instructor's role is predominantly that of a facilitator, the major responsibility for the outcomes eventually rests with the students themselves. Although we

expect students in graduate and, especially, post-graduate programs to be mature and possess the necessary knowledge, qualities, and skills to succeed in their coursework, in reality some of them come poorly prepared to advanced learning due to inadequacies in their previous schooling. To become autonomous learners, they must depend on colleges to support such a goal.

Thus, developing student independence and autonomy in learning is thus one of the major tasks of education (Dillner, 2005). There has been abundant research on this topic (Bembenutty, 2011; Luke, 2006; Carr, Ponton, & Ingram, 2003; Reeve, Bolt, & Cai, 1999; Bandura, 1997; Holec, 1981; Boud, 1981), but little has been done to implement it. Everything interferes with this task in the college: the curriculum, course syllabus and structure, lesson plans, mandatory assignments, required textbooks, instructor's authority, teaching habits and tradition of classroom management and control, and, finally, educational standards and formal tests. The regulations and routines of an organized class provide students with poor preparation for a highly innovative, flexible and team-based knowledge economy where routine is the enemy of innovation and risk (Hargreaves 2003, p. 14).

Dam (2000) spoke of autonomy in terms of creating an environment conducive to learning within the confines of the educational system where learners are given the possibility to be consciously involved in their own learning. The principle of learner autonomy is correlated with learner-centeredness of education, social constructivism, and collaborative approach:

- Autonomy means moving the focus from teaching to learning.
- Autonomy encourages and needs peer support and cooperation.
- Autonomy means empowering students (Lacey 2007).

According to the CIEL Language Support Network (2000), "Learner autonomy indicates a number of dimensions in which learners move away from dependence on the teacher and:

- Take responsibility for their own learning and learn to learn;
- Involve themselves in an interactive process in which they set short and long term learning objectives, reflect on and evaluate progress" (p. 5).

All this echoes the definition of the intentional learner developed by the Association of American Colleges and Universities (2002): "Students will continue to pursue different specializations in college. But across all fields, the panel calls for higher education to help college students become *intentional learners* who can adapt to new environments, integrate knowledge from different sources, and continue learning throughout their lives" (p. x).

It follows from this discussion that an autonomous learner is the one who is capable to learn independently, a self-directed person. Autonomous learning is teacher-independent, not requiring teacher presence or intervention. However, the level of this independence varies depending on the school, subject, environment, and other circumstances. In order to become autonomous, the learner must have an opportunity for independence and free choice in learning. To be able to exercise independence in learning, however, is not easy. Autonomy is both a means to an end (learning a subject or studying in a program) and an end in itself (making people life-long, autonomous learners). These two options are not mutually exclusive. Autonomy is a direct road leading to self-sufficiency and self-efficacy.

Organized Learning vs. Independent Study

Organized college education should be distinguished from independent, self-directed learning without any formal school affiliation. There are significant differences between the two; however, the principle of students' independence, autonomy, and freedom of choice should definitely be respected in a college environment, as much as in independent studies, whether in face-to-face or online environments. For the purposes of this paper, the present authors are not considering independent study options offered within college settings in exceptional cases. Independence can be ensured by granting students options when selecting courses, instructors, learning materials, activities, and tasks, as well as the schedule and pace of studies.

Independence in online learning is feasible in view of ample opportunities and choices available in this educational format, but only if a student desires to become independent and self-sufficient and the school is not hesitant to offer it. Therefore, to develop autonomy and self-sufficiency in higher education, at least three requirements must be satisfied:

1. Colleges and universities actively promote it.
2. Instructors desire to professionally support students in achieving self-efficacy and autonomy.
3. Students possess motivation, responsibility and the necessary skills.

Online learning, as argued before, is an environment conducive for independent learning. What are the advantages and disadvantages of online learning for developing students' autonomy and independence? An online learner, being separated from the school and instructor by space and time, gains the benefits of a more convenient self-study environment, individual learning style and pace, and flexibility of scheduling, together with access to unlimited internet resources, but loses organized, mandatory, bonding face-to-face classroom activities (Serdyukov & Serdyukova, 2012). When students do not physically see and interact with instructors, their feelings of respect, sense of duty, necessity to abide by the rules, and accountability diminish. Moreover, online students generally have limited communication with the instructor, have fewer opportunities to work collaboratively with their peers, do not usually have continuous and engaging face-to-face interactions with other participants of the learning community, and do not always receive critically important instantaneous feedback, which is readily available in a live classroom environment. Therefore students do not develop personal relationships in the class, which inhibits the feeling of belonging to a community. This may negatively affect learning outcomes, as learning is a social activity that requires participation in a social group (class) and interaction with members of the group (Vygotsky, 1962; Bandura, 1997).

In addition to restricting opportunities for developing relationships with peers and instructors in class, online learning has also created a paradox: The more freedom, flexibility, and convenience online students gain, the more vulnerable they become to multiple external and internal distractions that may jeopardize the success of their learning (Serdyukova & Serdyukov, 2006). These distractions for adult learners, who make up the majority of online students, stem from numerous job, family, and social responsibilities that place a high demand on their time and capacity to learn, and from their personal and public lives. An adverse effect of liberated online learning may also come as a result of a students' underdeveloped sense of accountability, lack of self-sufficiency, weak learning skills, and poor work habits.

The previous research by the present authors' demonstrates that students' attitudes toward learning in an online environment undergo a negative transformation (Hill & Serdyukov, 2007).

The absence of traditional lesson time constraints and direct face-to-face interactions with the instructor fosters the often erroneous belief that online courses are "easier" than those offered onsite. This misconception, combined with insufficient student preparation for college classes, leads to student problems that range from neglecting to purchase required course textbooks to a lack of timely communication with instructors, and eventually to the failure to meet assignment deadlines or academic expectations for the assignments. All too often, students regard college online learning as an easy way to obtain class credits or a degree without investing much personal time or effort. ClassLivePro, Adobe Connect, Skype and other telecommunication technologies may partially ameliorate this situation, but they do not significantly compensate for the dearth of true connection. Another option to develop a learning community is blended or hybrid classes that combine onsite and online formats, thus maintaining a limited level of live interaction in the class. Yet the necessity to attend live classes at preset times definitely restricts student independence and undermines the asynchronous learning mode, which is so appreciated by online learners because it increases their flexibility and, consequently, their independence.

Social networking, which is being swiftly adopted as an additional component of college education, presents a unique opportunity for providing students with an individual learning space and communication capabilities outside rigid course frameworks. (See Figure 1.) While formally remaining within the course, students now can step outside of it, communicating and collaborating on course matters at ease and without any restrictions. So, moving a part of the learning process into the freedom of social networking is a viable option for boosting independent learning.

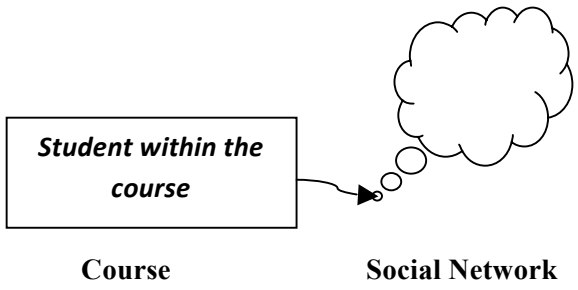

Figure 1. The role of social networking in college education.

Online courses are designed to impose a certain framework on the learning, which may become a hindrance for further cognitive and personal development if they do not allow for independence and free choice. The instructor depends on online class structures that are intended to ensure the same rigor and quality of education as an onsite class and ensure that most of the work is done by the student independently, i.e., without the instructor's direct involvement. Nevertheless, the instructor has an obligation to assure the achievement of the specific learning outcomes in the course, while the college or university makes certain that all parties abide by the academic standards and rules. Students may believe that everything in the course restricts their freedom and initiative. Yet, if the instructor offers opportunities for exercising students' independence and freedom while consistently maintaining rigor in the class, online learning can become more enjoyable and efficient, even as it requires more effort, thus producing better

learning outcomes and simultaneously bringing more satisfaction with the procedure and outcomes. To cope with the challenges of an increasingly independent but still college-supported education, instructors must create new, effective strategies of organizing, facilitating, guiding, and assisting students, while students need to (a) develop effective independent learning and time management skills, as well as appropriate dispositions, such as being goal-oriented and responsible for their own learning, (b) demonstrate the capacity to reflect on and critically assess their own learning, and (c) have basic preparedness proficiency, which includes, first and foremost, effective learning, reading, writing, time management, and ICT skills.

A Study of Student Independence in Online Classes

One of the goals of online teacher preparation, specifically, is to engage candidates in truly independent, life-long learning where the motivation is not to get a credential or a grade but primarily to attain excellence in learning that leads to excellence in teaching. At the same time, course study entails not only an acquisition of knowledge but preparation for real classroom situations where future teachers must be able to resolve problems, take a principled stand, make wise decisions, and act on their own appropriately in a dynamic and challenging environment.

To understand what contributes to and what interferes with independent learning in online classes, students' opinions on the matter were investigated in a pilot project. A survey was run in eight groups of the TED and MAT programs in the School of Education at National University during academic year 2011/12 using a specially developed questionnaire that was completed by 57 students with a response rate of 21%. Students were mature adults with various life and educational experiences.

As the research was focused on students' views on independent learning and abilities necessary to learn independently, an attempt was made to identify, first of all, their preference for organized classes versus independent learning, and then the factors that affect their independent learning.

According to the survey results, the majority of students (56.7%) prefer to take organized college classes, only 37.8% favor independent learning, and 5.4% would be comfortable in either format of learning. It is no surprise, therefore, when offered a choice between taking college courses and studying independently, 64.9% of students selected organized studies, while only 24.3% indicated they would choose independent study and 8.1% showed no preference. Thus, working adult students are not generally enthusiastic about learning independently. Why so? Based on the responses, students generally experience a need for better time management, straightforward course structure, clear organization of the class, and pressure from the instructor. So they are willing to trade the benefits of independent study for the security of an instructor-facilitated class. They are mostly teacher-dependent.

As one student admitted, "I prefer to learn in an organized college class because I am required to be there. When I take classes online, especially those that I can pick up or drop on a monthly basis, I find it hard to motivate myself to stay disciplined enough to put in the time and effort when no one is expected [sic] me to."

The need in externally imposed structure, organization, and obligation might be explained by students' lack of confidence in their abilities to accomplish their learning independently, which comes, as the survey demonstrated, from poor learning habits and a lack of diligence, persistence and effort, as well as insufficient learning skills (reading, writing, critical thinking, quantitative literacy, research, etc.), low motivation, deficient self-evaluation, and inadequate support from

family and employers. These are the factors educators need to consider addressing to help students succeed.

At the same time, within an organized college class, 70.3% of students prefer to study independently, while only 18.9% like to collaborate with their peers and even fewer, 10.8%, enjoy both options (see Table 1). These data imply that even when they are taking an organized, instructor-facilitated class, the majority of students prefer to do their work independently. This was quite an unexpected finding. Collaboration, according to students' responses, is fraught with difficulty in organizing and managing team work, and characterized by distraction and uncertainty, as shown by these three student responses:

> I am a hard worker and I can find that too often other people are more distracting than helpful. It is especially difficult with an online class because I have to study whenever I have free time, and that is often in the middle of the night or very early in the morning. Therefore, collaboration with others can be a very difficult thing to schedule.
>
> We have different job and family obligations.
>
> I work more efficiently alone.

Moreover, students have no confidence in their potential partners, as they openly state: "I don't want to do it all, and somebody will use what I have done without investing in it."

Table 1. *Students Preferences of Organized vs. Independent Learning*

Options\Format	% Independent Learning	% Organized Class	% Both
Preference	37.8	57.6	5.4
Choice	24.3	64.9	8.1
In organized class	70.3	18.9	10.8

So, though the majority of students prefer to take classes in an organized university program, an even higher percentage of them try to avoid studying collaboratively and prefer to work independently. This paradox can be explained by students' unwillingness to accommodate their peers' schedules and lack of confidence in their partners, especially when the study becomes high-stake (graded). Otherwise, students tend to consent to group work when their grade is not at much risk, for instance in threaded discussions.

How well can students study independently? Though the vast majority of students (97.2%) state they can study independently, their responses to some other questions contradict this opinion, which will be discussed later in the findings.

To gain a better understanding of students' attitudes towards independent learning, the present authors tried to identify their attitudes towards learning in general and also their

capability for independent learning. Three groups of questions were intended to identify students' attitudes towards learning, and they were phrased differently:

- What do you need to be able to learn independently?
- What are three major factors for you to successfully learn independently?
- What is restricting your efforts in learning?

Students' greatest need to be able to learn independently is time, which was indicated by 64.9% of those surveyed. However, this necessity seems to be related to any form of study. Additional needs that students identified are shown in Table 2.

Table 2. *Student Needs in Learning*

Type of Need	**%**
Time management	62.2
Diligence and persistence	59.5
More effort on their part	45.9
Better defined goals	45.0
Effective learning skills	40.5
Motivation	37.8
Support from family and employers	37.8
Pressure from outside sources	32.4
Lack of confidence	24.3

These factors are essential for successful independent work; note also that the data obtained from the survey do not confirm students' inflated opinion of their ability to work independently.

One of the preconditions of effective learning is the habit of continuous study. In this case, 63.9% of students state they study continuously, yet 36.1% confess they do their work only before the deadline, which is indicative of their not being able to do well in handling the pressures of independent learning.

Table 3 shows the problems that students indicated are constraining their efforts in learning. These numbers differ from students' responses to the question about their needs. Also, they do not support students' claims that they can effectively study independently. The difference in student evaluation of their needs and limitations in learning can be explained by their varying perceptions of independent learning and learning in general, the first being more demanding.

Table 3. *Problems in Learning*

Type of Problem	%
Attention issues	27.0
Insufficient pressure from the instructor	24.3
Poor time management skills	16.2
Low motivation	13.5
Difficulty in learning independently	8.1

Evaluating major factors ensuring their success in independent learning, students ranked these factors in the following order: time management (32.4%), structure, organization, and guidance (29.7), and motivation and support (10.9% each). These numbers are also different from the needs and interference assessment. It appears that students disregarded the last question, which reiterates the same factors as in the previous section of the questionnaire.

How do students evaluate their own abilities to study independently? The present authors used a 5-point Likert-type scale, where 5 is the greatest ability; Table 4 shows these results.

Table 4. *Students' Abilities Related to Independent Learning*

Type of Ability	Percent
Apply effort in class	4.39
Think critically	4.35
Write well	4.18
Comfortable with technology	4.14
Well prepared for college	4.03
Manage time efficiently	3.78
Can concentrate on learning	3.57
Read professional literature	3.53

As follows from the results presented in Table 4, students believe they apply a great deal of effort in class, can think critically, and write well. They feel they are comfortable with technology and are well prepared for college. However, some of them do not manage their time very

efficiently, cannot concentrate on learning for a long time, and do not enjoy reading professional literature. When compared to the factors of success in the class, it appears that students commonly tend to exaggerate their abilities and efforts.

What does this research suggest? Too many students experience a lack of confidence in their ability to learn independently and possess insufficient learning skills. Therefore, they look for guidance and support from an organized, instructor-facilitated class. They are clearly dependent on the instructor, structure, and organization of the course. It also seems students have kakosbathiophobia, the fear of bad grades. It is an attitudinal complex developed through years of standardized education, the purpose of which is to follow a strictly indicated path in order to earn the desired grades. Violation of standards is penalized by lowering the grade; therefore students have developed an obedient attitude towards course requirements and avoid the freedoms fraught with unknown risks. To change this attitude is a daunting task. It evidently takes a brave, well-developed, self-directed, responsible, and prepared student to be able to learn independently. But does this mean that students should not be offered opportunities for exercising their independence and freedom of choice in learning, especially in view of the need for curiosity, creativity, self-actualization and self-sufficiency? Should not we help them develop their independence and autonomy in learning?

Developing Student Autonomy

Autonomy in learning is a developed ability to establish clear goals for learning, identify learning objectives, define the outcomes, locate and select the necessary materials, use effective learning strategies, develop the target knowledge, skills and competencies, implement objective self-assessment, manage time efficiently, and construct an objective reflection. To achieve this goal, learners need to have an effective learning environment in which they have:

1. The right to critically review the course, offer suggestions for its improvement, identify their personal goals, and participate in defining their learning trajectory.
2. Meaningful, developmental assignments that do not impose heavy restrictions on implementation.
3. Availability of continuous, open and productive interactions, relationships, communication, and collaborative group work in the class.
4. Effective, specific, clear, and expeditious assessment of their performance, supportive feedback, and objective evaluation, together with effective self-assessment and reflection.
5. Opportunities to offer and implement their initiatives in the course, modify the assignments, freely choose implementation strategies, suggest their own activities, apply their professional and life experiences, and engage in situations requiring their demonstration of leadership qualities.

The instructor must provide continuous individual support and guidance in developing student self-sufficiency and responsibility by effectively facilitating the interactions in the course, especially in threaded discussion and technology-mediated class sessions, and providing effective and constructive feedback on student performance.

Numerous opportunities exist to offer students learning tasks and activities that foster their independence. For example:

1. Whereas mandatory online discussions have specially selected topics and offer specific guidelines for participation, students' postings are independent in terms of their content, ideas, arguments, applied resources, depth, language form, and to whom they choose to respond. Students may also be offered the opportunity to suggest a discussion topic for the class that is in line with the course and its learning outcomes.
2. Most classes have mandatory assignments, but the way students develop them may be less restrictive if students select the material for exploration and their own goals based on their own needs and interests.
3. Likewise, students may be offered the opportunity to complete projects collaboratively or choose the format by which their learning outcomes will be demonstrated: presentation, case study, video, simulation, PowerPoint, animation, etc.

These ideas are only the beginning of a long road. The next step will be to suggest that students, after familiarizing themselves with the course syllabus, design their own assignments and activities and offer the format and schedule of their implementation.

Conclusions

Developing learner autonomy is clearly one of the main goals of education, particularly at the college level. As the present research demonstrates, students nevertheless prefer organized, teacher-facilitated college classes to independent learning; and, when offered a choice, two-thirds would rather take organized classes than learn on their own. At the same time, within collective college group environments, the majority of students prefer to study independently. In both cases many students lack self-confidence, as well as trust in their classmates. Research also points to a lack of basic preparation for advanced college studies. It also suggests that students may be so focused on grades that they are unwilling to take the risk of completing a mandatory course component without an explicit rubric or template, especially when they feel pressed for time.

Are students capable of learning independently? While the overwhelming majority of them boast that they are, there is an evident lack of correlation between their self-evaluation of their capability to learn independently and an explicitly stated lack of the necessary skills. This connotes an inflated sense of self-esteem not supported by students' self-efficacy. According to our survey, students need better organizational and time management skills, increased diligence and persistence, effective learning skills, and even pressure from the outside to succeed. All this indicates the need to create in college courses a learning environment that would support students' development into independent, autonomous learners.

There is much that colleges and instructors can do to help students attain the important goal of becoming lifelong autonomous learners capable of meeting changing societal and work challenges. Colleges should adopt policies that encourage learner independence, while instructors must create conditions and the means to foster learner independence and autonomy. The unique qualities of online format, such as convenience and flexibility, not only attract adult learners who may be more prepared for the challenges of independent learning but also feature many technological tools that may provide students with pathways to autonomy, such as choice of assignment topics, a variety of implementation formats, social networking and virtual collaboration spaces, as well as self-paced study and continuous feedback. Ultimately, achieving

this goal will require the combined efforts of colleges, instructors, and students in recognizing and embracing the benefits of increased student independence and autonomy in online classes.

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Valuing Creativity in Online Teaching

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Abstract
This article focuses on the need for integrating creativity into higher education online teaching environments. Content includes a review of current research and suggests best practices for developing student creativity as part of the educational experience. Using examples from multiple disciplines, the authors offer fellow instructors several useful suggestions for increasing their own creativity and enjoyment of teaching while encouraging the creativity, learning, and motivation of their students.

Key Words
Creativity, teaching, student motivation, teacher satisfaction, online teaching

Introduction

"Creativity is the greatest gift of human intelligence. The more complex the world becomes, the more creative we need to be to meet its challenges" (Robinson, 2011, Preface).

Creativity is needed, admired, and highly valued in contemporary society. As noted in the European University Association (EUA, 2007) *Creativity in Higher Education: Report on the Creativity Project (2006-2007)*, society worldwide is changing rapidly and is becoming more complex in all areas of life. The report points out that "Creativity has been identified both as a key factor for adequately addressing the challenges caused by these changes as well as a major driving force towards knowledge creation and social and economic advancement through the development of a knowledge society" (EUA, 2007, Executive Summary).

The business world values creativity in their employees as well. Jackson (2008) stated that businesses value innovation to advance the "generic skills of creating which includes idea generation, creative teamwork, opportunity sensing and mobilizing people and resources around ideas to make them real . . ." (p. 1). Citing *Nurturing Creativity in Young People: A Report to Government to Inform Future Policy* (Roberts, 2006), Jackson added, "Many employers want people who see connections, have bright ideas, are innovative communicators, work well with others and are able to solve problems. In other words, they need creative people" (p. 3).

Colleges and Universities are becoming increasingly aware of the need to teach and value creativity in higher education. Sternberg (2010a, Preface) described a college admissions assessment instrument he used at Tuft's University that documented the positive relationship between creativity and college success. Similarly, Scotland's 1999 national report, *All Our Futures; Creativity, Culture and Education* (National Advisory Committee on Creative and Cultural Education, 1999), suggested that students who are creative will be better prepared for the accelerating pace of change in tomorrow's workplace. This emphasis on the need for and benefits of teaching creativity in higher education was also advocated by many contemporary researchers in the field (Jackson, 2006a, 2006b, 2006c; Gardner, 2009; Smith-Bingham, 2010; Bellanca & Brandt, 2010; Beghetto & Kaufman, 2010; Robinson, 2011).

Creativity is also connected to personal growth and life satisfaction. Jackson (2006a) suggested that "creativity is important to our well being. The world needs people who can combine their knowledge, skills and capabilities in creative and adventurous ways to find and solve complex problems" (p. 2). Creativity is often regarded as an important factor contributing to the

sustainability and success of individuals and organizations in business, education, science, communications, and numerous other fields. Sternberg and Lubart (1995) suggested that to be successful in any field, we need three kinds of abilities;

1. Analytical abilities—the capacity to analyze, evaluate, compare, and contrast
2. Practical abilities—the capacity to apply or transfer knowledge or experience to other situations
3. Creative abilities—the capacity to imagine, connect, discover, explore, and adapt. (p. 31)

A focus on these three kinds of abilities can strengthen and enhance the learning experience of both student and instructor in online classroom settings, no matter what the discipline.

Gardner (2010), originator of the theory of Multiple Intelligences, referred to the "creative mind" as a necessary tool for thriving in our rapidly changing and uncertain future. He commented that "throughout most of human history, creativity was neither sought after nor rewarded" (p. 77). He added that our current era is now different, and that now "in our global, wired society, creativity is sought after, cultivated and praised" (p. 77).

Jackson (2008) suggested that one of our greatest challenges in higher education is preparing students for a future that is unknown. "We are preparing students for jobs that don't yet exist, using technology that has not yet been invented, in order to solve problems that we don't know are problems yet" (p. 2).

What Is Creativity?

The term "creativity" can have multiple and somewhat illusive meanings. According to Harris (1998), creativity can be perceived as ability, an attitude, or a process. He suggested that creativity is the ability to imagine or invent something new, pointing out that everyone has creative ability; it just needs to be awakened. He went on to note that creativity is also an attitude: the attitude to accept change and newness, a willingness to play with ideas and possibilities, a flexibility of outlook, the habit of enjoying the good, while looking for ways to improve it. Concluding with the process, he then made the point that creative people work hard and continually to improve ideas and solutions by making gradual alterations and refinement to their works.

All three of these perceptions are important for both instructors and students. Online instructtors need to envision assignments and interactions in fresh new ways. They need to be willing to play with novel possibilities, adopt new technologies, and work at improving and refining ideas. When instructors demonstrate this kind of openness to creativity, their students are likely to risk working with new creative approaches as well. This attitude is suggested by Gregerman (2000) in what he referred to as "Lessons from the Sandbox." "The trick for grown-ups is to make the effort to recapture what we knew automatically as children" (p. 1). He suggested that creativity has three common elements: fun, joy, and love of learning.

Csikszentmihalyi (2010) discussed the need to interject the joy of learning into modern universities and suggested that the best way of doing so is to ensure that teachers are selected because they model the joy of teaching and learning. He continued that it is also important that the curriculum promotes joyful learning, that the teaching methodology is focused on encouraging students to be creative, and that the institution values and rewards the creativity of both students and teachers.

The premise of this paper is that these fundamental elements of joy and love of learning need to be brought into our online class experiences. Students are motivated to put forth greater effort when we offer more than the didactic, predictable kind of teaching and learning they have experienced in the past—an experience described by this interviewed student:

Our course is widely known to be academic. Consult the literature, base your practice on the evidence, bang, bang, bang, tick all the boxes, thank you very much. So my view of our course is that it is a conveyor belt. (Oliver, Shah, McGoldrick, & Edwards, 2006, p. 51).

The image of learning as a "conveyor belt" (monotonously transmitting information from the instructor and the text to the student) is disconcerting. What can we do to add a spark of humor? What can we do to make learning a joyful experience? A number of myths about creativity can hinder both instructors and students. Some see creativity as mysterious (a gift that only certain people possess); some see creativity as an indication of strangeness; some see it as a kind of "aha" moment that propels creative achievement (Cole, Sugioka, & Yamagata-Lynch, 1999). Instructors and students need to understand that creativity can be learned, cultivated, and developed through effort and practice (Wright, 1990).

The idea that creativity can be learned and developed has its roots in business and was used extensively in the 1970s and 1980s to build motivation, encourage innovation, and increase worker productivity. DeBono (1985) and von Oech (1983, 1986) were early "creativity gurus" who introduced new types of creativity strategies such as lateral thinking, undoing "mental locks" and seeking more than one right answer. They shared such compelling wisdom at hundreds of national and international seminars and training sessions for business executives and their employees. It is only recently that the need to teach, assess, and reward creativity in higher education has been accepted and addressed by academicians (Csikszentmihalyi, 1996; Sternberg, 2010b; Sawyer, 2010; Robinson, 2011; Wisdom, 2006).

Research on Creativity in Higher Education

Current research on creativity in higher education tends to focus on three major themes:

1. The system-wide need to change or transform the traditional academic culture into a more student-centered, interactive, technology rich, multi-dimensional learning environment (Thomas & Brown, 2011; Jackson, 2006a, 206b; Smith-Bingham, 2006, Robinson, 2011)
2. Definitions, descriptions, and developing measures for assessing and evaluating the creativity of students and teachers (Fryer, 2006; Sawyer, 2010, Cowan, 2006, Balchin, 2006; Baldwin, 2010)
3. Strategies and best practices for encouraging creativity and innovation in higher education classrooms (Muirhead, 2004, 2007; Jackson, 2006a, 2006b, 2006c, 2008; Baillie, 2006; Wisdom, 2006; Sternberg, 2010a, 2010b, and 1995).

The purpose of this paper is to provide fellow higher education teachers with a review and summary of existing literature on creativity in order to encourage them to teach more creatively, and thus increase student innovation, critical thinking, and motivation. The first question is this: "What does it take to be a creative teacher?"

In describing perceptions of creativity across the university, Jackson (2006a) noted that academics associate the same features of creativity regardless of their particular discipline:

- Being imaginative—generating new ideas, thinking out of the boxes we normally inhabit, looking beyond the obvious, seeing the world in different ways.
- Being original—this embodies the quality of newness, for example, inventing and producing new things or doing things no one has done before.
- Being inventive with someone else's ideas—recreation, reconstruction, recontextualization, redefining, adapting things that have been done before, doing things that have been done before but doing them differently.
- Having significance—there are different levels and notions of significance, but utility and value are integral to the idea.
- Being curious with an inquiring disposition—willing to explore, experiment and take risks.
- Being resourceful—using your knowledge, capability, relationships, powers to persuade and influence, and physical resources to overcome challenges or problems.
- Being able to combine, connect, and synthesize complex and incomplete data/situations/ideas/contexts—to see the world freshly/differently to understand it better.
- Being able to think critically and analytically—to distinguish useful ideas from those that are not so useful and make decisions that will take you in the right direction.
- Being able to represent ideas and communicate them to others—the capacity to explain something in lots of different ways so they are meaningful to a listener, to create and tell stories, communicate ideas, and show people possibilities, opportunities, and solutions in ways that make sense to them and capture their imagination. (p. 19)

The resourceful teacher then needs to establish a creative and comfortable environment in which to teach. In their qualitative study on encouraging student creativity, Cole et al. (1999) found four characteristics of a supportive learning environment that fosters creativity: (a) personal teacher-student relationship, (b) non-traditional assessment, (c) openness and freedom of choice, and (d) classroom activities that offer opportunities to practice creativity. For example, because the instructor developed personal relationships with students, these students felt more comfortable in sharing ideas. Teaching creative processes like thumbnail sketches or brainstorming broadened students' understanding. Because "no one right answer" was emphasized, students felt comfortable in taking risks. All assignments included an open option in every assignment, so students felt free to experiment and take risks.

In order to pave the way for boosting creativity, Amabile (1998) focused on ways leaders could encourage intrinsic motivation in the workplace. While her work focuses on business, her observations on creativity are frequently cited and highly applicable to education. She pointed out that intrinsic motivation must be present for creativity to occur. "When people are intrinsically motivated, they engage in their work for the challenge and enjoyment of it. The work itself is motivating" (p. 79). According to Amabile, the factors that encourage creativity are:

- ***Challenge.*** Assignments should stretch students but not overwhelm them.
- ***Freedom.*** For assignments, this might be seen as a degree of "choice." This is not a matter of changing a stated "course outcome," but of letting students decide how that goal might be met.
- ***Resources.*** Students welcome being introduced to new resources that will help them. For example, students appreciate knowing how to gain access to books and articles through their university, free tutorials on creating PowerPoint slides, YouTube clips that make

concepts clearer, or helpful Internet links that enhance learning in their particular field of study.

- ***Work group features.*** Giving online students an opportunity to share ideas or create a project together adds novelty and motivation. A small group might create a slide presentation on the work of a particular author, the life and inventions of an international scientist, or a blog on best reading strategies for third graders. These small group creations would later be presented to the larger group.
- ***Supervising encouragement.*** Students need to be encouraged for their creative efforts. Perhaps a student is thinking of meeting a class assignment/requirement in a novel way. The instructor would encourage the idea, offering guidance and suggesting resources on how the project might be accomplished.
- ***Organizational support.*** Instructor efforts to encourage creativity in their online classes, in both teaching strategies and assignment choices, should be applauded by the university because it indicates that our classes are working toward being enjoyed and connecting with real life. Such attempts at creativity need to be shared with colleagues.

What Does Creativity Look Like in the Online Class?

Incorporating creativity in an online class is made up of (a) instructor behaviors, words, and attitudes, and (b) assignments, activities, and assessments that include choice and expanded possibilities. As Muirhead (2004) noted, instructor behaviors, words, and attitudes can encourage creativity. "Teachers should communicate a picture of a creative thinker through their teaching style, sharing stories of innovative individuals and demonstrating novel ideas through the use of charts, lectures, and PowerPoint presentations" (p. 3). Through technology, teachers have a constantly developing array of additional formats, graphics, and multimedia tools to enhance their presentations.

Even the questions an instructor asks can encourage creative thinking. According to Collison, Elbaum, Haavind, and Tinker (2000), there are five types of questions to ask that encourage deeper, more creative thinking:

1. Questions that probe the "so what!" response—relevance, interest level, urgency, and context.
2. Questions that clarify meaning or conceptual vocabulary—ambiguity or vagueness and common concepts.
3. Questions that explore assumptions, sources, and rationale—qualities assumed and study evidence.
4. Questions that seek to identify causes and effects or outcomes—primary or secondary causes, internal, or external factors.
5. Questions that consider appropriate action—weighing different courses of action. (p. 143)

For example, you might introduce a question or a problem that lends itself to multiple perspectives. Since there is no "one right answer" to the problem, students are free to debate and share ideas. "Practicing problem solving as a team game should be a part of every student's experience" (Livingston, 2010, p. 61).

Throughout the literature, researchers found that creating a safe emotional environment is conducive to creativity. There are a number of ways to encourage students, reassuring them that you value them and are acting as their cheerleader or coach, rather than their judge. The follow-

ing are some suggestions for creating a positive online learning environment in any academic domain:

- Include pictures, illustrations, cartoons, jokes, or YouTube videos in your announcements occasionally. Students appreciate a show of your humanity and humor!
- Learn to create a video of yourself talking to students explaining an assignment or just introducing yourself.
- Give students an opportunity to introduce themselves to the group (through discussion boards or chatrooms). Both authors of this paper make a habit of asking students for a picture as well as a short bio. We create a PowerPoint presentation of the class that makes students feel they know each other a bit. To introduce themselves to the group (generally on the first discussion-board assignment), we ask them to include three pictures that represent their interests. These might be pictures of their child, their spouse, a trip, a pet, or a sport. This simple act gives a message that you care about the student as a person—rather than merely as a class member class who dutifully submits required assignments.

Muirhead (2004) also asserted that "Instructors can promote creativity by developing course materials and activities that reinforce reflective skills" (p. 2). Suggestions for enriching activities and assignments that will generate student enthusiasm and creativity include creating open options in assignments. In one online class, one of the authors of this paper assigns students an original project each week that connects with the readings. This project can be a brochure, a poster, a PowerPoint presentation, a flier, or a game. Students enjoy the freedom of this creative choice—which also helps to expand their repertoire of computer skills.

Another creative activity is to include a dialectical journal as a way to help students reflect on reading in the course content. A dialectical journal has two columns: On the left side, students write a quote from the readings that seems significant to them. On the right side, they reflect on why that portion of the readings got their attention. See Figure 1.

Name of Student _____

Text	Chapter/ page	Why I find this quote interesting or important
Xxxx	xxxx	xxxx
Xxxx	xxxx	xxxx

Figure 1. Dialectical journal options.

Case studies can be used as a way to promote thinking and reflection. These case studies can be instructor or student generated to reflect real-world experiences. Muirhead (2007), an instructor in business classes, shared his "Difficult People Assignment"—an excellent example of a writing project that allows for open-ended thinking; see Figure 2.

Your task is to create effective strategies to handle difficult people at work. You are to provide two strategies for effectively working with each of the following types of difficult people. Please write approximately 40–50 words for each of your narratives on the six types of difficult individuals (approximate total of 240–300 words).

- ***The Know-It-Alls.*** They're arrogant and usually have an opinion on any issue. When they're wrong, they get defensive.
- ***The Passives.*** These people never offer ideas or let you know where they stand.
- ***The Dictators.*** They bully and intimidate. They're constantly demanding and brutally critical.
- ***The Complainers.*** Is anything ever right with them? They prefer complaining to finding solutions.
- ***The Yes People.*** They agree to any commitment, yet rarely deliver. You can't trust them to follow through.
- ***The No People.*** They are quick to point out why something won't work. Worse, they are inflexible.

Figure 2. Difficult People assignment. From "Integrating Creativity into Online University Classes" by B. Muirhead, 2007, *Educational Technology & Society, 10*(1), pp. 4–5.

Aim for assignments that are relevant and interesting and connect with real life. Students benefit by assignments that involve interviews, portfolios, performance, or projects. Give them the option of creating a blog or a wiki. Think about the possibility of simulation as an assignment, perhaps using an avatar to present information. A number of virtual world options are available, such as Second Life. One such resource, which is free, is called "Voki" (http://www.voki.com/). Students find an assignment that includes creating a Voki highly motivating. In a class one of the authors teaches, students are asked to create a website that includes a blog. They are also tasked with creating a Voki that introduces their topic. This talking avatar has also been successfully used in class announcements. Voki enables users to express themselves on the web in their own voice using a talking character. You can customize your Voki to look like you or take on the identity of lots of other types of characters . . . animals, monsters, anime, etc. Your Voki can speak with your own voice, which is added via microphone, upload, or phone (Voki).
Other assignments and activities that expand student experiences are:

- Asking students to create a "Mind Map" that illustrates the connection and relationship between ideas or concepts. For example, you can download mind map templates at no charge from http://www.mymindmap.net. Such mind maps are appropriate for any academic subject from education or literature to history and science. A mind map template is shown in Figure 3.

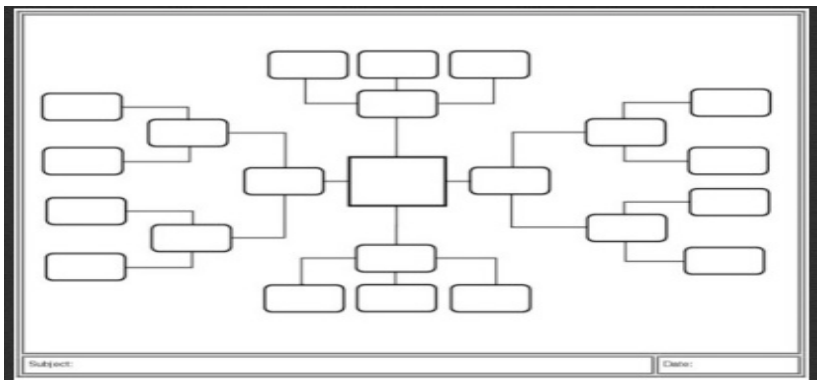

Figure 3. Mind map.

- Create small groups within your online class. Task them with brainstorming ideas and then creating a group project that will be presented to the whole group.
- Ask students to create a "game" on your course content that serves as a way to reinforce and review learning.
- Create an assignment that connects with real-life experience. For example, an education student visits a classroom, a business student interviews a small business owner, or a science student represents the table of elements in a novel way. Students are then asked to write a reflection of their experience.

The Assessment Challenge

The question of how to measure or assess creativity is a challenging one. As Balchin (2006) noted, "The aspect of creativity that poses the greatest challenge to higher education teachers is how to assess and evaluate it" (p. 173). Balchin (2006) suggested that "a summative assessment of creativity may not be necessary (or practical) in many higher education learning contexts" (p. 6) and posited an approach of consensual assessment in which students and teachers agreed on criteria to measure creativity in the process of learning, rather than by judging a final product. Balchin pointed out that ongoing formative feedback about creativity serves as an effective assessment tool that promotes student creativity, builds student self-awareness, and teaches students to value their own creativity, proposing that it is more valuable to build creativity during the learning process than to measure it at the end.

Cowan (2006) agreed, positing that one of the major tenets of interactive, student-based learning is student involvement in the assessment process. He suggested that we should give more attention to nurturing and building creativity than we do to merely assessing a product. He advocated the use of self-assessment portfolios in which students both design and play a major role in reflecting on and evaluating the creativity of their own work. A number of researchers agreed that building creativity requires student involvement in all aspects of the assessment process, in helping set the criteria for judging the product, and in self-reflection about both the product and the process (Muirhead, 2004; Sawyer 2006; Baldwin, 2010; Sternberg, 2010b.

Cole et al. (1999) related the success of a professor who used alternative assessment measures: No standard examinations were given in this class, and assessment was determined by four factors: (a) the students' creative solution to the problem; (b) how well the student executed the

solution; (c) how much work the student put into the assignment, and (d) the students' written analysis of their creative process.

The authors of this article suggest that we all pay increased attention to developing alternative assessment measures as we move forward in fostering creativity in the virtual classroom. Some ideas for developing alternative assessment instruments that encourage student creativity include:

- Developing learning contracts for a specific project or assignment. Include statements about knowledge and skills to be gained, resources to be used, and evaluation standards.
- Reflecting on assignments and projects. Include self-reflection of both the product and the creative process.
- Critiquing of peer assignments and projects in accordance pre-established standards or rubrics. (Cole et al., 1999)

Halpern (2010) suggested that a creative assignment should be awarded very few points so that students will risk trying something new. Halpern's approach connects with internal motivation—one of the important considerations alluded to by Amabile (1998). The goal of including and encouraging creativity in online teaching will likely take a variety of approaches, depending on the discipline considered. Case studies that may enhance a sociology class would likely fall flat in a biology class. In general, the present authors suggest a look at your expected course outcomes and the assignments that connect with them. What might you change in those assignments to encourage more creativity? Is there a way of including more than one option for fulfilling the requirements of the assignment?

In order to develop creativity in students, Sternberg (2010b) underscored the importance for teachers to encourage and reward creativity, reaffirming the concept that teachers need to serve as role models of creativity by teaching creatively and by providing students with choices on assignments and options for product development and delivery. Sternberg suggested the following instructional materials or assessments to stimulate student creativity:

- Create an alternative ending to the short story you just read that represents a different way things might have gone for the main characters in the story. (Literature)
- Invent a dialog between an American tourist and a French man on the street from whom he is asking directions to get to the Rue Pigalle. (French)
- Discover the fundamental physical principle that underlies all of the following problems, each of which differs from the others in the "surface structure" of the problem, but not in its deeper structure. (Physics)
- Imagine if the government of China keeps evolving over the course of the next 20 years in much the same way it has been evolving. What do you believe the government of China will be like in 20 years? (Government/Political Science)
- Suppose that you were to design on additional instrument to be played in a symphony orchestra for future composition. What might that instrument be like, and why? (Music)
- Predict changes that are likely to occur in the vocabulary or grammar of spoken Spanish in the border areas of the Rio Grande over the next 100 years as a result of continuous interactions between Spanish and English speakers. (Linguistics). (p.402).

The responses to these assignments would also require the development of creative assessment instruments or rubrics that establish specific guidelines for what is required "to be creative." Jackson and Shaw (2006, p. 90) noted that expressions of creativity differ, depending on specific

academic fields and areas of study, and they identified five qualities or abilities that cut across disciplines and are most frequently associated with creativity;

- Imagination
- Originality
- Openness to new ideas
- Use of critical thinking skills
- Ability to communicate

The present authors suggest that evidence of these qualities should be considered when designing tools to evaluate the creativity factor in student work.

Conclusion

This review is the beginning of an ongoing research study to determine how higher education instructors do and could integrate more creativity into their online classes. In our fast-paced society, rapid change is a constant, and that change continually impacts the ways creativity is expressed. For educators, the need to nurture the spirit of innovation and creativity in our students remains a continual challenge and an ongoing commitment. Realizing the importance of contributing to the education of our next generation, the present authors' hope is to encourage and support online instructors as they explore the possibilities of infusing more creativity into their own online courses. In summary, "If the next generation is to face the future with zest and self-confidence, we must educate them to be original as well as competent" (Csikszentmihalyi, 1996, p. 12).

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Moving from Online to Hybrid Course Delivery: Increasing Positive Student Outcomes

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Abstract
The present study compared student outcomes of a school psychology action research course delivered in online and hybrid instructional formats. Participants ($N = 30$) were enrolled in one of three consecutive course offerings. Student outcome was defined as the final course grade that students achieved, with positive student outcomes characterized by earning a passing grade of "In Progress" at the end of the course. Descriptive statistics analysis of student outcomes indicated that hybrid-format instruction facilitated positive outcomes at a rate 14% higher than online-only instruction. These results lend support to the utilization of hybrid instructional strategies by university educators.

Key Words
Online instruction, hybrid instruction, face-to-face instruction, onsite, distance learning

Introduction

Educators have long questioned the efficacy of distance education and scrutinized it in regard to its ability to facilitate positive student outcomes equivalent to traditional face to face instruction (MacFarland, 1998a, 1998b; Patterson & Hoehlein, 2002; Russell, 1999; Searcy, 1993; Sims & Schuman, 1999). For the most part, it is believed that distance education students fare worse than those taught in traditional classroom settings in terms of academic achievement and retention (Berge & Huang, 2004; Carr, 2000; Kember, 1995; Phipps & Merisotis, 1999; Simpson, 2003; Stumpf, McCrimon, & Davis, 2005). Tinto (1993) proposed that this can be attributed to a lack of contact between distance education students and their instructor and peers. Rather than creating a single novel approach to solving this problem, the answer may actually be a synthesis of two well-known approaches.

Recent attention has shifted to such a fusion of instructional models called *hybrid instruction*. Hybrid instruction is a blending of distance education and traditional face-to-face methodology that employs the best aspects of both instructional modalities in an attempt to deliver maximum benefit to students (Dziuban, Hartman, & Moskal, 2004; Graham, 2005; Martyn, 2003; Young, 2002). Hybrid courses have great potential utility in that they can accommodate students who desire the flexibility inherent within distance-only online courses, yet also would like some face-to-face contact with their instructor and/or peers. Hybrid courses could help distance education students succeed who otherwise might struggle for a variety of reasons (e.g., lack of structure, misunderstanding/ambiguity concerning course concepts, etc.). The benefit of flexibility innate to hybrid instruction is not limited exclusively to students. Academic institutions may find that having students in their classrooms for fewer class sessions affords them additional scheduling flexibility since there is reduced seat time in the classroom compared to traditional instruction (Dziuban et al., 2004; Garnham & Kaleta, 2002; Koohang & Durante, 2003; Young, 2002).

Though not a new concept (Dziuban et al., 2004), hybrid instruction is an emerging trend being used in multiple contexts. Not surprisingly, higher education settings have been quick to begin making use of the instructional approach (Ely, 2003; Young, 2002). However, business settings have not been shy to employ "blended learning" services either (Graham, 2005; Martyn, 2003). Some using this method of instruction have regarded the union of traditional residential

instruction and online distance instruction as "the single-greatest unrecognized trend in higher education today" (Young, 2002, p. A33). This increased attention surrounding hybrid instruction is due to a transformation in the discipline of education, in which paradigms are shifting from teaching-centered models of instruction to student-centered models (Dzuiban et al., 2004).

Hybrid instruction courses were reported to produce positive student outcomes when compared to other instructional modalities (Davis, 2007; Dziuban et al., 2004; Kiser, 2002; Martyn, 2003). Hybrid instruction courses were reported to produce higher student retention rates than purely online-delivered instruction courses (Davis, 2007; Dziuban et al., 2004). Moreover, nearly comparable results were reported regarding retention rates of traditional face-to-face instructed courses when compared to hybrid instruction courses (Dziuban et al., 2004). Dziuban et al. (2004) and Davis (2007) further reported that grades of hybrid-taught students were consistently higher compared to students of purely online courses. Additionally, grades of hybrid-taught students were equal to, if not greater than, traditional face-to-face–taught ones. Students who receive some face-to-face instruction were found to perform tasks up to 31% more accurately and up to 40% faster than students receiving only online instruction (Kiser, 2002).

Hybrid instruction was found to have additional benefits beyond positive student outcomes as well. For example, hybrid instruction makes highly efficient use of a campus's physical resources by simultaneously expanding its capacity, reducing traffic on the campus, and reducing the need for additional parking (Davis, 2007). Additionally, instructional delivery costs are reduced when hybrid instruction is implemented (Dziuban et al., 2004). As Martyn (2003) noted, hybrid courses allow institutions to deliver quality education with a more personal touch.

Students and instructors alike may be enticed to employ hybrid courses due to the unique benefits offered by this instruction method. Students who have additional responsibilities, such as a full-time job and/or family, may find hybrid instruction to be the preferred option for their lifestyle (Davis, 2007). This population of students may be drawn to the inherent flexibility hybrid instruction can offer (Garnham & Kaleta, 2002). Additionally, it was reported that the extra time between classes increases the occurrences of contact between individual students, their instructors, and their peers (Garnham & Kaleta, 2002; Koohang & Durante, 2003; Young, 2002).

Face-to-face and distance-learning instructional modalities have been investigated at length in terms of efficacy in facilitating positive student outcomes (e.g., MacFarland, 1998a, 1998b; Patterson & Hoehlein, 2002). The consensus has been that the traditional face-to-face method of delivery produces more favorable outcomes than those of distance learning (e.g., Berge & Huang, 2004; Carr, 2000). However, an emergent trend in instructional delivery methods is a hybrid model. Little research has focused on the efficacy of a hybrid method of instruction delivery in facilitating positive student outcomes (Dziuban et al., 2004; Kiser, 2002; Martyn, 2003). For this reason, more research is needed investigating hybrid instruction.

Purpose of the Study

The purpose of the present study was to compare student outcomes of an action research course delivered in online and hybrid instructional formats. More specifically, the study sought to compare the final grades of graduate students enrolled in a master's level School Psychology program. This study focused on answering the research question, "How many students successfully complete their action research study proposals within the allotted two months of the course?"

Method

Participants

Comprising the participant sample for this study were 30 students from a graduate school psychology course. For this course, two sections participated in an online instructional format, and two sections participated in a hybrid instructional format, resulting in two sections being included in each of the comparison groups. A total of 12 students were included in the online comparison group and students were equally distributed among each section, resulting in both sections' containing 6 students each. Of the 12 total students in the online comparison group, 67% (n = 8) were female and 33% (n = 4) were male. The hybrid comparison group included 18 students in sum; one section contained 10 students, while the other had 8 students enrolled. Of the 18 total students in the hybrid comparison group, 67% (n = 12) were female and 33% (n = 6) were male. All students included in the sample took the action research course in order to earn their Master of Science in School Psychology and Pupil Personnel School Psychology credential (PPSP). All students also self-selected the instructional modality of the section of the course they enrolled in.

Setting

Selected as the setting for this study were four sections of a graduate School Psychology research course (action research) offered by a large, private, non-profit university addressing knowledge and skills required to generate and evaluate research relevant in School Psychology. Of these, two sections participated in a purely online instructional format without any face-to-face sessions. The other two sections participated in a hybrid instructional format in which half the sessions were held face to face in a physical classroom and the other half were held online. Face-to-face sessions of the hybrid instructional modality took place bi-weekly for a duration of four hours per session and were held exclusively in San Diego, CA. These meetings afforded students the opportunity to obtain consultation with their course instructor and peers. Additionally, face-to-face meetings included lectures of course content and Institutional Review Board (IRB) application procedure. Students of online sections of the course were able to engage in consultation with their instructor and peers as well; however, consultation was done through message-board postings and email. Identical instructional materials (e.g., syllabi, project guidelines, evaluation rubric, PowerPoint lectures, and supplemental course materials) were used for all sections of the course. The purely online sections of the course were offered during the months of June through July, while the hybrid sections were offered during December through January of the same 12-month period.

Materials

The technical materials applied in this study included a laptop or desktop PC, the Microsoft Office 2007 software, the Adobe Professional software, and the Pearson eCollege software employed to facilitate the online instruction of the course. Using all these technologies, the instructor (researcher) provided instruction, supervision, and feedback to the students participating in the course. Data on academic achievement (i.e., end of course student outcome defined as earning an "In Progress" or "Unsatisfactory") were collected from all sections of the course.

Measures

The measurement method used in this study was an assessment of student academic achievement by the end of the 2-month-long course. The objective for students participating in the course was to earn a grade of "In Progress." In order to successfully do this, students were required to write and submit a complete action research project proposal manuscript consisting of an introduction, literature review, and method. Achieving this expectation to the standard specified in the course evaluation rubric earned them an extension, allotting the time required to collect, analyze, and write the results and discussion chapters of their action research project. The outcomes for the course were dichotomous; students earned the grade of either "In Progress" or "Unsatisfactory."

Procedures

A laptop or desktop PC was incorporated into all participating sections of the class. The instructor utilized a laptop PC, Microsoft Office 2007 software, and Adobe Professional software to create all course documents (e.g., syllabus and action research project guidelines), instructional materials (e.g., PowerPoint lectures and other supplemental documents), and digital handwritten feedback directly on students' action research project drafts submitted to the instructor via email. The Pearson eCollege software served as a centralized depository for all course materials that students could access and download, as well as another means of communication between students and instructor. Student achievement was measured by assessing the students' final draft of their action research project proposal submitted by the end of the 2-month course. The final grade earned at the end of the course was determined using the evaluation rubric outlined in the course syllabus.

Data Analysis

The four sections of the course were organized into two comparison groups, each consisting of two sections of the course. One comparison group consisted of the two sections of the course that received the purely online format of instruction. The other comparison group consisted of two sections of the course that received the hybrid format of instruction. Student outcome was examined and analyzed using descriptive statistics (i.e., number and percent of participants).

Results

Results of the data analysis indicated that a greater percentage of positive student outcomes (i.e., earning a grade of "In Progress") was achieved by students who participated in the hybrid instructional format of the course than those who participated in the purely online course. Among the 18 students who participated in the hybrid course, 72% (n = 13) earned a grade of "In Progress" by the end of the course. Of the 12 students who participated in the online-only course, only 58% (n = 7) achieved a grade of "In Progress" by the end of the course. Refer to Figure 1 and Table 1 for a summary of the descriptive statistical analysis.

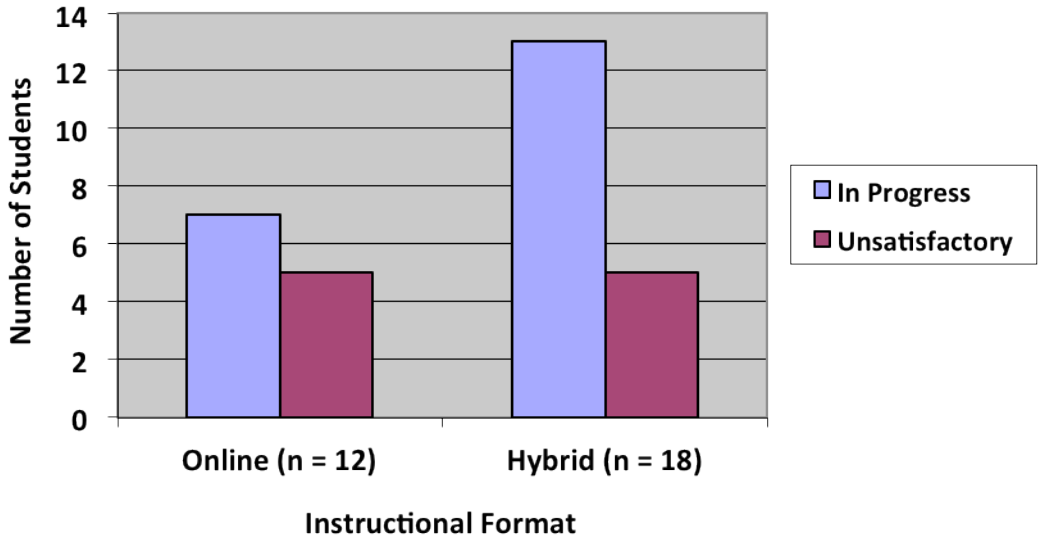

Figure 1. Graphical summary of students' course outcomes.

Table 1. *Descriptive Statistics Summary of Students' Course Outcomes*

Instructional Format	Course Outcome	
	In Progress	**Unsatisfactory**
Online (*n* = 12)	58% (*n* = 7)	42% (*n* = 5)
Hybrid (*n* = 18)	72% (*n* = 13)	28% (*n* = 5)

Discussion

Methods of instructional content delivery on university campuses around the world have evolved significantly in recent years in an attempt to employ the rapid advances of technology. Historically, it was thought that distance-education students tend to exhibit worse academic achievement outcomes when compared to their traditional classroom-taught peers (Berge & Huang, 2004; Carr, 2000; Kember, 1995; Phipps & Merisotis, 1999; Simpson, 2003; Stumpf, McCrimon, & Davis, 2005). This was thought to have been due, in large part, to lack of contact between students and their instructors (Tinto, 1993). However, findings contrary to this belief were found over the past decade of research endeavors exploring the efficacy of various instructional modalities (e.g., Davis, 2007; Dziuban et al., 2004; Kiser, 2002; Martyn, 2003).

Previous research regarding hybrid instruction indicated that students achieve equally, if not more, positive student outcomes relative to other instructional modalities (Davis, 2007; Dziuban et al., 2004; Kiser, 2002; Martyn, 2003). Hybrid instruction students have been reported to demonstrate academic achievement consistently higher than that of students engaged in purely

online instruction (Davis, 2007; Dziuban et al., 2004). Further, students who participated in hybrid instruction demonstrated comparable or better academic achievement than that of students engaged in traditional face-to-face instruction (Dziuban et al., 2004). The results of the present study are in alignment with this research, as students who participated in a hybrid course achieved a positive outcome, defined as earning an "In Progress" grade upon final assessment of their work, at a rate 14% higher than among those who participated in a purely online instructional format.

Implications for Educators and Candidates

The failure to complete a research project in a timely manner can have a wide-ranging impact on both educators and candidates. It can prevent candidates from completing their Master's degree, ultimately causing them to miss securing an available position as a School Psychologist and likely forcing them to wait until the following year to obtain such a position. This represents a considerable loss of future revenue for a candidate who typically has accrued a high level of student-loan debt obligation. The resulting stress and frustration that a candidate experiences may well be expressed in a broader-based dissatisfaction when they complete the "exit evaluation" of their program. Finally, as it becomes apparent to candidates that they may not be able to complete their project and graduate in a time to have the opportunity to compete for positions in an increasingly competitive job market, they could be anticipating considerable financial pressure as a result. The probability that they may blame the instructor or the process of the course (e.g., allowing a specific amount of time for their instructor to read the changes in their draft and provide feedback) may increase, resulting in a request (if not demand) for almost "instant" feedback on a draft submission of the project, and suggesting that the instructor has prevented them from completing their Master's degree in time to obtain an available School Psychologist position. This situation has often resulted in candidates' taking their argument to the next level (Program Lead and/or Chair), which then typically results in the course instructor's having to once again review the course expectations with the candidate and document all previous e-mail communications with the candidate, some of which have been spread over more than a month. This has resulted in the unfortunate consequence that few instructors are willing to teach the course.

Limitations

Students may gravitate towards a particular instructional format based on their personal characteristics and attributes, e.g., motivation, assertiveness, or confidence (Ormond, 2003, as cited in Davis, 2007). This should be kept in mind when drawing conclusions from the present study. This study did not attempt to control for students possessing personal characteristics and attributes that predispose them to better academic performance in online or hybrid instructional formats.

Another concern should be noted with respect to the time of year in which the sections of the course were delivered. Some students in this sample participated in a course that took place December through January, which coincides with a busy holiday season. Negotiating the personal demands of this time of year concurrent with the academic demands of the course could have impacted students enrolled in the course during the winter months differently than those enrolled in the course during the summer.

A noteworthy measurement-related limitation in the present study was the use of a dichotomous measure of student outcome. Unfortunately, the data available to the principal

investigators was limited because the data set used was an archival data set from approximately three years ago. The option to participate in an online-only offering of the action research course has since been removed from the School Psychology program. Future research gathering new data from new samples of participants should be mindful of the benefit of utilizing multiple outcome measures.

Recommendations for Future Research

Educators have yet to fully understand why one instructional format may prove more effective in achieving positive student outcomes than another. Studies, both quantitative and quantitative, should be done to further examine the efficacy of hybrid instruction relative to other instructional formats. Qualitative data such as interviews or surveys completed with students throughout the process of the course could yield additional information about what specific aspects of hybrid instruction are considered effective by the students. Future quantitative studies comparing instructional formats also hold value in terms of educators' employing the most appropriate evidence-based teaching practices.

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Instructional Methodology

Interpretation of the Concept of Photon in College Physics Course

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Abstract
Scientific literacy is one of the key elements in understanding a particular science. Accurate interpretation of basic concepts and terms is the foundation of basic knowledge constructed in a college Physics course. This article discusses one of the major concepts of Physics, a photon, historically interpreted differently from the corpuscular and wave theory viewpoints, which affects the teaching of this concept. A consistent theoretical and methodological interpretation of the concept is critical for understanding such parts of Physics as Light and Optics, Relativity, Quantum Physics, and Physics of Elementary Particles, and explaining experimental data. A new instructional application based on the Iterative Instructional Model can be instrumental for achieving better learning outcomes.

Key Words
Photon, quanta, photoelectric effect, concept interpretation, terminology, scientific literacy

Introduction

General Physics and Calculus-based Physics in a college can be challenging for many students. Research (Freedman, 1996; Steinberg, Wittmann, Bao, & Redish, 1999; Sadler & Tai, 2001), demonstrates these challenges can be caused by a number of factors, among them insufficient scientific literacy demonstrated through conceptual interpretation of physical facts, and appropriate use of special terminology. This article demonstrates the ambiguity of the "photon," one of the basic concepts in several parts of Physics, such as Light and Optics, Relativity, Quantum Physics, and Particle Physics; offers a new, concise interpretation based on historical analysis of its development; and explains how it can be effectively taught in a college Physics course.

Scientific Literacy

Scientific literacy is critical for understanding foundations and basic concepts of science taught in college. Scientific literacy is defined as "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity" ((Merriam-Webster). It also includes specific types of abilities, which are identified in the National Science Education Standards (NSES 1996).

Scientific literacy implies that a person can ask, find, or determine answers to questions derived from curiosity about everyday experiences. One must have the ability to search for answers and discuss the contradictions in meaningful ways. It means that a person has the ability to describe, explain, and predict natural phenomena. Scientific literacy entails being able to read, with understanding, articles about science in the popular press and to engage in social conversation about the validity of the conclusions. Scientific literacy also implies that a person can identify scientific issues underlying national and local decisions and express positions that are scientifically and technologically informed (NSES, 1996). "Scientific literacy is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in

order to understand and help make decisions about the natural world and the changes made to it through human activity" (Programme, 2003, n.p.).

While there are certainly other challenges, such as instructor professionalism, application of effective instructional methods and tools, student motivation, etc., that deserve special attention when discussing quality of teaching and learning, it would be useful to focus on the two of them pertaining to scientific literacy, i.e., clarity of concept interpretation and use of proper scientific terminology. It is clear that proper understanding of physical science depends very much on adequate presentation and interpretation of basic physical facts through accurate use of appropriate terminology. Moreover, there is a direct link between scientific literacy and academic identity (Reveles, Cordova, & Kelly, 2004), and between conceptualization through adequate use of terms and student learning outcomes (Arons, 1997).

Unfortunately, quite a few areas in Physics are not clearly defined by the science, nor are they properly expressed through exact terms. The major reason is physicists themselves have not come to a common interpretation of the same phenomenon and, correspondingly, the use of the same terminology. A demonstrative example can be derived from the interpretation of the "photon" in physical literature, which is a crucial notion in several major parts of Physics: Light and Optics, Relativity, Quantum Physics and Particle Physics.

This investigation encompasses the use of the term "photon" in the research, technical, and physics literature. The topic is considered important for research, as inconsistent and often ambiguous interpretation of this concept is noticeable in a large number of scientific books, especially in college Physics textbooks. For instance, the *Encyclopedia of Laser Physics and Technology* stated, "Although a 'naive' interpretation of photons as particles of light gives a useful picture for the intuitive understanding of many quantum phenomena, it can be seriously misleading to apply it without understanding its limitations" ("Rüdiger Paschotta," 2008). This supports the argument about the need for specifying the concepts and corresponding terminology for ensuring effective learning.

Scientific Terminology

Terminology of science, which reflects conceptual interpretation as "the technical or special terms used in a business, art, science, or special subject" (*Merriam Webster Online Dictionary*), integrates the words denoting the essential and characteristic notions of the content area. Vygotsky (1997) argues that the use of language is critical for the development of concepts to the extent that "The relation of thought to word is not a thing but a process, a continual movement back and forth from thought to word and from word to thought. . . . Thought is not merely expressed in words, it comes into existence through them" (p. 218). This argument points to the utmost importance of correctly identifying, presenting, interpreting, and using the terms of the subject matter in learning.

Terminology of the subject of study is key to understanding its fundamental concepts. Incorrect or incomplete explanation of the term can lead to erroneous or inadequate conceptualization, interpretation, and application of major laws and principles. Fisher suggested that "All individuals construct knowledge about science and other academic subjects in their conscious working memory and store that knowledge in long-term memory. The prevailing model for the way in which denotative knowledge is stored in memory is the semantic network" (Fisher, 2004, p. 5), which is built from the meaning of the words (terms).

It is surprising to see, however, that even such an important document as *The Role, Education, Qualifications, and Professional Development of Secondary School Physics Teachers,* written by experts in teaching Physics in secondary school at the request of AAPT, while recommending that "The focus of physics teaching is to guide students to an understanding of physics concepts and to have the ability to apply their knowledge" (*The Role,* 2009, p. 27), also advised the teachers to "avoid using terminology with which students are unfamiliar" (p. 8). This advice is not only erroneous from the point of view of cognitive psychology; it is detrimental to students' knowledge; is there any other way to understand physics concepts than to understand physics terminology? No wonder students coming to college physics classes often demonstrate massive incompetence in this science. Concept interpretation and terminology of science need to be specially taught in the corresponding course.

Incidentally, college professors expect students to be well prepared in the subject and terminology when they come from high school to the university class, "*starting with the assumption that students must already 'know' both the phenomena and the terminology,* [which] *is responsible for a substantial portion of the subsequent difficulties students have. . .* (Arons, 1997, p. 168). The problem, evidently, deserves attention. Therefore, current theories of light that led to a misinterpretation of the concept of "photon" will be explained, and how the term "photon" is explained in physics literature will be also analyzed.

Interpretation of the Photon

An electromagnetic wave (light) spreads out and is being absorbed and emitted in the form of indivisible portions—quanta. Development of the quantum (corpuscular) theory of light, as well as any other theory, takes place in several stages. In the process of theory of light development, there have been two stages.

1. ***Initial theory.*** According to Einstein, the light is dispersed, absorbed, and emitted as corpuscles (quanta of light or quanta of energy) (Einstein, 1905). The simplest model of corpuscles is a material point. Quantum of light (quantum of energy) was later called "photon." Despite its success, the initial theory immediately came in conflict with the wave theory of electromagnetism.
2. ***The modern theory.*** This theory, developed primarily by Dirac (1927), maintains the discreteness of the energy of electromagnetic waves from the standpoint of quantum mechanics and confirms Einstein's hypothesis. However, there is a significant difference between these two theories. In Dirac's theory, the photon is represented in the form of a standing electromagnetic wave with minimal energy (Dirac, 1927). Thus, each photon occupies the entire volume in which there is an electromagnetic wave (not a material point). The corpuscular nature of the photon is not in its spatial limitation, but in the discreteness of energy.

Understanding the corpuscles of light as a material point for many decades has been leading (and currently leads) to inconsistencies in the explanation of experiments in diffraction and interference of light. This happens despite the existence of a clearly formulated and long-standing quantum theory of electromagnetic emission: the modern theory. For example, according to the modern theory, in contrast to the initial one, the passage of light through two parallel slits can divide the photon, but from the point of view of energy the photon is regarded as a whole. In other aspects, or rather, in its essence, the light is an electromagnetic wave. In

Dirac's (modern) theory, the contradiction between the corpuscular and wave properties of light is completely eliminated. It should be noted also that the corpuscular properties are manifested only during the absorption and emission of light. Following are presented the results of the theoretical interpretation of the experiments, which confirm the hypothesis of the corpuscular properties of light—Einstein's hypothesis—but from the standpoint of quantum mechanics. The resulting incorrectness is closely associated with the development of the photon theory, so we will briefly review its major concepts.

The concept of "light quantum" (a corpuscle of light) was first introduced by Einstein to explain the photoelectric/photo effect. The model of corpuscle of light is presented as a material point with the energy concentrated in it. The interaction of the photon with the electron occurs as a result of inelastic collisions of corpuscles, so that the electron acquires sufficient energy to carry out the work of ejection from the metal. This model easily explains basic properties of the photoelectric effect, but it contradicts the wave theory. A great number of well-known physicists of the time, including Nobel laureates Planck and Wien, argued against the corpuscular properties of light. The main argument of the opponents was the flawlessness of the Maxwell's theory of electromagnetism. Further on we will see that the opponents were partially correct; Einstein's hypothesis was merely ahead of its time. Later on, the quantum theory of electromagnetic waves substantiated Einstein's formula for the photoelectric effect, but without using the corpuscular properties of light (Koroteev & Schuman, 1991). Although Einstein's theory was imperfect, for De Broglie it served as the basis for discovering the wave properties of corpuscles (), and for obtaining the Schroedinger's wave equation. Quantum theory has confirmed Einstein's hypothesis on the basis of new developments (Pantell & Puthoff, 1969).

The initial theory tries to reconcile the corpuscular and wave properties of light: the so-called corpuscular-wave dualism. According to this dualism, the photon is the arrangement whose energy is concentrated in a vanishingly small volume, or "bunch," according to Born's (1989) figurative expression. Spatial distribution of electromagnetic energy is proportional to the concentration of photons in given points. By analogy with the distribution of the quantum particles, the distribution of photons' concentration is considered to be subject to the laws of probability. This misconception of a photon is common in scientific and technical literature, and it prevails in the physics textbooks to this day.

English physicist Dirac (1927) was successful in eliminating the contradiction between the corpuscular and wave properties of light. Dirac applied the mathematical apparatus of quantum mechanics, fairly well developed at that time, to the electromagnetic field. Dirac considered the electromagnetic field as an infinite number of standing electromagnetic waves in a given volume (resonator). The field is associated with a mechanical system. A set of standing waves is equivalent to a set of oscillators described by the generalized coordinates, which are an infinite number of degrees of freedom. Electromagnetic energy is distributed over these degrees of freedom. By using the mathematical apparatus of quantum mechanics, Dirac replaced the generalized coordinates of classical mechanics with quantum-mechanical operators (the principle of correspondence), setting up and solving Schroedinger's wave equation for electromagnetic oscillations. As a result, Dirac obtained the wave functions and the energy of the oscillator. Formula 1 is the resulting formula for the energy of oscillators (standing waves):

$$E = \sum_{k=1}^{\infty} n_{\kappa} h\nu_k + \frac{1}{2}\sum_{k=1}^{\infty} h\nu_k \qquad (1)$$

where h is Planck's constant, ν_k is the natural/proper) frequency of an κ-th oscillator, and n_κ is a positive integer.

Consider the first sum. The main conclusion from this equation is that the energy of oscillators (types of oscillations or modes) is quantized: κ-th mode contains an integer n_κ of energy quanta $h\nu_k$. This supports Einstein's idea of the quantum (corpuscular) nature of electromagnetic oscillations. The number of quanta of energy in each oscillator depends on the degree of its excitation. For example, in an absolutely black body, the distribution by energies is determined by the Boltzmann's formula, and using it makes it easy to obtain the corresponding Planck's formula for the distribution of energy quanta by modes. The very fact of discretization of standing wave energy is deservingly called Einstein's hypothesis (Pantell & Puthoff, 1969).

In contrast to the initial photon theory in the Dirac's theory, the quantum properties do not contradict the wave theory. In accordance with the Dirac's theory, the energy of a photon is not concentrated in a particular point in space (not a material point); each photon exists at all points in space where an electromagnetic field exists. Photons are "mixed up" in space as much as the standing waves are "mixed up." To observe the photons is possible only when they interact with the matter particle, while the absorption (emission) of a photon occurs only in those points in which these particles are found. This is illustrated in Figure 1.

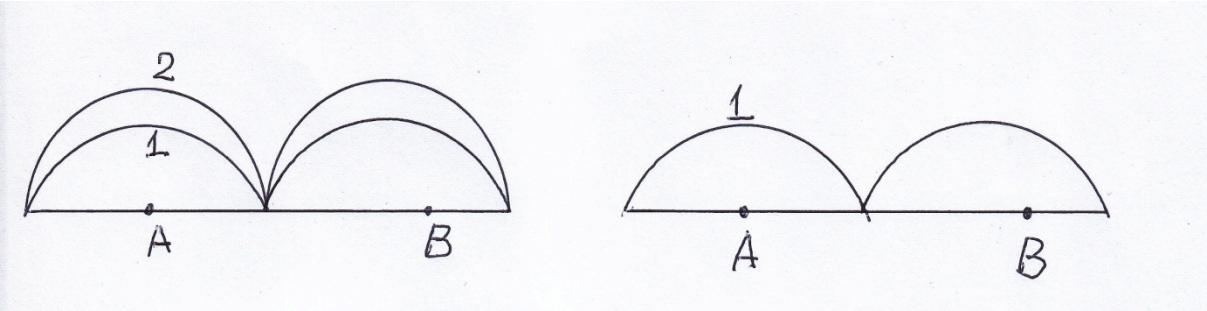

Figure 1. Example of energy distribution for a standing wave along one of the directions in a resonator (in relative units).

The total energy of the wave before emission is considered to be equal to two photons (left side), whereas the total energy after emission of one photon is shown on the right side.

Suppose in the given direction over the length of the resonator the wavelength of any type of oscillations out of their infinite number is placed. The squared modulus of sinusoid, the value that is proportionate to the distribution of energy along this direction, is shown in Figure 1. Suppose on the left side a standing wave with the energy corresponding to two photons—two sinusoids—is represented. Suppose that at point A is the center which absorbs one photon. The photon is absorbed from the total volume, including from point B. There is only one photon left, distributed throughout the volume (the right figure). The probability of absorption is proportional to the energy density of photons; in the nodes of standing waves, the probability is zero.

Dirac's calculations confirm Einstein's theory of photoelectric effect, yet from the standpoint of quantum mechanics. These calculations also exhaustively explain other experiments in the interaction of light with matter, but without coming into conflict with the wave properties.

The uncertainty correlations for the photon lead to similar consequences (Pantell & Puthoff, 1969). Physical meaning of relations for the photon is significantly different from the relations for quantum particles. As is known, the ratio of quantum particles characterizes the probability of

finding a particle in a given point. Note that this correlation is a consequence of the wave properties of the corpuscles.

For wave propagation, the uncertainty relation is an inherent property of any oscillations. Indeed, it is impossible to determine the frequency of oscillation for the time period considerably smaller than the period of oscillations. Therefore, it is also impossible to accurately determine the wavelength in a short interval. Contrary to the correlation of the uncertainties for quantum particles, the correlation of the uncertainties for the wave determines the accuracy of measurement of the wavelength and frequency of fluctuations, and not the probability of finding the photon in a given point. Mathematically, the correlations can be expressed as shown in Formula 2:

$$\Delta x \cdot \Delta\lambda \geq \frac{\lambda^2}{4\pi}\ ; \qquad \Delta x \cdot \Delta v \geq \frac{c}{4\pi}; \qquad \Delta v \cdot \Delta t \geq \frac{1}{4\pi}; \qquad (2)$$

where: Δx, $\Delta\lambda$, Δv, Δt are the uncertainties of the coordinate, wavelength, oscillation frequency, and time, respectively, and c is the speed of light. Planck's constant is not included in the correlation of the uncertainties for the oscillations, which is an indication that this correlation is not a quantum one, as was noted before.

Consider the second sum in the equation for energy (Formula 1). This is the sum of discrete oscillations of constant energy, called "zero-point vibrations." The number of oscillators is infinite; so is the full energy of zero oscillations. The fact of infinite energy is not anything special, because the energy is calculated up to a constant. Note that the previous theories do not imply zero-point fluctuations.

But interpretation of the new experiments required bringing into play these oscillations. In 1934, a slight change in wavelength was observed in the Balmer series for hydrogen atom. Lack of precision in measuring instruments of the time made it impossible to confirm the experimental results. Reliable results were obtained by Lamb and Rutherford in 1947 using radiophysical methods. They measured the relative shift of energy at levels of 2s and 2p for the hydrogen atom - the Lamb shift - which makes 1057 MHz. A comprehensive theory of the shift was given by Bethe. According to the theory, the orbital motion of electrons is superimposed by its chaotic motion in an electromagnetic field of zero oscillations. Theoretical calculations coincide with the experimental results with high accuracy and thus confirm Dirac's photon theory. Note that this is the only experiment, the explanation of which cannot be made without the Dirac's theory.

The Term *Photon* in Educational Literature

Now it might be worthwhile to analyze how "photon" is interpreted in educational literature where it is defined differently. This has developed historically. The greatest influence on the way it was presented was made by an authoritative textbook on nuclear physics by Born (1989. The first edition of the textbook preceded the proliferation of modern theory of the photon, which led to erroneous ideas. Arguments in favor of the primary theory proposed by Albert Einstein will be used to explain the photoelectric effect. In the experiments on photoelectric effect, the photocurrent appears immediately after switching on the light. At uniform illumination of the photocathode, a considerable time is needed to accumulate the energy necessary to release an

electron. The corpuscular model of light was proposed, which explained that light propagates in a stream of photons (bunches), with pre-concentrated energy. This model explained the main features of the photoelectric effect, but it soon ran into the contradiction with the wave theory of light. The question arises: How does one present the photoelectric effect on the basis of the modern wave theory? In the classical interpretation and according to the "non-photon" quantum theory, it is a resonant absorption: the energy distributed throughout the volume of a sample is concentrated on the absorbing center in a short time.

An example of this interpretation was presented in Physics of high-power laser radiation (Koroteev & Schuman, 1991). The authors did not generally use the concept of the photon; in particular the photoelectric effect was laid out according to the "non-photon" quantum theory. But in some cases the impact of the primary theory of the photon can be noticed. For example, in the paragraph on "Kinetic equation for the density of photons in the resonator" and in some other places, the concept of "the density of the number of photons" suggested that the photons exist as material points. This suggested that density is uniformly spread in the resonator volume. To avoid incorrect interpretations it should be specified what is meant by density, since each photon in the laser resonator is in its entirety.

Especially "unlucky" is the photon in general physics textbooks. We have analyzed more than 30 books, while referring here only to some of them (Sivukhin, 1986; Frish, 2006; Cholpan, 2003; Tippler & Llewellyn, 2008; Urone 2001; Jewett & Serway, 2007; Wilson, Buffa, & Lou, 2010). The textbooks either avoid the topic of "photon" or interpret it on the basis of the initial theory. If the energy density is discussed, it is considered as the density of the number of photons (bunches), despite the fact that the concept of the coordinates of the photon is meaningless. None of the textbooks mentions "non-photon" quantum theory, not to mention the modern quantum theory of the photon. This is surprising, since it has been more than 80 years since the advent of the modern theory.

The photon is also "unlucky" in the study of interactions between short-impulse laser radiation and matter (Veeser & Solem, 1978; Harris, Kmetec 1988; Hora 2000). In the calculations, for example, often compared are the photon energy and the oscillation frequency of short impulses with the energy (or corresponding frequency), which characterizes the solid body (the width of the energy zone or the frequency of plasma oscillations). However, it is incorrect for short impulses. The frequency spectrum exceeds the frequency of oscillations at the impulse length close to the oscillation period. A comparison of the photon energy with the main frequency of oscillations requires great care. Indeed, the concept of "photon" was introduced for stationary processes, in which the impulse must be much larger than the oscillation period. This incorrectness is apparent in the correlation of uncertainties. Let $\Delta t = \nu^{-1}$, where ν is the main frequency of vibration; then according to Figure 2, $\Delta\nu \geq \nu/4\pi$ is a frequency variation close to the frequency of the main vibrations. The spread of the photon energy looks the same. Comparing this energy to the characteristic energies in a solid body leads to errors in excess of 100% or more.

It is relieving to note that in the majority of textbooks on quantum mechanics the modern theory of the photon is presented (Levich 1962; Pantell & Puthoff, 1969, Urone, 2001, Wilson et al, 2010). In addition, the effects of interaction of radiation with matter are often considered in quantum mechanics as "non-photon" quantum theory, in which the electromagnetic field is not quantized. This theory perfectly explains all experiments of the interaction between radiation and matter. The only exception is the Lamb's shift.

This discussion demonstrates the importance of making students of Physics acquainted with various interpretations of crucial concepts of science which are still in the process of development and scientific study. Presenting different views of these basic concepts engages students in higher-order thinking, allowing them to compare opposing and complementing definitions and thus helping to form students' scientific literacy.

Methodology of Teaching Physics

Instructional methodology of teaching General Physics in a college commonly includes several major steps: presentation of the new material in a lecture (using visuals, video clips and experimental demonstrations), explanation of problem solving techniques (usually on the white board), student independent or group problem solving, analysis of solved problems, independent text reading, and homework problem solving. Finally, theoretical study is followed by lab work on selected topics. It is important, however, to focus here on introducing the new concepts and terms, which is usually done before presenting the new topic. When starting the new concept of photon, students are expected to understand the concept of energy, which had been studied in the Classical Mechanics part. Then they had to cover the topic Oscillations and Waves and connection of energy to wave propagation. The new concept of photon as a portion of energy is first introduced in Wave Optics. Further on, it is discussed at a higher level in Quantum Mechanics and Physics of Elementary Particles. In each of these parts of Physics, we emphasize that the energy and wave processes are linked within the theory of light propagation and behavior of elementary particles.

One effective method that can improve concept understanding and retention of concepts and terms is the Iterative Instructional Model (Serdyukova, 2008). The principle of iteration suggests that we introduce the same concept in several cycles, beginning with the most basic explanation and moving on to the most complex, each time raising explanation to a higher level of understanding. In each cycle, a growing volume of knowledge is being embraced until understanding of the concept becomes complete.

In teaching about photon using the Iterative Instructional Model, the instructor must first explain the development of this concept from historical and methodological points of view. Then the iterative process unwinds like a spiral in which there are several cycles:

1. The two stages in the development of the concept are described in
    a. Corpuscular theory (Einstein), and
    b. Wave theory (Dirac).
2. The corpuscular nature of the photon is explained that lies not in its spatial restrictions but in the discreteness of energy.
3. Following this, it is made clear that each photon exists in all points of the space in which there is electromagnetic field.
4. A notion of existence of zero oscillations is related to the term photon.
5. Finally, an experimental confirmation of existing theories is presented, which is followed by problem solving.

In this way, the concept of photon is covered in full, presenting a complete picture of this key concept in Physics. Similarly, other important concepts and terms are introduced.

Conclusions

In teaching General Physics, providing accurate and sufficient interpretation of basic concepts and ensuring understanding of scientific terminology play a key role in the construction of knowledge in the course. It is critical for developing scientific literacy, which is necessary for effective study of a particular subject matter, explaining experimental data and applying its concepts, laws, and principles. Therefore, basic concepts and terms, when teaching certain topics in the science course, should be given proper attention throughout the course. They must be explained both from a historical developmental view and from the points of view of related fields of science. This article demonstrates how scientific and methodological interpretation of one of the principal concepts and terms of Physics, the photon, can be instrumental for developing student scientific literacy when teaching several parts of Physics, namely Light and Optics, Relativity, Quantum Physics, and Physics of Elementary Particles. Effective concept understanding and retention can be accomplished using the Iterative Instructional Model.

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Direct Negative Experience as a Means of Effective Learning: An Exploratory Study

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Abstract
The acceptance of new knowledge is dependent on learners' pre-existing beliefs, peer practices, industry norms, and professional role models. Going through a negative experience can alter pre-existing beliefs that counter the new knowledge. The objective of this exploratory study is to apply the Deep Smarts Theory to learning structured programming principles and proper program code formatting practices in an undergraduate course. A before-and-after experiment was performed. The results indicate that a negative experience can alter learners' pre-existing beliefs and enhance their acceptance of structured programming principles and practices.

Key Words
Programming courses, structured programming, learning, instructional design, instructional examples

Introduction

In the field of Computer Science, the teaching of a certain set of principles and practices, such as structured programming and proper program code formatting, has always been performed via lecture and positive examples. Learning is usually reinforced with giving points (or deducting them) for conforming to (or violating) the principles and practices taught. This research investigates the use of a negative experience to enhance learning.

The Deep Smarts Theory

The Deep Smarts Theory, as explained in the book by Leonard and Swap (2005), is the theoretical basis of this research. "Deep smarts" is a form of expertise that exists in an organization. Such expertise is acquired by an individual through active knowledge building. In short, we can say that "acquiring deep smarts" is equivalent to learning. When one learns a new concept, one changes from not having this new knowledge to internalizing it as one's own.

According to Leonard and Swap (2005), the four factors that influence a learner's acquisition of deep smarts are (a) the learner's pre-existing beliefs and assumptions that frame the new knowledge to be acquired, (b) social influences that act as a filter of new knowledge, (c) the availability of coaching and guided experience from a knowledgeable coach for transferring deep smarts, and (d) the availability of relevant new experience and expertise for building deep smarts.

The first factor, the learner's pre-existing beliefs, acts as a gate to determine which of the information presented is true. If a piece of new knowledge is in conflict with a pre-existing belief, the learner will encounter difficulty receiving this new knowledge. Methods to change such a belief that contradicts a new piece of knowledge include challenging the learner's frame (i.e., assumptions and pre-existing beliefs) and creating direct counter-experiences. The second factor, social influences, justifies the learner's beliefs and knowledge when building deep smarts. When applied to the context of this research, such social influences exist in the form of peers,

organizations (communities of practice and professional disciplines), and role models in the field.

This research focuses on the first factor of knowledge framing, one's pre-existing beliefs and assumptions. The second factor of knowledge filtering, social influences, is included as other possible attributes that can affect learning. As for the third factor, having a willing and skillful coach and a receptive and able learner, the instructor of a college class acts as a mentor/coach to the students in the class. The fourth factor, offering guided experience with feedback, is implemented in various components of a college course. In fact, this research focuses on how changing the first factor in the context of the second factor could enhance the third and fourth factors.

Structured Programming and Proper Program Code Formatting

"Structured programming" is an approach used to design and write computer programs in a higher-level programming language, such as C, Java, and BASIC. It was advocated by Dijkstra (1968) and the theoretical basis was made by Bohm and Jacopini (1966). The purpose of practicing structured programming is to produce easily traceable lines of code for easier human understanding and more efficient long-term code maintenance. This would lead to more accurate code and fewer errors, i.e., bugs. Most modern computer systems run on code written with the structured programming approach (Auerbach, n. d.).

For code writing in a program module, the structured programming principles include (a) no Goto statements for program execution to freely jump from one point to another (Dijkstra, 1968), (b) only three control structures (sequence, iteration, and selection) allowed, and they can be properly stacked and nested (Auerbach, n.d.; Mills, 1986), and (c) one entry and one exit point for each block of code (one iteration or selection structure forms a block of code) (Auerbach, n. d.).

In addition to the above principles, the structured programming approach also advocates additional proper program code-formatting practices to handle the syntactic and typographic aspects of the code (Mills, 1986; Ala-Mutka, Uimonen, & Jarvinen, 2004). These practices enhance the readability and understandability of program code and logic for long-term maintenance. They are (a) proper indentation and lining up of code (Pane & Myers 1996; Lowe & Burd, 2007), (b) local variable declarations in a module before the first action statement (Lowe & Burd, 2007), (c) only one statement on one physical line (Lowe & Burd, 2007), (d) adding comments (Lowe & Burd, 2007), (e) adding blank lines between different sections or control structures (Lowe & Burd, 2007), and (f) no complex statements that combine more than one operation (Lowe & Burd, 2007).

Structured programming principles and proper program code formatting practices are still necessary in the 21st century. Although many programming languages, such as Java and C++, are object oriented, a common way of teaching programming in such languages begins with teaching procedural programming and introducing the concepts of classes and objects later. These principles and practices are still applicable with procedural programming and when one writes the code inside the methods of a class (Zhang, 2010).

It is important to let first-year students acquire proper program-writing habits early, because changing the bad habits of an experienced programmer later is a difficult task (Schorsch, 1995; Ala-Mutka et al., 2004; Pendergast, 2006). Students must learn these standard practices and understand the value of these principles by seeing their benefits and keeping them as habits. In reality, many programming languages allow flexibility outside structured programming and proper formatting. Instructors must find a way to convince students about these principles and

practices and help them form good code-writing habits. The next section is a brief review on empirical research in the area of teaching programming courses in higher education.

Literature Review on Teaching Programming Courses in Higher Education

Empirical research in the area of teaching computer programming is mainly about teaching approaches and teaching tools. Roussev (2003) reported positive empirical results in teaching software design and development with JavaScript in an original model-based approach. This approach introduces programming concepts, beginning with the states of objects, variables, and assignment, and then proceeds to If statements and functions and so forth. Ala-Mutka et al. (2004) showed the empirical evaluation of a tool to help students develop proper program writing habits in C++. This tool is an automatic program style assessment aid. Students can run their program through this tool before submitting it, and the grader can also use the tool for the actual grading of style. It takes over the checking of proper code format and informs the students about any shortfalls. However, such a tool does not directly help them understand the importance of learning and keeping the habit of proper code-writing practices. Al-Imamy, Alizadeh, and Nour (2006) presented the empirical findings of using a computer programming teaching tool to include teaching design and creativity for teaching the first programming language class. This tool is similar to a computer-aided Integrated Development Environment (IDE) tool that gives the skeleton structure of a program to be completed. Using this tool can improve syntax skills and logical thinking skills. Pendergast (2006) reported an empirical study on the impact of using Java for teaching introductory programming to IS students. The report concluded that, the use of active learning (writing a program in a group) for measuring students' understanding and allowing them to learn from each other is effective. Nikula, Sajaniemi, Tedre, and Wray (2007) reported positive empirical results using the language Python and emphasizing the role of variables in the first programming classes at three universities. Similarly, Sorva, Karavirta, and Korhonen (2007) reported positive results in improving students' programming knowledge with teaching the roles of variables in programming classes. Rajala, Laakso, Kaila, and Salakoski (2008) reported a case study of providing a program visualization computer-aided tool for novices to learn programming in an introductory programming course. Their paper concluded that this tool provides some support in helping students learn programming, and it can enhance learning for students with no prior substantial programming experience. Goel and Kathuria (2010) reported an experiment and concluded that collaborative-pair programming is effective. Sahli and Romney (2010) reported positive learning outcomes with Ruby, a programming language for teaching programming language concepts.

None of the aforementioned works studied the introduction of a negative experience as a tool for teaching programming concepts. None considered students' pre-existing beliefs and the influence of peers, industry norms, and role models as factors that might hinder them from learning new concepts. The next section presents the research methodology of the study.

Methodology

The research objective was to perform an initial verification of the applicability of the Deep Smarts Theory (Leonard & Swap, 2005) to the teaching of structured programming principles and proper program code-formatting practices (termed "proper code-writing practices" hereafter)

in an introductory programming class. It is hypothesized that a student's acceptance of such practices is affected by one's pre-existing beliefs and other influencing factors, such as peers, industry norms, and professional role models. Besides using conventional teaching methods, providing students with a negative hands-on experience can enhance their "buy-in" and alter any pre-existing beliefs that hinder or prevent the learning of such practices. The research question posed in this paper is, "Does a direct negative experience enhance the learning of proper program code-writing practices?" This research uses a before-and-after design with a three-part instrument. The negative experience (treatment) is having to understand and debug a piece of computer code that does not conform to proper code-writing practices.

Instrument

The instrument was a three-part assignment. Part A was the "before" questionnaire. Part B was an exercise of debugging a piece of code that violates structured programming principles and proper formatting practices (the treatment). Part C is the "after" questionnaire. Questions in Parts A, B, and C are shown and explained in Table 1. The program code, with problematic issues and bugs circled, is in Figure 1. Table 2 lists these issues and bugs.

Table 1. *Questions in Parts A, B, and C of the Assignment*

Question (example, AQ1 means Part A Question 1)		Purpose/rationale
AQ1	In this class, we were exposed to the importance of making our program code more readable and understandable by properly indenting and lining up code within a block, adding enough blank lines between sections, adding enough comments for code explanation, declaring variables up front (not anywhere in the code), and going by the principles of structured programming (e.g., one entry and one exit for each program block) through lecture, lecture notes, sample program code, and homework requirements, etc. (Agree/Disagree)	To ensure that a subject has been exposed to the concepts of such practices
AQ2	I consider myself reasonably capable of making my program code more readable and understandable through properly indenting and lining up code within a block, adding enough blank lines between sections, adding enough comments for code explanation, declaring variables up front (not anywhere in the code), and going by the principles of structured programming (e.g., one entry and one exit for each program block). (Agree/Disagree)	To ensure that a subject has the capability to follow such practices
AQ3	To date, have you gone through the experience of having to read and understand a piece of program code (written by another person, not you) that does not conform to what we have learned about enhancing readability and understandability, such as lines of code not properly indented and lined up, no comments, no blank lines between sections, variables declared anywhere in the program, and program logic not conforming to structured programming? (Answer choices listed in Table 3.)	To understand the possibility of similar previous experience—we want to isolate the effect of this negative experience as the treatment

Question (example, AQ1 means Part A Question 1)		Purpose/rationale
In all the questions that are shared by Part A and Part C, the starting words "At present" (not shown below) in Part A are changed to "After the experience of completing Part B" in Part C. Part A Questions 4 through 11 use a 5-point Likert-type scale, from "strongly disagree" to "strongly agree," for answer choices, with an additional "don't know yet" to catch this possible answer.		
AQ4 and CQ1	. . . , I personally believe that adhering to such programming practices and principles can decrease the human time and effort spent on program-code debugging and maintenance.	To understand the intellectual belief about the immediate usefulness of such practices
AQ5 and CQ2	. . . , I personally believe that adhering to such programming practices and principles has value to the career of a software developer.	To understand the intellectual belief about the long-term value of such practices
AQ6 and CQ3	. . . , I personally believe that the habit of adhering to such programming practices and principles is worth developing and keeping for software development.	To understand the intellectual belief about the effort-worthiness of such practices
AQ7 and CQ4	. . . , given two program developers who are equally competent, I think the one who adheres to such programming practices and principles is a more professional developer than the one who does not.	To understand the intellectual belief about the professionalism related with such practices
AQ8 and CQ5	. . . , I am personally willing to develop and adhere to such programming practices and principles, despite the fact that more effort would be needed, such as doing the correct formatting, when I key in the source code.	To understand the emotional willingness to spend effort to follow such practices
AQ9 and CQ6	. . . , whether I am willing to adhere to such programming practices and principles also depends on whether my peers are doing the same or not.	To understand the influence of peers on one's willingness to follow such practices
AQ10 and CQ7	. . . , whether I am willing to adhere to such programming practices and principles also depends on whether they are a well-known norm in the software-development industry or not.	To understand the influence of industrial norms on one's willingness to follow such practices
AQ11 and CQ8	. . . , whether I am willing to adhere to such programming practices and principles also depends on whether my personal hero (role model) in software development is an advocate of such practices and principles or not.	To understand the influence of a role model on one's willingness to follow such practices
AQ12	Approximately how many years have you been learning or practicing writing computer programs (in all programming languages and all paradigms of programming)?	To understand the background programming experience—a long one may indicate powerful pre-existing beliefs or Part B might have been too easy
The debugging problem to be solved manually in ten minutes is in Part B. Due to page limit, we have not included it here (available from first author via email). The program code, with problematic issues and bugs circled, is in Figure 1. Table 2 lists these issues and bugs.		
BQ1a	The bug(s) is/are (please write your answer in detail; if you do not know yet, please write "I do not know yet."):	A direct measure of the performance—if high, the

Question (example, AQ1 means Part A Question 1)		Purpose/rationale
BQ1b	The way to fix the bug(s) is/are (please write the corrected C++ statement(s); if you do not know yet, please write "I do not know yet."):	assignment might have been too easy
BQ1c	On a scale of 1 (no confidence at all) to 10 (with 100% confidence), how confident are you about the correctness of your answers to 1a. and 1b. above? Please write "Not applicable" if you did not put down the bug(s) and the corrected statement(s) for 1a. and 1b.	An indirect measure of the performance—if low, then we can further understand why in the next question
BQ2	If you could not figure the bug(s) out and the way(s) to fix it/them in ten minutes or if your confidence level above is below 7, why? Please just write "Not applicable" if you did figure out the bug(s) and how to fix it/them with a confidence level of 7 or above:	An indirect measure of the performance and to understand any difficulty in the debugging process
BQ3	Did you ever want to give up before the ten-minute time period was over? Why or why not?	An indirect measure of the treatment experience to understand any frustration
BQ4	How much time did you actually use to debug the program (if you finished in less than ten minutes)?	An indirect measure of the performance—if much less than ten minutes, this can mean that Part B was too easy
Questions 9 through 12 use a 5-point Likert-type scale, from "strongly disagree" to "strongly agree," as answer choices, with an additional "don't know yet."		
CQ9	Going through the experience in Part B helped me understand the importance of such programming practices and principles better.	Two indirect measures of the short-term contribution of this experience
CQ10	Going through the experience in Part B convinced me to adhere to such programming practices and principles in the future.	
CQ11	Going through the experience in Part B helped me retain the concepts of such programming practices and principles, so that I can adhere to them better when I write programs in the future.	An indirect measure of the short and long-term contribution of this experience
CQ12	Going through the experience in Part B made the overall learning process in this class more interesting.	An indirect measure of the short-term emotional contribution of this experience
CQ13	Please tell me what you think about going through this exercise.	An open-ended question to collect feedback

```
#include <iostream>
using namespace std;

int main()
{
int in_sp_ID;
double sp1_tot_amt = 0.0;
double sp2_tot_amt = 0.0;
double sp3_tot_amt = 0.0;
double sp4_tot_amt = 0.0;

cout << "Please enter the next salesperson ID (-1 means no more): " ;
cin >> in_sp_ID ;
while (in_sp_ID != -1)
{
if (in_sp_ID == -1)
break;
cout << "Please enter this person's sales amount: " ;
double in_sales_amt;
cin >> in_sales_amt;
if (in_sp_ID == 1)
sp1_tot_amt =+ in_sales_amt ;
else
if (in_sp_ID == 2)
sp2_tot_amt =+ in_sales_amt ;
else
if (in_sp_ID == 3)
sp3_tot_amt =+ in_sales_amt ;
else
sp4_tot_amt =+ in_sales_amt ;
cout << "Please enter the next salesperson ID (-1 means no more): ";
cin >> in_sp_ID;
}
if (sp1_tot_amt < 10000.00)
cout << "Salesperson 1: Total Sales Amount: " << sp1_tot_amt << " Commission Rate: 1.5%  "
<< " Commission Amount: $" << sp1_tot_amt * 0.015 << endl ;
else
if (sp1_tot_amt <= 20000.00)
cout << "Salesperson 1: Total Sales Amount: " << sp1_tot_amt <<
" Commission Rate: 2.5%  Commission Amount: $" << sp1_tot_amt * 0.025 << endl ;
else
cout << "Salesperson 1: Total Sales Amount: " << sp1_tot_amt <<
" Commission Rate: 3.5%  Commission Amount: $" << sp1_tot_amt * 0.035 << endl ;
if (sp2_tot_amt < 10000.00)
cout << "Salesperson 2: Total Sales Amount: " << sp2_tot_amt <<
" Commission Rate: 1.5%  Commission Amount: $" << sp2_tot_amt * 0.015 << endl ;
else
if (sp2_tot_amt <= 20000.00)
cout << "Salesperson 2: Total Sales Amount: " << sp2_tot_amt <<
" Commission Rate: 2.5%  Commission Amount: $" << sp2_tot_amt * 0.025 << endl ;
else
cout << "Salesperson 2: Total Sales Amount: " << sp2_tot_amt <<
" Commission Rate: 3.5%  Commission Amount: $" << sp2_tot_amt * 0.035 << endl ;
if (sp3_tot_amt < 10000.00)
cout << "Salesperson 3: Total Sales Amount: " << sp3_tot_amt <<
" Commission Rate: 1.5%  Commission Amount: $" << sp3_tot_amt * 0.015 << endl ;
else
if (sp3_tot_amt <= 20000.00)
cout << "Salesperson 3: Total Sales Amount: " << sp2_tot_amt <<
" Commission Rate: 2.5%  Commission Amount: $" << sp2_tot_amt * 0.025 << endl ;
else
cout << "Salesperson 3: Total Sales Amount: " << sp3_tot_amt << ;
" Commission Rate: 3.5%  Commission Amount: $" << sp3_tot_amt * 0.035 << endl ;
if (sp4_tot_amt < 10000.00)
cout << "Salesperson 4: Total Sales Amount: " << sp4_tot_amt <<
" Commission Rate: 1.5%  Commission Amount: $" << sp4_tot_amt * 0.015 << endl ;
else
if (sp4_tot_amt <= 20000.00)
cout << "Salesperson 4: Total Sales Amount: " << sp4_tot_amt <<
" Commission Rate: 2.5%  Commission Amount: $" << sp4_tot_amt * 0.025 << endl ;
else
cout << "Salesperson 4: Total Sales Amount: " << sp4_tot_amt <<
" Commission Rate: 3.5%  Commission Amount: $" << sp4_tot_amt * 0.035 << endl ;
return 0;
}
```

Figure 1. The given program code in Part B with problematic issues circled.

Table 2. *A List of Issues and Errors in the Given Code in Part B of the Homework*

	Formatting issues to make logic more difficult to trace	Explanation
1	No indentation of lines of code at all, no blank lines between sections, and no comments	Violations of proper program code-formatting practices
2	A variable, in_sales_amt, is not declared up front	

3	There are two exit points for the first "if" block with the "break;" statement	A violation of a structured programming principle: one entry and one exit for each block
Syntax and logical errors to be pointed out by subjects		**Explanation**
1	sp1_tot_amt =+ in_sales_amt ; //*assigning //in_sales_amt to sp1_tot_amt which is not correct* sp1_tot_amt = sp1_tot_amt + in_sales_amt ; *//the //proper way or: sp1_tot_amt += in_sales_amt;*	A logical error due to a violation of a proper program code formatting: no complex statements that combine more than one operation
2	if (in_sp1_tot_amt < 10000.00) //*should be <=, not <*	A syntax error
3	if (sp3_tot_amt <= 20000.00) cout << "Salesperson 3: Total Sales Amount: " << sp2_tot_amt << " Commission Rate: 2.5% Commission Amount: $" << sp2_tot_amt * 0.025 << endl;	A logical error: The 2 "sp2_tot_amt" variables should be "sp3_tot_amt"
4	Else cout << "Salesperson 3: Total Sales Amount: " << sp3_tot_amt << ; " Commission Rate: 3.5% Commission . . " . .;	A syntax error: The first semicolon should be removed

Subjects

The subjects were students in an online section of CSC 242 (August 2012), the first programming course (using C++) of the B.S. in Computer Science program in a non-profit, non-traditional university in California. The first author of this article was the sole instructor, and 14 students were enrolled in the course. This university offers four-week courses for working adults.

Procedure

The major steps in this research were (a) lecturing about the importance of structured programming principles and proper program-code formatting using positive examples, (b) asking the students (subjects) to voluntarily work on a homework assignment (the instrument), and (c) performing analysis based on the answers of the subjects.

In Week 3 of the course, the students had to complete two separate homework assignments, Homework (HW) 3A and Homework 3B. This debugging exercise was given as HW3A Option 1. HW3A Option 2 was writing a C++ program relevant to the material learned in Week 3. Homework 3B was the regular homework assignment of the course. Each student had one week to turn in one of the two options for HW3A. HW3A was given immediately after the midterm, based on the assumption that the students should have become familiar with the C++ language by this time. The C++ knowledge required to do the debugging exercise in the instrument had been covered earlier in the course. Full completion of HW3A Option 1 (this

debugging exercise) was worth 10 homework points. Full and correct completion of Option 2 was also worth 10 homework points. The day HW3A was due, seven students turned in HW3A Option 1 and four turned in Option 2. Three did not turn in any document for HW3A. The instructor downloaded these documents, graded them, and returned them to the students. Among the seven students who turned in HW3A Option 1, one received a 9.72/10 for not answering one question, and the rest received a 10/10 each. After all the HW3A Option 1 sets were collected, the identities of these subjects were coded.

In Week 3, one student asked if the class could turn in both options of HW3A for 20 homework points. This suggestion was initially declined. Then at the beginning of Week 4, in order to encourage more students to participate, the instructor offered 10 bonus homework points for the completion of the other HW3A option by the end of Week 4. Four students who turned in HW3A Option 2 in Week 3 also turned in their HW3A Option 1 (this debugging exercise). Five students who previously turned in HW3A Option 1 turned in their Option 2. The three students who did not turn in HW3A in Week 3 did not turn in any work in Week 4. As a result, a total of 11 subjects completed this experiment with the instrument.

Results

Since having 11 subjects is too few to make any inferential statistical analysis, the data were analyzed in a descriptive manner. Table 3 shows the subjects' demographic information and relevant program reading and writing experience. Based on their experience of reading bad code, these subjects could be divided into three groups. The first was those who had encountered a piece of bad code two times at most (Subjects 1 through 8). This exercise could serve as their first major experience of having to read, understand, and debug a piece of poorly written code. They all had programming experience ranging from less than one year to up to two years. The second group was those who had encountered a piece of poorly written code 3 to 10 times (Subjects 9 and 10). They had less than one year of programming experience. The third group was those who had encountered a piece of poorly written code more than 10 times (Subject 11), and this group was the most experienced with program writing. As reviewed in subsequent results below, it seemed that technical experience did not affect their debugging performance and beliefs about proper code-writing practices. All subjects answered "agree" to both Questions 1 and 2 in Part A. This means that they were aware of such practices and they considered themselves capable of performing them. These answers cleared the way for analyzing the rest of the answers in our study.

Table 3. *Subjects' Demographic Information and Programming Background*

Gender	***n***	**Age**	***n***	**Academic program**	***n***
Male	9	20 and below	2	BS–Computer Science	4
Female	2	21 to 30	4	BS–Math	2
		31 to 40	3	Undergraduate–No Majors	2
		41 and over	2	Graduate: Preparation for MS–CS	3
Total	11		11		11

Subject	Part A, Q3: . . . having to read and understand a piece of program code … that does not conform . . . ?	Part A, Q12: . . . , how many years have you been learning or practicing writing computer programs . . . ?
3–8	Not that I remember	Less than 1 year
1 & 2	Only once or twice in my life	1 to 2 years
9 & 10	Only around 3 to 10 times in my life	Less than 1 year
11	More than 10 times in my life	2.1 to 5 years

Overall, acceptance of proper code-writing practices was improved after the debugging exercise. Table 4 shows the subjects' intellectual beliefs about the value of such practices (Part AQ4 through AQ7 and the counterparts in Part C) and their emotional willingness to follow them (Part AQ8 and Part CQ5) before and after the assignment. A 5 meant "strongly agree" and a 1 meant "strongly disagree." All average "after treatment" scores (range 4.636 to 4.909) were higher than the average "before treatment" scores (range 4.0 to 4.1) in corresponding questions of Parts A and C. All individual "after treatment" scores were 4 or 5, except that for Part CQ4 the rating from Subject 5 was a 3 before and after. Two subjects (Subjects 3 and 5) changed almost all their answers from 1 to 5. The "before treatment" scores of the rest of the subjects began with 4 or 5.

The results regarding those other factors that affected the subjects' beliefs before and after the experience are presented in Table 5. Overall, these scores (range of all "before treatment" and "after treatment" score averages was 1.5 to 2.54, leaning towards the "disagree" side) showed that these factors were not as strong as the treatment results presented in Table 4. We can speculate that any positive attitude change in favor of structured programming and proper program-code formatting was an effect of this negative hands-on experience.

Prior to the assignment, the subjects believed that industry norms were the most powerful force, followed by peers, with role models in the field being the least influential, as shown in Table 5. After the assignment, peers and industrial norms exchanged places. It is very interesting that, the strength of these factors was raised slightly after the negative experience. Without further verbal explanations from the subjects, the real reasons for this trend cannot be determined.

Table 4. *Subjects' Answers for Corresponding Before-and-After Questions—Part 1*

Questions on one's intellectual beliefs and emotional willingness to follow such practices										
	… can decrease … time and effort …		… has value to the career …		… is worth developing ….		… is a more professional developer ….		… personally willing ….	
Subj.	**AQ4**	**CQ1**	**AQ5**	**CQ2**	**AQ6**	**CQ3**	**AQ7**	**CQ4**	**AQ8**	**CQ5**
1	5	5	5	5	5	5	5	5	5	5
2	5	5	5	5	5	5	5	4	4	5
3	1	5	1	5	1	5	1	5	1	5

4	5	5	5	5	No ans.	5	5	5	5	5
5	1	5	1	5	1	5	3	3	1	5
6	5	5	5	5	5	5	5	5	5	5
7	5	5	4	5	5	5	4	5	4	5
8	4	5	4	5	4	5	4	5	4	5
9	4	4	5	4	5	4	4	4	5	4
10	5	5	4	5	5	5	4	5	5	5
11	5	5	5	5	5	4	5	5	5	5
Avg.	4.091	4.909	4.000	4.909	4.100	4.818	4.091	4.636	4.000	4.909

Table 5. *Subjects' Answers for Corresponding Before-and-After Questions—Part 2*

Questions concerning other factors influencing one's beliefs: ". . . also depends on . . ."						
	whether my peers . . .		**. . . well-known norm . . .**		**whether my role . . .**	
Subject	**AQ9**	**CQ6**	**AQ10**	**CQ7**	**AQ11**	**CQ8**
1	1	1	1	1	1	1
2	4	4	5	5	3	3
3	1	1	1	1	1	1
4	1	5	1	1	1	1
5	1	1	1	1	1	1
6	2	5	4	4	2	5
7	1	1	2	1	1	1
8	4	2	2	2	2	2
9	2	2	Don't know	2	Don't	Don't
10	2	2	3	2	2	2
11	1	4	1	5	1	5
Avg.	1.818	2.545	2.100	2.273	1.500	2.200

The results in Part B indicate that the assignment was difficult enough to challenge any pre-existing beliefs against proper code-writing practices. Table 6 shows the subjects' performance in Part B. One bug (out of four) was correctly discovered by only 5 subjects. Similarly, 6 subjects were able to present only one correct solution. Therefore, none of the 11 subjects could find all four bugs in 10 minutes; even some claimed to be fully confident about their answers or did not use up all the time allowed. (Column 5 of Table 6 shows the actual time used.)

Table 6. *Subjects' Performance in Part B*

Subject	**B1a: No. of bugs correctly**	**B1b: No. of fixes correctly**	**B1c: Confidence about the correctness of answers (1 = none to 10 = with 100%**	**BQ4: How much time did you actually use . . . (if you finished in less**

	discovered	mentioned	confidence)	than 10 minutes)?
1	1	1	10	9.5 minutes total
2	1	0	8.5	Probably 5 minutes
3	0	0	6	10 minutes
4	0	0	5	Exactly 10 minutes
5	1	1	1	About 14 minutes.
6	0	1	10, but not sure I found all.	9 minutes
7	0 (no ans.)	0 (no ans.)	Not applicable	Not applicable
8	0	0	5	9 minutes
9	1	1	9, however, I'm not entirely sure if I found them all.	8 minutes
10	1	1	8	Roughly 10 minutes
11	0	1	8	8 minutes

Question 1c in Part B (Table 6) asked the subjects to indicate their confidence in the correctness of their answers, and Question 2 asked why. (Only the reasons related to the treatment are shown in Table 7.) Among the 5 subjects who replied, 4 of them cited the treatment, i.e., the difficulty of reading and understanding the given code, and one blamed his/her own inexperience with programming.

Question 3 of Part B asked the subjects if they had thought about quitting before time was up. (Only answers related to the treatment are shown in Table 8.) Of the 11 subjects, 10 answered this question. Six of them did not want to give up because they considered themselves problem-solvers or they saw this exercise as a practice. Among these six, one mentioned that the code was difficult to read. Three others did want to give up, and one did not even want to begin. Among these four subjects, three cited the hard-to-read code as the reason. One (Subject 5) reported frustration due to his/her own lack of programming knowledge at the time. Overall, 4 out of 10 subjects cited the treatment as a reason for not wanting to continue. These answers indicate that having to understand a piece of code that does not follow proper code-writing practices was indeed a negative experience.

Table 7. *Subjects' Answers for Part B, Question 2*

Part B, Q2: If you could not . . . in 10 minutes or if your confidence . . . is below 7, why?	
Subject	**Answer (only reasons related to the treatment are shown below)**
3	My confidence level was below a 7 because I knew there was another bug I just could not figure it out in the 10-minute timeframe. I could not figure out the bug and how to fix it because I feel like the program was not organized at all and I kept losing my spot. If it were better organized and properly spaced

	out, I think I would have been able to spot the bug within the 10 minutes.
4	My confidence level is below a 7 because it was really difficult to read this code because it was literally now "white" space left in the code segment.
7	The way the program was structured made it very difficult to process the logic of the program quickly enough to discover what the bugs were. The lack of spacing and disorder of variables made it almost impossible for me to follow the program in a meaningful way and locate the point of the error.
8	My confidence is at a 5 because the code is very poorly separated with no comments and it [is] very hard to follow. There are no brackets for any of the if/else statements, which further complicates the task of finding the bugs.

Table 8. *Subjects' Answers for Part B, Question 3*

Part B, Q3: Did you . . . give up before the 10-minute time period . . . ? Why or why not?	
Subject	**Answer (only reasons related to the treatment are shown below)**
1	I didn't really want to start because the code is difficult to read and follow. It does not follow the procedures we have learned in class for structure and readability. Blank lines, comments, and indentation would have made a huge difference.
6	No! I love solving puzzles. I also enjoy fixing things, and finding errors in printed materials. It just seemed like a[n] interesting problem to fix, especially given the time crunch. It was difficult to read, though.
7	Absolutely, because just trying to read the program was very frustrating with the lack of spacing and cohesion in the program.
8	Yes, because the code was very hard to look at and figure the logic or structure of the program.

The subjects found this learning experience to be very effective. The questions in Part C related to the usefulness of this experience (the treatment) in the process of learning are shown in Table 9. Three out of four answer averages were above 4.0, with a 3.909 average for Question 12. (Subjects 3 and 5 were neutral about whether this experience made the course more interesting.) The most telling conclusion was that students were convinced of the principles and practices of proper code-writing (Question 10, with the highest answer average of 4.273).

All subjects shared their opinions about this experience by answering the open-ended Question 13 in Part C, and only those answers related to the treatment are shown in Table 10. Among these 11 answers, 7 showed the effectiveness of this negative experience. One answer (Subject 2) was about the course in general, which is irrelevant to the question. Two subjects (10 and 11) mentioned aspects of this exercise that are irrelevant to proper code-writing practices. One

subject (5) agreed on the importance of such programming practices, but his/her agreement stemmed from long-established similar practice in another field.

Table 9. *Subjects' Answers About the Usefulness of the Experience in Learning*

Questions on the experience for learning: Part C, Questions 9 through 12				
Subject	**Q9: . . . helped me understand . . .**	**Q10: . . . convinced me to adhere . . .**	**Q11: . . . helped me retain . . .**	**Q12: . . . learning process . . . more interesting**
1	5	5	5	5
2	4	4	3	5
3	5	5	5	3
4	5	5	5	5
5	4	4	4	3
6	5	5	5	5
7	4	5	4	4
8	5	5	5	4
9	4	4	4	4
10	4	5	5	5
11	5	5	5	5
Avg.	4.091	4.273	4.091	3.909

Table 10. *Subjects' Subjective Feedback About the Experience*

Part C Q13: Please tell me what you think about going through this exercise	
Subject	**Answer (only feedback related to the treatment is shown below)**
1	I think this was an excellent exercise because it reinforces all of the lessons we have learned in formatting and structuring code. Sometimes the examples in lecture and the book don't display it as well because they follow the convention, but the code in part B shows a clear example of why those conventions have been developed and taught. If I had to do part B in real life, I would probably write the person an e-mail afterward and explain to them that their code is difficult to debug and that I hope I don't have to do so again in the future.
3	Before going through this exercise, I felt like I was simply adding comments

	to my code just to add them, but I now see and understand how important it really is. If the developer in Part B would have added comments and spaced and indented the code, it would have made it a lot more organized and easier to understand.
4	I felt that this exercise helped me really hone my skills as a program developer and code analyst. It helped me further realize the importance of structure and the high necessity of proper usage of syntax, variable declarations, and initialization.
6	I enjoyed the time-crunch and the idea of finding bugs in someone else's program. The exercise definitely demonstrated how difficult it is to read poorly formatted code. Before the class, I would have imagined C++ would require a very specific style of input, just like the one we do. I was surprised that it didn't, and I'm glad to be learning how to do things in a way that is easy to understand. I think this homework would make a great 3-part quiz. It would certainly help enforce the time crunch.
7	This exercise made it much more clear how detrimental poor construction of a program can be. The spaces, indentation, and comments are not just to be aesthetically pleasing; they actually make a huge difference in the clarity of the program, which is hugely important since all programs must be usable by people outside of the person who constructed it, in order to be of any use at all.
8	This exercise was very beneficial to proving the point about how to effectively write code. Adhering to strict guidelines for format and commenting is important. The code above was very difficult to decipher and even more difficult to debug. This drove home the need to be disciplined when writing code, not just for the programmers' benefit but for others that will ever use or read the code.
9	This was a fun exercise to show how to look at code without a computer. It's a good way to go about debugging and also shows how *[sic]* importance of proper coding techniques.

Discussion

This exploratory study demonstrated that the use of a negative experience changed the beliefs of this group of subjects. Two subjects underwent a change so extreme that they went from "strongly disagree" to "strongly agree" when they rated the usefulness of practicing structured programming and proper program-code formatting. Some subjects' beliefs were unchanged because they had already accepted the positive attributes of such practices. One subject (Subject 5) already believed in the importance of neat work because of his/her previous career. All subjects affirmed the usefulness of such an experience in helping them learn the importance of proper code-writing practices.

In addition to writing code, programmers need to read other programmers' code (Lefkowitz, 2005). This study brings up the importance of giving debugging assignments to programming

students, besides asking them to write programs. Requiring students to read and debug other people's programs benefits their future in the software development field.

According to Valentine (2004), research about education in Computer Science needs more empirical investigations than "I went there and saw that," self-promotion, or description of tools. In this study, a before-and-after experiment was performed based on an established theory. However, this research had two limitations: the small number of subjects and the lack of opportunity to do in-depth interviews with the subjects to collect more qualitative data. The subjects in this study were participating in an intensive four-week course, and many of them were also working full-time. It would not have been considerate to require them to make appointments for in-depth interviews. These limitations prevent the results from being generalized to situations beyond this study. More research is needed in the future.

Future Research Directions

The next step to this study is the formulation and large-scale validation of applying the Deep Smarts Theory to the learning of structured programming. The theory formulation can be formally based on a qualitative study with a group of students (subjects) who have the time to contribute to such a project. The large-scale validation of this theory can be done with a similar experiment with more subjects and the proper inferential statistical analysis.

Second, besides validating such a theory with students in an online beginning programming class, other settings can also be investigated: an on-site programming class at the beginner's level, middle level, or advanced level. It can then be seen how students of different levels and learning in different settings benefit from the Deep Smarts Theory.

Third, further research can be done on the experience used for the changing of pre-existing beliefs. As for negative experiences, we need to investigate how negative an experience must be in order to change the pre-existing beliefs of learners. In addition to negative experiences, other types of experiences can be investigated for improving learning. Such research can be done to advance the Deep Smarts Theory.

Fourth, the technical issues of the proper application of the Deep Smarts Theory to teaching programming can be further explored. Such issues can include the amount of time the students are given to solve the problem, the use of different assignment formats, such as doing a face-to-face lab session, the use of a group or individual setting, and doing it with a computer-aided software engineering tool or on paper only, etc.

Fifth, besides structured programming and proper program-code formatting practices, more research can be done on the proper application of the Deep Smarts Theory to teaching other Computer Science subjects beyond Programming.

Sixth, besides investigating this theory with beginning programming courses in undergraduate university programs, studying the applicability of the Deep Smarts Theory for learning programming with other types of programmers in other settings is another direction, such as experienced programmers, full-time programmers who are not students, and self-taught programmers, etc. Other settings can include corporate training and high schools, etc.

Conclusions

This research has performed an exploratory study on the application of the Deep Smarts Theory to learning structured programming and proper program formatting by conducting an experiment with students in an online beginner level C++ programming course. Overall, a negative hands-on experience is a useful tool in showing the students the importance of such programming principles and practices. This learning tool has also convinced them of such importance. The results of this study show the effectiveness of using the Deep Smarts Theory in the area of teaching computer programming at the beginner level. Further research directions are also developed to expand this research, so as to enhance the learning of other subjects in the area of Computer Science.

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Student Built Games in Economic Courses: Applying the Game Design Methodology as Another Approach to Deeper Learning

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Abstract
It is known in the economics education literature that experiments in classrooms enhance engagement and help students understand economics. We tried to go even further by requesting students create their own games in a very fast and intensive term and evaluate its effect on deeper learning. We find that adult students benefit from games played in class to understand technical economics concepts directly related to the game, but the games have no effect on other subsequent subjects. Game assignments, on the contrary, not only increase students' general economics understanding but, also very important, diminish the gap between high- and low-GPA students.

Key Words
Assessment, deeper learning, games, experiments, adult students, undergraduate economics, economics

Introduction

The purpose of this study was to examine and report the effects of utilizing the game design methodology (GDM) to enhance teaching and learning in higher education economics courses. The researchers developed a particular implementation of the GDM, used primarily in engineering courses, to facilitate a unique set of student activities in the Economics 203: Principles of Microeconomics at National University (NU). NU's unique format for accelerated learning (one month courses), coupled with a focus on adult learners, created an ideal test bed for implementation, data collection, and analysis of the GDM for online and onsite modes of delivery in higher education.

Students in the treatment group were commissioned to create original games to describe specific concepts in principles of microeconomics courses. During this specific study, these student-built games were assigned as projects in one onsite and one online course in 2011 and 2012, respectively. Additionally, two control groups (not using the GDM) were examined in 2010 and 2011. Both the control and treatment groups were facilitated by the same instructor and maintained the identical assessment measures and activities to mitigate possible experimental bias. Major findings from this research study included demonstration of the GDM as a viable means for increasing overall student performance and the additional benefit of further positive effects on historically lower-performing students.

In this paper we first present a literature review, where a broad focus on the influence of games in education is then narrowed to the application of game design in economics and adult students. Next, we describe the application of GDM to online and onsite microeconomics courses and the characteristics of the student population. Then we expand on descriptive comparative results and regression methods to identify causation effects of game assignments in exams and course-grade performance. Finally, we provide concluding remarks that highlight the overall benefits of GDM in general and its positive effect on closing the natural gap between low- and high-GPA students in particular.

Literature Review: From Experiments in the Classroom to GDM Justification

Educators from all disciplines are looking for ways to engage students and interest them in deeper learning in their respective fields (Shaffer, 2008). The traditional classroom environment, using an industrial approach towards education, has proven a challenge in promoting effectiveness, especially in the STEM+ fields, including economics. Games and game design have been shown to be one way of creating an interactive environment, where students and teachers are able to expand the traditional lecture assignment structure to include a more stimulating and pragmatic approach to education (Durham, McKinnon, & Schulman, 2007; Jaurez, Fu, Uhlig, & Viswanathan, 2010; Prensky, 2008).

Games as a method for teaching and learning have been integrated into many classroom settings and are proving to be a powerful tool in engaging and motivating students (Lewis & Massingill, 2006). Students and teachers using the playing of games for education will often question the value of this type of exercise and its ability to convey course materials in an effective manner. Research has shown that games do have a positive effect on student performance and the ability to create meaningful learning environments (Magerkurth, Cheok, Mandryk, & Nilsen, 2005). Additionally, it has been recognized that classroom games have multiple benefits, including motivation and engagement, active learner participation, knowledge retention, and insights about links between theory and practice (Billings & Halstead, 2005). Instructors have developed many games to incorporate key economics, finance or nursing concepts, and used formats from game boards like Monopoly to TV shows like *Who wants to Become a Millionaire?* (Horsley, 2010).

In classrooms, both in online and onsite environments and from nursing to computer science, the expansion of project-based and constructivist learning into the use of simulation and simulation games has been shown to be a method that allows students to interact with topics and subjects in a unique and deeper way (Glendon & Ulrich, 2005; Lewis & Massingill, 2006). Often the immersive qualities of game play, be it paper or computer-based games, allows students a view of subject matter that not only demonstrates the concepts or desired outcomes in a course but succinctly reveals the often complex relationships between different topics and allows students the opportunity to test those associations. Furthermore, while playing subject-matter-based games, students can iterate through or against challenges that represent the systemic relationships between a range of variables or subjects in the course. This iterative nature of games also has been shown to cause students to learn through testing in a fault-tolerant environment (Fullerton, 2008).

The game design methodology (GDM), as created by the researchers, involves the use of student-built games as a vehicle for classroom teaching and learning (Jaurez et al., 2010; Prensky, 2008). In this game-design environment, students are commissioned to create original games that describe and demonstrate any number of course concepts. By having the students build the games that demonstrate course learning outcomes and the often-complex relationships between course content, students are moved towards a system-based perspective of the discipline (Jaurez et al., 2010). This system-based perspective shows the relationships between subjects and concepts in the field and gives a deep understanding of the forces that govern these relationships (Jaurez et al., 2010; Prensky, 2001).

In order for students to create games, they must first understand the basics of game design and the tools required to build their games. Since the student is not a student in a game-design–related field, this additional knowledge and skill is in addition to the traditional coursework. This

conveyance of these often-new game-creation skills would have to minimize the overhead while providing the necessary elements to enable the students to be successful in designing their games (Jaurez et al., 2010).

In implementing the GDM in economics courses, the minimizing of overhead associated with learning the game-design skill was facilitated through the use of online resources designed to teach the elements and tools of game design through playing of generic games (Jaurez et al., 2010; Morrison & Preston, 2009). While demonstrating and then playing simple games, students learn how the game is put together and the components common to game creating. These components include characters in the game, specification, rules, procedures, objectives, challenges, and even dramatic elements that motivate the game play (Aldrich, 2004; Fullerton, 2008). The approach of asking students to develop their own games using economics concepts within the rules and strategies is more or less the same approach science school teachers use when asking their students to develop control-variable strategy experiments. Many studies had found that a combination of lecturing and hands-on experimentation gives better learning outcomes than lecturing alone or experimenting alone, emphasizing that explicit guiding is critical to efficient, faster, and effective learning (Lorch et al., 2010; Rieber, 2005). In our case, we want to enhance the hands-on aspect of experimentation that is found positive in the literature by requesting students to create their own games and evaluate its effects.

Durham et al. (2007) performed a detailed three-year study to evaluate the effects of classroom experiments in overall learning, learning styles, attitudes about economics, and retention for principles of both microeconomics and macroeconomics. In general, the authors concluded that the start-up costs and time class costs of implementing experiments may very well be balanced by improved knowledge, attitude, and retention. More interesting, they found that not all experiments produce the same benefit; some have high positive effect, others nothing, and still others negative effect. It seems experiments improve learning when dealing with abstract and difficult-to-understand concepts, but generate enthusiasm only with less complex topics (Durham et al., 2007). Kinesthetic and multimodal learners, 16% and 71% of the sample respectively, benefitted the most, and the read-write learners (4% of sample) performed just as well in the traditional lecture/discussion format. Visual and aural learners, 2% and 7% of the sample, respectively, benefited only in the macroeconomics sections. This distinction about topics and experiments that engage some students but not others, coupled with the recognition of different students' styles of learning, suggests to us that empowering students as game designers may be better than just allowing them to play games designed by professors.

Dickie (2006) demonstrated that experiments combined with grade incentives are no better than just experiments alone. In fact, the non-incentive group outperformed the incentive group, measured by the difference between pretest and posttests of the Test of Understanding in College Economics (TUCE) scores. Dickie asserted that there is no doubt that

> . . . integrating classroom experiments into the introductory microeconomics curriculum increases learning, whereas use of grade incentives offsets this positive impact. Perhaps the effort students devote to earning grade credit crowds out the attention they would otherwise pay to the economic lessons conveyed by the experiments. (p.283)

This conclusion coincides with Holt's (1999) argument that grade incentives distort teaching objectives. We found during our study that when commissioning students to create and develop their own games, extra credit is not necessary.

According to Dickie (2006), conducting experiments provided ancillary objectives and added value apart from the gains in achievement measured by the TUCE. Learning may not be confined

to the topics of the experiments and often expands into other professional skills (Emerson & Taylor, 2004). Students may learn something about conducting experiments or about testing theories. Also, students seem to enjoy participating in experiments and may recognize that experiments aid learning. We think these complementary benefits could be even more relevant when students create their own games because of the development of skills that are usually not present in traditional assignments.

According to Shaffer (2008), learner engagement is correlated with mindfulness, attention, cognitive effort, and intrinsic motivation. It is important to distinguish external from internal motivation because students do not get the same learning engagement from one or the other. External motivation engages students in activities to meet a predetermined end, for instance, writing a paper to meet grade requirements or completing a quiz to prepare for exams; while internal motivation engages students in activities for their own sake. It is unclear whether external and internal motivations are negatively correlated, but it seems that learning engagement is reinforced when internal motivation is significantly present (Lepper, Corpus, & Iyengar, 2005; Lim, 2008). We think that asking students to create their own game is a self-driven activity or internally motivated. During our study we had witnessed that game assignments in economics make students spend much more time and effort than any other assignment, and students allocate so much effort towards the assignment that it seems the grade-external motivation plays no role in that engagement decision. Of course, students want good grade recognition at the end because they realized their creative product is something they are proud of, but grade was not their driver.

Economics professors make efforts to use experiments or games in the classroom to teach students key concepts that are complex in nature. These concepts are, for instance, contracts and shirking, R&D decisions, bond, stock markets and risk, exchange rate and PPP, inflation, real and nominal interest rates, free-rider, and public-goods problems (Gächter & Königstein, 2009). Playing the games or experiments designed by instructors in economics classrooms does not guarantee students will learn how to "be" an economist, i.e., think like an economist.

We agree with the previous idea that merely playing games does not guarantee learning. We found that many students in our classes, if not the majority, did not realize what they were doing in classroom experiments until we ran the debriefing section. Sometimes, this is exactly the purpose of the game, when games are played before previous instruction of key concepts, and sometimes players "see the trees but not the forest" during playing time. Such experiments contrast with video games like Rollercoaster, Tycoon, or Neverwinter Nights, where players immerse into a process of doing and being and assume characters, roles, and behaviors to the point that players change identities to become doctors, researchers, or managers (Lim, 2008). The ultimate objective of teaching economics is to create learning experiences for students to think and act like economists. This seems to be already created for an introductory microeconomics class at the University of North Carolina at Greensboro (http://web.uncg.edu/dcl/econ201/). However, most economics professors are not video game experts, and most students are not graduate students of economics, so it is unrealistic to think that economics professors will develop such rich games that incorporate doing-and-being characteristics.

Our student population at National University is composed primarily of adult learners, and we found in the literature that adult learner characteristics can benefit from GDM. Adult learners, depending on their age and maturity, usually bring prior knowledge, plus work and life experiences, to the classroom. More precisely, the five main characteristics of adult learners are that they (a) are independent and self-directed, (b) value life experience with age, (c) want learning to be linked to required tasks, (d) focus on problem-centered learning, and (e) are primarily

motivated by internal sources (Merriam & Caffarella, 1999). Given these characteristics, it seems appropriate to embrace a learning environment where teachers are more learning facilitators and instructors empower students during the learning process (Knowles, Holton, & Swanson, 2005). Last, according to Lim (2008), empowering students to take charge of their own learning experience was the most positive way of having them embrace the learning process.

Asking students to develop their own games empowers them in the lines of Knowles' andragogy theory (Knowles et al., 2005). Students apply economics concepts to situations they are familiar with and that are relevant to them (foundation and readiness in the Knowles theory). Learning becomes problem-centered rather than content-oriented, students focus on the concepts they want or need to learn in order to develop their games, and students find their own self-motivation to accomplish the assignment (orientation, self-concept, and motivation in Knowles' theory).

The benefit of asking students to create their own game, even if it does not work or look as a finished product, is the deeper understanding of economics. Rieber (2005) and Prensky (2008) have demonstrated that most learning happens during the creation of games rather than from the resulting games. Modeling, designing, and testing enhance subject learning, and students achieve deeper levels of learning (Jaurez et al., 2010).

Description of Pilot Study and Data

This study was conducted at National University, a private non-profit teaching university that offers onsite and online programs, the second largest in California. Most students are working adults who take one class per month, and a regular Principles of Microeconomics class (ECO203) is taught in 4 weeks.[3] ECO203 is a core course for general education and the Bachelor's of Business Administration at the School of Business and Management. The quasi-experimental study was conducted by the same instructor in four sections—two onsite (February 10 and November 11) and two online (March 11 and March 12)—between February 2010 and March 2012, with a control and game application for both onsite and online.

All four sections used Gwartney's *Microeconomics: Private and Public Choice,* covering 3 chapters every week. Students learn the Basics of Economics and Markets (chapters 1, 2, and 3) during the first week, Supply & Demand Applications, Elasticity and Production Costs (chapters 7, 4, and 8) during the second week, Price Taker and Price Searcher Markets (chapters 9, 10, and 11) in the third week, and finally Resource Markets and the Role of the Government (chapters 12, 13, and 5) in the fourth week. All sections have three exams, held in succession at the end of weeks 1, 2 and 4, respectively. Each exam covers the material presented since the preceding exam, and the third exam includes eight questions that test for course-learning outcomes.[4]

[3] A full-time undergraduate student in a quarter-system takes 3 courses (12 units) in 10 weeks, or 3.3 weeks per class. National University offers the same class in 4 weeks and students focus only in one topic during the month instead of 3. This format fits well the need of working adults who want to earn a degree while continuing to work.

[4] Exam 1 covers the material of week 1, exam 2 covers the material of week 2, and exam 3 covers the material of weeks 3 and 4. All questions were the same for all 4 sections except February 10; this section has only two exams at the end of weeks 2 and 4. By the middle of 2010, the department of Accounting, Finance and Economics decided to split the midterm into two exams (exam 1 and exam 2). There were no changes in the course learning outcome questions that are used by all microeconomics sections at National University.

Pilot-Study Description

The onsite environment had control and treatment sections. The control section (February 10) had 10 regular lecture sessions of 4.5 hours each, and asked students to write a short paper due by the end of week 3. The treatment section (November 11) had 8 lecture sessions, 1 session (second class) for a double-auction market experiment played in class, and 1 session for a game-paper workshop (Saturday, week 3) and asked students to write a group game paper due by the end of week 4.

The double-auction market experiment is a modified version of Bergstrom and Miller (1997) to make students transact in the market as buyers or sellers and adjust to price controls. These students were not lectured previously about market equilibrium and became extremely engaged in the experiment. After students were exposed to the rules of the game, they played eight rounds selling and buying, recording their earnings and accommodating to price controls. Players were asked to report their transacted price to the instructor, and the average price of the market was made transparent to all players after every round. At the end, prizes (NU gadgets) were granted for the buyer and seller with the highest earnings and the debriefing section took place. The debriefing explained the theory of market equilibrium, the specific location of each player in the Demand and Supply curves, the expected winners and the difference of the theoretical result with the data from the market game. Particular attention was placed on showing the game engine in Excel and how it calculates and graphs all relevant information. It was expected that this game in class would not only enhance the understanding of supply, demand, market equilibrium, and price controls but also be a good support in game methodology for students to develop their game assignments.

The group game paper asked students to design a game that incorporates microeconomic theory in the rules and strategies and has an Excel engine that makes all the necessary calculations during the game, computes the winning rule, and supports the debriefing section. It was expected that at the end of this assignment students would understand economics at a deeper level and learn how to differentiate theoretical results from real situations; gain Excel skills, team-working skills, and game-creation skills that would be useful in their working environments; reinforce their writing and presentation skills; and finally learn economics by doing it and having fun. The paper itself included 5 sections (Abstract, Instructions and Rules, Game Board and Engine, Microeconomics Debriefing Section, References, and Appendix) and was to follow the same APA style required in traditional papers at our School. The instructor support included not only the access to all materials from the double-auction market game played in class, but also continuous references about economic concepts that can be part of rules and strategies during lectures and a 4-hour-long workshop devoted entirely to game creation, game boards, and engines with the instructor and Dr. James Jaurez. In addition, students had access to online materials developed by the Catalyst group at National University since week 2 of the term. The results were four great papers with titles like “Mo’ Money,” “Urban Jungle,” “Smart TV,” or “Bang for Your Buck.” None was a double-auction market type. Students became so involved with this assignment that some groups remained after class coordinating their projects, met during weekends, and showed graphic/Excel/design skills and interests that usually do not come in regular microeconomics classes.

The online environment also contained control and treatment sections. The control section (March 11) had 8 live sessions (2 hours each) that were interactive lecture/discussions using Class Live Pro (CLP), weekly threaded discussions, and the same individual paper required in

the onsite control section (due by the end of week 3). The treatment section (March 12) differed from the control only in the written assignment.

The online game assignment was exactly the same as the one asked to the onsite treatment section (November 11), but there were critical differences in terms of instructor's support. Online students did not play the double-auction market game in class as their onsite fellows did, but received much more information. In addition to the Catalyst online support, they had access to all games created by students early and the complete information about the market game experiment. Instead of the 4-hour workshop onsite students had, online students got three live tutoring sessions devoted to the game assignment (Saturdays, weeks 1–3, each 3 hours long). In terms of engagement, these online students were as engaged as or more engaged than the onsite students. Some groups met independently every night using CLP, all groups remained in break-out rooms after the eight live sessions, and suddenly there were always students attending the weekly live office hours. The resulting game assignments were as fantastic as the ones created in the onsite, with titles like "Pay Check to Pay Check," "Opportunistic Chairs," "CostNomics," "Branding," "Design Your Life," or "Pump It Up."

In summary, the control sections onsite (February 10) and online (March 11) were regular lecture interactive classes with no game component. The treatment onsite section (November 11) played the double-auction game in class and requested a paper game assignment. The treatment online section (March 12) passed information about the double-auction game only and requested a paper game assignment.

Data Description

National University runs small sections, when these are compared to large public universities. The enrollments for the two onsite sections were 17 and 18, respectively, and 26 and 28 for the online, as shown in Table 1. Multiple sections of microeconomics were offered in the months of February 2010, November 2011, March 2011, and March 2012, and the Academics office distributed students randomly, with the only condition to equalize size for all onsite and online sections, respectively. Students and instructors did not have control on enrollment allocation. So we think the condition of random allocation for control and treatment sections was met.

The average age at the time of taking microeconomics was 33.7 years old; and as can be seen in Table 1, all sections, online and onsite, had age means that are not statistically different. On terms of gender, the probability of being female was 48.3% for all students, but onsite sections showed a much lower percentage, below 30%. So, given that it was found in the literature that female students perform worse than male students, we expected the female factor to be over-emphasized in the online sections. Most of the students were business majors, 66.7% in general. Although the onsite control section had a statistically significant lower business-major presence (only 42%), we found that business major was not a relevant factor to condition student scores in our study. It may be that previous training in economics would have been a more relevant factor. The average GPA at the time of taking microeconomics was 2.87 ("GPA before" in Table 1) in a scale where 3.0 is B, and this factor was homogenous through all four sections in our study.[5]

[5] National University accepts undergraduate students if they graduated from a regionally accredited high school with a minimum GPA of 2 (C). It also accepts transfer students if they graduated from high school and have a cumulative GPA from all schools and universities of 2 or better (C or better) (National University, General Catalog 2012, p. 60).

Table 1. *Student Population Characteristics*

	Online		Onsite		
	Treatment	**Control**	**Treatment**	**Control**	
	Mar 12	**Mar 11**	**Nov 11**	**Feb 10**	**All**
N	28	23	17	19	87
Business school	0.75	0.78	0.71**	0.42	0.67
GPA eco	2.74	2.69	2.98	2.59	2.74
GPA before	2.92	2.80	2.89	2.71	2.87
Units before	20.68*	34.26	36.29***	18.84	26.92
Online units before	21.86	26.61	2.12***	0.47	3.24
Gender (female)	0.68	0.57	0.29	0.26	0.48
Age	32.86	36.76	35.17	30.42	33.70

* means control and treatment are not equal at 10% significance
** means control and treatment are not equal at 5% significance
*** means control and treatment are not equal at 1% significance

Comparative Results and Regression Analysis

Comparative Exam Results in Control and Treatment Sections

Exam 1 focused on demand, supply, and basic market equilibrium concepts. The double-auction market game played in the classroom reinforces these concepts directly. If this game enhances comprehension and mastery of these concepts, we would expect onsite students (November 11) who played this game to perform better in exam 1 than students who didn't. The exam 1 scores confirmed this expectation, as shown in Figure 1. The average student in the onsite game section scored 83.6 points, while the average students in the online treatment and control sections scored 76.6 and 73.2, respectively. The 10-point difference between the online treatment and onsite control was enough to reject the null hypotheses that mean and median are the same for these sections at the 1% significance level.[6] However, within the online environment, the higher mean and medians for the treatment section were not statistically different from the scores in the control section.

Exam 2 focused on elasticity and costs; it built on supply and demand elements from the previous week but had no direct relationship with the double-auction market game played in class. This exam had no direct relationship with the game assignment either because students focused on their assignment after this exam was taken. The exam 2 scores in Figure 1 show that the average student in the onsite game section scored 72.8 points, followed by the average

[6] We used EViews for all our calculations, and the test of hypothesis for equal mean included *t*-test, Satterthwaite-Welch *t*-test, Anova *F*-test and Welch *F*-test. All of them rejected this hypothesis at 1% significance. The tests for equal medians included Wilcoxon/Mann-Whitney, Chi-square, Kruskal-Wallis, and Van der Waerden; all rejected this hypothesis at 1% significance.

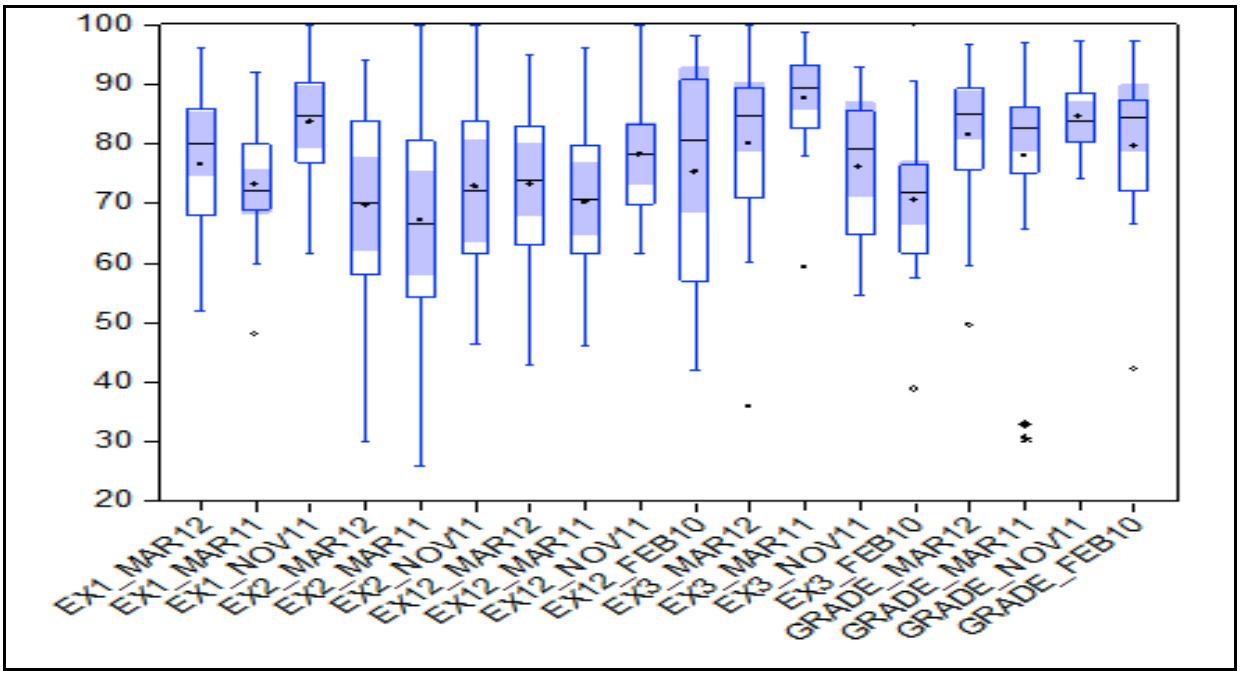

Figure 1. Boxplot exams and course grade online and onsite.[7]

student in the online treatment section with 69.7 points and the online control with 67.1 points. However, we could not reject that these means (and the medians) were the same. Given that exam 2 was not directly related to the experimental game experience, we did not make any econometric analysis for it.

Exam 3 focused on competitive and non-competitive markets, the markets for resources, and government intervention. The market game played in class during week 1 applied government price controls, and we expected the engagement of students with their game assignment would have some influence in exam 3 scores. Comparing the onsite sections, the average student in the treatment section scored 76.1 points versus 70.5 points in the control. However, this difference is not statistically significant and we can't reject the hypothesis that both means are equal. The results for the online sections show the average student in the control section scored 87.6 points versus 80.1 points in the treatment section, and the hypothesis that these means are equal was rejected at 5% significance.[8] Furthermore, the variance in the game section is higher and we rejected the hypothesis that both variances are equal at 10% significance.[9] A lower mean and higher variance in the section with games is certainly not good for education purposes. These results coincided with some comments written by students in the evaluation of the class and

[7] A boxplot illustrates the maximum and minimum observations, the first and third quartiles, and the median for the respective exam. Dots inside boxes are the means and dots outside represent outlier observations. The shaded area represents approximate confidence intervals for the median and are useful to compare differences in medians between exams. If the shaded areas do not overlap, then the medians are significantly different at a 95% confidence level (EViews 7 User's Guide I, 2009).

[8] The tests performed in Eviews that rejected the null hypothesis were *t*-test, Satterthwaite-Welch *t*-test, Anova *F* test, and Welch *F*-test.

[9] The tests performed in Eviews that rejected the null hypothesis were *F*-test, Bartlett, and Levene.

private emails to the instructor after taking exam 3, that the game assignment consumed most of their time in week 4 and they didn't have time to study for exam 3. We will test whether the differences in exam 3 scores are caused by the game played in class and the game assignment.

The overall grade reflects the performance of students considering all grading elements; exams are only 61% of the grade. While exam 1 and exam 3 focused only on the understanding of microeconomics per se, the overall grade captured also the performance in discussions, papers, and presentations. Within the onsite sections, the average student of the game section scored 84.6 points, 5 more points than the average student in the control section. This difference was not enough to reject the hypothesis that both means are equal, or both medians are equal. However, we could reject the hypothesis that variances are the same at 5% level of significance.[10] Similarly, within the online sections, the average game student scored 81.5 points, 3.6 points higher than the control average student. This difference was not enough to reject the hypothesis that both means are the same. However, the variance for the game section was lower, and we rejected the hypothesis that both variances are the same at 5% significance.[11] We think that reducing the variance around a higher mean is significant for learning purposes. Somehow the negative effect we identified with exam 3 was compensated at the end in the final score.

Regression Analysis: Model and Results

Following Dickie (2006), the general model to test for the effects of games in the performance of students in exam 1, exam 3, and course grade was the following:

$$\mathbf{Yi} = c + di1\,\delta 1 + di2\,\delta 2 + \left(\mathbf{Wi} - \overline{\mathbf{W}}\right)'\boldsymbol{\beta} + di1\,(\mathbf{Wi} - \overline{\mathbf{W}})'\boldsymbol{\gamma 1} + di2\,(\mathbf{Wi} - \overline{\mathbf{W}})'\boldsymbol{\gamma 2} + \varepsilon i$$

This model assumed that the $\mathbf{Yi}$ vector of dependent variables (exams 1, 3, course grade, and course learning outcomes) depends on treatment variables di1 and di2 (game in class and game assignment) that take the form of dummy variables. Control variables are introduced in the model to avoid omitted variable bias for the treatment variable coefficients.[12] These control variables are age, GPA, number of units taken previously, number of online units taken previously, gender (female = 1, male = 0), program chosen (business = 1, other = 0), and class type (online = 1, onsite = 0). All these control variables, $\mathbf{Wi}$, were measured before students had taken microeconomics, and could not be affected by the quasi-experiment. Control variables were mean centered in the model, $\left(\mathbf{Wi} - \overline{\mathbf{W}}\right)'$, to simplify interpretations of coefficients (Dickie, 2006). Interaction of treatment variables with control variables was also allowed to test for the effect of games, given some student characteristics. The unknown coefficients were the constant *c*, $\delta 1$, $\delta 2$, and vectors $\boldsymbol{\beta}, \boldsymbol{\gamma 1}, \boldsymbol{\gamma 2}$.

Under the assumptions of OLS for quasi-experimental regressions (Stock and Watson, 2006, 479) including that the error term is conditionally mean independent of experimental variables, given control variables $\mathbf{W}$, it follows that

[10] The tests performed in Eviews that rejected the null hypothesis were *F*-test, Bartlett, Levene, and Brown-Forsythe.

[11] The tests performed in Eviews that rejected the null hypothesis were the *F*-test and Bartlett.

[12] This model assumes that control variables are correlated with the error term but treatment variables are not. This is the conditional mean independence assumption of ordinary least square (OLS) models for quasi-experimental models (Stock & Watson, 2007, p. 478).

$$E(yi|Wi = \overline{W}, d1 = 1, d2 = 1) = c + \delta 1 + \delta 2,$$
$$E(yi|Wi = \overline{W}, d1 = 0, d2 = 1) = c + \delta 2, \text{ and}$$
$$E(yi|Wi = \overline{W}, d1 = 0, d2 = 0) = c,$$

so that the constant term *c* measures the mean dependent variable for the average student in the control groups onsite and online. Given that $\delta 1$ *and* $\delta 2$ measure the effects of playing the game in class and the game paper assignment, respectively, the mean dependent variable for the average student that played the game and wrote a game assignment would be $c + \delta 1 + \delta 2$, and the respective score for a student who wrote a game assignment but did not play a game in class would be $c + \delta 2$. Regressions were run for all dependent variables using OLS and considering heteroskedasticity to have consistent standard errors and co-variances, white heteroskedasticity.

The results of how the market game in class affected the results of exam 1 in the first week of the term appear in Table 2. Model 1 tested the effect of the game in class (DGC) and controls for gender, GPA, and age, all in mean centered form (MGENDER, MGPA and MAGE, respectively) and all were significantly different from zero. The average student who participated in the game in class performed 6 points above a student who did not have that experience, and this result held with more complete models too.

Table 2. *Exam 1 and the Effects of Game in Class and Preconditions*[13]

	Model 1			Model 2		
Variable	**Coefficient**	***t*-Statistic**	**Prob.**	**Coefficient**	***t*-Statistic**	**Prob.**
C	76.72388	51.86758	0	76.84694	52.1701	0
DGC	6.128197	2.17815	0.0331	5.978362	2.168931	0.0339
MGENDER	–7.040818	–2.759212	0.0076	–7.260473	–2.864038	0.0057
MGPA	5.218598	4.935688	0	6.038296	5.561595	0
MAGE	–0.225672	–1.978188	0.0523	–0.210127	–1.84351	0.07
DGC*MGPA				–3.825142	–1.622777	0.1097
R-squared	0.356874			0.37282		
Adjusted *R*-squared	0.31604			0.322241		
F-statistic	8.739748			7.371027		
Prob (*F*-statistic)	0.000011			0.000018		
Akaike criterion	7.470074			7.474379		
Schwarz criterion	7.633273			7.670218		
Hannan-Quinn crit.	7.534738			7.551976		
Durbin-Watson stat.	2.149391			2.19216		
Observations	68			68		

[13] These regressions have Exam 1 as a dependent variable, use Least Squares, and include White Heteroskedasticity-Consistent Standard Errors & Covariance.

Control variables showed that female students made 7 points less than male students and that older students made 0.2 points less than younger students. These two findings have also been found in studies with traditional students at research universities. When interaction of the treatment and control variables were added (Model 2), only DGC*GPA was statistically significant at 5% level. Although *F* and *LM* tests suggests that none of these three interactions belong to the model, we kept DGC*GPA in Model 2, given its high *t*-statistic.[14] Given the negative sign of this interaction, games in the classroom helped "less able" students to perform 4 points better than "more able" students. This coincided with previous studies that found the same result for a younger type of population. On the other hand, games do not improve or reduce the performance of female students who are already in disadvantage to male students when taking microeconomics. Age is a negative factor to consider when taking microeconomics, but the size of this factor is less than 0.25 points. It seems age in adult economics education is not a determinant factor like gender or GPA.

Table 3 shows the effects of the game assignment (DGP) in exam 1. The control variables were gender, GPA, and age in Model 1, all except age being relevant. Age was not statistically significant at 10% and for this reason will not be considered in subsequent models. When interactivity between the treatment and control variables were allowed (Model 2), individual *t*-tests and group *F* tests rejected their relevance in the model. Given that the game assignment was required in onsite and online environments, we tested if MTYPE, or the interaction DGP*MTYPE, was relevant to predict exam 1. It turns out that type does not condition the score for the first exam, nor the interaction with DGP. However, we found in Model 2 that MGPA*MTYPE is a powerful factor that suggests good students in online sections would almost double the points of good students in onsite sections (4.6 + 4.3). After we insert the control variables that are statistically relevant in Model 2, students who got the game assignment performed 6 points higher than students with no game assignment. It seems this assignment not only engaged them but also motivated them to study more and consequently perform better. The average female student gets 8 points less than male students, and the game assignment did not improve or reduce this gap. Therefore, age is not a factor, and students with higher GPAs perform better.

Exam 3 was taken at the end of week 4, covered all the material learned in weeks 3 and 4, and had no relationship with the game performed in week 1. These were also the weeks that students focused on their written assignments, a regular paper due in week 3 for the control sections and a game assignment due in week 4 for the treatment sections. The results are presented in Table 4. Model 1 incorporates the treatment variable DGP, the control variables for gender, GPA, age, and type (online versus onsite), as well as the interaction of the treatment and control variables. After statistical tests to remove redundant variables in Model 1, and using model-selection tests to find the best model, the remaining variables are in Model 2.[15] Notice that student characteristics, such as gender and age, did not condition grades for this exam. More important, the treatment variable DGP does not cause any effect on the variations of exam 3 in general, but the interaction DGP*MTYPE did. As it can be seen in Model 2, the

[14] A test for the redundant variable DGC*MGPA for Model 3 returns Prob $F(1,62) = 0.2140$ and Prob Chi-Square (1) = 0.1913. So we cannot reject the hypothesis that this variable does not belong to the model.

[15] The 3 criteria are Akaike information criterion, Schwartz criterion and Hannan-Quinn criterion. All are provided in Table 4.

Table 3. *Exam 1 and the Effects of Game Assignment and Preconditions*[16]

	Model 1			Model 2		
Variable	**Coefficient**	***t*-Statistic**	**Prob.**	**Coefficient**	***t*-Statistic**	**Prob.**
C	74.52988	37.34407	0	74.31183	41.33187	0
DGP	5.812785	2.276328	0.0265	5.908976	2.501716	0.015
MGENDER	–6.084411	–1.760577	0.0835	–8.144015	–3.440941	0.001
MGPA	6.137653	3.764642	0.0004	4.336059	3.728742	0.0004
MAGE	–0.267414	–1.904156	0.0618			
DGP*MGENDER	–2.166014	–0.449988	0.6544			
DGP*MGPA	–1.25978	–0.563847	0.575			
DGP*MAGE	0.056978	0.254811	0.7998			
DGP*MTYPE	–3.823927	–1.149462	0.255			
MGPA*MTYPE				4.565592	1.872196	0.0658
R-squared	0.383934			0.36579		
Adjusted *R*-squared	0.3004			0.325522		
F-statistic	4.596129			9.084028		
Prob (*F*-statistic)	0.000215			0.000007		
Akaike criterion	7.544733			7.456114		
Schwarz criterion	7.838492			7.619313		
Hannan-Quinn crit.	7.661129			7.520778		
Durbin-Watson stat.	2.278398			2.207629		
Observations	68			68		

average student taking an online course could do 15.4 more points than an onsite student, but if that online student worked in the game assignment, it is expected that the assignment's benefit would be only 5 more points (15.4 – 10.4). Within the treatment groups, online and onsite, the game assignment was not beneficial for exam 3. Online treatment students loved their game assignment but complained about the lack of time to study for exam 3.

Let us now consider the effect of the game assignment in the overall grade of the course. These results are summarized in Table 5. Model 1 contains the treatment DGP variable, the control factors of gender and GPA, and interactions showing that some of them are not

[16] These regressions have Exam 1 as dependent variable, use Least Squares, and include White Heteroskedasticity-Consistent Standard Errors & Covariance

Table 4. *Exam 3 and the Effects of Game Assignment and Preconditions*[17]

	Model 1			Model 2		
Variable	**Coefficient**	***t*-Statistic**	**Prob.**	**Coefficient**	***t*-Statistic**	**Prob.**
C	80.81228	51.33556	0	79.81378	71.37871	0
DGP	–1.536623	–0.663247	0.5092			
MGENDER	2.752851	0.757092	0.4514			
MGPA	7.713817	3.610506	0.0006	6.601462	4.699322	0
MAGE	–0.25115	–1.643588	0.1045			
MTYPE	15.78388	4.426333	0	15.39208	4.70139	0
DGP*MGENDER	–8.261604	–1.677376	0.0977			
DGP*MGPA	–1.818591	–0.654082	0.5151			
DGP*MAGE	0.056501	0.218134	0.8279			
DGP*MTYPE	–9.449869	–1.899884	0.0613	–10.40974	–2.217899	0.0294
R-squared	0.445626			0.389559		
Adjusted *R*-squared	0.378202			0.366668		
F-statistic	6.60932			17.01761		
Prob (*F*-statistic)	0.000001			0		
Akaike criterion	7.658712			7.612197		
Schwarz criterion	7.948095			7.72795		
Hannan-Quinn crit.	7.775041			7.658728		
Durbin-Watson stat.	2.217166			1.996879		
Observations	84			84		

statistically significant. After statistical tests to remove redundant variables, our preferred model is Model 2.[18] The game assignment has a 4.5-point positive effect after controlling for student characteristics. The average female student scores 4.5 fewer points than her male counterpart, and it seems games do not help to close this gap. High-GPA students tend to perform better, by 9.8 points, than low-GPA students, but the game assignment close this gap to 5.1 points (coefficient for DGP*MGPA).

[17] These regressions have Exam 3 as dependent variable, use Least Squares, and include White Heteroskedasticity-Consistent Standard Errors & Covariance.

[18] Model 2 includes MAGE*MTYPE. This variable is statistically significant, but its coefficient is only 0.35. So we keep the variable to avoid estimation bias in the model.

Table 5. *Overall Grade and the Effects of Game Assignment and Preconditions*[19]

	Model 1			Model 2		
Variable	**Coefficient**	***t*-Statistic**	**Prob.**	**Coefficient**	***t*-Statistic**	**Prob.**
C	79.60842	41.67917	0	79.1386	43.10151	0
DGP	3.675603	1.625478	0.108	4.522255	2.065539	0.0421
MGENDER	–4.365241	–1.080286	0.2833	–4.524746	–2.047662	0.0438
MGPA	10.18516	4.332544	0	9.811279	4.67245	0
DGP*MGENDER	0.037956	0.008307	0.9934			
DGP*MGPA	–5.841219	–2.225642	0.0289	–5.061563	–2.113334	0.0376
DGP*MAGE	0.029635	0.192984	0.8475			
MAGE*MTYPE				0.348775	1.77541	0.0796
R-squared	0.366462			0.391068		
Adjusted *R*-squared	0.318947			0.353479		
F-statistic	7.712506			10.40394		
Prob (*F*-statistic)	0.000001			0		
Akaike criterion	7.53428			7.471679		
Schwarz criterion	7.732687			7.641742		
Hannan-Quinn crit.	7.614172			7.540158		
Durbin-Watson stat.	2.095039			2.15951		
Observations	87			87		

Conclusions

Our study focused on the performance of adult students of microeconomics in a fast and intensive learning format of 4 weeks and tested how games played in class and assignments that requested students to develop their own games affected the learning of economics in technical and more general forms. In terms of the learning of economic theory per se, the game played in the classroom and the assignment to create games both positively affected the learning of specific economic concepts directly related to the game itself (6 more points), but not other concepts beyond the first week. We also found that gender and GPA are very strong factors to determine test scores of economic theory. As is found in the literature for younger populations (Emerson & Taylor, 2004; Dickie, 2006), female students tend to perform more poorly, by 4.5 points, than male students among adult students, and games do not alter this precondition. As is also mentioned in the literature (Emerson & Taylor, 2004, Dickie, 2006), we found that high-GPA students tend to perform better than low-GPA students, but the game played in class closed this gap significantly in our study. Traditionally low-GPA students who accomplished the game assignment realized an additional 5-point benefit to their final grades, beyond that of traditionally high-GPA students, closing the "natural" gap that both type of students have in microeconomics.

[19] These regressions have the course grade, GRADEECO, as dependent variable, use Least Squares, and include White Heteroskedasticity-Consistent Standard Errors & Covariance.

In terms of the learning of economics in a more general form that includes, in addition to tests, discussions, presentations, and written assignments, we found that students who experienced game assignments outperformed students who did not, by 4.5 points.

It is relevant to notice that the results of our study coincide with previous studies performed in traditional universities and younger populations, and that our results hold for regular onsite and online settings. We can argue that games motivate not only young students, as was found previously, but also adults with an average age of 33.7 years. We can also assert that asking students to develop their own games is an effective tool to learn economic theory and acquire/ develop soft skills. The challenge for instructors willing to incorporate this approach when teaching economics is to develop efficient support materials and increase time for office hours to compensate for the crowding-out effect that the game assignment had on end-of-course tests. We had no choice but to crunch the game assignment and exam 3 in the same week, but this could be easily re-designed in a regular term setting. Our study also showed that the distinction between online and onsite is not a significant factor to condition student scores. This result may be specific to our study, given that the same instructor taught both our onsite and online sections and had ample experience teaching online.

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Psychology

Assessing Counseling Students' Knowledge about Sexual Compulsivity: Implications for Training Curricula

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Abstract
Both the professional literature and the authors' clinical observation provide evidence of the need to educate potential clinicians about the assessment and treatment of sexual compulsivity. A survey completed with marriage and family therapy students in their clinical practicum showed a serious lack of ability to both accurately assess and choose effective treatment options for clinical vignettes depicting clients with sexual compulsivity. This article discusses potential curricula options for teaching these skills in graduate psychotherapist education programs.

Keywords
Counselor education, sexual compulsivity, graduate training curricula

Introduction

There is a growing awareness among psychotherapists about the increasing prevalence of sexually compulsive behaviors and the need for clinical treatment for clients exhibiting such behavior. Cooper (1998) estimated that between 7% and 10% of the United States population evidenced some form of sexually compulsive behavior. Wolfe (2000) noted that "one person in 20 experiences dysfunctional levels of compulsive behavior in one form or another" (p. 236). Other estimates of the prevalence rate of sexual addiction range from 17 to 37 million Americans (Carnes, 2001; Cooper, Delmonico & Burg, 2000; Morris, 1999). Cooper et al. (2000) have also noted that the incidence of sexual addiction is on the rise, which may be partially attributed to the pervasive availability and accessibility of sexually explicit material and pornography on the Internet, coupled with the anonymity that the Internet affords its users. Based on these current trends, Cooper (2004) has suggested that the prevalence of sexual addiction will continue to rise at a rapid rate.

The increasing prevalence of sexually compulsive behaviors raises the serious concern that traditionally trained addictions and offender counselors are often unprepared to counsel clients with sexual addictions (Hagedorn & Juhnke, 2005). Even within the larger clinical education community, little time and attention is devoted to the inclusion of treatments for this specific client population in graduate school training. The lack of acceptance of sexual addiction as a recognized disorder within the DSM-IV is one possible explanation for the lack of inclusion in training. This is highly problematic, considering the data which suggests that sexual compulsivity is often comorbid with substance use disorders and is often an unidentified cause of relapse (Schneider & Irons, 2001). As Hagedorn and Juhnke (2005) stated:

> If one accepts that during their career counselors are likely to encounter a client struggling with substance abuse, compulsive gambling or an eating disorder, it seems practical to equip them with the knowledge and skills necessary to treat these disorders concurrently. Given that sexual addiction is often comorbid with these and other addictive disorders, it is not sensible for counselors to be adept at assessing and treating one disorder (e.g., chemical dependency) without understanding the impact of comorbid disorders. (The "Relationship Between Addictions" section, para. 5).

Preparing Future Counselors

Sexual compulsivity is often found in conjunction with common psychiatric disorders. It can be complicated to assess for sexual compulsivity because, to the untrained eye, it may go unnoticed, hidden beneath other presenting problems such as depression, suicide attempts, or anxiety (Manley & Kohler, 2001; Ragan & Martin, 2000). If counseling students are not specifically trained about these disorders in their graduate work and are not prepared for the possibility of an underlying, exacerbating, or comorbid sexual compulsivity, treatment outcomes will likely be affected (Hagedorn & Juhnke, 2005).

While there has been an increasing amount of discussion in the clinical literature regarding sexual compulsivity, to our knowledge it is not a subject that has been incorporated into most graduate counseling educational programs. The accreditation bodies for graduate programs in psychology, social work, and marriage and family therapy (American Association for Marriage and Family Therapy, 2005; American Psychological Association [APA], 2001; Council on Social Work Education, 2001) do not specifically address the need for training or education in the treatment of sexual compulsivity. However, the increasing awareness of sexual compulsivity as a pathological behavior, as demonstrated by the growing discussion of the topic in the professional literature, indicates the need to educate clinical students in the assessment and treatment of sexual compulsivity. Additionally, the Marriage and Family Therapy (MFT) licensing law in California has been changed to incorporate required education about the assessment and treatment of behavioral addictions as well as chemical dependency (Board of Behavioral Sciences [BBS], 2007). While sexual compulsivity is not listed specifically, it is usually considered one of the behavioral addictions; and, as such, MFT students in California are now expected to have knowledge about this population. It may be only a matter of time before other states adopt similar educational requirements. Thus it is important for educators to begin consideration of how to integrate this material into the curricula.

Questions pertaining to the theoretical and clinical approaches to educating potential clinicians about sexual compulsivity, where and how to integrate the material into the curriculum, and the development of appropriate texts need to be answered in preparation for inclusion into counseling educational programs nationwide. In this article we will first attempt to determine the need for sexual compulsivity education by assessing students' ability to identify such behaviors in case vignettes and to select appropriate interventions. We will then discuss theoretical approaches to sexual compulsivity and potential curricular design options.

Method

Participants

Participants were full-time students enrolled in the required 6-month-long clinical practicum at the authors' institution. Students were at different points in the program, i.e., some were near the end and some were just beginning. The majority of respondents (44.79%) were at least three quarters though the program, another 21.43% were at least halfway through the program, and 32.15% were at the end of the program; the remaining respondent had completed 7 classes. A total of 56 students were given the survey and completed it. All participants signed an informed consent form.

The majority of individuals in the sample were heterosexual (92.86%), female (82.14%), and single (25% divorced and 30.36% single and never married), and self-reported some form of

Christian religious affiliation (51.8%). The age range was between 20 and 60 years, with most students being under the age of 40 years; see Table 1. Slightly more than 46% of the sample self-identified as Caucasian, 16.07% as Hispanic or Mexican American, 12.5% as African American, 5.36% Asian American, 7.14% mixed ethnicity, and 3.57% Filipino; 5.36% identified no ethnicity, and the remaining 4.5% of the sample (1 student in each group) reported other ethnicities such as South American or Vietnamese American.

Table 1. *Student Demographic Information as a Percentage of the Sample (*N = *56)*

Characteristic	Percent	Characteristic	Percent
Sex:		***Age:***	
Female	82.14	20–29	41.05
Male	16.07	30–39	28.57
Unknown	1.79	40–49	17.86
		50–59	7.14
Religious affiliation:		60–69	1.79
Agnostic	5.36	Unknown	3.57
Baptist	1.79		
Catholic	23.21	***Ethnicity:***	
Christian	17.86	African American	12.50
Episcopal	1.79	Asian American	5.36
Islam	1.79	Caucasian	41.07
Pagan	1.79	Filipino	3.57
Pentecostal	1.79	Hispanic	10.71
Nondenominational	5.36	Irish	1.79
None	25.00	Italian	1.79
Not Indicated	3.57	Mexican American	5.36
		Mixed	7.14
Sexual orientation:		Polish	1.79
Heterosexual	92.86	South American	1.79
Bisexual	5.36		
Gay	0	***Marital status:***	
Lesbian	0	Married	39.30
Transgender	0	Single, never married	30.36
Not indicated	1.79	Divorced	25.00
		Domestic partnered	1.79
		Widowed	1.79
		Not indicated	1.79

Approximately 71% of the respondents reported experience working in the field of mental health (excluding their experience in practicum). Of those reporting work experiences (see

Table 2), the majority reported experience working as counselor/case managers (33.33%), counselors (22.5%), or case managers (17.5%). Other types of work experience included behavioral specialists, crisis (hotline) counseling, mental health worker, or social worker. The range for the number of years working in mental health was 1–28, with 8.57% reporting less than one year, 51.43% reporting 1 to 4 years, 28.57% reporting 5 to 10 years, and 11.43% over 10 years. Only 23.21% of the sample reported experience working with addictions; and of those, 5.36% were certified addictions counselors in California (California Association of Alcoholism and Drug Abuse Counselors, CAADAC).

Table 2. *Student Mental Health Worker History as a Percentage of the Sample (*N = *56)*

Category	Percent	Category	Percent
Mental health experience:		***Capacity:***	
Yes	71.44	Behavioral specialist	7.50
No	25.57	Career counselor	2.50
		Case manager	17.50
Number of years:		Child care worker	2.50
< 1	8.57	Counselor	22.50
1–2	31.43	Crisis counselor	2.50
3–4	20.00	Case manager/counselor	33.33
5–6	8.57	Domestic violence counselor	2.5
7–8	11.43	Mental health worker	2.5
9–10	8.57	Office manager	2.5
> 10	11.43	School case manager	2.5
		Social Worker	2.5
Experience with addiction:			
Yes	23.21	***CAADAC certified:***	
No	76.71	Yes	5.36
		No	94.64

Survey

The survey was developed by the authors of this study and is shown in Appendix A. The survey solicited general demographic information about the students, e.g., sex, age, identified ethnicity (open, fill-in question), marital status, and experience working in the mental health field. Central to the purpose of the study were four case vignettes in which students were asked to judge whether the client exhibited sexual compulsivity. Common practice utilizes multiple interventions with clients dealing with sexual compulsivity. Therefore the students were given a list of four possible interventions and asked to identify the one which would not be appropriate for the client described in the vignette. The last section of the survey included questions about training and education pertaining to issues of sexual compulsivity, such as graduate coursework, workshops, clinical supervision, and discussion of sexual issues with clients.

Procedure

After obtaining approval from the Institutional Review Board, the researchers identified ongoing sections of clinical practicum. Faculty members teaching practicum were contacted by phone to inform them of the purpose of the survey and to provide general instructions. Surveys, informed consent forms, and instructions were mailed to the instructors. Instructors were asked to read a standard set of instructions to the students and then have the students read and sign the informed consent form and complete the survey. To protect the identity of the respondents, consent forms and the completed surveys were sealed in separate envelopes and returned to the researchers.

Results

An analysis of the vignettes revealed that students were better at identifying sexual compulsivity than they were at excluding inappropriate interventions. As can be seen in Figure 1, approximately 60% of respondents correctly identified sexual compulsivity in Vignette One, but of those only 32.35% were able to exclude the incorrect intervention. In Vignette Two, 50% of the respondents correctly identified sexual compulsivity, but of those only 28.57% selected the incorrect intervention. In Vignette Three, approximately 39% of the respondents correctly identified sexual compulsivity, but of those only 31.82% selected the incorrect intervention. In Vignette Four (see Figure 2), 66% correctly identified sexual compulsivity, and when in the second part of the vignette they were given additional information about the client's use of Internet pornography, over 98% identified sexual compulsivity. However, only 31.82% were able to identify the incorrect intervention.

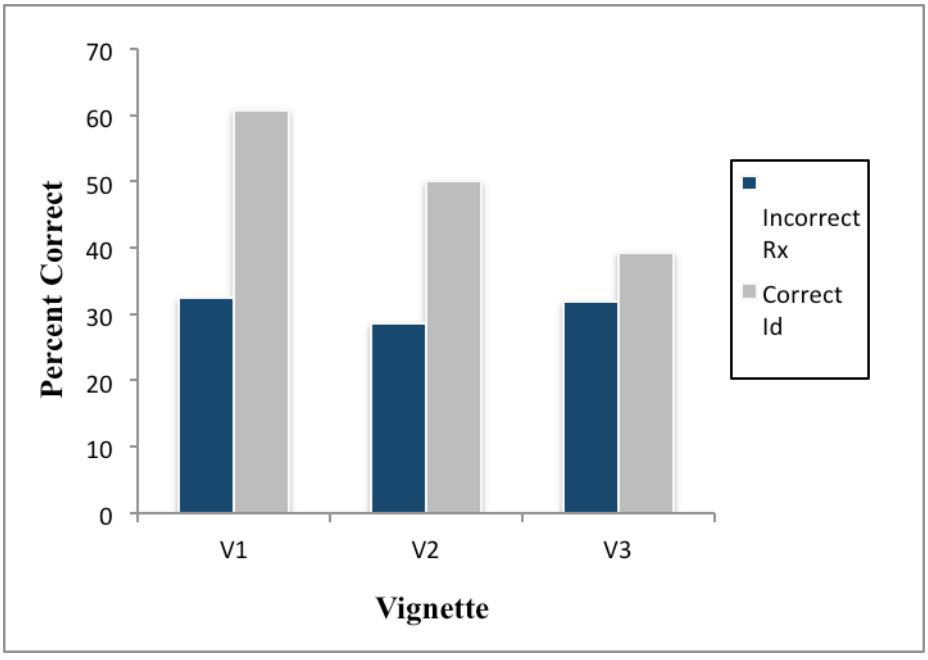

Figure 1. Percentage of students who correctly identified sexual compulsivity (Correct Id), but did not exclude an inappropriate treatment (Incorrect Rx) in each of the three case vignettes.

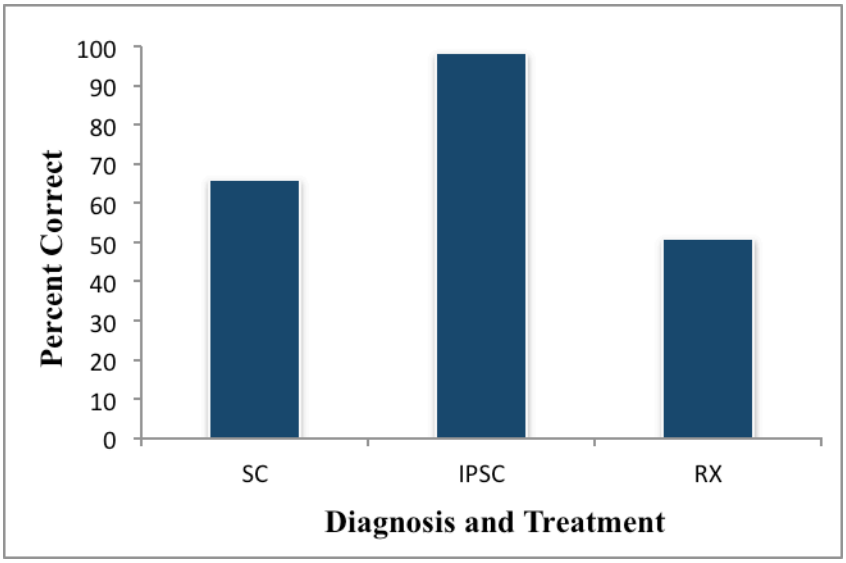

Figure 2. Percentage of students who correctly identified sexual compulsivity (SC) before and after additional information was provided about Internet pornography (IPSC). The third bar shows the percentage who did not exclude the inappropriate treatment (RX).

As can be seen in Table 3, the majority of students reported some graduate training in discussing sexual issues with clients (82.14%). However, the majority reported no training about issues of sexual compulsivity either in graduate coursework (60.71%), in workshops (91.07%), or from their clinical supervisor (78.57%). In contrast, the majority of students (76.79%) reported working with clients who communicated with them about issues of sexual compulsivity. However, most students (66.07%) did not initially assess for the presence of such behaviors.

Table 3. *Percentage of Students with Training and Experience with Sexual Compulsivity*

Question	Yes	No	Question	Yes	No	NA
Graduate coursework about working with sexual compulsivity in clients?	39.29	60.71	Graduate coursework about talking about sexual issues with clients?	82.14	17.86	
Clinical supervisors asked you about issues of sexual compulsivity in your clients?	21.43	78.57	Worked with a client who reported sexually compulsive behavior?	76.79	23.21	
Attended workshops or clinical training about sexual compulsivity?	8.93	91.07	Ask clients about possible sexually compulsive behavior?	32.14	66.07	1.79

Discussion

As the results of the survey show, there is clearly a need to educate students pursuing licensure as clinicians regarding the assessment and treatment of sexual compulsivity. Even among those who correctly assessed a vignette as describing a client with sexual compulsivity, fewer than one-third of them were able to exclude the inappropriate treatment intervention. If training in sexual compulsivity assessment and treatment were to be incorporated into the curriculum, we would expect that most students would demonstrate clinical competency in this area. These findings, combined with the increasing prevalence of sexual compulsivity and the movement in California to require coursework that includes a broader range of process addictions (BBS, 2007), strongly indicate that faculty nationwide should begin the discussion of how to incorporate this material into psychotherapist educational curricula. In our opinion, the initial issues that should be considered are etiological information necessary for students to understand sexual compulsivity, essential theoretical and/or clinical approaches to treatment, and where to place the material in the curriculum.

Theoretical Approaches and Curricular Integration

The questions about theoretical and clinical approaches, as well as where and how to integrate material into the curriculum, appear to be related. We have identified three major possible theoretical approaches, and we certainly recognize there may be others. The first is the addiction model first proposed by Carnes (1983, 2001). The second conceptualizes sexual acting-out behaviors as part of an obsessive-compulsive process (Swartz & Abramowitz, 2003). The third views sexually compulsive behavior as part of a greater constellation of attachment and/or developmental issues (Parker & Guest, 2003). This model has the greatest emphasis on etiology as part of the information required for accurate assessment and treatment. All three models contribute to a holistic understanding of sexual compulsivity and, in our opinion, should be included in any curriculum. Identifying one as the primary model, with the others as secondary yet important, is one possible method to determine where the information is incorporated into a graduate program's curriculum.

Addictions Model

If the addictions model is the primary theoretical conceptualization chosen by the faculty, then the logical placement of the material would be in a class devoted to the diagnosis and treatment of addictive disorders. This is clearly the intent of the recent California legislation. The rationale for such a course would be the ability to teach treatment modalities common to all addictive disorders, such as motivational interviewing, the effectiveness of group treatment, cognitive behavioral therapy techniques specific to addictive disorders, the use of intervention as a method to reduce denial, and the use of 12-step programs in addiction recovery. It would also allow the faculty to discuss the concepts of cross-addiction and relapse as they relate to multiple addictions. The majority of the faculty at our institution who already include the diagnosis and treatment of sexual compulsivity in the curriculum utilize this approach. However, anecdotal evidence from many clinicians specializing in the treatment of sexual compulsivity indicates concerns with this theoretical orientation. Clinicians question the value of 12-step program support for sexual compulsivity because of the subtle message that may be included in some of these programs that sexuality itself is shameful. An example of this is the definition of abstinence in Sexaholics Anonymous as being sex occurring solely within a heterosexual, marital

relationship. This means that masturbation, homosexual relations, and sex outside of marriage would all be considered a relapse. They also question Carnes' (1983, 2001) inclusion of paraphilias in the definition of sexual addiction. Although that debate is beyond the scope of this article, it may arise during discussions among faculty about the way in which to incorporate sexual compulsivity into the curriculum, and it demonstrates how complex such a discussion can become.

Obsessive-Compulsive Model

When faculty members conceptualize sexual compulsivity as a type of obsessive-compulsive disorder, then this material could be incorporated into classes on human sexuality or perhaps psychopathology. Including material on the assessment and treatment of sexual compulsivity in a human sexuality course seems to fit this model best. Whether it is described as a type of sexual disorder with obsessive-compulsive aspects or an obsessive-compulsive disorder that affects sexuality, it is our opinion that this is the best curricular fit. Assessment and treatment strategies that would incorporate topics such as discussing sexual issues with clients, conducting a sexual history, and selecting treatment interventions related to sexuality would all be similar to other topics in this course. Including sexual compulsivity in a psychopathology class may be more difficult to justify until sexual compulsivity becomes an official DSM diagnosis, but it is certainly a viable option.

Attachment/Developmental Model

If sexual compulsivity is conceptualized as part of a greater constellation of attachment and/or developmental issues, the curricular placement is more complex. The major aspect that differentiates this orientation from the others is the belief that an understanding of the etiology of sexual compulsivity from an attachment theory/developmental perspective is essential to determining an effective treatment strategy. This theory of etiology could be incorporated into courses on developmental psychology, and the assessment and treatment could be included in coursework on human sexuality as described above. However, this approach has the limitation that the material is presented to students at different times and probably by different instructors, which may not be as desirable as exposing students to it all at once. Another possibility would be to incorporate the attachment theory/developmental perspective into a class on addictive disorders, since this theory applies to all addictions, not just sexual compulsivity; and then discuss treatment of addictions from that perspective as part of the coursework.

Another curricular question is how to address working with clients in a primary intimate relationship with a partner who has issues of sexual compulsivity. Programs that have courses on couple's therapy could certainly include that aspect in those classes. One answer for programs that do not offer a course in couple's therapy may be to include this material in the class that covers working with sexually compulsive clients.

Conclusion

We hope this article stimulates faculty at institutions around the country to address these issues in their curricular discussions and to begin to incorporate this material into the coursework for their students. Those of us who teach in California are already being required to do so. Students are facing the challenge of working with sexually compulsive clients now and need faculty to

realize the importance of integrating this information into the graduate curriculum so graduates have at least an entry-level knowledge of where to begin to assess and treat sexual compulsivity.

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Appendix A
Knowledge of Sexual Compulsivity Survey

1. Sex: ( ) Male ( ) Female ( ) Transgendered

2. Age: ( ) 20-29 ( ) 30–39 ( ) 40–49 ( ) 50–59 ( ) 60–69 ( ) 70–79

3. Please write in your identified ethnicity: _____

4. Please write in your religious affiliation: _____

5. Sexual Orientation: ( ) Heterosexual ( ) Bisexual
( ) Gay ( ) Lesbian ( ) Transgender

6. Marital Status: ( ) Married ( ) Domestic Partnered
( ) Single, never married ( ) Widowed
( ) Divorced

7. Do you have children? ( ) Yes ( ) No

8. If yes, please indicate their ages: ( ) 0–5 years ( ) 16–18 years
( ) 5–9 years ( ) 19–25 years
( ) 10–15 years ( ) over 25

9. Have you had any experience working in the field of mental health? ( ) Yes ( ) No

10. If you answered "Yes" to the above, how many years have you worked in mental health? Please specify the number of years: _____

11. In what capacity have you worked in mental health? i.e., counselor, case manager, mental health worker, psychological technician, etc. Please list positions held: _____
_____

12. Have you ever worked in the addictions field? ( ) Yes ( ) No

13. Are you CAADAC certified? ( ) Yes ( ) No

14. Are you enrolled in an: ( ) open enrollment system ( ) cohort system

15. How many classes have you completed? _____

16. Please check each of the following classes that you have completed:

Completed	Course	Completed	Course
	619 Research: Paradigms and Critiques		631B Practicum II: Marriage and Family Therapy
	623A Individual Psychotherapy and Clinical Assessment I		632A Couples/Family Therapy A
	623B Individual Psychotherapy and Clinical Assessment II		632B Couples/Family Therapy B
	624 Assessment Techniques for Marriage and Family Therapists		635 Developmental Contexts in Psychotherapy: Child and Adolescence

	626 Human Sexuality in Psychotherapy		636 Principles of Psychotherapy II: Child and Adolescence
	627 Legal and Ethical Issues in Marriage/ Family Therapy		637 Principles of Psychotherapy V: Cultural Competencies
	628 Principles of Psychotherapy III: Group Approaches		640 Addictions: Contexts and Treatment
	629A Developmental Contexts in Psychotherapy: Adulthood and Aging		642 Relational Violence
	631A Practicum I: Marriage and Family Therapy		652 Psychopharmacology

Vignettes

17 (V1). John is a 42-year-old Caucasian male who has been married for 14 years. He lives with his wife and three children, ages 12, 11, and 7. He and his wife have a "good sexual relationship." They have intercourse 2–3 times a week. John states that he finds the sexual relationship with his wife fulfilling. John reveals that he has been having an affair for the last 4 months. He states that he has had two other affairs over the last several years. When asked what his motivation is for seeking sexual relationships with women outside his marriage, he says that he no longer feels the same level of excitement with his wife even though they have "good sex." When he goes several months without being in a new sexual relationship, he gets bored and somewhat depressed. He says he feels guilty about "cheating" on his wife and wants to change his behavior.

Reviewing the above vignette, please circle the response that you believe represents John's behavior.

(a) John exhibits symptoms of sexual compulsivity. ( ) T ( ) F

(b) If you circled F above, please skip to item 18. If you circled T above, please circle what you believe to be the indicated treatment plan. All of the following could be part of an initial treatment plan for John except:

(1) Referral to a 12-step program

(2) Development of a sexual health plan

(3) Marital therapy

(4) Individual therapy

18 (V2). Michael is a 53-year-old Caucasian male who is recently divorced. He was married to his ex-wife for 26 years. He has begun to date and is currently dating three women. He is sexually involved with all three of them. He reports feeling "like I'm a teenager again." He has sex with each of them at least two times a week and often has sex with two of them on the same day. They all know he is "dating" other women, but he has not said directly to any of them that he is sleeping with the others.

Reviewing the above vignette, please circle the response that you believe represents Michael's behavior.

(a) Michael exhibits symptoms of sexual compulsivity. ( ) T ( ) F

(b) If you circled F above, please skip to item 19. If you circled T above, please circle what you believe to be the indicated treatment plan. All of the following could be part of an initial treatment plan for Michael except:

(1) Referral to Sex and Love Addicts Anonymous

(2) Referral to Sexaholics Anonymous

(3) Referral to a men's group

(4) Individual therapy

19 (V4). David is a 22-year-old Caucasian male who is not married or in a sexual relationship with a partner at this time. He reports masturbating 2–3 times a day to release his sexual frustration. If he is unable to masturbate, he reports increased anxiety. He states that when he is in a sexual relationship he does not masturbate as often but that he has always had a high level of sexual desire and increased anxiety if he is unable to have a sexual release at least once a day.

Reviewing the above vignette, please circle the response that you believe represents David's behavior.

David exhibits symptoms of sexual compulsivity. ( ) T ( ) F

20. Upon closer questioning, you learn that David is masturbating to Internet pornography and that he spends up to 4 hours per day on the Internet surfing pornographic sites. Answer the questions below using this additional information.

(a) David exhibits symptoms of sexual compulsivity. ( ) T ( ) F

(b) If you circled F above, please skip to item 21. If you circled T above, a treatment plan for David's sexual compulsivity would include all of the following except:

(1) Referral to a 12-step program

(2) Abstinence from masturbation

(3) Abstinence from the use of Internet pornography

(4) Family therapy

21 (V3). Monica is a 47-year-old Caucasian female who is a recovering alcoholic/addict. She has been struggling with staying sober for the last 20 years. She is able to stay sober for 2–3 years at a time and then relapses and uses for several months. When asked about common triggering events or environments, she reports that when she is not in a sexual relationship she will frequent bars as a way to meet available men with whom to have sexual encounters. She can go to the bars for a few weeks without drinking but eventually has a drink and then may use drugs, usually cocaine, to help heighten her sexual experience.

Reviewing the above vignette, please circle the response that you believe represents Monica's behavior.

(a) Monica exhibits symptoms of sexual compulsivity. ( ) T ( ) F

(b) If you circled F above, please skip to Scenario 22. If you believe Monica does have symptoms of sexual compulsivity, it is important to treat her drug and alcohol addiction first before beginning any treatment for sexual compulsivity. ( ) T ( ) F

Education and Training

22. Have you had any formal education in your graduate coursework about working with sexual compulsivity in clients?

( ) Yes ( ) No

23. Have you had any formal education in your graduate coursework about working with erotic transference and/or countertransference with clients?

( ) Yes ( ) No

24. Have your clinical supervisors asked you about issues of sexual compulsivity in your clients?

( ) Yes ( ) No

25. Have your clinical supervisors asked you about erotic transference and/or countertransference with your clients?

( ) Yes ( ) No

26. Have you been to any workshops or clinical training about sexual compulsivity?

( ) Yes ( ) No

27. Have you been to any workshops or clinical training about erotic transference and countertransference in therapy?

( ) Yes ( ) No ( ) I don't know

28. Have you had any formal education in your graduate coursework about talking about sexual issues with clients?

( ) Yes ( ) No

29. Have you ever worked with a client who reported sexually compulsive behavior?

( ) Yes ( ) No

30. Do you ask clients about possible sexually compulsive behaviors?

( ) Yes ( ) No

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Teacher Preparation

The Relationship between Professional Development and Teacher Learning: Three Illustrative Case Studies of Urban Teachers

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Abstract
This study explored the impact of a three-year tandem professional development and coaching model on levels of teacher knowledge. Illustrative case vignettes described how this model for change unfolded in classroom practices of three urban elementary teachers. Results of adult learning ranged from resistance to changes in instruction to deep integration of new knowledge into everyday classroom practice. Measures examined whether or not teachers learned and taught more effectively, a first step in measuring the effectiveness of professional development and coaching interventions. However, sustainable change in teacher practice also depended on the critical elements of leadership, climate, and school culture.

Key Words
Professional development, coaching, urban settings, teacher knowledge, adult learning

Introduction

The Nation's Report Card 2011 reported encouraging news in that scores on the National Assessment of Educational Progress (NAEP) for nationally representative samples of fourth and eighth grade students from lower income families (i.e., students eligible for free or reduced-price school lunch) were slightly higher in 2011 than in 2009. However, not all findings were encouraging. For example, the percentage of African-American fourth grade (51%) and African-American eighth grade (41%) students scoring below Basic (partial mastery of prerequisite knowledge and skills that are fundamental for proficient work) in 2011 was higher than the percentages of White, Hispanic, and Asian/Pacific Islander students scoring below Basic; and, there was no significant change in the White–African-American score gap from 2009 to 2011 (National Center for Education Statistics, 2011).

These excerpts from *The Nation's Report Card* underscore the problem that U.S. schools continue to face: failing to meet the needs of all children; African-American children from low-income and low parental-educational-attainment families continue to perform far below their more advantaged peers. A continuing challenge, then, is to ensure that schools work for all children. Research suggests that highly qualified, effective teachers are the most powerful factor in increasing student achievement. The seminal work by Bembry, Jordan, Gomez, Anderson, and Mendro (1998) found that when students experienced a truly ineffective teacher, even if for just one year, there was a substantial drop in their later achievement. Similarly, the landmark study reported by Sanders (1998) illustrated that as the level of teacher effectiveness increased, students of lower achievement were the first to benefit. These pivotal studies led to a paradigm shift in the field of professional development from the traditional one-day workshop model to continuous, sustained, and job-embedded experiences.

In the introduction to *Teaching as the Learning Profession* (Darling-Hammond & Sykes, 1999), Sykes posited that continuing development of highly qualified teachers would be critical in improving schools. The key, Sykes suggested, was the enhancement of teacher learning across the continuum of a career; schools needed to become places of learning for both teachers and students (Drago-Severson, 2009). Improving the quality of classroom instruction has become not

only the professional responsibility of individual teachers but a critical organizational responsibility (Allington, 2006).

The need for additional research about how to enhance the quality of instruction has been demonstrated in the limited number of studies that examined direct observation of changes in teacher practice (Dillon, O'Brien, Sato, & Kelly, 2011). This particular research focused on the direct observation of adults' learning in an urban context. The researchers examined the impact of a professional development and coaching model on teacher knowledge.

Review of Literature

Adult Learning

The study of learning in adulthood has been traditionally focused on the ways in which adult learners seek new information (Knowles, 1980). Those who have written extensively on the topic of adult learning offer various research and observation principles that can be applied in practice, such as Knowles' (1980) discussion of the assumptions underlying andragogy. Mezirow (2000) contended that unless learning is transformed through expanded awareness, critical reflection, validating discourse, and reflective action, adult learners would remain focused on merely accessing information. Informational learning centers on knowledge and skills—what a person knows. Transformational learning, however, seeks changes in the core assumptions, beliefs, and ways in which individuals make sense of learning experiences (Kegan, 1994, 2000).

The focus has shifted from *what* a person knows to *how* a person knows. Kegan (1982, 1994) referenced this shift as the constructive-developmental view of adult growth and development. Kegan's (1994) constructive-developmental theory joined together two powerful lines of intellectual discourse. His constructive-developmental theory posited that the systems by which individuals make meaning, grow and change over the course of a lifetime. This theory implies that individuals are unique in their ways of knowing and understanding experiences; these ways of knowing must be considered as the educational system designs professional development programs to support and challenge adult learners (Drago-Severson, 2011).

Professional Development

The development of teacher knowledge has traditionally been cultivated through professional development activities. Darling-Hammond and Richardson (2009) found that traditional professional development focused on one-shot workshop models with emphasis on training teachers in new techniques and had little or no effect on student learning. Thus, to counter fragmented professional development, the new professional learning models are designed as lifelong, collaborative learning processes that support a job embedded, learner-centered approach. The recently published *Standards for Professional Learning* (Learning Forward, 2011) reflected this shift from the traditional delivery models and emphasized the need for educators to take active roles in their professional learning and development. This movement away from the traditional professional development model emphasizes the need for schools to become learning communities that support the growth of both teachers and students (Darling-Hammond & Sykes, 1999; Drago-Severson, 2009). The most salient variables in school improvement efforts appear to be teachers and their classroom practices (Reeves, 2010); support for the development of effective learning communities may be provided by adding coaching to the model (Knight, 2007).

Coaching

Although in theory effective professional development offers opportunities for new learning and contributes to a culture of school change, Bully, Coskie, Robinson, and Egawa (2006) cautioned that actual change in practice is rare, and "fewer than 10% of teachers actually implement instructional innovations following workshops or inservice experiences" (p. 27). Thus, workshops and professional development in-service experiences are insufficient, and the role of the coach becomes critical, serving many purposes, since coaching affects the school culture, supports significant change, promotes reflection and decision making, and honors adult learners (Toll, 2005).

Viewing coaching through the lens of adult learning suggests that it is a means of conveyance; supporting the movement of a teacher from where the teacher is to where the teacher wants to be (Costa & Garmston, 2002; Evered & Selman, 1989). The recently revised IRA Standards (International Reading Association, 2010) reinforce this concept by defining the role of the coach as one who supports teachers in their instructional efforts as well as in their own professional learning. Using the model of Joyce and Showers (1995), the important role of coaches in professional development is clearly evident. Joyce and Showers proposed five kinds of support for teachers: theory, demonstration, practice, feedback, and in-class coaching. They found that when feedback and in-class coaching were combined with the other supports, there was an increase in teacher knowledge and eventually classroom practice. In a study of urban coaches, Blachowicz et al. (2010) found that coaches' effect on the "instruction and infrastructure of the school emerged as one of the top three influences for change…" (p. 348).

Urban Settings

Urban settings provide unique challenges for change, given that they are often casualties of the "Christmas tree effect" (Raphael, Gavelek, Hynd, Teale, & Shanahan, 2002), wherein numerous sources provide funding and attempt to remedy the school's diverse problems. Just like the child at Christmas time, urban teachers are often overwhelmed; they don't know where to begin or how to juggle so many new programs. If resources are not accompanied with support systems to integrate and sustain change initiatives, the situation can become overwhelming.

It has been noted that one of the greatest challenges to education today is the persistent failure in urban schools (Payne, 2008). Teachers in high-needs, urban schools often face demoralization and a degraded professional culture on a daily basis. These demoralized schools are sometimes described as incapable of basic collective decision-making; in fact some would describe such schools as technically irrational organizations mired in bureaucracy (Payne, 2008).

Ironically, one of the most encouraging aspects of the national conversations centered on school improvement is the research on teacher quality. And yet, while quality matters most in disadvantaged schools (Presley, White, & Gong, 2005), bottom-tier schools are less likely to get and maintain highly effective teachers (Guarino, Santibanez, & Daley, 2006.)

Teacher Knowledge

Proposition 2 of *The Five Propositions of Accomplished Teaching* (National Board for Professional Teaching Standards, 1987) emphasizes that teachers must have mastery in the subject(s) they teach, as well as a deep understanding of the history, structure and real-world applications of the subject. Traditionally, teacher knowledge has been viewed as a fixed entity, in that once a teacher was certified there was a shift in status, and thus the body of knowledge that a

teacher required was established. Snow, Griffin, and Burns (2005), however, posited that such a "status shift" view of teacher development does not take into account the developmental view of adult learning but rather views adult learning as stagnant.

Hammerness et al. (2005) discussed teacher knowledge in terms of teachers as adaptive experts who can balance the dimensions of efficiency and innovation. They examined how teachers learn and develop over the course of their professional career. Hammerness et al. discussed the importance of examining teacher knowledge development through the lens of the unique context of that learning.

Snow, Griffin, and Burns (2005) outlined five potential teacher knowledge levels representing progressive phases that teachers may move through across the span of a professional career: the preservice, apprentice, novice, experienced, and master teacher (p. 6). This developmental view of adult learning specifies stages of knowledge acquisition and presupposes the development of structures to support teacher learning. These increasing levels of teacher knowledge suggest the need for differentiation as adult learners build capacity, self-assess, and expand their teaching practices. The five knowledge levels outlined by Snow et al. are aligned with the International Reading Association's (2010) assumptions: teachers grow and develop at different rates, and knowledge construction is contextual.

Methodology

Context

This particular study involved a three-year university-school partnership that was supported by funds from a private grant foundation. This K–8 private elementary school served a population of 100% African-American students from an urban, low-income community. This school had been inundated with at least a half dozen separate grant-supported programs, as well as mandated initiatives. Teachers were indifferent, noting that "programs come and programs go." Volunteers, tutors, and university field-experience students flocked to the school, but there was no evidence that any coordination of services took place. Coordination was complicated by the fact that three different principals served during this study; the absence of strong, consistent leadership permeated all aspects of the school community.

Intervention activities included monthly professional development meetings, classroom observations, and one-to-one coaching sessions. Over the course of the project, each school team (primary, intermediate, and middle school) was assigned to one of five instructional coaches who rotated responsibilities; three coaches handled traditional coaching activities, and two assumed the dual role of researcher/coach. Coaching activities included modeling, observing, providing feedback, and supporting the implementation of best practices introduced during monthly professional development sessions. Responsibilities of external coaches did not focus on evaluation or dispositional issues.

Year one. The first 12 months of this partnership focused on assessing needs, building relationships, and establishing an ongoing partnership. First steps included monthly professional development sessions aimed at building foundational knowledge in literacy education. Coaching and modeling opportunities were gradually introduced as teachers accepted the concept of ongoing and continuous support.

Year two. The second year of the partnership continued to build teacher knowledge as well as a shared vision of effective literacy practices. Professional development sessions followed a book

club model; monthly conversations, modeling, and professional development activities were based on readings from Harvey and Goudvis' (2007) text, *Strategies that Work: Teaching Comprehension for Understanding and Engagement.* Coaching conferences shifted toward providing feedback regarding the implementation of effective literacy strategies that were emphasized in the monthly professional development meetings. Preliminary efforts were made to collect student-learning data; however, the data collection was rudimentary and inconsistent. It proved challenging to gather valid measures of student learning. The researchers measured what was possible to measure, and coaches attempted to engage teachers in conversations related to the impact of effective literacy instruction on student performance.

Year three. The third and final year of this university/school partnership continued to respond to the unique context of this urban, private school setting. The Harvey and Goudvis (2007) text continued as the foundation for coaching conversations and strategy modeling during professional development sessions. Classroom coaching visits expanded to provide comprehensive examination and feedback regarding the overall classroom environment; coaches used Pianta, LaParo, and Hamre's (2008) *Classroom Assessment Scoring System* (CLASS) to provide teachers with feedback related to the overall classroom environment.

Research Question

This study was guided by the research question: Will a professional development and coaching model have a positive impact on teacher knowledge? This illustrative case study called for an interpretative, contextual design, which required gathering quantitative and qualitative data (Stake, 1995). The use of quantitative methods alone might have reduced the words and perceptions of participants to statistical equations and would not adequately have captured the complex context and human interactions that shaped practice within these three classrooms. Therefore, the researchers gathered and quantified observational data.

Participants

Since this was primarily a qualitative study, a non-probability strategy seemed most appropriate and the most common form is purposeful (Merriam, 1998). A purposeful sampling appeared to be the logical choice for this study, since it is based on the assumption that the researchers aim to discover and understand, and gain insight. Patton (2002) argued, "The logic and power of purposeful sampling derive from the emphasis on in-depth understanding. This leads to selecting information-rich cases for study in depth" (p. 46). The researchers proceeded to select the participants precisely because of their special attributes. Three participants were chosen to represent a purposeful sampling from the ten classroom teachers assigned to this high-needs, urban K–8 elementary school. Over the course of the three-year partnership, a total of 14 teachers participated in at least some portion of the study; 10 teachers participated for the full three years of this project. At the conclusion of the study, the teacher knowledge rankings of these 10 participants were averaged, and case vignettes were specifically developed for the 3 teachers scoring at the lowest (teacher H), midpoint (teacher C), and highest (teacher G) rankings. Figure 1 displays the average teacher knowledge ratings for all ten participants.

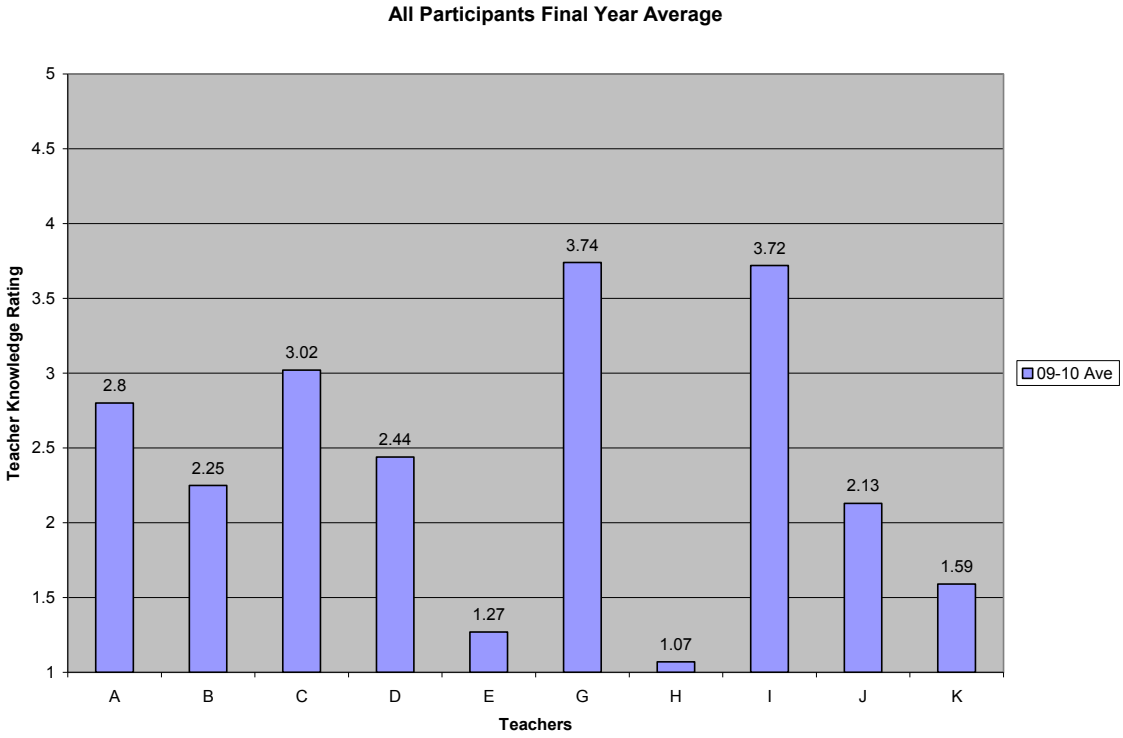

Figure 1. Average teacher knowledge rating of all participants in 2009–2010.

Teachers H, C, and G were participants for the full three years of this study. Each of these 3 teachers taught in a self-contained classroom with class sizes averaging approximately 25 students, and each experienced changes in grade-level assignments over the course of the project. Although the school received Title 1 services, there were very limited supplemental resources available to support teachers dealing with special needs students. In purposeful sampling, one teacher was Caucasian and two teachers were African-American; all three teachers were females. Teacher H, Ms. Tina, the lowest ranking participant, did not hold a state teaching certificate but had taught at this urban, private school for seven years. Teacher C, Ms. Sara, the teacher ranked at the midpoint of the teacher knowledge rubric, was a certified elementary school teacher with 14 years of experience at various private schools. Teacher G, the highest-ranking participant, Ms. Gretchen, had over 30 years of experience at this same school, despite her lapsed certification. (All names are pseudonyms.)

Data Sources

Quantitative and qualitative data for these case studies were gathered from three primary sources. The researchers examined teachers' written summaries from professional development community experiences. Over the course of this three-year partnership, teachers were asked to summarize and reflect upon their understandings following monthly professional development sessions. The data were primarily collected through the use of teacher's written reflections. Although the questions and format of these reflections evolved over time, each variation allowed teachers to frame their understandings from both text readings and professional development

activities. In addition, teachers were asked to share their individual action plans and teaching logs detailing the implementation of literacy strategies. Additional qualitative and quantitative data were collected through monthly observation tools; these tools ranged from observation checklists to the formal CLASS observation instrument. In each of the various observation tools, only the qualitative observational log notes were used as data sources and then coded using a rubric adapted from Snow et al. (2005).

Data Analysis

Data from each of the sources were reviewed and scored by at least two researchers in an effort to ensure inter-rater reliability. Each piece of data was examined for evidence of movement through the levels of teacher knowledge. Table 1 was adapted from the work of Snow et al. (2005**)** and displays the rubric criteria for the five teacher knowledge categories and descriptions used to code all data for this study.

Table 1. *Teacher Knowledge Development Rubric*

Levels of Knowledge	Description
Level 1: Declarative	Preservice level—learning from texts, lectures, professional development sessions (child development, instructional approaches, etc.); acquiring procedural knowledge about what to do in various situations.
Level 2: Situated	Apprentice level—the level of procedural knowledge required to function effectively in teaching with the support of a coach/mentor.
Level 3: Stable procedural	Novice level—the teacher can plan instruction for the whole group, can maintain order and implement instruction, can assess student progress, and can adapt instruction within the limits of normal practice.
Level 4: Expert, adaptive	Experienced level—the teacher is capable of dealing with a full array of instructional challenges, identifies problems, seeks research-based solutions, and incorporates that new knowledge into his or her practice.
Level 5: Reflective, organized, analyzed	Master Teacher level—the teacher analyzes and evaluates new information from various sources, leads professional development activities, and serves as a mentor/consultant for less-experienced colleagues.

Case Vignettes

Case vignettes were created to describe each teacher's classroom at the end of year three; each vignette captures one actual observational session. These vignettes demonstrate each teacher's stage of teacher knowledge at the conclusion of the study. Tina, Sara, and Gretchen are unique and represent different points in the progression of teacher knowledge.

Ms. Tina. It is March, shortly after lunch, and Ms. Tina is reading aloud from the basal textbook. As Ms. Tina returns to her desk, no directions are given, but she tells her second-grade students to work independently in their reading workbook. A student asks for help and Ms. Tina replies, "Uh-um. No. Earlier when the other teacher was here, you were playing. In the morning when I was giving directions, you were playing. Now do it by yourself." The room remains silent except for Charlotte, who is reading quietly to herself. Ms. Tina reprimands Charlotte for reading out loud and sounding out the words; Charlotte completes her work by randomly filling in the blanks. Ms. Tina warns one student to keep his feet under his desk and another to pick up the paper from the floor.

Finally, when the second graders finish their reading workbooks, they are expected to complete their spelling work for the day, but the words that are written in cursive in the workbook present challenges for the class, who has no formal training or experience in cursive writing. One student raises her hand and comments, "I can't read the words in cursive," wherein Ms. Tina replies, "If you all would stop socializing, you make a big to-do about nothing. Just check your work—I can't be giving you the answers all the time." The room remains as silent as it has been since lunch. Figure 2 compares written reflections and observations for Ms. Tina.

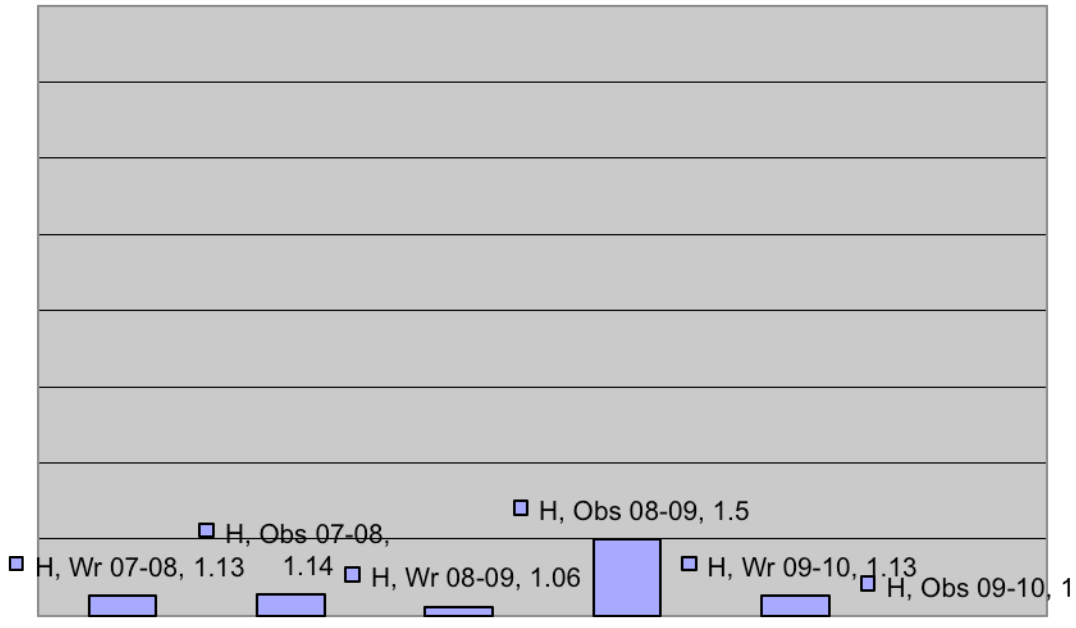

Figure 2. Teacher H, Ms. Tina, comparison of written reflections and observations, 2007–2010.

Ms. Sara. During the final year of this study, the observer enters Ms. Sara's first-grade classroom just as school is beginning. The students are actively involved in a daily oral language activity by responding with their individual worksheets, along with editing on the large group sheet. As the students transition to their basal textbook, Ms. Sara begins by reading the story aloud to the students. The room is quiet, but not all are attending to text and several are playing with objects from their desks. In an attempt to actively engage the students, Ms. Sara has the class chorally read the story, but again some struggle because the text is too difficult. Throughout the morning there are no opportunities for students to engage in reading text at their individual instructional levels or differentiation of text. However, Ms. Sara always circulates the classroom answering questions and assisting students as they complete their workbook assignments.

There is evidence of Sara's emerging understanding of literacy instruction (e. g., chart paper with sticky notes for interactive reading, a pocket chart with a poem, and a word wall with recent additions). Ms. Sara's classroom represents a positive learning environment in which her caring attitude and respect for students is clearly evident. There is constant interaction with students, whether talking quietly to individuals, to small groups, or to the whole class. She remains flexible in her instructional delivery, even when changes in schedules occur.

Figure 3 compares written reflections and observations for Ms. Sara.

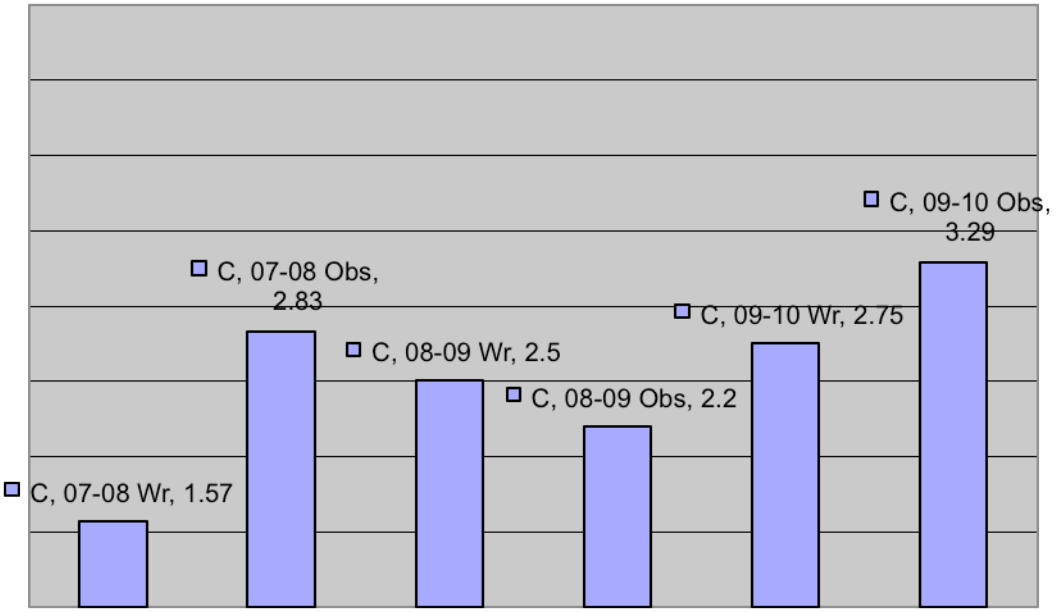

Figure 3. Teacher C, Ms. Sara, comparison of written reflections and observations, 2007–2010.

Ms. Gretchen. As the observer enters on this particular morning, the students in Ms. Gretchen's fifth-grade classroom are engaged in a lesson focused on expository text strategies. It is

immediately evident that Ms. Gretchen is implementing an action plan from a recent professional development meeting. The classroom environment is welcoming, safe, and positive. There is evidence of an emotional connection between the teacher and the students. There are frequent displays of respectful, positive communication taking place, not only between teacher and students, but between students as well. Ms. Gretchen demonstrates a high level of flexibility and tolerance for productive conversations.

The lesson begins with Ms. Gretchen using chart paper to model the strategy of finding the main idea and supporting details. She uses a think-aloud to engage students and facilitate understanding. Discussions demonstrate that Ms. Gretchen is acutely aware of potential misconceptions; she carefully dignifies incorrect responses, prompts thinking, and uses feedback loops to guide understanding.

As the class moves into small groups for guided practice in finding the main idea and supporting details, the teacher circulates, keeping students on task. Ms. Gretchen allows students to lead conversations, offers encouragement and affirmation, and monitors the productivity of the small-group work. As she moves around from group to group, Ms. Gretchen links this activity to previous lessons. She also scaffolds conversations to help students make text-to-text connections. She frequently pauses to provide additional information, map her own thinking, and/or repeat or extend students' comments. Finally, Ms. Gretchen gathers one small group of students experiencing difficulty with the task. She takes them to a side table where she carefully scaffolds their practice while providing support and encouragement.

Figure 4 compares written reflections and observations for Ms. Gretchen.

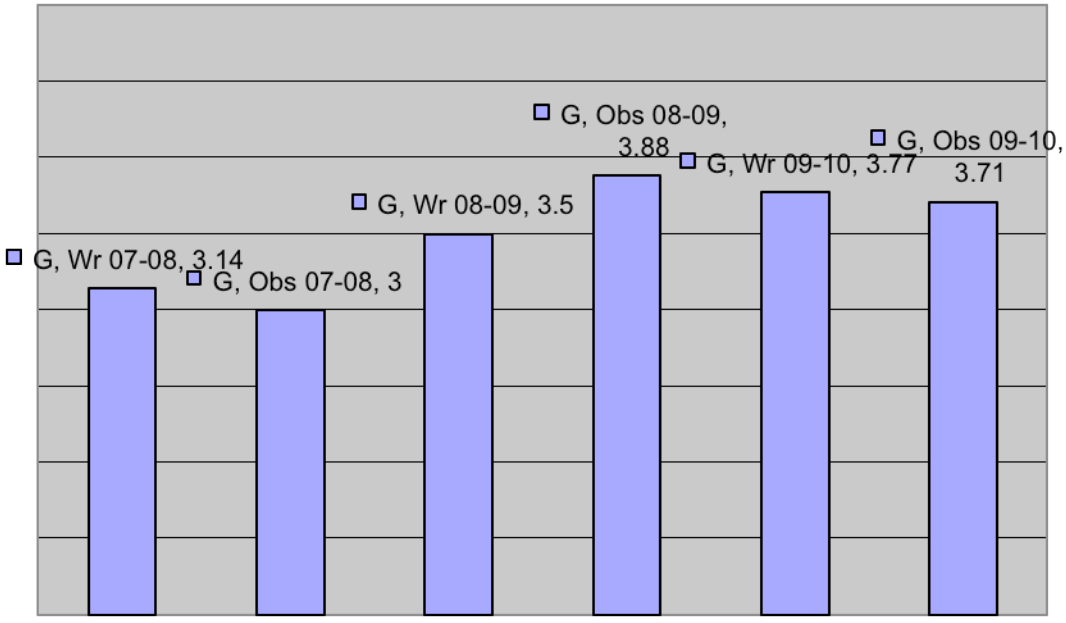

Figure 4. Teacher G, Ms. Gretchen, comparison of written reflections and observations, 2007–2010.

Results

An examination of the data generated for these three teachers revealed uneven results. The first case vignette, Ms. Tina, illustrated the significant challenges of working with an urban teacher who clearly resisted the movement to change classroom practices. The second scenario, Ms. Sara, described the professional development journey of a teacher who has made surface responses to professional development experiences but has not reached that deeper level of integrating new knowledge into everyday classroom practice. The data summarized in the third and final vignette, Ms. Gretchen, suggested that even seasoned teachers can respond to and become energized by professional development and coaching experiences.

The data displayed in Figure 5 compare teachers' written reflections and coaches' observation logs for the three teachers over the course of three academic cycles. Ms. Tina's (teacher H) data illustrated the very low level of knowledge reflected in her written summaries and action plans. Her knowledge level remained in the declarative/pre-service level throughout the three-year experience. Ms. Sarah's data displayed a positive trend as her early writings were at the declarative level, but moved over the course of her three-year participation to the stable, novice level. Ms. Gretchen's data demonstrated a trend that moved her from the stable/novice level to the experienced/adaptive level.

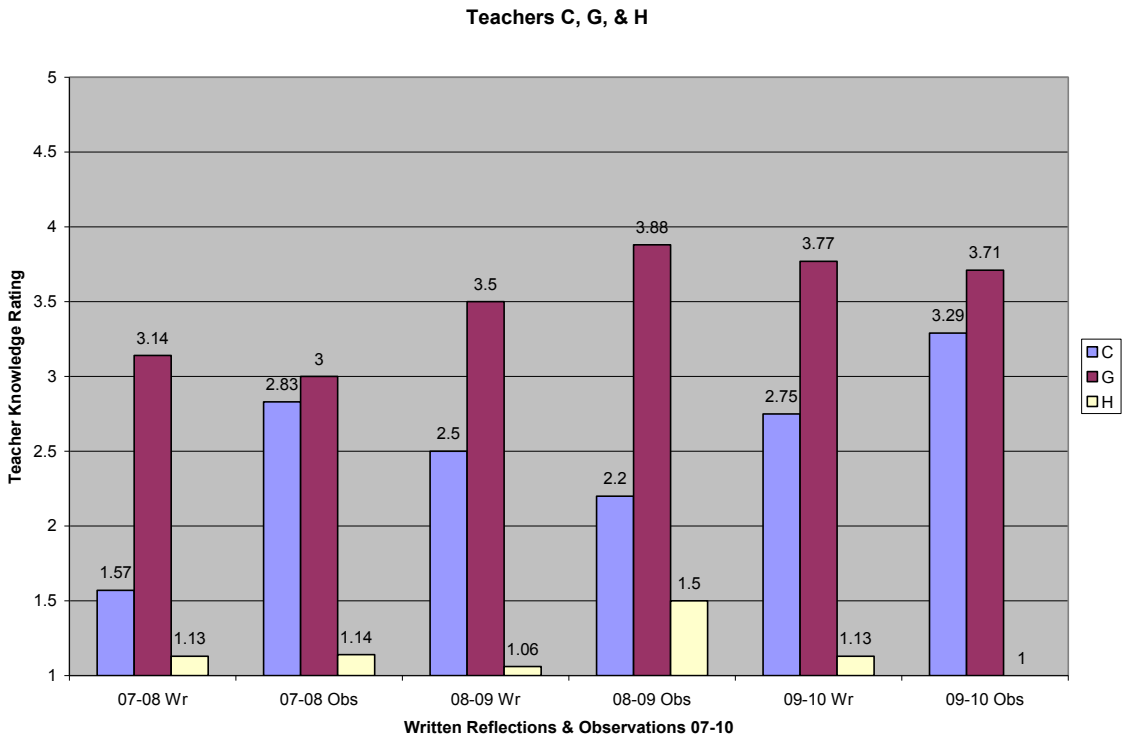

Figure 5. Teachers C, G, & H comparison of written reflections and observations, 2007–2010.

The data for Ms. Tina revealed her initial low level of preservice teacher knowledge at the beginning of the study, a brief rise early in the second year, and finally a return to the original

low levels. During the three years of supported professional development, an analysis of Ms. Tina's growth in teacher knowledge showed little or no progress towards higher levels of knowledge and understanding. The classroom observation data revealed little direct instruction, no evidence of developing conceptual understanding of material, and low levels of questioning with dependence on questions from the teacher's manual of the basal series. In Ms. Tina's classroom, there was no table to facilitate small group work or a gathering area for whole group meetings. The classroom library consisted of leveled books purchased as part of the grant funded partnership; however, the students were rarely allowed to use these books, and then only on teacher-selected occasions. Ms. Tina's major focus remained constant: a silent, orderly, and controlled classroom.

An analysis of Ms. Tina's written responses from the professional development meetings mirrored coaches' observation ratings—her teacher knowledge development ratings remained at the lowest level, declarative knowledge, where she was acquiring procedural knowledge about learning situations in her classroom. According to Snow et al. (2005), this knowledge rating parallels the understandings of preservice teachers. Ms. Tina's classroom practice remained at the lowest level of performance, suggesting that Ms. Tina was absent from the teaching/learning experience and was simply covering the content. In the professional development meetings, Ms. Tina's written responses indicated no movement towards acting on or internalizing concepts developed and discussed.

In her reflective response about differentiation from a professional development meeting, Ms. Tina reported that she used "read aloud, discuss novel, and reread the chapter quietly." Again, she continued with instructional routines that were previously established. Both the quantitative and qualitative data suggested that Ms. Tina resisted efforts to facilitate changes in her teaching practices. However, since she was a non-certified teacher, she may have been operating in a default mode—teaching as she had been taught. Ms. Tina may have been an example of Lortie's (1975) seminal work on teacher knowledge that focused on the problem of "the apprenticeship of observation," the preconception of teaching and learning as a result of being a K–12 student.

The data for Ms. Sarah (teacher C) demonstrated stable, procedural knowledge at the outset, followed by a dip down to the situated level before vacillating between stable/novice and expert/experienced during the final year of the partnership. The vignette describing the final year of observation in Ms. Sara's classroom illustrated her return to stable/novice and expert/experienced levels of teacher knowledge. During the previous two years, she demonstrated stable, procedural knowledge at the outset and a slight decline to the situated level during the second year. Throughout the time of the study, she always demonstrated careful planning and adaptation of instruction when confronted with changes in daily routines. Even though she continued to use traditional literacy formats, she began to include suggestions from the professional development meetings, such as teacher modeling and teacher think-aloud, along with making predictions and connections. After a professional development session on visualizing and inferring, Ms. Sara commented, "When I use visualizations, they are all actively engaged. That is always a great day when you have eager learners." With these additions, there was growing evidence of her attempts to move students toward higher levels of thinking and engagement.

The data for Ms. Gretchen (teacher G) provided evidence of her steady movement from the stable/novice level to the expert/experienced level as she participated in this three-year, continuous and supported professional development experience. In one particular written

response, Ms. Gretchen reflected, "I have learned that I can use so many strategies . . . and will continue to do so. This is the way comprehension takes place." The window into Ms. Gretchen's classroom presented in the vignette illustrates and affirms the growth in knowledge that was revealed in the data. Ms. Gretchen's teaching in this scenario clearly displayed the qualities of an expert, adaptive, and experienced teacher. This particular lesson emphasized her ability to seek out research-based solutions and incorporate that new knowledge into classroom practice. In addition, her actions demonstrated the ability to see the nuances of learning taking place in her classroom as she formulated questions, exchanged feedback, and observed her students' learning. Ms. Gretchen's actions displayed her ability to generate explanations, define terms, and scaffold student understanding. In another professional development reflection, she asked, "How can I better help students to read closely and with a critical eye so that they are aware of how language and writing can influence thinking?"

Limitations

This particular study explored three years of a professional development and coaching project that focused on a sample of only one private, urban elementary school; the participants were not randomly selected, and so the results of this study cannot be generalized to a larger population. However, the case vignettes may allow others to benefit from what the researchers have learned.

The dual role of researcher and professional developer/coach was potentially a significant limitation. Although there were a total of five consultant/coaches across the duration of this partnership, the two researchers did serve as both professional development presenters and as coaches at various points over the three years. The university affiliation of the professional development presenters and coaches may potentially have been a limitation. Some of the participants viewed the researchers and other presenters/coaches as outsiders; thus the development of trust and rapport was uneven.

Discussion

Expanding teachers' knowledge, skills, and dispositions allows for a broader repertoire of effective strategies, improves classroom practice, and ultimately improves student learning (Learning Forward, 2011). To meet this challenge, professional development providers and coaches need to explore various avenues to support the growth and development of adult learners. Just as effective teachers adapt instruction to address the diverse needs of children, professional development providers and coaches need to differentiate practices to attend to differences in how professional educators learn in each particular context (Drago-Severson, 2009).

Throughout this three-year study, the professional development and coaching conversations aimed to support adult learning by expanding awareness, conducting exercises in critical reflection, encouraging validating discourse, and supporting reflective action in classroom practices (Mezirow, 2000). These four elements framed each professional development and coaching session in an attempt to move teachers from informational learning toward transformational learning (Kegan, 2000). Research on professional development suggested that monies are well spent when they are invested in programs that are implemented on-site, embedded in local context, and focused on student outcomes (Chappuis, 2007). Over the course

of this three-year study, monthly sessions were designed with best practices in professional development in mind. Professional development sessions focused on written reflections and conversations centered on assigned readings; small groups led by coaches engaged in lively discourse and action planning.

If the ultimate goal of professional development is to make each classroom a more effective learning environment, then the logical first step includes a significant and sustained investment in effective teaching. As the primary agents of instruction, teachers hold the key to student achievement (DuFour, 2007; Guskey, 2000; Roy & Hord, 2003). However, change in teacher practices is more likely to occur if teachers are provided with a mentor or coach who is physically present and engaged in supporting, encouraging, and guiding them (Bloom, Castagna, Moir, & Warren, 2005; Knight, 2007; Reeves & Allison, 2009). In this study, coaches provided support through monthly demonstration teaching, classroom observations, written and oral feedback, and one-to-one conferencing.

The question guiding this study was: Will a professional development and coaching model have a positive impact on teacher knowledge? The tandem approach of continuous professional development and coaching appears to have made a positive difference with Ms. Gretchen's knowledge related to best practices in literacy instruction. The coaches' log entries describing her overall movement from the stable/novice level to the expert/experienced level as she participated in this three-year, continuous, and supported professional development community experience, is encouraging. Ms. Gretchen's written responses also demonstrate a trend that moved her from the stable/novice level to the expert/experienced level. At the outset of the partnership, Ms. Gretchen's classroom practice demonstrated a tired, traditional format. However, Ms. Gretchen herself notes that this particular partnership energized and revitalized her teaching as well as her enthusiasm for her profession.

The data indicated that Ms. Sarah appears to be gradually moving forward in her knowledge of effective literacy practices. The observation data gathered regarding Ms. Sarah demonstrated her stable, procedural knowledge at the outset, a dip down to the situated level, before vacillating between stable/novice and expert/experienced during the final year of the partnership. Ms. Sarah's written response data displayed a positive trend, as her early writings were at the declarative level, but moved over the course of her three-year participation to the stable, novice level. In this particular assignment, Ms. Sarah struggled to maintain her teaching focus and moral level as she experienced both personal and professional challenges. Ms. Sarah felt a significant lack of support from the building principal during the tumultuous second year of the study; she responded positively to the changes introduced by the new principal in year three. However, the administrative challenges and removal of the new principal towards the end of year three proved disheartening for her.

Ms. Tina, however, remained steadfastly unchanged over the course of this three-year partnership. The teacher knowledge data gathered via coaches' observations revealed her initial low level of preservice teacher knowledge at the beginning of the study, a slight rise early in the second year, and finally a return to the original low levels. Ms. Tina's written responses presented a disheartening scenario. The data clearly illustrated the very low level of knowledge reflected in her written summaries and action plans. Her knowledge level remained in the declarative/pre-service level throughout the three-year experience.

While none of the teacher participants in this study achieved the master teacher level of reflective, organized, analyzed knowledge, two have made progress toward the expert, adaptive knowledge level. Continued support may, over time, move these two teachers closer to the

desired master teacher level. Guskey's (2002) model of professional development and teacher change proposed that professional development leads to change in teachers' classroom practices; this in turn leads to change in student learning outcomes; and finally a change in teachers' beliefs and attitudes occurs. Teachers must believe that students' achievement can be positively impacted. Guskey noted that "[t]eachers who have been consistently unsuccessful in helping students from educationally disadvantaged backgrounds to attain a high standard of learning, for example, are likely to believe these students are incapable of academic excellence" (p. 384). In the case of these three teachers, however, the belief that all students can learn was not unanimously embraced.

School culture and contextual factors mattered significantly in the overall delivery of a professional development and coaching model. Individual teachers reacted differently to school culture and context; and that in turn impacted their acceptance or rejection of change. Issues related to school leadership, teacher turnover, and resistance to change presented barriers and detours in this university/school partnership.

Teachers in urban schools frequently encounter challenges that leave them feeling isolated and overwhelmed. Some even become passive or resistant to change initiatives, and thus understandings and actions that would transform teaching and positively influence student learning are stifled. In this particular context, the researchers found a wide range of responses. The case study vignettes presented here capture the high, midpoint, and low range of results along the continuum.

Conclusion

The data seem to suggest that professional development and instructional coaching that includes direct observation can be an effective design for increasing teacher knowledge. The key, however, is the unique context in which these adult learning activities are supported. As demonstrated in this study, leadership, climate, and school culture can slow the progress. The researchers' experiences in this study demonstrate that the nature of change in high-needs schools is inherently a long-term process; there are no quick fixes.

This study represents the first step in measuring the effectiveness of a professional development and coaching model: whether or not teachers learned and taught more effectively. The next step would be to determine the impact on student learning. The researchers would recommend that professional developers working with high-needs urban schools narrow the focus to a few essential initiatives. These selected initiatives should be implemented slowly and in tandem with frequent and ongoing support; taking time to slowly build a culture of trust—and then change. The support and active participation of the school leaders is also critical. Professional developers working in urban school contexts need to carefully consider the importance of long-term partnerships that can continuously support the knowledge development and classroom practices of teachers. Success in urban schools is fragile (Au, Raphael, & Mooney, 2008); yet, at the same time Cunningham (2006) reminds us that perseverance and persistence are critical in fostering sustainable change in high-poverty schools.

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Note to the Authors

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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

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About the Author (10pt bold, followed by 12pts white space; all type in this section is also 10pt)

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