The aim of the Journal of Asynchronous Learning Networks is to describe original work in asynchronous learning networks (ALN), including experimental results. Our mission is to provide practitioners in online education with knowledge about the very best research in online learning. Papers emphasizing results, backed by data are the norm. Occasionally, papers reviewing broad areas are published, including critical reviews of thematic areas. Entire issues are published from time-to-time around single topic or disciplinary areas. The Journal adheres to traditional standards of review and authors are encouraged to provide quantitative data. The original objective of the Journal was to establish ALN as a field by publishing articles from authoritative and reliable sources. The Journal is now a major resource for knowledge about online learning.

JALN

The Sloan Consortium
A Consortium of Institutions and Organizations
Committed to Quality Online Education

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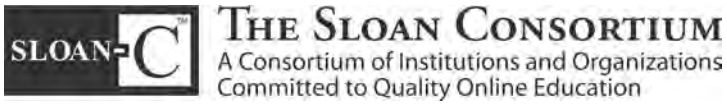

The purpose of the Sloan Consortium (Sloan-C) is to help learning organizations continually improve the quality, scale, and breadth of their online programs according to their own distinctive missions, so that education will become a part of everyday life, accessible and affordable for anyone, anywhere, at any time, in a wide variety of disciplines.

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Editorial and Advisory Boards

The Sloan Consortium, Inc. is a consortium of higher-education providers sharing the common bonds of understanding, supporting and delivering education via asynchronous learning networks (ALNs). With the mission of providing learning to anyone anywhere, the Sloan Consortium seeks to provide new levels of learning capability to people seeking higher and continuing education. For more information about Sloan-C, visit www.sloanconsortium.org.

INTRODUCTION TO THE SPECIAL ISSUE ON BLENDED LEARNING

Anthony G. Picciano
Associate Editor, JALN

In April 2008, the University of Illinois-Chicago hosted the *Fifth Sloan-C Workshop on Blended Learning and Higher Education.* This workshop attracted 180 educational leaders, faculty members, instructional designers and researchers who discussed, shared and considered effective practices in the design and delivery of blended learning environments. Presentations on best practices, lessons learned, and research on the phenomenon of blended learning stoked the discussion for two days.

The theme of the workshop, *Blending with Purpose*, attempted to focus the discussions on the importance of designing blended learning courses and programs with specific educational goals and objectives in mind. The theme developed out of a growing concern that many faculty were using the latest technology simply for the sake of the using technology without carefully considering the pedagogical benefits and "purpose". The organizing committee for the workshop also understood that blended learning was not just a faculty-driven activity but needed support and guidance from administration and instructional designers. As a result, three areas of focus helped organize the workshop activities namely: administration, pedagogy, and evaluation/assessment.

The administrative focus of the workshop centered on developing strategic and purposeful approaches to blended learning that related to an institutional visions and long-range plans. As all administrators, department heads and program directors who have tried to juggle competing priorities over scarce resources know, implementing a blended learning initiative without considering all stakeholders or having a clear vision and concrete objectives is an effort doomed to failure. As obstacles emerge—and they always do—following the institution's roadmap keeps the blended learning initiative focused on the mission and goals and provides a means to assess progress.

The pedagogical focus of the workshop looked to specifics of improving instruction. Sessions were designed to examine new ways to present content, improve student communication, actively engage students, design assessments, and provide "real" world and service learning experiences for students. Blended learning was discussed as a way to provide students with more flexibility in learning, more opportunities to practice what they are learning, and more time for reflection.

The workshop's third focus concentrated on the ever growing issues and practices related to evaluation and assessment. How do stakeholders evaluate and assess the impact of blended learning on the institution as well as on learning? Discussions centered on evaluation models that reflect blended learning's impact on the institution, the students, and the instructors as well as on the need to develop new outcome models. Assessment considerations focused specifically on how student learning is moving from objective, non-authentic and non-contextual practices to models that reflect interpretive, authentic and contextual approaches.

The seven articles selected for this special edition reflect some of the most important issues presented at the Sloan-C Workshop. The first article by Anthony Picciano provides background on the theme of the workshop, *Blending with Purpose*, and recommends that instruction be designed to meet the needs of a

variety of learners. Specifically, *Blending with Purpose: The Multimodal Model* recognizes that because learners represent different generations, different personality types, and different learning styles, teachers and instructional designers should seek to use multiple approaches including face-to-face methods and online technologies that meet the needs of a wide spectrum of students. Critical to this model is the concept that academic program and course goals and objectives drive the pedagogical approaches and technologies used.

Mary Niemiec and George Otte in *An Administrator's Guide to the Whys and Hows of Blended Learning* provide insightful advice on the importance of administrative attention to blended learning. This article points out the institutional benefits as well as the institutional challenges related to the integration of online and on-campus instruction. The reasons for engaging in blended learning determine how things will play out, so the *why* is given precedence over the *how*. Nevertheless, there is an attempt to elaborate the methods even more extensively than the reasons and to drill down into the issues that must be taken into account in any successful implementation. How the details sort out necessarily varies from one institution to the next, but there are certain considerations that seem genuinely indispensable, and are the keys to success or failure, sustainability or aborted effort.

David Larson and Chung-Hsien Sung in *Comparing Student Performance: Online versus Blended versus Face-to-Face*, report on a three way comparison of delivery modes in an introductory Management Information Systems course. The purpose of the study was to determine if there existed a difference in student success among the delivery modes. The research compares student exam and final grade results in a course that was taught by the same instructor using face-to-face, blended, and online delivery modes. Additionally, a discussion of this course in relation to student satisfaction, learning effectiveness, and faculty satisfaction is presented. Their research found no significant difference among delivery modes. Additionally, blended and online modes did very well when measuring student satisfaction, learning effectiveness, and faculty satisfaction.

The next article, *A Case Study from Golden Gate University: Using Course Objectives to Facilitate Blended Learning in Shortened Courses*, discusses utilizing course objectives to drive the change of existing 10–15 week undergraduate courses into 8 week courses that feature blended learning tools. Bob Fulkerth provides first-hand insights on how to design faculty and instructional development programs by stressing the importance of examining purposes and pedagogical goals. This article reflects his years of experience in leading faculty to adopt technology within the context of meaningful pedagogy.

Kathryn Lowell and Karen Vignare in, *MSU Medical Colleges Blended Learning for First Year Science Courses: Uniting Pedagogy to Maximize Experience and Real World Limitations* take the reader into Michigan State University's use of blended learning as a vehicle to insure that learning experiences are equivalent for students at three separate campuses. They richly describe how faculty, staff, and administrators meet on a regular basis to discuss working toward a NSF CyberInfrastructure model where all basic science learning experiences are available online. These online resources are coupled with face to face learning as well. Numerous debates occurred on how best to facilitate student learning in multiple locations using new technology tools, recognizing that the goal for students is not only to pass medical board exams but also to acquire life-long learning skills in an ever changing medical and science environment. The authors share the processes used as well as their perspectives on best approaches and strategies in determining what students find effective.

The provocatively titled, *Dancing with a Bear: One University's Experience with Evaluating Blended Learning* by Patsy Moskal, presents lessons learned at the University of Central Florida when developing

and conducting a longitudinal impact evaluation. Since 1997, the University has been collecting data on its online and blended learning initiatives and sharing same with faculty, administration, and colleagues in an attempt to validate its investments in instructional technology and to develop a culture of continual improvement and advancement. The title of this article relates to a Russian parable: "*When you dance with a bear, you can't quit when you are tired…"* Patsy and her colleagues at UCF have been national leaders in sharing their trials and tribulations with other researchers. This article presents many important lessons learned.

Last but by no means least, is *The Sloan-C Pillars and Boundary Objects as a Framework for Evaluating Blended Learning* by Mark Laumakis, Charles Graham, and Chuck Dziuban. The authors contend that blended learning represents a boundary object: a construct that brings together constituencies from a variety of backgrounds in which each of these cohorts defines the object somewhat differently. The Sloan-C Pillars (learning effectiveness, access, cost effectiveness, student satisfaction, and faculty satisfaction) provide a foundation for the evaluation of asynchronous learning networks that works equally well for the evaluation of blended learning environments. The Pillars and a simplified model of a learning system focus on inputs, processes, and outputs, while providing the framework for a case study of blended learning design and evaluation in a 500 student section of an Introductory Psychology course. The results of a multi-method evaluation of this course indicated very high levels of learning effectiveness and student satisfaction. The article concludes with the suggestion that blended learning may represent a black swan: a high-impact, unpredicted, and rare event that highlights the limitations of our ability to reliably predict the future in any arena, including online learning environments.

In closing, I would like to acknowledge the efforts of a number of individuals who have helped make the Sloan-C Workshop on Blended Learning and Higher Education a success and led to this special edition of JALN. First, without a doubt, credit goes to the leadership of Mary Niemiec and her staff at the University of Illinois–Chicago. They have worked tirelessly to make each of the workshops a success. Second, the members of the Planning Committee for the 2008 Blended Learning Workshop gave unselfishly of their time, namely:

Mary Niemiec, University of Illinois, Chicago, Chair
Chuck Dziuban, University of Central Florida
Bob Fulketh, Golden Gate University
Joel Hartman, University of Central Florida
Bob Kaleta, University of Wisconsin, Milwaukee
George Otte, City University of New York
Anthony G. Picciano, Graduate Center and Hunter College, City University of New York
Karen Swan, Kent State University
Karen Vignare, Michigan State University

Third, there are also several individuals who, by virtue of their dedication, I would also like to acknowledge. First, Kimberly Barba, Janette Salamanca and Emilie Wagner, University of Illinois-Chicago, who do a fantastic job of managing all of the details of the workshop. John Bourne and the Sloan Consortium staff especially Katie Fife Schuster, Director of Publications, whose expertise in editing and publication is appreciated by all who work with her. Finally, A. Frank Mayadas, Program Officer at the Alfred P. Sloan Foundation, a visionary and leader who saw earlier than most of us the potential of online learning for our colleges and universities.

The editors of JALN hope our readers enjoy this special issue and welcome any comments.

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BLENDING WITH PURPOSE: THE MULTIMODAL MODEL

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ABSTRACT

The purpose of this article is to propose a blending with purpose multimodal conceptual model for designing and developing blended learning courses and programs. A blended learning model is presented that suggests teachers design instruction to meet the needs of a variety of learners. Specifically, *Blending with Purpose: The Multimodal Model* recognizes that because learners represent different generations, different personality types, and different learning styles, teachers and instructional designers should seek to use multiple approaches including face-to-face methods and online technologies that meet the needs of a wide spectrum of students. A major benefit of multiple modalities is that they allow students to experience learning in ways in which they are most comfortable while also challenging them to experience and learn in other ways as well. Critical to this model is the concept that academic program and course goals and objectives drive the pedagogical approaches and technologies used. Issues related to definitions of blended learning, how teachers and students use technology, generational characteristics among student populations, and learning styles are examined.

KEYWORDS

Online Learning, Blended Learning, Distance Learning, Asynchronous Learning, Computer-Mediated Learning, Computer-Mediated Communications, Learning Styles, Instructional Design, Instructional Technology, Multiple Modalities

I. INTRODUCTION

Educators at all levels have been challenged over the past several decades by a plethora of technologies designed to assist in teaching and learning. While various technologies including television, microcomputers, presentation software, and simulation programs have been used with varying degrees of success, much of what goes on in education continues to rely on teacher-student interaction in face-to-face traditional classrooms. However, with the emergence of the Internet and World Wide Web in the 1990s, online technology has begun to make serious inroads into the traditional physical classroom model. Seaman and Allen [1] after tracking online enrollments in colleges for more than five years estimated that there were approximately 3.5 million students or almost twenty percent of the total higher education population enrolled in fully online courses in American colleges and universities in 2006–2007. There are few, if any, estimates of the number of students enrolled in blended (part online and part face-to-face) courses. While it is generally believed that blended learning has reached well into the mainstream of American higher education, little data are available that document this reach. There are several reasons why so little is known about this phenomenon.

First, many faculty do not necessarily identify themselves as teaching blended learning courses when, in fact, they are. Many college faculty, along with other segments of the general population, have become immersed in online technology and using Internet tools for instruction has become second nature. They use these tools as they would overhead projectors or blackboards. As the mystique and aura of teaching online that was present in the mid to late 1990s disappears, the faculty no longer see themselves as doing something unique and special, particularly in blended learning environments where only a portion of the class may be conducted online. As Eliot Masie, president of the Masie Center for Learning and Technology, has observed: the "e" in e-learning is disappearing and it is all just learning [2].

Second, colleges and universities are not necessarily keeping accurate records on faculty who teach blended courses. The Sloan Consortium, in collaboration with the Babson Survey Research Group, conducts annual national surveys on online learning at American colleges. The findings from these surveys represent important baseline data on student enrollments in fully online courses including the percentage and nature of colleges and universities offering these courses. While these surveys are frequently cited in studies and articles on online learning, very little data are presented on blended learning. Jeff Seaman, one of the authors of these studies, is concerned and a bit frustrated that these data are not being systematically collected at most colleges and universities. In effect, faculty might be teaching blended courses but many administrators do not necessarily know who they are or what they actually are doing in these courses. The lack of mechanisms for incorporating information on blended courses in college databases creates a situation in which a large-scale study becomes difficult to conduct and vulnerable to misinformation.

A third issue relates to definition. There is no generally accepted definition of blended learning. There are many forms of blended learning but a generally accepted taxonomy does not exist. One school's blended is another school's hybrid, or another school's mixed-mode. Furthermore, the issue is not just one of labels but the lack of agreement on a broad versus a narrow definition as well. Without a clear definition, blended learning is perceived as some nebulous combination of online and face-to-face instruction. Readers wishing to examine this issue further might refer to Graham and Robinson who in a study at Brigham Young University (BYU) identified three types of blended courses: transformative blends, enhancing blends, and enabling blends [3]. However, while identified and defined for the study's purposes, these types were not officially recognized in a formal way by the BYU administration or faculty.

Without administrative systems in place for identifying blended learning courses and without a widely-accepted definition or taxonomy, collecting data on blended learning becomes difficult. At the same time, there is a belief that colleges and universities are not doing enough to use the available technologies to engage students in meaningful explorations of content and curricular materials [4, 5]. Marc Prensky initiated the popular "digital natives versus digital immigrants" thesis that hypothesizes a disconnect in the way younger and older generations use technology [6]. In education, students represent the younger "native" generations who are most comfortable in using technology while older faculty are the "immigrants" struggling to use it. However, while informal observation supports this theory, carefully collected data are not readily available. For example, while young people might be using technology in greater numbers than adults, especially for social activity, the quality of its application to education is unknown. It may be the case that faculty are actually more knowledgeable and use the technology more effectively for education purposes. Despite the lack of hard data and given the growing concerns about program quality, student attrition, and assessment of learning that permeates higher education, it is accepted that colleges and universities need to do more to engage students. Online technology is perceived as one of the mechanisms that will foster this engagement.

The faculty perspective in teaching online becomes increasingly important as colleges and universities seek to make greater use of this technology in their course and program offerings. Online learning is seen as an important means of access for students who otherwise have difficulty attending traditional face-to-face programs. While geographic distance was the initial incentive for colleges to offer online courses, many of which grew out of well-established distance learning programs at institutions such as the Penn State World Campus and the University of Maryland University College, time and convenience evolved as a major factor in the expansion of online learning. Colleges especially those for whom access to an education is a part of their mission, started developing online courses and programs as a convenience for their traditional students. The Allen and Seaman studies [1] referenced earlier substantiate this phenomenon in their findings that community colleges and publicly-financed colleges tend to have the largest online student enrollments and the most prolific online programs. While not all faculty have embraced the new technology, many have developed the skills necessary to teach online and do so as needed. Research suggests that many faculty blend online with face-to-face activities because they see it as beneficial to their teaching [3, 7, 8]. Late adopters of online technology might see it as a compromise when faced with the challenge of developing fully online courses. The assumption being that it might be easier to develop parts of courses for online delivery rather than entire courses. Blending also allows faculty to maintain the familiarity and security of some face-to-face contact with their students. Nevertheless, more and more faculty perceive online learning in some form as important for their students. Related to, and equally important to, this discussion is the role of college and university administrations in encouraging and supporting online instruction.

College and university administrations increasingly are dealing with institutional issues and in some cases criticisms related to tuition costs, program quality, and student attrition. Generically these are important issues, but when the online element is added, they become more complex. Judith Eaton, President of the Council for Higher Education Accreditation (CHEA), in an article directed at "presidents, chancellors, other college and university administrators, and trustees" called on administrators to become informed on quality issues related to distance learning. In the article, she goes on to state:

> In the fluid and sometimes volatile environment created by [online] distance learning, we at the Council for Higher Education Accreditation (CHEA)—the national coordinating body for national, regional, and specialized accreditation—struggle to bring some order to the avalanche of information about both distance learning and quality assurance [9].

Eaton concluded her article with a warning that CHEA as well as the accreditation agencies need to provide more organization and coherence to the "plethora" of information and issues involved with quality assurance in online learning and noted that "the price for misunderstanding ... is very, very high." [9] It is clear that college and university administrators are pursuing the expansion of online learning opportunities in any case. Most have invested in course management systems such as Blackboard and have established the requisite support structure to maintain technological stability for their online learning activities. Furthermore, increasingly they are providing the necessary leadership in tying online learning to institutional goals and objectives related to the broader issues of student access to education and academic program quality.

In sum, the current environment in higher education requires the consideration of online technology in confronting a number of issues related to teaching, learning, student access and academic program quality. Blended learning increasingly is seen as one of the important pedagogical approaches that can help in this regard. The purpose of this article is to propose a *blending with purpose multimodal* conceptual model for designing and developing blended learning courses and programs.

II. DEFINING BLENDED LEARNING

Blended learning means different things to different people. The word "blended" implies a mixture or combination. When a picture is pasted above a paragraph of text, a presentation is created that may be more informative to the viewer or reader, but the picture and text remain intact and can be individually discerned. On the other hand, when two cans of different colored paints are mixed, the new paint will look different from either of the original colors. In fact, if the new paint is mixed well, neither of the original colors will continue to exist. Similar situations exist in blended learning. The mix can be a simple separation of part of a course into an online component. For instance, a course that meets for three weekly contact hours, two hours might meet in a traditional classroom while the equivalent of one weekly hour is conducted online. The two modalities for this course are carefully separated and although they may overlap, they can still be differentiated. In other forms of blended courses and programs, the modalities are not so easily distinguishable. Consider an online program that offers three online courses in a semester that all students are required to take. The courses meet for three consecutive five week sessions. However, students do a collaborative fifteen week project that overlaps the courses. The students are expected to maintain regular communication with one another through email and group discussion boards. They also are required to meet face-to-face once a month on Saturdays where course materials from the online courses are further presented and discussed, and some sessions are devoted to group project work. These activities begin to blur the modalities in a new mixture or blend where the individual parts are not as discernable as they once were. Add to this, the increasing popularity of integrating videoconferencing, podcasting, youtube videos, wikis, blogs, and other media into class work and the definition of blended learning becomes very fluid.

In 2004, the Alfred P. Sloan Foundation funded an invitation-only workshop on blended learning. An important aspect of this workshop was to develop a working definition of the term “blended learning”. The participants in this workshop had difficulty in formulating a simple definition of blended learning and the discussion alternated between a broad versus a narrow definition. Gary Miller, Associate Vice President for Outreach, and former Executive Director of The World Campus, the Pennsylvania State University, described a lengthy process at his university which resulted in a definition containing five variations of "blended learning" environments [8]. In the broadest sense, blended learning (see Figure 1) can be defined or conceptualized as a wide variety of technology/media integrated with conventional, face-to-face classroom activities. However, several workshop participants wanted to focus on a narrower definition that centered on an online component that replaced seat time in the conventional classroom (see Figure 2). The issue of a broad or narrow definition was discussed extensively and the two core elements (online and face-to-face instruction) were deemed critical to blended learning. One year later in 2005 at a second invitation only workshop, the following definition of blended learning was adopted by the participants:

1. Courses that integrate online with traditional face-to-face class activities in a planned, pedagogically valuable manner; and
2. Where a portion (institutionally defined) of face-to-face time is replaced by online activity [11].

This definition serves as a guideline and should not be viewed as an absolute, limiting declaration. Also while it was developed to refer specifically to courses, it also can apply to entire academic programs.

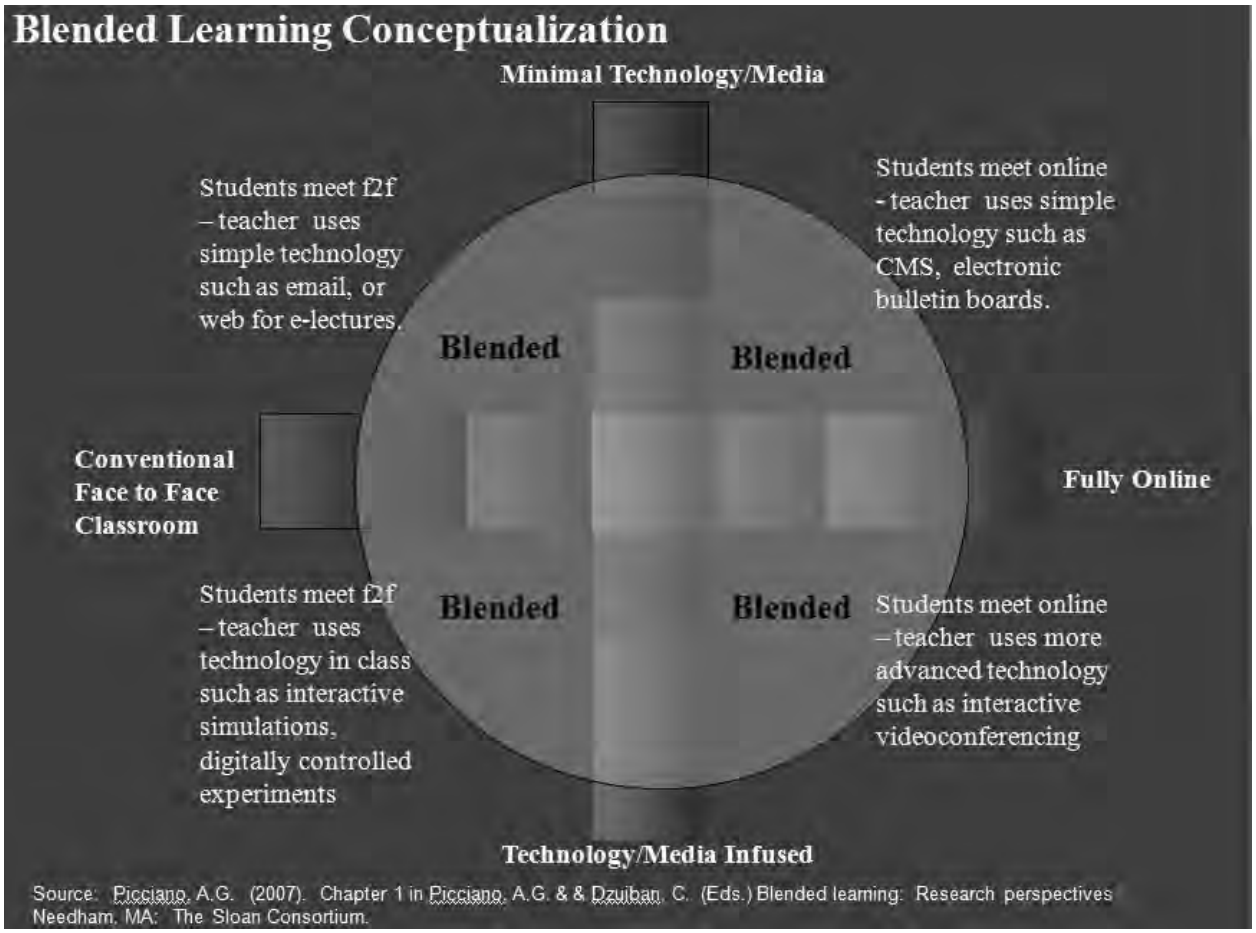

Figure 1. Broad Conceptualization of Blended Learning

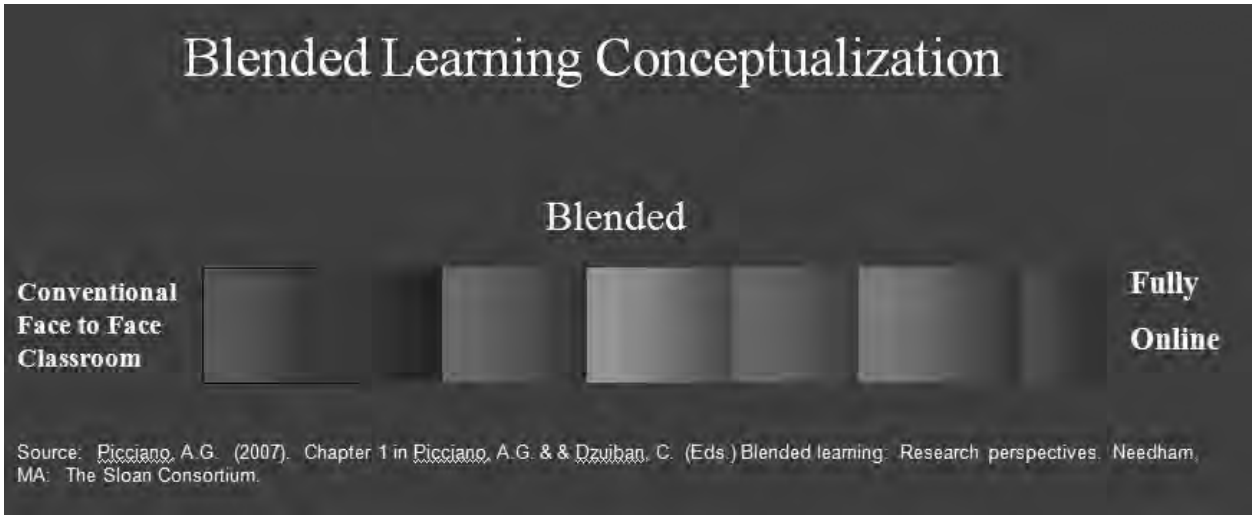

Figure 2. Narrow Conceptualization of Blended Learning

III. THE GENERATIONS

Earlier in this article reference was made to the generational differences in American society related to the use of online technologies in daily life. Without a doubt, the younger generation (millennial—*digital natives*) use these technologies for much of their social and informational activities. Table I provides a brief description of the generations of the 20th century. There is a legitimate concern that as the millennial generation enters college in greater numbers, faculty will need to adjust their teaching to accommodate technology-savvy students [4, 5].

Name	Years of Birth	Current Age
G.I.	1901–1924	80s and Older
Silent	1925–1942	60s and 70s
Baby Boom	1943–1960	50s and 60s
Generation X	1961–1981	30s and 40s
Millennial	1982–2002	20s and Under

Table 1. The Generations of the 20th Century
Source: Howe, N. & W. Strauss. *Millennials Rising: The Next Generation*. New York: Random House Inc., 2000.

College administrators and faculty are aware of this and are adjusting by making greater use of online technologies (as evidenced by the 3.5 million students enrolled in online courses), investing in course management systems, and expanding and converting library holdings to electronic media. However, while the millennials will be enrolling in colleges in greater numbers, they will not represent the vast majority of students for many years to come.

Age	1990	1995	2000	2002	2005	2010	2014
Total	13,819	14,262	15,312	16,612	17,350	18,816	19,470
14 to 17 years	177	148	145	202	201	216	215
18 and 19 years	2,950	2,894	3,531	3,571	3,705	4,067	3,951
20 and 21 years	2,761	2,705	3,045	3,366	3,456	3,848	3,845
22 to 24 years	2,144	2,411	2,617	2,932	3,143	3,384	3,686
25 to 29 years	1,982	2,120	1,960	2,102	2,374	2,724	2,913
30 to 34 years	1,322	1,236	1,265	1,300	1,290	1,399	1,573
35 years plus	2,284	2,747	2,749	3,139	3,181	3,178	3,287

Table 2. Total Fall Enrollment in Degree-Granting Institutions by Age: Years 1990 through 2014 (in thousands)
Source: U.S. Department of Education, National Center for Education Statistics. Digest of Education Statistics (NCES 2006-030), 2006.

Table 2 provides student enrollments by age from 1990 through 2005 and projections through 2014. In examining this data closely, it is obvious that older students (25 years plus) make up a sizable percentage of the total student population and will continue to do so for the foreseeable future. In 2005, 40% percent of the higher education student population was 25 years and older, and almost 60% was 22 years and older. Whether seeking advanced graduate degrees, completing undergraduate programs from which they dropped out when they were younger, upgrading their professional and job skills, or simply interested in life-long learning and intellectual growth (a major phenomenon that accelerated in the latter part of the 20th century), Americans of all ages were engaged in higher education. The phenomenon of the non-

traditional (older) student started in the 1950s with the G.I Bill of Rights and the inclusion of returning World War II veterans in higher education. It has continued unabated ever since. In many college classes, especially in large public institutions and community colleges with diverse populations, students continue to represent a broad spectrum of age groupings. Course delivery should be designed to address a variety of needs and learning styles rather than specifically targeting a particular segment.

IV. LEARNING STYLES

Student learning can be influenced by many factors including the technology and media used for delivery. Over the decades, however, the various technologies that have dominated American society have not necessarily altered how students learn. A good example is television. Vladimir Zworykin, one of the individuals credited with inventing the "tube" in the 1920s and 30s, hoped that his work would result in a technology that would among other things be an aid to education. In the 1950s, television proliferated throughout American society. By the1960s, classrooms throughout the country were being equipped and reconfigured for television. In many or in most of these classrooms, the television was rarely or never used. At first, it was generally believed that there just wasn't enough quality educational content available. But even after major investments by entities such as the Public Broadcasting System and the Annenberg Foundation, video materials while enhanced and integrated, were not a substitute for traditional instruction. For the most part, television was a passive technology with little direct interaction that required the teacher to provide the interaction and engagement with the material in order to be successful. However, another important factor was that people learn in different ways. Visual stimulation is important for some but not for others. The same is true for classroom interaction; some students thrive in active learning environments while others learn just as well in less active environments. These differences are well documented in much of the learning styles literature that has evolved in cognitive and educational psychology. For example, Lin, Cranton & Bridglall remind us that much of the work of Carl Jung in the early 1900s on personality types (e.g., extroversion v. introversion) is still applicable to learning environments whether face-to-face or online [12]. The extrovert may prefer active, highly collaborative environments while the introvert would prefer less interaction and less collaboration. This suggests that instruction should be designed to allow both types of individuals—the outgoing social organizer as well as the introspective reflective observer—to thrive.

Probably one of the better-known theories on learning styles relates to the "multiple intelligences" work of Howard Gardner [13]. Dating from the late 1970s and early 1980s, Gardner posited that intelligence is not a singular entity but is made up of multiple entities in different proportions used by individuals to understand and to learn about the world. Gardner identified eight basic intelligences (linguistic, logical/mathematical, spatial, musical, bodily kinesthetic, interpersonal, intrapersonal, naturalistic) that influence how people learn and lead to individual preferences in learning situations. The implications for learning are significant and Gardner recommends that instruction should use multiple modalities that allow learners to engage in ways they prefer/have interest/have ability in while also challenging them to learn in other ways where they have less preference, interest or ability. Gardner's work also addresses the concern that too much of teaching and learning is linguistically-based (reading, writing, speaking) and that the other intelligences need to be better utilized.

More recently, cognitive science is making major contributions to the learning styles literature. Interdisciplinary in nature, cognitive science draws from psychology, biology, neuroscience, computer science, and philosophy to try to understand the workings of the mind as well as cognitive development which forms the foundation for how people learn and acquire knowledge. Much of the research in cognitive science and learning styles continues increasingly is being influenced by physiological research on brain function. Current cognitive science research suggests that students learn in different ways

depending upon a number of factors including their age, learning stimuli, the pace of instruction, etc. It also suggests that learning is a dynamic process that may evolve and change from one classroom to another, from one subject to another, and from one day to another [14]. Finally, cognitive science suggests that multiple intelligences and mental abilities do not exist as yes-no entities but within continua from which the mind blends the manner in which it responds to and learns from the external environment and instructional stimuli. Conceptually this suggests a framework for a multimodal instructional design that relies on a variety of pedagogical techniques, deliveries, and media.

V. BLENDING WITH PURPOSE

Figure 3 depicts the *Blending with Purpose* model that derives from the discussions above on blended learning technology, generations, and learning styles. It posits that pedagogical objectives and activities should drive the approaches that faculty use in instruction. It also suggests that blending these objectives, activities, and approaches within multiple modalities might be most effective for and appeal to a wide range of students. This model presents six basic pedagogical objectives and activities and appropriate approaches for achieving them. Of course, there may be other objectives that can be added where appropriate. Most importantly, instructors need to consider carefully their objectives and understand how to apply the technologies and approaches that will work best for them. A quick review of the objectives used in the model and their concomitant technology will be helpful in understanding the overall model.

Content is perhaps the primary driver of instruction and there are many ways in which content can be delivered and presented. Increasingly, course management systems such as *Blackboard, WebCT,* or *Moodle* provide the basic content delivery mechanisms. CMS software handles the delivery of a variety of media including text, video and audio. Multi-user virtual environments (MUVE) and gaming are also evolving and playing more of a role in providing instructional content. In providing and presenting content, the *Blending with Purpose* model suggests that multiple technologies and media be utilized.

The *Blending with Purpose* model posits that instruction is not always just about learning content or a skill but is also about supporting students socially and emotionally. Perhaps more readily recognized for younger K–12 students, social and emotional development is an important part of anyone's education. Faculty who have taught advanced graduate courses know that the students, even at this advanced level, frequently need someone with whom to speak whether for understanding a complex concept or providing advice on career and professional opportunities. While fully online courses and programs have evolved to the point where faculty can provide some social and emotional support where possible and appropriate, this might best be provided in a face-to-face (F2F) mode.

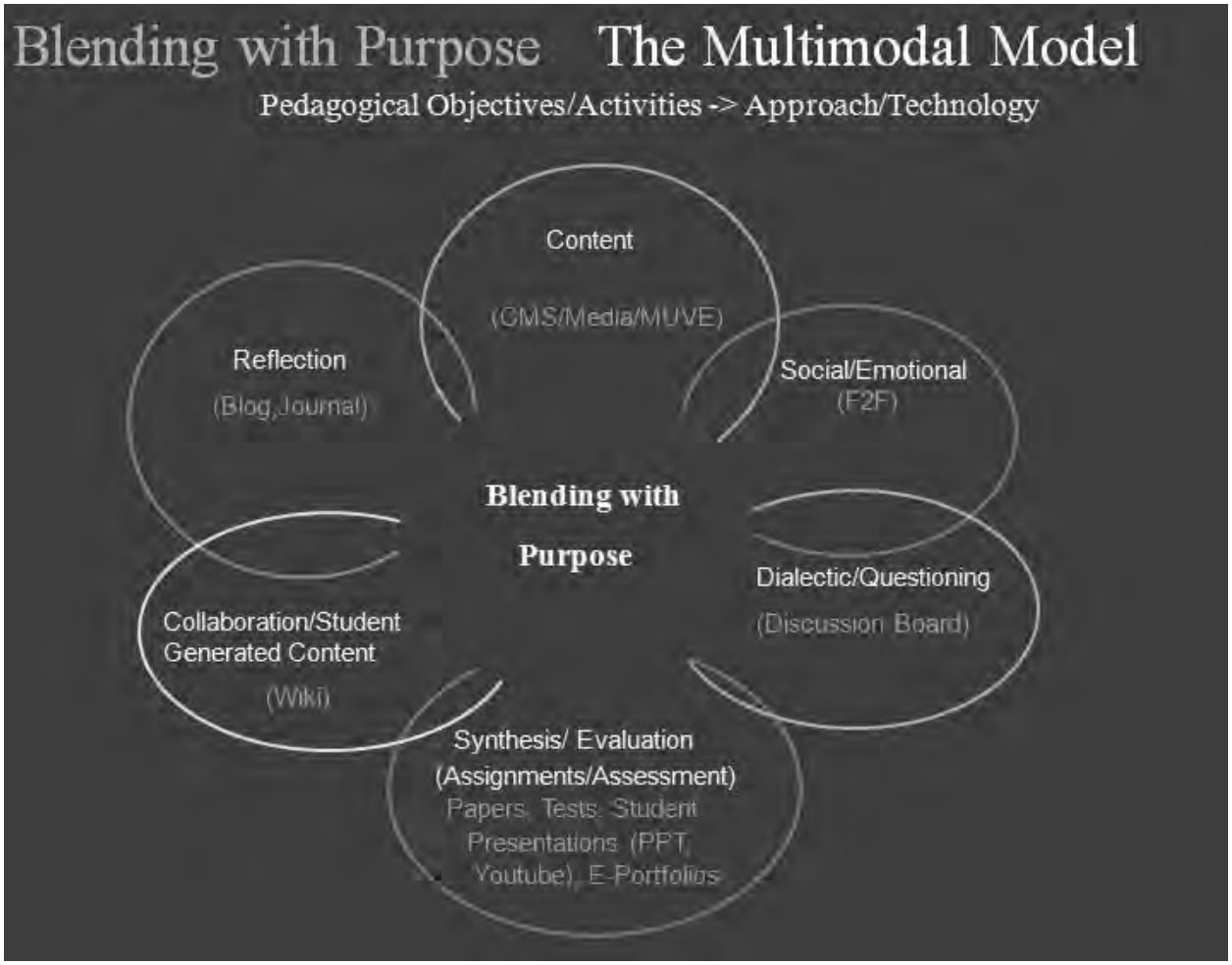

Figure 3. Blending with Purpose: The Multimodal Model

Dialectic/questioning is an important activity that allows faculty to probe what students know and to refine their knowledge. The Socratic Method remains one of the major activities used in instruction and many successful teachers are proud of their ability to stimulate discussion by asking the "right" questions that help students think critically about a topic or issue. In many cases, these questions serve to narrow the discussion down to very specific "points" or aspects of the topic or issue and are not meant to be open-ended "anybody can say anything at anytime" activities. For dialectic and questioning activities, a simple to use, threaded electronic discussion board is as or more effective than most other approaches. A well-organized discussion board activity generally seeks to present a topic or issue and have students respond to questions, provide their own perspectives while also evaluating and responding to the opinions of others. The simple, direct visual of the "thread" also allows students to see how the entire discussion or lesson has evolved. In evaluations of online learning activities, the main interactive tool for many courses has been and continues to be discussion-board activity centered on a specific topic.

Incorporating reflection can be a powerful pedagogical strategy. There is an extensive body of scholarship on the "reflective teacher" and the "reflective learner". While reflection can be a deeply personal activity, the ability to share one's reflection with others can likewise be most beneficial. Pedagogical activities that require students to reflect on what they are learning and to share their reflection with their teachers and fellow students are viewed very positively. Blogs and blogging, whether as group activities or for

individual journaling activities, are evolving as appropriate tools for students reflecting on what is being learned and on other aspects of course activities.

Collaborative learning has been evolving for decades. In face-to-face classes, group work has grown in popularity and has become a staple in many course activities. In the past, the logistics and time needed for effective collaboration in face-to-face classes were sometimes problematic. However, with email and other electronic communications, some of these logistical problems were alleviated. More recently, wikis have grown significantly in popularity and are becoming a staple in group projects and writing assignments. Furthermore, unlike group work that typically ends up on the instructor's desk when delivered in paper form, wikis allow students to generate content that can be shared with others during and beyond the end of a semester. Papers and projects developed with wikis can pass seamlessly from one group to another and from one class to another.

Finally and perhaps the most important component of the model is synthesizing, evaluating and assessing learning. CMSs and other online tools provide a number of mechanisms for assisting in this regard. Papers, tests, assignments and portfolios are among the major methods used for assessing student learning and increasingly are being done electronically. Essays and term projects pass back and forth between teacher and student without ever being printed on paper. Oral classroom presentations are giving way to youtube videos and podcasts. The portfolio is evolving into an electronic multimedia presentation of images, video, and audio that goes far beyond the three-inch paper-filled binder. Weekly class discussions that take place on discussion boards or blogs provide the instructor with an electronic record that can be reviewed over and over again to examine how students have participated and progressed over time. They also are most helpful to instructors in assessing their own teaching and in reviewing what worked and what did not work in a class. In sum, online technology allows for a more seamless sharing of evaluation and assessment activities. It also provides an on-going record that can be referred to over and over again by both students and teachers.

The six components of the model as described above should blend together in an integrated manner that appears as seamless as possible for students. As mentioned earlier in this paper, blending should be more a mixture of different colors of paint to create new colors or new learning environments rather than cutting and pasting visibly separate combinations of images, text and other media or material. Furthermore, not every course must incorporate all of the activities and approaches of the model. The pedagogical objectives of a course should drive the activities and hence the approaches. Not every course needs to require students to do group work. Not every course should rely entirely on reflective activities. Finally, beyond examining individual courses, faculty and instructional designers should consider examining their entire academic program to determine which components best fit which courses to serve cohesively overall programmatic goals and objectives.

VI. CONCLUSION

The purpose of this article was to examine a blending with purpose multimodal conceptual model for designing and developing blended learning courses and programs. In this article, a blended learning model was presented that suggests that teachers design instruction to meet the needs of a variety of learners. Specifically, the *Blending with Purpose: The Multimodal Model* recognizes that because learners represent different generations, different personality types and different learning styles, teachers and instructional designers should seek to try to use multiple approaches including face-to-face and online technologies to meet the needs of a wide spectrum of students. Furthermore, it posits that a major benefit of multiple modalities is that they allow students to experience learning in ways in which they are most comfortable while also challenging them to experience and learn in other ways as well. Critical to this

model is the concept that academic program and course goals and objectives drive the pedagogical approaches and technology used.

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VIII. ABOUT THE AUTHOR

Anthony G. Picciano is a professor and executive officer of the Ph.D. Program in Urban Education at the Graduate Center of the City University of New York (CUNY). He is also a professor in the graduate program in Education Leadership at Hunter College, the doctoral program in Interactive Pedagogy and Technology at the Graduate Center (CUNY), and the interdisciplinary program in Communication and Culture at the CUNY School of Professional Studies. He has forty years of experience in education administration and teaching, and has been involved in a number of major grants from the U.S. Department of Education, the National Science Foundation, IBM, and the Alfred P. Sloan Foundation.

In 1998, Dr. Picciano co-founded *CUNY Online*, a multi-million dollar initiative funded by the Alfred P. Sloan Foundation that provides support services to faculty using the Internet for course development. Currently he serves on the Board of Directors of the Sloan Consortium. His major research interests are education policy and leadership, Internet-based teaching and learning, and multimedia instructional models.

Dr. Picciano has authored numerous articles and eight books including *Data-Driven Decision Making for Effective School Leadership* (2006, Pearson), *Educational Leadership and Planning for Technology*, 4th Edition (2005, Pearson), *Distance Learning: Making Connections across Virtual Space and Time* (2001,Pearson), and *Educational Research Primer* (2004, Continuum). His most recent book was co-edited with Chuck Dzuiban and is entitled, *Blended Learning: Research Perspectives* (2007, Sloan Consortium). In 2007, Dr. Picciano completed a national study, with Jeff Seaman on the extent and nature of online learning in American school districts. It is one of the first studies to collect data on and compare fully online and blended learning in K–12 schools. He is currently collecting data for a follow-up study on this topic.

AN ADMINISTRATOR'S GUIDE TO THE WHYS AND HOWS OF BLENDED LEARNING

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ABSTRACT

Given the importance of administrative attention to blended learning, this article adumbrates the institutional benefits but also the institutional challenges of this integration of online and on-campus instruction. The reasons for engaging in blended learning determine how it will play out, so the *why* is given precedence over the *how*. But there is an attempt to elaborate the methods even more extensively than the reasons, to drill down into the considerations that must be taken into account in any successful implementation. Just how the details will sort out will necessarily vary from one institution to the next, but there are certain considerations that seem genuinely indispensable, the keys to success or failure, sustainability or aborted effort.

KEYWORDS

Blended Learning, Hybrid Courses, Institutional Change, Degree Completion, Assessment and Evaluation, Sustainability and Scalability

I. INSTITUTIONAL BENEFITS OF BLENDED LEARNING

The challenges administrative leadership must rise to in making blended learning successful are considerable. They include such formidable tasks as change management (at all levels), implementing strategies for successful support, using data to guide planning and decision-making, overcoming resistance, and addressing the policy issues. Meeting these kinds of challenges—even giving them serious consideration—demands some expected return on such investments. And the returns will depend on an institution's goals for blended learning. This hybrid form of instruction is not a single or simple phenomenon, and neither are its outcomes. Even defining blended learning, an exercise discharged by so many pieces in this volume, most notably by Anthony Picciano's "Blending with a Purpose" [1], forces the realization that the *what* of blended learning cannot be stated without also acknowledging—even foregrounding—the *why*. The key is always the purpose and point of an institution's engagement with blended learning. Just stating the supposedly self-evident aspects of blended learning helps to drive this home. As an integration of online and face-to-face instruction, it relies wholly on neither mode. Faculty and students (and they can be any or all of those at an institution) need to meet less often, displacing face-to-face time with interaction that is mediated by technology (itself a multifaceted nexus of considerations). The ways and means of a blended learning initiative could entail vast institutional change and enormous demands on resources, or they could have very localized and limited impact. So much depends on the expectations and motives for engaging in blended learning. It's logical, therefore, to outline the reasons before taking on the challenges.

B. Economic Motivations for Engaging in Blended Learning

Granted: change, particularly the kind of institutional or cultural change a commitment to blended learning can entail, must come at a cost. Much of the cost will be frontloaded. The start-up investment may be considerable. And the return on investment may be more in qualitative benefit than in quantifiable monetary gain. How this falls out will of course vary according to specific institutional contexts and circumstances. It is also important to see how the allocation of resources can be offset by real but perhaps unforeseen or once-removed gains—reduced opportunity costs for students, for example. But such projected gains can seem a kind of special pleading, not least of all at the campus where such resources must be mobilized, and during an economic downturn. It is better to start with more immediate, tangible, measurable gains. Among these may be the recouping of investments already made.

1. Reaping What Is Already Sown

Consider the following scenarios:

- College A has made a considerable investment in an online course management system that is under-utilized. With the exception of a few early adopters quick to seize on the possibilities, most faculty use the CMS as a place to hang the syllabus and a few course documents—if they use it at all. And most don't. What complicates this under-utilization is the fact that the CMS is, for students, the most visible purchase made with a student technology fee now in place for some time.
- College B has made a commitment to local outreach as a means of expanding enrollments, particularly among adult students who are in-service professionals. The evening and weekend classes for these students aren't working. They are under-attended, and students who do register for them complain that they are exhausted when they come to these classes, or take them at real personal cost as regards day care, family time, and some modicum of leisure.
- At College C, students and even faculty are complaining that the online course management system is being used the wrong way. In addition to the same amount of class attendance, they are supposed to engage in discussion boards and other online interaction. Meanwhile, since they all commute, they see a missed opportunity to reduce their commuting time and gas consumption.
- College D has been engaged in online learning for 10+ years primarily as a means to attract new online students. It is now looking to incorporate blended learning to meet several goals geared to improve its ability to teach its undergraduate students. The initial intent was to utilize existing infrastructure to support both online and blended—however, it became apparent early on that the capacity of that infrastructure needed to be expanded. College D must decide how to expand the infrastructure for its online programs and courses (that are funded through online tuition revenue) to handle the needs of blended learning. Primarily, where to find the additional resources. An organizational consideration is present as well—should the responsibility and driver for the blended effort be housed with the unit responsible for online instruction—the outreach unit?

In each case, it is apparent how blended learning, by repurposing already-made investments, can make what is achieved by those investments more effective and productive. But there is a deeper similarity that bridges such cases with those where new investments would have to be made: especially from the perspective of institutional benefits, blended learning should not be done for its own sake. It should be seen as a solution to a serious problem. To avoid seeming frivolous or ancillary, a merely trendy add-on, blended learning must be put in the service of broad institutional goals. This is particularly true at institutions where blended learning would entail significant re-allocation of resources or significant institutional change.

2. Justifying New Investment

Here are some other scenarios to consider:

- College E faces projected enrollment growth in spite of (and even because of) the economic downturn. At the limit of what its classrooms can accommodate, and with campus parking in a constant state of crisis, it can expect no new funding to do the kind of building out that would accommodate such growth. Yet granting access to qualified applicants is part of its mission, and it needs the revenues new enrollments would bring.
- At College F, an external review confirms what administrators had already suspected: that they lag behind competing schools in the use of technology in instruction. The administrative leadership does not see an important place for fully online instruction, and is still more reluctant to pay for high-end "smart classrooms" that superannuate quickly, but it does want to invest in technology-mediated instruction that serves real needs and reaps real benefits.
- College G has a new strategic plan, one that emphasizes learning outcomes and gives special emphasis to degree completion, noting that research shows the United States fares ever more poorly in international comparisons in that respect [2]. The school stands to gain materially if successful: its own institutional research indicates that job demands and family obligations are taking a toll on student persistence—and, of course, the revenues that retained enrollments bring.

In each case, the projected economic gains are tied to other gains—accommodated enrollment growth, enhanced reputation and competitive edge, improved time to degree—but that is as it should be. In fact, it is important to acknowledge how quickly the benefits that entail measurable gains shade into the more qualitative and less quantifiable benefits.

C. Less Quantifiable (But Perhaps Greater) Benefits of Blended Learning

Most fundamentally, the change blended learning represents is a change in pedagogy. "At its simplest," say Garrison and Kanuka, "blended learning is the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" [3]. But much depends on that "thoughtful integration" —so much, in fact, that blended learning succeeds or fails by how effectively faculty are implicated. The prospect of developing blended or hybrid courses can be intimidating, but it is perhaps no stronger than the felt need to keep up with academic uses of technology. Faculty can be resistant, but they can be eager to learn, truly teachable—even to the extent that, as one of us has argued, blended learning can be both a motive and a means to institution-wide faculty development [4]. One reason is that, whatever the resistance to blended or hybrid instruction, it is less than the resistance to fully online instruction. The very nature of the blended learning, its mixture of the familiar and the unfamiliar, the traditional and the technological, makes it more palatable, as has been reported in the *Chronicle of Higher Education*: "Even some professors who have been skeptical of online-education projects say that hybrid models could work—as long as faculty members are left in control of the courses" [5]. That insistence on faculty control is a double-edged sword: undirected, blended learning can become a centrifugal force, creating courses so different in format that it becomes impossible to generalize (and plan around) student experiences of them; nevertheless, faculty must have ownership, must feel that blended learning is pursued through (and not against) their prerogatives, their responsibility for the design of instruction. Administrators are right to realize that a consistency in the approach to blended learning is necessary to reap the institutional benefits, but they are no less right to suspect that top-down mandates will not be the way to cultivate such consistency.

With these things in mind, here are a few more scenarios:

- At College H, generational shifts among the students and even the faculty have increased pressure

to use more technology in instruction, and administration is resolved to respond. A special committee has been formed, charged to make sure such uses of technology amount to more than bells and whistles, that they speak to the core mission of teaching and learning.

- College I has a new chief academic officer who has made improvement of teaching her major initiative. It is an ambitious plan, intent on mobilizing the entire faculty, but the question is what would do this without being either too abstract or too discipline-specific. A further complication: the CAO, wary of relying too much on top-down mandates, wants the hallmark to be faculty collaborating with faculty on "best practices."
- A self-study prior to accreditation review at College J finds that college instruction must now take due cognizance of web-based kinds of knowledge creation and dissemination; the report urges that pedagogy in the new century must include online interaction and online resources, and that faculty must commit themselves to making access to these part of their instruction.

Given a pressing problem to solve, blended learning could seem the ideal solution in a variety of cases. Whether it is a matter of getting technologically or pedagogically up-to-speed, whether the primary impetus comes from the faculty or the administration, whether the change is to be dramatic or gradual, blended learning looms as the via media, the middle way. It combines traditional and tech-enhanced approaches. It does not demand the wholesale change in teaching mode fully online instruction requires, but it does require much more commitment and thought than the mere dabbling with technology that can characterize web-enhanced courses. It is like the bed Goldilocks chooses: not too hard, but not too soft. For it to be just right, it has to be the key to unlocking an institutional problem, a way of addressing a real need. When it is time to begin with blended learning (or to take what may have been relatively small-scale experiments with it to the next level), that defined problem or need is the place to begin.

II. THE CHALLENGES OF BLENDED LEARNING

The potential benefits of blended learning are so considerable because blended learning is, at least potentially, the most transformative and pervasive initiative an institution can undertake. It touches on everything, from students and faculty to administration and infrastructure. It can of course be localized in pilot programs or discipline-based ventures, but there is no necessity to keep it fenced in thus. Even if it begins on a small scale, the questions of whether or how to scale up should be addressed at the start. How these questions are posed, much less answered, depends so much on the institution's mission and the needs blended learning is intended to address.

D. A. Developing a Plan

1. Achieving Clarity on Institutional Mission and Goals

It is critical to align any major campus initiative with an institution's mission. This syncing provides a rationale for resource allocation and serves as a barometer in making certain that the effort is consistent with the institution's comprehensive strategy. There must be "mission fit" for any blended learning initiative to be successful, and that must be articulated so it is clear to all at the outset.

Institutional missions in higher education do not differ so radically that a list of the greater goals of blended learning cannot seem to have some relevance. Here are some of those goals already considered:

- Increased Access to Instruction
- Accommodated Enrollment Growth
- Improved Time to Degree
- Better Retention/Persistence

- Enhanced Teaching and Learning
- Technological Skills Acquisition, Improved Information Literacy
- More Efficient Use of Campus Space and Other Resources

It should be clear that these goals are by no means mutually exclusive, but it should be no less clear that any one of them may represent the best "mission fit" for a particular institution, the most appropriate priority depending on an institution's goals and circumstances.

2. Identifying the Barrier

A variety of pressing needs that create barriers to meeting institutional goals may drive a blended learning initiative. Perhaps the problem is a lack of sufficient classroom space that restricts the institutions ability to accommodate enrollment growth restricting access to education. At another institution, the problem may be a lack of large lecture halls for certain introductory courses, capping enrollment in those courses and negatively impacting time to degree. Identifying the need provides a strategic advantage in marshaling resources where they can be most effective. Continually revisiting the institutional goals keeps the initiative on mission. Examples of how blended learning can be a tool to mitigate these barriers are given in Table 1.

GOAL	**BARRIER**	**STRATEGY**	**BENEFIT**
• Increased Access to Instruction	Large lecture courses restricted to a few lecture halls	Replace F2F lectures with online lectures Create additional discussion sections using currently allocated classroom space	Increased enrollment opportunity Increased interaction, improved learning effectiveness
• Accommodated Enrollment Growth	General lack of classroom space	Replace one out of two class meetings with required online activity utilizing the same classroom for two sections	Increased classroom availability and accommodated enrollment
• Improved Time to Degree	Registration closes quickly in high demand courses creating bottleneck	Re-design curriculum to integrate online and F2F instruction replacing 50% of classroom time with online activities. Open additional sections of courses utilizing existing space.	Timely access to required courses
• Enhanced Teaching and Learning	Large lectures create distance between students and faculty Online tools under-utilized	Establish required participation in online discussion Focus classroom time on faculty/student interaction Make interaction with course content available 24/7	Increased interaction Self-directed learning Improved learning effectiveness

• Better Retention/ Persistence	Student need for scheduling flexibility due to life situations Cost of transportation	Require fewer campus visits and time on campus Replace portion of f2f instruction with online instructional activities	Access to degree programs for time- and place-bound professionals Flexible scheduling to reduce need for stop-out or withdrawals

Table 1

In the above grid, the problem of access is pervasive. Whether it is access to a specific course, access to admission, access when time and place dictate, the cost of access—blended learning has the potential to remove this barrier if systemically and strategically implemented. No less important is access for faculty. We focus on student needs, however, by creating an environment that provides opportunity for faculty to utilize technology to access research and materials, engage their students more effectively, create opportunities for peer interactions—we expand the potential for research, teaching and service. Surely such an initiative would have an impact on the learning experiences and outcomes for the students—otherwise why undertake it? —but that impact would also be enriched by thinking through and capitalizing upon the multitude of likely outcomes for the faculty as well.

Because blended learning is a means to many ends, because any form of it is likely to have myriad ramifications, it is also useful to identify a blended learning strategy and then think it through to its likely consequences and the institutional goals it makes possible. A general and generic outline of matching strategies with goals (rather than the reverse) is given in Table 2.

BLENDED STRATEGY	**ACHIEVABLE GOAL**
Blended re-design of large lecture courses with limited classroom space	Increased access to courses Increased interaction Accelerated time to degree
Pedagogically planned use of online and F2F classroom time	Enhanced teaching and learning Improved technological skills Enhanced reputation, competitive edge
Blended instruction for the sake of flexible schedules and timely access to courses and degree programs	Improved retention/persistence Expanded enrollment Accelerated time to degree Increased access to courses
Additional course sections utilizing blended strategy to conserve classroom space	More efficient use of existing resources Increased access to courses Improved retention/persistence Expanded enrollment Accelerated time to degree

Table 2

As Table 2 indicates, there is a good deal of overlap even in the primary goals each blended learning strategy is capable of achieving. The critical distinction is a question of priorities. Is blended learning being done primarily for the sake of improved teaching or better resource management? In neither case can teaching or resource management be ignored, but so much depends on which is given top priority. And so much depends on the circumstances of a specific institutional context. If an institution, interested in using blended learning to conserve classroom space also has an information fluency, initiative underway, that will be critical to the planning an implementation of blended learning, just as will a strategy that foregrounds improvements to teaching and learning but also seeks to expand enrollment.

3. Identifying Strengths and Weaknesses

Once clarity is achieved on goals and strategies, it is time to look beyond "mission fit" to other kinds of fit: how well the proposed use of blended learning suits available resources, current perceptions, levels of leadership, and so on. Like the exercise in matching strategies and goals, the identification of issues can be an opportunity to match apparent problems with what might be, when viewed from another angle, means of solving them, even pre-empting their perception as problems.

Here are some examples:

- Is there likely to be resistance from the faculty or from department heads?

It is always best to try to address likely concerns before they are voiced. Is the issue at root a matter of unfamiliarity, of control, of workload concerns, of pedagogical viability? Each kind of concern should be addressed and ameliorated before concerns emerge as vociferous objections. Communication can go a long way in heading off likely opposition. It may be wise to enlist sensitive groups—chairs, union representatives (if the institution is a "union shop"), influential faculty, members of faculty governance—in exploratory discussions that surface concerns ahead of time. The always avoidable danger is failing to give these concerns some consideration until such time as the plan is in full implementation, and the approach is a non-negotiable fait accompli.

- Will existing infrastructure scale to accommodate increased need?

Inventorying the current technical and support infrastructure is vital. As more students and faculty begin using the course management system, online library resources, help desk, and the networks generally, will existing resources handle increased capacity? Technical glitches can cripple what would otherwise be a viable blended learning program. And the inventory must be a full accounting of personnel as well as software and hardware. Is the support staff for the online instruction already too lean and strained before the blended learning initiative begins? Then a top priority must be addressing this deficiency. Adequate infrastructure is the foundation of a campus's ability to engage in blended learning.

- How does institutional culture accommodate instruction that is not only brick and mortar?

Are there procedural barriers (e.g., special approvals) that make it difficult to change the instructional modality of a course? If so, there may need to be some bureaucratic streamlining. Is the institution's experience with online instruction restricted to a satellite program, off in a special silo? If so, there will need to be some perception management in bringing partly online instruction into the mainstream.

- Does the institution have a sense of what blended learning is?

There may be an established definition; on the other hand, there may be utter unfamiliarity. In either case, there needs to be communication and consensus-building. For blended learning to succeed, there must be clear means of identifying courses and/or programs as blended. Having everyone on the same page is

important, and may be most important of all for students, whose clear and reliable expectations of blended instruction will allow them to vote with their feet.

- Are there likely to be student concerns regarding academic quality?

As is the case with overcoming faculty resistance, it is important to be proactive in addressing concerns that are more likely to be suspicions than experienced-based fact. Is there likely to be a sense that blended courses will be easier or harder? Do students suspect they will be taught by different and less qualified faculty? Will there be any reason to worry that students in these courses are somehow shortchanged or under-supported? Not only is it imperative that these perceptions be identified, but drilling down to the core reasons for the attitude (perhaps through focus groups) would offer opportunity to determine the origins of these concerns and their possible validity; the planned implementation then can and should address these.

- Are there apparent issues with workload structures, with contractual procedures?

Most institutions determine credit hours (often also called contact hours) by "seat" time. When instructional time online displaces some of that face-to-face time, are there questions or issues about how course time is determined or attendance taken, either for the instructor or the students? This may simply mean taking into account the formidable tracking features of most course management systems. But it may entail a demanding if salutary re-examination of learning objectives and outcomes.

- Is there sufficient funding for developing, implementing, sustaining and perhaps even scaling up blended learning?

There is rarely confidence about sufficient funding for any new initiative, especially during an economic downturn, but blended learning is a special case for several reasons. First, it is an initiative with an expected ROI (or return on investment): it can produce revenue (especially through enrollment growth) as well as drain it. What's more, unlike most online programs, blended learning targets the core student population. Depending on how it is planned and rolled out, blended learning has the potential to reach and benefit all the students, not a select constituency. It may not need special earmarked funding if it is seen as a core expense. Similarly, the plans for sustaining and scaling up blended learning may require that it show ROI to justify this.

B. Suggestions for Implementation

As the foregoing questions suggest, planning—especially truly effective, proactive planning—will shade into action items very quickly. Once action on a plan is taken, implementation is underway. Here we offer some early steps in implementation that can make the difference between success and failure.

1. Ensuring the Adequacy of Available Resources

A comprehensive support structure is one of the primary success factors. An effective support system tracks back to the mission and goals of the institution. It is not an isolated enterprise, but one that mobilizes the full range of resources. Figure 1 (below) represents the essentials of a comprehensive approach to blended learning, one that pulls together key elements for instructor support, learner support and information dissemination.

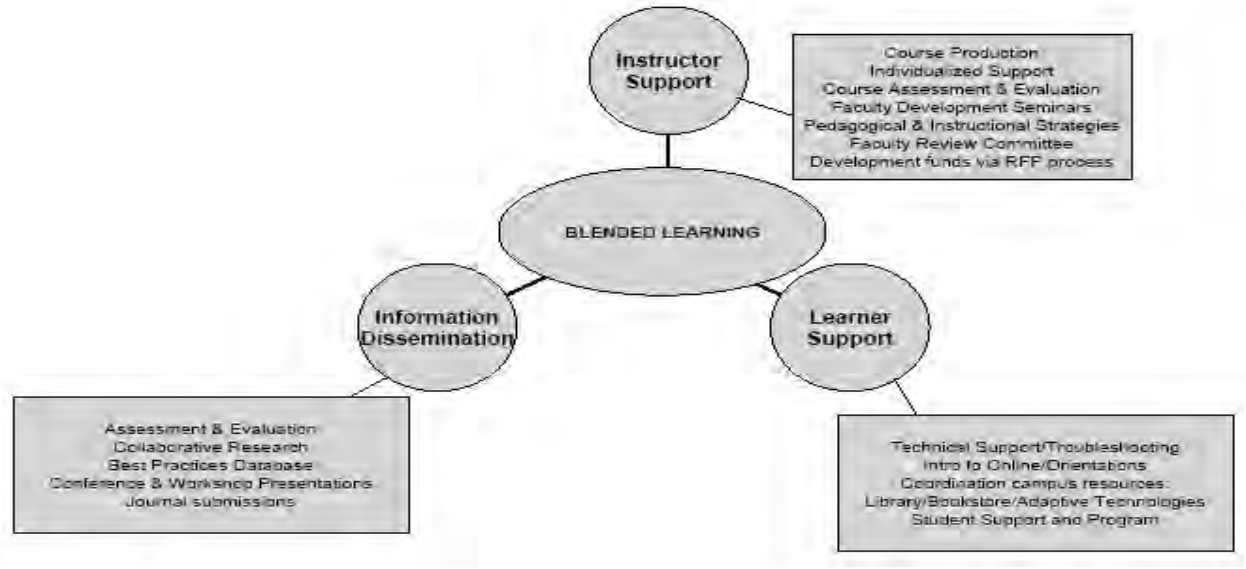

Figure 1

The details of resource management depend on circumstances that will very greatly from one institution to the next: the role of the library in everything from access to online resources in instruction to support for information literacy/fluency for students and even professional development for faculty; the role of graduate students in instruction and/or in mediating uses of technology in instruction; the existence (or absence) of a student surcharge or technology fee in funding technological support; and so on. The point here is not to play out all the institution-specific contingencies but to stress the indispensable essentials: established policies and principles, effective communications, and assessment and evaluation procedures.

Probably the most complicated and complex issue surrounding the implementation of blended learning is how to pay for it. Institutions engaged in online instruction tend to target efforts towards new student populations –resulting in new sources of revenue. Blended initiatives focus on meeting goals designed to meet institutional needs for its existing student body. This does not necessarily result in new sources of revenue. While many institutions will look externally for funds to develop and jump-start their efforts, resources to keep it going are hard to come by. The first discussion on campus must center on the sustainability of the blended effort. Whether it is seen as a core expense or not additional resources are needed. Some strategies used include a technology fee, distribution of tuition revenue and shared resources. Senior support is essential along with pulling together financial decision makers. A resource strategy must be one of the first plans in place.

2. Clarifying Policies and Principles

Do current administrative and educational policies consider blended instruction? Do the characteristics of this teaching modality necessitate changes? Key areas to consider include program/course approval, intellectual property and copyright policy, workload and reward structures, existing evaluation practices (including standard data-gathering for institutional research), and procedures for gathering and publishing course descriptions and schedules as well as any determinants for student access to courses (screening for preparedness and other means of gauging eligibility). If these seem overwhelming, it is worth considering that the key to blended learning is effective integration: potentially, there is no kind or level of instruction it would not touch. It is not a special program needing special policies and procedures, but a different modality of mainstream instruction, and can in fact seem, now or prospectively, to *be* the new mainstream, particularly as seen in studies like "Blended Learning Enters the Mainstream" [6]. In terms

of policies and procedures, it should hew as closely to standard operating procedures as possible. Blended learning may require some tweaking of existing policies, but it should not belong to a different policy universe.

3. Providing Effective Information

Any viable blended learning initiative is going to have compelling reasons for coming into being. If it speaks to important goals, and it must, these need to be conveyed to the campus community. Everyone, potentially, is a stakeholder. This means that the dissemination of information ought to be multi-level and multi-source. The initiative should have executive sponsorship from the highest level, but it can and should have champions among the faculty, support staff, and even the students as well as the administration. Once the initiative is begun, every effort should be made to put information and resources in the hands of those who can move it forward.

It is tempting but fundamentally mistaken to think of communication about any initiative as a kind of one-shot approach, a newsletter or monthly memo. This would be a compounded mistake when it comes to blended learning, which calls for a blended approach to communication: it makes sense to proceed by face-to-face meetings and briefings, but it makes at least as much sense to provide online communication as well. As an exemplary approach to the latter aspect, any institution would be hard pressed to outdo than University of Wisconsin-Milwaukee website. The UWM site for "Hybrid Courses" (for so it calls its blended courses)—see http://www4.uwm.edu/ltc/hybrid/ —provides resources for students and faculty, rationales and goals, testimonials, and other information. Useful as it is to its intended audiences, it can give other institutions a strong sense of why an institution would engage in blended learning as well as how to communicate that to that institution's constituency.

4. Having an Effective Assessment and Evaluation Plan in Place

Too often in implementing new initiatives, planning for assessment and evaluation is an afterthought. For a blended learning initiative, it is a key feature of any effective launch, and for two compelling reasons. First, the key to validity in assessment is always to measure outcomes against goals: if these are articulated at the outset, the assessment plan has its gauge for validity; if the goals are measurable outcomes, definable by clear metrics, so much the better—assessment will be reliable as well as valid.

But the second reason may be more important still, especially for any blended learning initiative with hopes of sustainability and scalability: assessment should ideally provide a feedback loop that either validates the initiative's progress or suggests needed mid-course corrections. Is enhanced teaching and learning the goal, and, if so, is that demonstrated by learning outcomes? Is enrollment growth and increased revenue the goal, and, if so, is that trend manifested in the early trials? Are there unintended consequences that require adjustments? Are there new trends or circumstances—anything from changes in technology to changes in instruction or enrollment patterns—that need to be taken into account? Having an effective assessment plan in place is obviously critical. For detailed consideration of the shape that it should take, and the issues it should take into account, there is no better guide than a companion piece in this volume: "The Sloan-C Pillars: Boundary Objects for Evaluating Blended Learning" [7].

III. CONCLUSION: CRITICAL SUCCESS FACTORS

Particularly from an administrative perspective, no consideration of blended learning can escape the realization that there is much to consider. Its multi-faceted nature can make blended learning seem overwhelming—a hydra-headed monster, impossible to tame. But there is no reason to feel overwhelmed.

In fact, there is good reason not to: even and especially when there is much to consider, it is essential to prioritize. A few top priorities (no more than half a dozen) should rule planning and anchor procedures. Here are those priorities, those critical success factors, for blended learning:

- Matching Blended Learning to Institutional Goals (Problem-solving)

Blended learning does not have a predetermined outcome. It needs to be put in the service of an institution's mission, ideally presenting itself as a solution to a real institutional problem, a way of addressing a real institutional need.

- Matching Goals to Specific Strategies (and vice versa)

Like any complex initiative, blended learning promises multiple ramifications. Care must be taken to make sure the sought-after goals are achieved, but it is really no less important to reap the full range of benefits that any blended learning strategy promises.

- Identifying Strengths and Weakness (and Proactively Tackling the Latter)

An initiative's initial success is as likely to be about perceptions as resources. Effectively planning means overcoming unfamiliarity and resistance, enlisting engagement, bringing stakeholders on board.

- Providing Critical Support

A careful inventory of available resources is only the first step. Blended learning has pedagogy at its center, which means that faculty and students need to be adequately supported and that most of the answers to problems of support will come in the form of people, not technology.

- Ensuring Effective Communication (A Blended Approach)

Blended learning needs a multi-faceted, multi-level approach to communication, and a blended one: like the pedagogy it incarnates, the information about it needs to be disseminated both face-to-face and online. Access to that information, like access to the course content in blended courses, should be the opposite of one-shot: it should be ubiquitous, an anytime/anywhere proposition.

- Using Assessment Effectively (and Formatively)

Blended learning is a latter-day evolution of higher learning that will continue to evolve, both in its generic and institution-specific forms, both in its pedagogical and its technological aspects. It will need to be informed and reformed by on-going assessments that not only verify but improve its viability.

Administrators are sometimes accused of being all too enamored of "big-picture" perspectives. But blended learning presents a case when it is especially dangerous to lose sight of the forest for the trees. And so it is entirely right to invoke the key priorities that are critical to success while keeping the big picture in sight. After all, blended learning, on so many levels, promises a big win for the whole institution.

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George Otte is the University Director of Academic Technology at the City University of New York where supervises instructional technology and chairs a committee of directors of academic and instructional technology from CUNY's 20 campuses. He is also the chief academic officer for CUNY's School of Professional Studies, home of CUNY's first online degree programs. A professor for over a quarter century, he is on the doctoral faculties of the CUNY Graduate Center programs in English, Urban Education, and Technology & Pedagogy. He has authored a number of articles on online education, including "Using Blended Learning to Drive Faculty Development (And Vice Versa)," "Online Learning: New Models for Leadership and Organization in Higher Education" (with Meg Benke), and "Online Instruction as Local Education: CUNY's Online Baccalaureate."

COMPARING STUDENT PERFORMANCE: ONLINE VERSUS BLENDED VERSUS FACE-TO-FACE

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ABSTRACT

The purpose of this research was to perform a three way comparison of delivery modes for an introductory Management Information Systems course to determine if there existed a difference in student success among the delivery modes. The research compares student exam and final grade results in this class that was taught by the same instructor using face-to-face, blended and online delivery modes. An Analysis of Variance test was used on the exam and final grade data to determine if a significant difference existed. Additionally, a discussion of this class in relation to student satisfaction, learning effectiveness and faculty satisfaction is presented. This research demonstrates that there is no significant difference among delivery modes. Additionally, blended and online modes for this class do very well when measuring student satisfaction, learning effectiveness and faculty satisfaction.

KEYWORDS

Online, Blended, Face-to-Face, No Significant Difference, Leaning Mode Comparison

I. INTRODUCTION

The purpose of this research was to determine if there is a significant difference in student success in an introductory Management Information Systems class delivered in three different modes; face-to-face, blended, and online. This paper presents a three way comparison of student success using these modes of delivery. This research differs from other research in this area in that it compares all three modes, rather than the two way comparisons typically found in the literature. A search of the literature has not, to this point, discovered research that does a three way comparison of these delivery modes.

Based on the research performed over the last several years, it has become a foregone conclusion that there is no significant difference in student learning outcomes between face-to-face versus online delivery modes [1, 2, 3]. Additionally, the website http://www.nosignificantdifference.org contains hundreds of articles showing that there is no significant difference between face-to-face and online delivery modes. Another delivery method, blended, is emerging as a new mode of delivery and must past this same test. In the past, face-to-face delivery methods were considered the standard against which other delivery methods were measured. Now, given the research on online delivery, we can use both or either face-to-

face or online delivery methods as the measure of other techniques such as blended.

Blended learning combines multiple modes of delivery for delivering course content to students. Typically, and in the context of this study, the multiple modes are face-to-face and online [4, 5, 6, 7, 8]. The idea is to use the best or most appropriate features of each method to help enhance the student experience and maximize the possibility of student success.

Studies comparing different types of media are not new. As Clark [10] points out, "Studies of the influence of media on learning have been a fixed feature of educational research since Thorndike (1912) recommended pictures as a labor saving device in instruction." Additionally, since the introduction of the computer, numerous studies have been conducted trying to determine if computer technology improves learning. Kulik [11, 12, 13] and his colleagues conclude in their meta-analysis of numerous studies that "computer-based instruction (CBI) usually produces positive effects on students." Additionally, Yuen-kuang's [19] study concludes that Computer Assisted Instruction (CAI) is more effective than traditional instruction in Taiwan. Clark [10] on the other hand finds that, "Consistent evidence is found for the generalization that there are no learning benefits to be gained from employing any specific medium to deliver instruction." Kozma [14] argues that success is found when the "capabilities of the medium" are employed. And, Jenks and Springer [15] conclude that "CAI should be at least as effective as conventional instruction."

If we take Marshall McLuhan's famous quote "the medium is the message" and view it from a somewhat surface level, we might think that he would support those who conclude that computer technology (medium) does provide benefits. And, that he indeed would support all this analysis of "medium" such as computers and the Internet. McLuhan recognized the impact of what he called "electric technology" was going to have on society; "The medium, or process, of our time—electric technology—is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and reevaluate practically every thought, every action, and every institution formerly taken for granted. Everything is changing—you, your family, your neighborhood, your education, your job, your government, your relation to 'the other.' And they're changing dramatically" [16]. Studies such as this one and others, are certainly reconsidering and reevaluating the impact of these technologies on learning. We will discuss MuLuhan more later on in the paper.

It is entirely appropriate that we try to figure out how we can improve learning using new technologies. As Kenny [17] points out; "A change in educational techniques is inevitable. What must be done is to figure out how and when, not if, this new *combine* [digital convergence] will be incorporated into the instructional designers' thinking about the current batch of students, who are steeped in exposure to new media."

II. STUDY BACKGROUND

This study focuses on an introductory Management Information Systems course. The course is a required core course for any student pursuing a bachelor's degree from the University of Illinois at Springfield's College of Business and Management. It should be noted that there is currently no Management Information Systems bachelor's degree offered at this university. Consequently, none of the students taking this class are majoring in Management Information Systems. The course has been taught, by the same instructor, in three delivery modes; face-to-face, online, and blended. The university is on a semester format with sixteen class meetings during the semester. All class sections used the same textbook and supporting materials.

The face-to-face sections followed a typical face-to-face format with the textbook and lectures being the primary mode of providing content to students. Students did have lecture notes available through a course management system. Students needed an access key from the book publisher to access the lecture notes area and acquisition of this key was not required. Face-to-face sections met all sixteen sessions with three of the sessions being used for exams.

The online section was conducted in a typical online format. For the online section the textbook and lecture notes, delivered through a course management system, were the primary modes of providing content to students. Students in the online class were required to acquire the access key from the publisher for access to the lecture notes. In the online section, students were required to participate in weekly asynchronous online discussions. Several discussion questions were posted on the class course management system site and students were required to provide a comprehensive answer to one of the discussion questions posted. Students were also required to respond to another student's answer. Exams were taken at proctor locations selected by the students. Proctor locations were required to be a university or college, library, or military installation. Additionally, the proctor was required to check photo identification before providing the test to the student.

The blended sections were a combination of the face-to-face format and online format. The class met in the face-to-face format for eleven sessions and the online format for five sessions. Three of the eleven face-to-face sessions were used for exams. During the online sessions, students were required to participate in online asynchronous discussions with the same expectations as for the online sections. Students did have lecture notes available through a course management system. Students needed an access key from the book publisher to access the lecture notes area and acquisition of this key was not required.

With the exception of the graded online discussions that occurred in the online and blended sections, all homework assignments were the same with the same expectations. While the face-to-face sections did not have graded discussions, the discussion question topics were discussed in class. Assignment expectations were provided through assignment rubrics.

In all cases above three exams were given. The exams consisted of true/false, multiple choice and essay questions. For all sections the true/false and multiple choice question portions of the tests were identical. The essay questions were not identical but were similar. The analysis below looks at the exam results with and without essay scores.

III. PROCEDURES

Study participants included 168 students who took an introductory Principles of Management Information Systems course. The course is a required core course for any student pursuing a bachelor's degree from the university's College of Business and Management. Of the 168 students, 63 participated in the face-to-face sections, 22 participated in the online section, and 83 participated in the blended sections. An analysis of the students enrolled (data was acquired from the university's enrollment data) in the class sections studied, indicates there is no significant difference in students based on race (Table 1) and age (Table 2). However the analysis did find a significant difference based on gender. While the male and female ratios are similar in the face-to-face and blended sections, the online section has significantly more females (Table 3). While this does show dissimilarity among the modes of delivery, it is not an uncommon difference. Several sources reviewed indicate that females tend to be the majority in online classes [20, 21, 22]. Consequently, it can be assumed that many analyses comparing the online delivery

mode to other delivery modes will have this characteristic.

Observed	White	Non-White			P-value
F2F	51	9	60		
Blended	78	13	91		
On-Line	22	1	23		
	151	23	174		
Expected	White	Non-White			
F2F	52.06897	7.931034	60		
Blended	78.97126	12.02874	91		
On-Line	19.95977	3.04023	23		
	151	23	174		
Chi-Sq					
	0.021946	0.144078			
	0.011946	0.078425			
	0.208546	1.369152			
			1.834093		0.399698

Table 1. Analysis of Race

Source	*d.f.*	S.S.	M.S.	F*	P-value
Group	2	216.28416	108.1421	1.5	0.2251
Error	171	12291.3538	71.87926		
Corrected Total	173	12507.6379			

Table 2. Analysis of Age

Observed	Male	Female			P-value
F2F	28	32	60		
Blended	54	37	91		
On-Line	6	17	23		
	88	86	174		
Expected	Male	Female			
F2F	30.34483	29.65517	60		
Blended	46.02299	44.97701	91		
On-Line	11.63218	11.36782	23		
	88	86	174		
Chi-Sq					
	0.181191	0.185405			
	1.382629	1.414783			
	2.727046	2.790465			
			8.681519		0.013027

Table 3. Analysis of Gender

To determine if there was a difference in student success among the three modes of delivery for this class, student exam scores and final class grade were used. For purposes of this research, exam scores were analyzed in two ways. First, exam scores were analyzed with the essay portions of the exams excluded from the analysis. The reason for excluding the essay questions for the analysis is due to these questions not being identical for all exams. Only the true/false and multiple choice questions in all exams were identical. Second, exam scores which include the essay questions were analyzed. Third, student's final grade in the class was analyzed.

Lastly, student evaluations were analyzed in relation to student satisfaction, learning effectiveness and faculty satisfaction. For the sets of data for exams and the final grade, an Analysis of Variance test was used.

IV. RESULTS

A. Exam Score Analysis

First, using average exam scores without essay questions (Table 4), which are expressed in the number of questions the student missed hence the negative numbers, the Analysis of Variance test was run using a .05 level of significance. The test was based on the following null hypothesis:

H_0 = average exam score without essay questions for Face-to-face Group
= average exam score without essay questions for Blended Group
= average exam score without essay questions for Online Group

Group	Exam 1 Total Points = 83	Exam 2 Total Points = 84	Exam 3 Total Points = 78
Face-to-face	-17.56 ± 1.26	-19.11 ± 1.31	-19.77 ± 1.13
Blended	-18.39 ± 1.02	-21.13 ± 1.22	-21.57 ± 1.19
Online	-18.18 ± 2.07	-24.77 ± 2.05	-23.73 ± 2.03

Table 4. Summary (Mean ± Standard Error) — Exams Without Essay Questions

Next, using average exam scores with essay questions included (Table 5), which are expressed in the percentages, the Analysis of Variance test was run using a .05 level of significance. The test was based on the following null hypothesis:

H_0 = average exam score with essay questions for Face-to-face Group
= average exam score with essay questions for Blended Group
= average exam score with essay questions for Online Group

Group	Exam 1	Exam 2	Exam 3
Face-to-face	84.11 ± 1.19	79.74 ± 1.52	80.15 ± 1.18
Blended	82.22 ± 0.96	76.54 ± 1.28	79.33 ± 1.23
Online	84.25 ± 1.81	74.43 ± 2.37	79.05 ± 2.24

Table 5. Summary (Mean ± Standard Error) – Exams With Essay Questions

Since all P-values are >0.05 (Tables 6 thru 11), the level of significance used in the test, the results of the

Analysis of Variance tests indicate there is no significant difference among the average exam scores with or without essay questions among face-to-face, online and blended sections of the course.

Source	*d.f.*	S.S.	M.S.	F*	P-value
Group	2	25.12811	12.56406	0.14	0.8729
Error	165	15242.49093	92.37873		
Total	167	15267.61905			

Table 6. Analysis of Variance - Exam 1 Without Essay Questions

Source	*d.f.*	S.S.	M.S.	F*	P-value
Group	2	528.21781	264.10891	2.41	0.0935
Error	159	17456.79453	109.79116		
Total	161	17985.01235			

Table 7. Analysis of Variance - Exam 2 Without Essay Questions

Source	*d.f.*	S.S.	M.S.	F*	P-value
Group	2	276.57035	138.28518	1.47	0.2338
Error	157	14799.87340	94.26671		
Total	159	15076.44375			

Table 8. Analysis of Variance - Exam 3 Without Essay Questions

Source	d.f.	S.S.	M.S.	F*	P-value
Group	2	156.04934	78.02467	0.97	0.3831
Error	165	13338.49948	80.83939		
Total	167	13494.54881			

Table 9. Analysis of Variance - Exam 1 With Essay Questions

Source	d.f.	S.S.	M.S.	F*	P-value
Group	2	587.12146	293.56073	2.21	0.1132
Error	159	21129.47153	132.88976		
Total	161	21716.59299			

Table 10. Analysis of Variance - Exam 2 With Essay Questions

Source	d.f.	S.S.	M.S.	F*	P-value
Group	2	30.76684	15.38342	0.15	0.8622
Error	157	16268.11034	103.61854		
Total	159	16298.87718			

Table 11. Analysis of Variance - Exam 3 With Essay Questions

B. Final Class Grade Analysis

Prior to performing the analysis for the final class grade, seven students were removed from the data.

These seven students dropped the class without officially dropping through the university's registration system. While they were still enrolled in the class each student missed at least the last exam and stopped doing assignments and participating in the class.

Using the average final class grades (Table 12), which are expressed in the percentages, the Analysis of Variance test was run using a .05 level of significance. The test was based on the following null hypothesis:

H_0 = average final class grade for Face-to-face Group
= average final class grade for Blended Group
= average final class grade for Online Group

Group	Final Class Grade
Face-to-face	84.21 ± 1.05
Blended	81.55 ± 1.19
Online	84.20 ± 1.91

Table 12. Summary (Mean ± Standard Error) — Final Class Grade

Since the P-value is >0.05 (Table 13), the level of significance used in the test, the results of the Analysis of Variance tests indicate there is no significant difference among the average final class grades among face-to-face, online and blended sections of the course.

Source	*d.f.*	S.S.	M.S.	F*	P-value
Group	2	281.38052	140.69026	1.59	0.2066
Error	157	13867.05675	88.32520		
Total	159	14148.43728			

Table 13. Analysis of Variance — Final Class Grade

C. Student Evaluation Analysis

In addition to the analysis of student results on exams and final class grades, student evaluations were also analyzed in relation to student satisfaction, learning effectiveness and faculty satisfaction. The university where this course is taught requires that students are given an opportunity to evaluate each class they take. The university provides a standard evaluation instrument that is required to be used. The evaluation is anonymous and students are not required to complete the evaluation. While the evaluation has ten questions, one question from the evaluation is relevant to student satisfaction, two questions are relevant to learning effectiveness and one question is relevant to faculty satisfaction. The student evaluation response rates are 95.45% for online, 70.73% for blended and 95.08% for face-to-face. The results for these four questions are found in the discussion which follows.

V. DISCUSSION

The discussion herein is based on the categories contained within Sloan-C's Effective Practices. "Sloan-C focuses on five pillars of quality in online education: student satisfaction, access, learning effectiveness, faculty satisfaction and institutional cost effectiveness" [9]. Within this article we will confine our discussion to the categories of student satisfaction, learning effectiveness and faculty satisfaction. While

Sloan-C practices focus on online learning, the authors felt the categories were an appropriate means for organizing the remainder of our discussion.

A. Student Satisfaction

This question related to student satisfaction is discussed below.

Question: As a result of taking this course, my interest in this subject has: student response options are; Decreased, Stayed the Same, Increased and No Response.

It appears from the student responses (Table 14), that no matter what the delivery mode, nearly forty percent or more of the students had an increase in interest in this subject. Given that no students taking this course are majoring in Management Information Systems, this statistic is encouraging. Also seeing that no more than fifteen percent of the students had a decrease in interest in the subject is again encouraging. One could assume that if the delivery mode were affecting the student's interest, one of the modes would stand out but, in this case all ratings are fairly consistent.

	Decreased	Stayed the Same	Increased	No Response
Average for Online	9.52%	52.38%	38.10%	0%
Average for Blended	14.84%	33.19%	51.97%	0%
Average for Face-to-Face	12.01%	48.51%	39.49%	0%

Table 14. Interest In Subject Evaluation Results

Using the above question and the resulting student ratings, it does not appear that any of the delivery modes stands apart from the other in either positive or negative terms. Student interest was rated in the positive direction.

B. Learning Effectiveness

Learning effectiveness is measured by Sloan-C as the following: "The course or program is designed to be at least equivalent in quality to face-to-face courses offered at the same institution." This course is built around specific learning outcomes that are the foundation for exams and final grades. The research done as part of this paper indicates that using exam scores and the final grade for the class, no significant difference exists among the three delivery modes used for this class. Consequently, the online and blended modes of delivery for this class are at least equivalent to the face-to-face mode. Additionally, two questions from the student evaluations address learning effectiveness. These questions are discussed below.

Question: This course has increased my critical thinking: student response options are; Yes, No, No Response.

Since face-to-face is traditionally the standard by which other modes of delivery are measured, seeing that both blended and online provide a higher rating for increased critical thinking (Table 15) is an indication that they are no worse and arguably better than face-to-face.

	Yes	No	No Response
Average for Online	80.95%	14.29%	0%
Average for Blended	75.69%	24.31%	0%
Average for Face-to-Face	62.61%	37.40%	0%

Table 15. Critical Thinking Evaluation Results

Question: This course has motivated me to work at my highest level: student response options are; Yes, No, No Response.

Again, using face-to-face as the standard, more online and blended students indicated they were motivated to work at their highest level in these sections than in the face-to-face sections (Table 16).

	Yes	No	No Response
Average for Online	71.43%	28.57%	0%
Average for Blended	78.07%	21.93%	0%
Average for Face-to-Face	51.98%	48.03%	0%

Table 16. Work Motivation Evaluation Results

The one possible exception to this, being the critical thinking rating for the face-to-face class, it is the closest rating to the negative direction. Perhaps this is influenced by discussions in the face-to-face sections not being graded. Since students are not required to prepare a response to the questions, they do not put in as much effort thinking about answers to the discussion topics. However, since face-to-face is the benchmark, having online and blended ratings higher reinforces that these delivery modes are at least as good as face-to-face. It appears that students are, for the most part, learning effectively in this class regardless of the delivery mode.

C. Faculty Satisfaction

The university where this course is offered is highly supportive of the online and blended modes of teaching. This is evident through the state-of-the-art technology infrastructure, high level of faculty support, stipends for course development, and in tenure and promotion decisions. The university is also supportive of faculty who perform research in this area.

A measure of faculty satisfaction relates to student evaluations. At this university, student evaluations play an important role in performance reviews. One question on the evaluation particularly relates to this area.

Question: Do you think this teacher is competent in the content or material offered in this course: student response options are a five scale range with three range titles being; incompetent, satisfactory and exceptionally competent, no response. When this question is used for performance reviews, the highest two ranges are combined for rating purposes.

	Incompetent		Satisfactory		Exceptionally Competent	No Response	Highest Two Combined
Average for Online	0%	4.76%	4.76%	14.29%	76.19%	0%	90.48%
Average for Blended	3.27%	2.51%	14.96%	35.62%	43.64%	0%	79.26%
Average for Face-to-Face	0%	1.85%	23.12%	38.11%	36.92%	0%	75.03%

Table 17. Teacher Competency Evaluation Results

For performance rating purposes, the higher the percentage for the highest two categories, the better it is for the teacher. Given the ratings (Table 17), both online and blended resulted in a higher rating than face-to-face. This will consequently provide a more favorable rating for the teacher than the rating for face-to-face.

The primary author for this article is the instructor for the course sections being analyzed in this study. While student evaluations are important, there are other factors that this instructor feels are related to his satisfaction. First, the instructor feels that the discussions in the online and blended sections are much richer than in the fact-to-face sections. In the online and blended sections, students tend to put more effort into their responses to the questions and all students participate. Were as in the face-to-face sections, students who respond, do not put as much thinking effort into their response. Additionally, a limited number of students tend to participate. Second, online particularly and blended somewhat provide the instructor with more freedom of time and place. The instructor has the freedom to work with the class when and where he finds most convenient. Third, the instructor feels there is more interaction with students in online and blended sections. While the interaction most often is not face-to-face, it occurs more frequently via private discussion areas and email. Consequently, it is the author's preference to teach using the online and blended delivery methods.

VI. CONCLUSIONS

It appears from this research it can be concluded there is no significant difference in student performance, for this class, whether it is taught using the face-to-face, online or blended mode of delivery. While we cannot necessarily generalize these findings to all situations, this research does add to a body of research that supports there are no significant difference between face-to-face and online delivery modes. Additionally, the results show that there is no significant difference in student performance when comparing the blended mode of delivery to either face-to-face or online delivery modes.

Additionally, based upon student satisfaction, learning effectiveness and faculty satisfaction, both the blended and online versions of the class compare favorably to the face-to-face versions.

Let's revisit McLuhan. What does McLuhan mean by "the medium is the message"? According to Federman [18] the meaning is; "We can know the nature and characteristics of anything we conceive or create (medium) by virtue of the changes—often unnoticed and non-obvious changes—that they effect (message)." How does this relate to this study? It relates in that we have conceived or created media for helping students learn—traditionally face-to-face delivery and more recently online and blended delivery.

We are still trying to figure out if these last two media are beneficial. Perhaps though we ought to be looking at one potential message these media are telling us. That message being, we have new ways of helping students learn that are just as good as the old way. Perhaps we should not focus so much on the technology aspect as on the assistance to learning aspect.

We may also be getting another message—people adapt. Since many of the studies result in a no significant difference conclusion maybe the message is it doesn't matter because people will adapt to the medium and learn. We have long argued about the delivery mechanisms and which were best to use. But, is this the real argument? Is this the right thing to focus on? It appears the body of literature is showing the medium may not matter.

Perhaps another message is the traditional mode of education delivery is prevalent only because there were no alternatives and now that there are alternatives, we have options and do not have to hold on to something that existed because it was our only option. It exists not because it has to, but it exists because it was the only option.

We can surmise from this that delivery mode may not be a major factor in student performance. Since there is no significant difference, it can be concluded that other factors may be more important such as course design, selection of the right content materials, instructor/student interaction, and/or student motivation may play a more important role than delivery mode. It seems that if the instructor uses best practices for whatever delivery mode they will be using, then the mode of delivery will not be a major factor in student performance.

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A CASE STUDY FROM GOLDEN GATE UNIVERSITY: USING COURSE OBJECTIVES TO FACILITATE BLENDED LEARNING IN SHORTENED COURSES

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ABSTRACT

This paper discusses utilizing course objectives to drive the change of existing 10–15 week undergraduate courses into 8-week courses that feature blended learning tools. To begin the redesign process, instructors and a faculty mentor revisit course objectives for currency, and with an eye toward blended course restructuring. The restructuring is overseen to ensure that standards are met. The resulting course redesign has overarching objectives and weekly objectives tied directly to weekly activities, many of which are blended.

In addition to blended tools, the courses are considered blended as to modality in that while there is a weekly face-to-face meeting, there is also a fixed expectation for out of class work, where blended tools find good use. An approach to using blended tools as bridge activities between "last week" and "next week" is also presented.

The redesigned classes are proving satisfactory to students and teachers; no differences in student course evaluations with respect to course quality are noted. Some students indicate there is "more work", which is perhaps a function of the need to better manage student and faculty time management expectations.

The redesign has been so successful that it we intend it to become a fundamental institutional faculty development tool.

KEYWORDS

Case, Objectives, Redesign, Faculty Development, Blended, Blending, Modalities, Objectives, Online, 8 Week Courses

I. INTRODUCTION

This paper discusses utilizing course objectives to drive a change of existing 10–15 week undergraduate courses into 8-week courses, featuring blended learning tools. Course length was and is being adjusted from 10 and 15 weeks to 8 and 16. Some courses are taught exclusively online, some face-to-face. Irrespective of mode, all courses are expected to have a Web component, known in our environment as "web enhanced." In addition to our commitment to using blended learning, our redesign process is driven by our attention to course objectives as the entry point to the redesign process.

Course objectives are a given in learning environments, so they are a reasonable focus for redesign. It was

initially assumed that those objectives would be merely a jumping off point for course redesign, but this proved to be only partially the case. In fact, revisiting course objectives proved to be a central impetus to both course redesign and overall course improvement.

This process, one that leverages objectives and the commonalities of both online and face to face teaching environments, and that incorporates blended learning skills and tools, is now nearly completed, and that process is described in this paper. Our success in this process leads us to believe that we can enlarge the scope of this effort to become a significant component of faculty development in our school.

II. SETTING

Golden Gate University (www.ggu.edu) is a private institution in San Francisco with an over 100-year history in fields of tax, law and business. We are the largest provider of MBAs in the San Francisco Bay area. Like many schools, we began offering online courses several years ago, and have evolved to providing multiple degrees online via our Cybercampus. The institution is fully accredited by the Western Association of Schools and Colleges. The university's mission states that the university "is an independent center of in-person and virtual learning that changes the lives of adult students through professional practice degree, certification and life-long learning programs in business, law, tax, technology and related professions." A keyword in the mission statement is "adult." The average age of both graduate and undergraduate students is over 30. Eighty percent of our courses are taught by adjunct faculty, many of whom are working in their fields of expertise. An increasing number of our students take courses or full degrees via our Cybercampus, and although they continue to say they prefer face-to-face courses, in increasing numbers they are choosing the Cybercampus.

Two additional and important factors are at play in our blending effort: student expectations for a "rich" course experience, even in the Cybercampus, and the ongoing need to improve the quality of teaching. Our students are by and large working people who are technologically savvy, and who often use fairly sophisticated technology systems for personal use and at work. Eighty percent of our courses are taught by adjunct faculty, most of whom have had little or no teacher training other than what is provided by an institution at which they teach. Historically, the success of our courses was driven by the expertise of the faculty, but over time, younger and newer students expect that their learning experience be technology-mediated and carefully managed. Being a dynamic face-to-face lecturer is no longer a guarantee for a successful class, and interpersonal presentation and content skills do not necessarily translate to a successful Cybercampus class.

Until recently, improvements in online teaching pedagogy and tools have reached our faculty sporadically. Our Cybercampus course designers are talented, and are engaged in helping online teachers present courses that are educationally sound and well managed. However, this essentially one-on-one approach to course design is less than satisfactory in creating a sea change in the look and feel of our online courses. Further, as the lines between online and face to face classes continue to blur, teachers need new skills that find fit with the expectations of value and time-conscious students.

III. ISSUES

Institutional research on contemporary students and current educational practices led us to understand that course length is an issue for many students. Many institutions successfully offer shorter course lengths, and research on student expectations, particularly of adult learners, suggests that these are attractive to our students as well.

Our institution had (and still does) offer courses in various lengths. Most graduate courses continue to be offered in the 16 week format, and for a period of time, we offered some 10 week courses, which were popular with both instructors and students. However, because of financial reporting issues, those could not be continued. The previous course lengths provided problems specifically with student financial aid reporting; with both 15 and 10-week semesters, the university appeared to have a 3 and 5 term semester structure, which could not be reconciled with lenders. With 8 and 16-week course lengths, the courses overlay one another neatly, removing the problem. 8 week courses created several advantages. Students could perhaps take several courses in the same time frame. A desired institutional outcome is that students would raise the average units taken per semester, and the 8 week offerings were considered a way to accomplish this. We wanted to avoid both the appearance and reality of merely compressing courses. The 8 week courses had to be fully featured, comprising the same content, teaching tools and expectations of student performance as other, longer courses. Using blended learning tools and approaches was, and is, a way to accomplish this.

This fact was one driver for a grant proposal that was submitted and funded by the Alfred P. Sloan Foundation. Since more students are opting for the Cybercampus courses, and we had also determined to shorten some course lengths, it seemed appropriate to seek assistance for this effort in incorporating a blended learning approach. Our original Sloan proposal stated that

> The overarching project goals are to increase adult working students' access to GGU undergraduate and graduate degree programs in business-related fields, by:
>
> (a) increasing anytime/anywhere learning,
>
> (b) decreasing commute time, and
>
> (c) condensing course term-length.

To improve the quality of education provided by the university, by transforming significant numbers of courses now offered in all online or all in-person formats to blended formats.

IV. COURSE REDESIGN

The first stage in the redesign process has been for a faculty mentor to meet with a teacher to discuss course content, currency and other general matters. This stage-setting step allows for informal information exchange among participants, but it provides the mentor with a course and teacher perspective that is important.

Next, course objectives are discussed. Objectives remain the purview of the instructor, but shaping those objectives occurs in concert with the faculty mentor and our online (Cybercampus) course designers.

As we began to work with teachers, we quickly discovered several things. Most course objectives had been codified years earlier, and while course content is nearly always updated, course components such as the objectives were handed down from semester to semester and instructor to instructor, often without review and with only cursory changes. Another finding was that most instructors had foggy notions of what objectives are. As a result, revisiting objectives became a focus of initial work with instructors.

A. Bloom and the Action Verb Approach

Benjamin Bloom's Taxonomy [1] remains an important tool in our arsenal. While it has been somewhat revised by one author for new millennium currency, its basic tenets remain.

For our work in revisiting objectives, we chose the "action verb" approach, noted by Overbaugh and Schultz [2]:

> Remembering: can the student recall or remember information?
>
> Verbs: define, duplicate, list, memorize, recall, repeat, reproduce, state
>
> Understanding: can the student explain ideas or concepts?
>
> Verbs: classify, describe, discuss, explain, identify, locate, recognize, report, select, translate, paraphrase
>
> Applying: can the student use the information in a new way?
>
> Verbs: choose, demonstrate, dramatize, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write
>
> Analysing: can the student distinguish between the different parts?
>
> Verbs: appraise, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test
>
> Evaluating: can the student justify a stand or decision?
>
> Verbs: appraise, argue, defend, judge, select, support, value, Evaluate
>
> Creating: can the student create new product or point of view?
>
> Verbs: assemble, construct, create, design, develop, formulate, write.

B. What We Found: Awakening "Sleepy" Objectives

An example of the kind of objectives we often found is presented below, from a course in information technology security:

> In general, how well has the course contributed to your understanding of the development of protocols and procedures designed to minimize business and enterprise risks associated with disasters and other major disruptions.

To what extent do you have a better understanding of

1) how to write a disaster plan.
2) the importance of rapid response and business recovery.
3) how to identify critical business functions.

First, note that these are not learning objectives. They are a list of questions to the student, asking for an assessment his/her own learning on several aspects of course content.

While this objective structure did reflect general expectations for student learning, it did nothing to state expectations for either student learning or criteria for assessment of the learning.

The finding that many of our courses had such objectives was somewhat startling, but not completely surprising. It did make us realize that determining actionable objectives had to be consistently addressed at the front end of our work with faculty.

Here are "awakened" objectives for the same course (underlining added):

> Students will articulate the importance and role of rapid response and business recovery to the contemporary business.
>
> Students will compare/contrast components of disaster and recovery plans.
>
> Students will identify critical business functions and structure disaster and/or recovery plans accordingly
>
> Students will describe alternative business operations, including virtual continuity and collaboration with inter-company business-continuity planning teams."

As further illustration, here is an additional set of course objectives, from our Information Technology Management (ITM) 185 Networking course. Underlining is added:

> "This course will provide you with knowledge and skills in network security in the context of networks, information and computer systems.
>
> 1) By completing the first part of the course, understanding LAN Internetworking Standards and Fundamentals, students will be able to evaluate existing networks and explain how standards and connection-oriented services are utilized when managing network communications. .
>
> 2) By completing the second part of the course, WAN communications, students will compare the LAN standards and fundamentals they learned in part one with WAN communications protocols and standards used in today's global networks.

3) By completing the third part of the course, Bridging and Switching concepts, students will have the skills necessary to distinguish between different bridged and switched network traffic solutions, and have the ability to analyze network designs and determine which types of bridging and switching solutions would best serve to manage each network's communications needs.

4) By completing the fourth part of the course, Internet and Routing protocols, students will have the ability to assess network addressing schemes and troubleshoot networking address problems. Students will also be able to evaluate routing protocols according to different network traffic practices and demands, and propose which types of routing practices are best suited for specific network demands.

C. From Course Objectives to Weekly Objectives

The next step in the redesign is to connect overall course objectives with weekly activities, so that macro objectives carry over into the student's homework, exams, and into course projects.

Here is an example of a revised weekly overview and objectives from week 6 of the same ITM 185 course:

Overview: This week's lesson examines the TCP/IP protocol suite and IP addressing. By the end of this lesson students will have a strong understanding of the operations of TCP and IP, core protocols in the suite, and several other important protocols in the stack. IP version 4 addressing is also evaluated in detail, as well as the purpose and application of the subnet mask value. . . .

Objectives:

By completing Lesson 6 the student will be able to perform the following and more:

Explain the basic history and evolution of the TCP/IP protocol suite

Analyze where TCP/IP protocols are found in the stack, and where they relate to comparable layers in the OSI model

Examine an IP packet structure

Classify the different IPv4 class addresses

Identify how many addresses are available for different IP class addresses

Describe a subnet mask with both decimal and binary values

Analyze an IP address and its subnet mask and determine which part of the address represents the network and which part of the address represents the node

Discuss the purposes and practices of the ARP and ICMP protocols

Provide a thorough explanation of the features provided by the TCP connection oriented services

Compare transport layer protocols TCP and UDP and identify which applications would best utilize each transport protocol.

Name several protocols that are found in the TCP/IP application layer.

It can be seen that the revamped objectives alone can provide a much stronger focus to the course. As well, this activity tends to reinvigorate the teacher, giving him/her new ways to think about the course. In short, working with objectives alone has proven highly satisfactory to mentors, developers and teachers.

D. Revisiting Course Projects and Research Papers

As we found with course objectives, the same situation existed with objectives for research projects. Here is a very typical example of a research paper assignment:

> Write a 15-20 page paper on a topic from our course. Following is a list of potential topics:
>
> Submit your paper on week 15 of the course
>
> Don't plagiarize!

This of course gives neither the student nor the instructor any criteria for creating or evaluating the paper, or any assistance in creating a context or setting for that work. Here is a redesigned assignment for a research project (underlining added):

> Objectives: To apply course material and technology savvy to one, or several, solutions to the problems exhibited at American International Bank. Articulate the solution(s) in writing as you would in a business proposal.
>
> What should you (the student) do?
>
> Identify a business problem
> Articulate an institutional strategy and tactics to address it
> Identify and discuss the business and technology solution(s) that will address the problem
> Explain specific benefits of your proposed solution

V. BLENDED LEARNING

The above material summarizes our work with objectives as a focus in course redesign. Given that we were shortening courses from 10–15 weeks to 8, it can be seen that objectives provide a much stronger framework for a shortened course, assisting in teaching, learning and assessment outcomes. While the work with objectives proved to be more important and time consuming than was originally thought, it was helpful in moving us into the integration of blended learning tools. This section discusses that effort.

Most redesigned courses have both Cybercampus and face to face sections, taught in the same semester by the same teacher, which has made both redesign and coordination /implementation somewhat easier. This also means that participants are able to see in real time how tools can work, or must be modified, to accommodate both formats.

Students are able to choose between Cybercampus and face-to-face classes, depending on their locations, time constraints, family and work schedules. Face to face courses are always offered at the San Francisco campus and less often at distance campuses, so the Cybercampus is favoured by distant students and those local students who prefer the online modality.

"Blended" has somewhat separate applications for different course modalities. In a face to face course, students meet for a regular length class session (2 hours and 40 minutes) once a week. Out of class activities are expected to comprise the remainder of that time. Homework and readings are often loosely used for out of class work. Given that such out of class work in an 8 week course is a significant part of the contact hour structure, we intended that this time should be well used, and supported by blended tools.

In the Cybercampus course, students never meet face to face. It is a completely asynchronous environment, consisting of text or audio lectures and supplementary material, online discussions and assignments. These courses are of a blended modality by nature, given their combination of elements, and use some blended tools in the courses' basic form.

A. Blended Tools

Irrespective of mode, we encourage the use of blended learning tools. Examples of those tools are:

1. Email

Email and group discussions in the Cyber shell are an integral part of the Cybercampus courses, and Cyber shells (a Cybercampus environment) are also available for teachers and students in f2f courses. The threaded discussions are used to have conversations among students and teacher on any number of topics, both on content and other course matters.

2. Internet and Web

Supplementary information on content and concepts, computer system demos (particularly useful), and student-generated information.

Web-based or downloadable videos are very engaging for students, and their use should be encouraged. There are many of these online, although sometimes they are difficult to find. Another tool, YouTube, is particularly attractive to teachers and students, although some assistance should be provided in searching video content appropriate to the course needs.

3. Student-created Audio

The concept called "podcast" has captured student imagination, so students are willing these days to create mp3 audio. These are useful for ad-hoc communication, and for students to provide soundtracks for PowerPoint or other documents.

There are several free or low cost audio tools available for Windows and Macintosh platforms. Students and teachers, however, still approach these somewhat differently. Teachers are often somewhat ashamed to admit that they don't know how to create audio, while students are eager to learn, but less interested in expending resources in finding software and purchasing a microphone/headset.

4. Teacher-created Audio

Faculty members frequently record lectures and mini-commentaries for students. These are easily uploaded, and should feature a corresponding text. Students periodically comment that "it's nice to hear the teacher's voice" in evaluation comments.

5. PowerPoint

The ubiquitous PowerPoint is a powerful blended tool for the classroom, with the caveat that the teacher should be very clear on the objectives and purposes for its use. The tool works well in both f2f and online classes, but the teacher should provide evaluation criteria and context for use. For example, students should know the number of desired slides for a given presentation time frame, the amount of material per slide, the appropriate background and effects, the audience for the presentation, and the purpose.

PowerPoint also allows for adding audio, but resultant files are large. If computer and media memory is not an issue, PowerPoint with audio works, but what is also doable is a non-audio PowerPoint combined with a separate audio, which creates much smaller files and easier management.

6. Social Networking Tools

Instructors and students are increasingly using Weblogs and WIKIs for course activities. A web search will quickly show you any number of free sites for their creation.

Weblogs for the faculty member may or may not be appropriate to a class, although students may be interested in creating a blog for a specific course purpose, or inviting classmates to visit an existing blog. WIKIs have more immediate application. These can be used as a kind of knowledge management tool, where files can be stored for a particular workgroup, or the class, and discussions can occur.

B. Using Blending Tools as Pedagogy to Bridge Class Sessions: From Last Week to Next Week

One of the ways blending tools have proved powerful is as a pedagogical tactic to connect a previous class with a following class. Recall that in the 8 week model, out-of-class activities are intended to play more than a supporting role. Teachers are always interested in reinforcing or amplifying taught material as a way to assess learning and to further engage students. Blended tools can help accomplish this purpose.

A second approach is that teachers can use blended tools as a way to engage students in material that has not yet been taught, e.g., “next week’s work.” Taken together, the out-of-class activities serve those masters, reinforcing last week’s work and foreshadowing what comes in the next session, as Figure 1 suggests:

Figure 1 Class-to-class Blending Approach

C. Example Class Session Bridging Activity

As an example bridging assignment, consider the following activity:

> This week in class, we discussed Enterprise Resource Planning systems in the contemporary business. You have two jobs before our next class.
>
> > First, create a proposal for an ERP system for a business, to be delivered to a C-level management team. This proposal summarizes your belief that an ERP system can solve a particular problem, but demonstrates your understanding that such systems also have problems. Utilize any number of supplementary tools: online demos, Web searches, podcasts.
> >
> > The second part of the assignment is to complete a preliminary research into next week's work on Customer Relationship Management (CRM) systems. Summarize and describe what they are, how they work, and what marketing, sales and general business functions they fulfil. Include your work and any supplementary audio/videos (demos) that you find on our course WIKI, under the discussion "CRM".
>
> Here are the specific outcomes intended to be accomplished with the above between-class assignment, which can avoid the usual "For next week, read Chapter 5 and answer the questions at the end."
>
> > Revisit past learning (last week, summary)
> >
> > Integrate current (analysis, interpretation, translation for classmates, creating transparency)
> >
> > Foreshadow (upcoming content; thoughtful reading and summary, aimed at student interest and knowledge; students summarize and share for self-learning and for classmates)

VI. WHAT WE'VE LEARNED

Combining objectives and blending activities in course redesign has proved to be very beneficial for the participants, for students, and for the quality and overall look-and-feel of the courses involved. While we do not have specific assessment-level data yet, students and teachers have been enthusiastic, and we have all learned from each other in the process.

Participating faculty members are supportive of the changes in the courses. Of course, they are expected to teach for fewer weeks, but they have been positively impacted by the assistance of faculty mentors and Cybercampus personnel in reshaping the courses. Virtually all participants report that their sense of involvement with the course and their ability to teach the course better than before have been positive outcomes for them.

Student satisfaction in these newly blended courses, as measured by course evaluations, has not been measurably affected. There are a number of metrics addressed by questions to the students who reply both by comment and by rating on a 1–5 scale. Courses being well taught (students like the teacher and content) typically receive an average score of from 4–4.75. Less favored courses and teachers can receive scores from 2.5 to 3.9. Students are encouraged to provide written comments as well.

During the last several semesters, we have tracked course evaluation scores and found little deviation from historical norms. We do periodically get comments such as "this is a lot of work for 8 weeks." However, we continue to publicize that these courses are full courses, and not "condensed" or "experimental."

Blended-mode courses provide an attractive approach for corporate clients. We are currently involved in an onsite cohort MBA program with a pharmaceutical corporation, in which 2 courses alternate during a 16 week period. This is satisfactory to management, and satisfactory to students, who are talented and highly motivated, and are able to make the most of this time-saving but challenging blended modality arrangement.

VII. CONCLUSIONS

The redesign process has proven so successful that a faculty team charged with addressing our existing faculty development structure strongly supports having the objectives-driven blended approach discussed in this paper become a central part of our faculty development activities

We shouldn't overlook the benefit to the faculty culture. Too often, teachers, particularly adjuncts, come and teach without much interface with the university at large, and, sadly, with other faculty. This development process is serving to create a greater communicative interface among faculty, mentors, and course developers.

It is envisioned that group course development activities can be undertaken on a semester basis, allowing for people and groups to come together for the common purpose of teaching/learning improvement. Our experience until now suggests that this will create a positive change on the larger culture that should ameliorate some of the current distancing felt by some faculty.

Faculty development is directly related to quality, which is directly related to student/client perception of our institution, so we believe that our faculty development efforts must enjoy real financial and time resource support on an ongoing basis. The committee on faculty development has created a proposal that was recently forwarded to our Vice President of Academic Affairs for consideration, and it has been adopted. We intend that our success with creating 8 week blended courses will now become a major component in our faculty development schema.

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IX. ABOUT THE AUTHOR

Dr. Robert Fulkerth is department chair of the Operations and Information Technology Management Department in the Ageno School of Business at Golden Gate University, where he has worked since 1991.

He is a pioneer in the school's online learning faculty, having taught English courses in an early bulletin board environment. He has taught using the Cybercampus (eCollege) system since its introduction. He is a leader in faculty-side online pedagogy, course configuration, blended learning, course management and colleague mentoring.

He was and is a faculty implementer in the mentioned 8-week blended course redesign, and chairs the Faculty Development Committee, a subcommittee of the Faculty Senate, which is currently revisiting the entire university faculty development process, a great part of which will comprise implementation of the objectives-driven blended learning approach.

MSU MEDICAL COLLEGES BLENDED LEARNING FOR FIRST YEAR SCIENCE COURSES: UNITING PEDAGOGY TO MAXIMIZE EXPERIENCE AND REAL WORLD LIMITATIONS

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ABSTRACT

At Michigan State University the two medical schools, College of Human Medicine (CHM; M.D. degree) and College of Osteopathic Medicine (COM; D.O. degree), have offered the same science courses to first year students for many years. Science departments report to both colleges, and the same faculty can effectively teach the content required in the first year of medical school. The faculty have created online resources to maximize student choice and learning approaches. For example, classroom lectures (audio and screen video) are recorded; online homework may contribute to the course grade; virtual microscope software and material for histology laboratory is available online in addition to computer-based laboratory sessions with instructors present; and many practice exams are available online. MSU is expanding to three new campuses during the 2008–2010 period. CHM will open a sister campus in Grand Rapids, while COM will open two branch campuses in southeast Michigan.

The goal is to make the learning experiences equivalent for all students at all campuses. Faculty, staff and administrators have met on a regular basis to discuss working toward a NSF CyberInfrastructure model where all basic science learning experiences (with the exception of gross anatomy lab) are available online. These online resources will be coupled with face to face learning as well. Currently, efforts to make course materials available online in the most effective manner are underway. Discussion about how to provide online communication channels is also progressing. Numerous debates have occurred on how best to facilitate student learning in multiple locations using new technology tools, recognizing the goal for students is not only to pass medical board exams but also to acquire life-long learning skills in an ever changing medical and science environment. The authors will share not only processes used, but also perspectives on best approaches and strategies to determine what students find effective.

KEYWORDS

Medical Students, Blended Learning, Multiple Sites, Online learning, Cyberinfrastructure, Medical Education

I. INTRODUCTION

A. Overview and Expansion at Michigan State University Medical Schools

At Michigan State University, the allopathic (College of Human Medicine; CHM; MD degree) and osteopathic (College of Osteopathic Medicine; COM; DO degree) medical schools teach the first year basic science courses jointly, with 356 students currently enrolled. The colleges are expanding in both number of students and number of locations, with goals to produce more primary care physicians that will practice in Michigan. CHM accepted 50 additional Year 1 students in fall 2007; those 50 will attend Year 2 classes at a new Grand Rapids campus in fall 2008. In fall 2010 there will be 100 students in East Lansing & 100 students in Grand Rapids at sister campuses. Two years ago, COM increased from 125 to 200 Year 1 students, and will accept an additional 100 students and create two new campuses in southeast Michigan in fall 2009.

With the planned expansions, each Year 1 basic science course will be delivering content to 500 students at four sites. High resolution videoconferencing will be used to broadcast lectures to multiple locations. This paper describes a planning process for curricular delivery and design of online materials for blended learning in selected courses, as well as student input into the important features of online materials and communication.

The process was introduced as the Basic Science Distance Learning Initiative (BSDLI). Faculty met on a regular basis to discuss general principles of online learning, strategies for blended learning, and the potential implementation of curricular delivery based on the NSF CyberInfrastructure Model. Principles defined to guide consideration of learning options for multiple locations included the preservation and enhancement of:

course and and content quality

student learning options to accommodate lifestyles and learning styles

student learning efficiency and effectiveness

As part of the process, student surveys and focus groups were conducted to determine which approaches are important for students, and to assess effectiveness from the student point of view.

B. Cyberinfrastructure Model

The 'cyberinfrastructure' model is a term made popular by the National Science Foundation in 2007 [1]. The design of the cyberinfrastructure model is based on the need for super computing, instantaneous connectivity to all resources, and relationships among researchers, professors, observers and students. The MSU medical schools' expansion focused on using Internet connectivity to build more extensive relationships among the four campuses. This model moves education beyond the current old school classroom based approach. A ubiquitous learning environment is envisioned which connects classrooms, workplaces, home, laboratories, corporations, government offices and others to offer a new open learning environment. These new models for learning should allow for further collaboration, promote the ability to model and visualize complex concepts, assess learning gains differently, and allow students to personalize learning environments to meet their needs. MSU envisioned the best way to approach cyberinfrastructure was to phase it in using a blended learning solution.

The cyberinfrastructure model is based on relatively new work from neuroscience and cognitive science. According to Bransford, Brown and Cocking, students' needs vary and it is incumbent upon experts to

build better learning systems [2].These systems need to be active and offer students different ways than multiple choice tests to interact with learning materials. The learning environments need to recognize the various stages of learning and the opportunities to learn from each other rather than reliance on text based materials. While the "How People Learn" research did not specify any specific type of learning, online asynchronous learning allows faculty to offer more pedagogical approaches and better connectivity to students.

C. Blended Learning Solutions and Approaches

The MSU medical school expansion stimulated discussion of increased integration of online learning and classroom approaches. While the classroom has been a successful model, there are many reasons, including pedagogical ones, for choosing to integrate online learning. At least one definition of blended learning discusses the opportunities and challenges of blended learning.

> A "blended course" is the integration of online with face-to-face instruction in a planned, pedagogically valuable manner; and not just a combination (addition) of online with face-to-face but a trade-off (replacement) of face-to-face time with online activity (or vice versa) [3].

Since 1998, the University of Central Florida (UCF) has been using a similar definition for its blended learning courses termed mixed-mode courses [4]. The UCF data reveal that blended learning is effective and can lead to higher student success (grades) rates in specific academic disciplines. In addition faculty seem to be very satisfied with teaching either blended or online as long as they receive training and academic support [5]. Research by Garrison and Kanuka posited that blended learning is not only an acceptable methodology but a transformative one for higher education [6]. This view that online learning technology could transform learning was also suggested by Bransford et al in their book on "How People Learn" [2]. Hiltz and Turoff also strongly support the view that the introduction of asynchronous learning networks to campus courses will be viewed as a critical breakthrough in improving learning [7]. McCombs & Vakili reached a similar conclusion because blended learning can lead to a more learner-centered education environment [8].

Online learning has been shown to be just as effective as classroom education and allows faculty an opportunity to rethink and redesign the course. When redesigning a course it is important to identify the distinct parts of the learning process: teaching, cognitive and social. Each of these parts and presences are critical to student success [9]. Using a "community of inquiry" model, teaching can spur the parts to collaborate and build, like the NSF CyberInfrastructure Model, a more dynamic learning environment.

The online learning environment provides students with structure when designed correctly. This environment affords students with clear instructions on what to learn and it requires them to participate fully in the learning process encouraging them to take more responsibility. The cognitive portion does remain similar to the classroom environment through testing and assessment. However, online methods can offer instructors the ability to track what students write or demonstrate online. In addition, the use of computer models or laboratory testing online offers not only a chance to assess students but a chance to offer students more practice, which is a critical part of long-term retention [11]. There are opportunities to problem solve through interactive cases studies or virtual patient simulations.

D. Blended and Online Learning in Medical Education

The role of blended and online learning in medical education has been recently summarized [12, 13]. These articles described results supporting the concept that online learning is at least as effective as traditional instructor-led methods (e.g. lectures). Thus, in medical education, as other components of higher education, "traditional instructor-centered teaching is yielding to a learner-centered model that puts learners in control of their own learning." [12] An important element in development of interactive online resources for students is the creation of repositories or digital libraries to manage access to digital learning objects (e.g. images, diagrams, animations, interactive modules).

Implementation of asynchronous learning modules as part of blended learning strategies for science courses is very important, in part because of the large class size for many undergraduate and medical school science courses. A number of factors contribute to the large class size. Basic science faculty members' at large institutions are often under pressure to obtain grant funding and conduct research; this leaves less time for teaching assignments. In many cases, especially medical schools, there is a strong desire from students to have standardized instruction from the same individual for a given course, and from the best teaching faculty. The best way to accommodate these issues is often by having large classes with lectures and exams provided by a few experienced faculty members. In courses with laboratory sessions, smaller groups are scheduled, usually with graduate teaching assistants playing a key role in the individual instruction. Since the objectives and methods of the lab sessions are planned by faculty, the variation may not be a substantive issue and the availability of multiple teaching assistants can assist students with different types of questions and level of understanding. Often the application and problem-solving that may occur in a lab session is important to the understanding of complex concepts. Lab experiences are difficult to simulate online, both because of the "hands-on" experiences in many lab sessions and because of the application of knowledge required with more variation in learner styles and skills. Thus, both large class sizes and the complex nature of science content contribute to unique challenges for blended learning strategies

II. METHODOLOGY

A. Process

A coordinated effort began in spring 2007 with involvement of multiple campus units, including administrators in both medical schools, MSU Global, Virtual University Design and Technology, Blended Curricular Learning Resources (CHM), Health Information Technology-Educational Technology, MSU Libraries, and teaching faculty. Regular planning sessions were held (usually twice per month). Besides lecture delivery, strategies were discussed for development of interactive digital materials that can be shared. These would include multimedia objects for use without copyright fees (e.g. from Health Education Assets Library). Requirements for faculty support and features needed in a local searchable repository of re-usable learning objects were discussed.

B. Student Survey

To determine student preferences and perceptions, input was obtained from Year 1 students about the most effective use of online options. An online survey was sent to students at the beginning of the second year, asking for input related to the first year of medical school. Following compilation of results from the online survey, two focus group interviews were conducted. In each college, the Year 2 student curriculum liaison recruited other students. There were 6 students in the COM focus group and 8 students in the CHM focus group. Questions were posed to obtain more in-depth information about lecture interactivity and presentation options, communication methods, and approaches to online learning resources. From written notes and an audio tape, comments were grouped into topics.

III. RESULTS

A. Strategies for Improvements In Courses

Development of online interactive modules has been planned and partially implemented for disciplines of biochemistry, physiology, histology, bacteriology, immunology, and neuroscience, with attention given to effective modalities for specific course objectives, focusing initially on difficult concepts. Faculty agreed it was important to make decisions on design and priorities according to pedagogical principles. (Some of the development described below was initiated prior to the Basic Science Distance Learning Initiative.)

1. Biochemistry

In the Biochemistry course, three lectures were replaced with online modules and a 2-hour interactive case conference using clickers was added. Faculty thought the new methodology achieved all goals, and replacement of additional lectures is planned.

2. Cell Biology & Physiology

In the Cell Biology and Physiology course, which includes histology, introductory histology laboratory materials were provided, along with online exercises that contributed a very small amount to the student grade. These exercises had to be completed prior to the laboratory session so that students would be prepared to participate in the session. In addition, there were quizzes using clickers at the beginning of lab sessions, to ensure that each student completed the online exercises independently. Faculty thought lab sessions were more productive and efficient and students were better prepared.

3. Neuroscience

In the neuroscience course, there were pre-recorded lectures (using Camtasia Studio) for selected topics that replaced several lectures. Some class time was devoted to case presentations with live patients in the classroom to reinforce concepts in recorded lectures. Faculty thought content delivery was effective and cases were valuable. Students were enthusiastic about the patient case presentations.

4. Microbiology and Immunology Course

Virtual Interactive Bacteriology Laboratory (VIBL) modules were designed to simulate activities in two bacteriology laboratory sessions. The modules demonstrated methodology for performing clinical lab tests for identification of organisms and gave students an opportunity to replicate the methods and interpret results. Faculty thought the simulations were effective, but should not replace live lab sessions. Students agreed. In addition, animations to illustrate immunology concepts are in progress.

B. Survey Results

1. Online Survey Results from Students

Out of 356 students, there were 159 responses (45% response). Selected survey results are listed below; the percentages of those choosing a given option are shown in parentheses.

For the lecture material, which learning materials do you use most often? (Select all that apply.)

coursepack (92%)

attending lecture (60%)

lecture recordings (audio & screen) posted online (45%)
scribe notes (43%)
reviewing powerpoint slides posted online (16%)
textbook (11%)

What parts of classroom lectures do you find most helpful? (Select all that apply.)
live presentation by faculty (64%)
live or video patient presentations (35%)
note taking (34%)
case studies (33%)
filling in blanks in the coursepack (31%)
questions from instructors to students (18%)
small group activities (9%)
hearing other people's questions (3%)
opportunity to ask my own questions (3%)

Of the online resources that you've *used* in your courses, which do you find most helpful? (Select all that apply.)
lecture recordings – audio/screen video (90%)
practice exam questions and past exams (84%)
Other options had less than 14% selection.

Of the following online resources, which would you use if available? (Select all that apply.)
practice exam questions and past exams (87%)
lecture recordings – audio/screen video (84%)
online activities to practice with content and improve recall (41%)
online case studies (34%)
web-based tutorials on specific topics (28%)

2. Focus Group Results From Students

a. Lectures and Interactivity

Students agreed that large lectures in general are not very interactive. Use of an audience response system (clickers) can make lectures more interactive when the instructors use the system effectively, but technology problems can be very distracting. Examples of desired use included asking questions during the lecture and/or asking questions at the end as a self-test of understanding. Students also said that animations in lectures could make concepts easier to understand.

b. Communication/Collaboration

When students were asked about communication methods with other students, all said they used in-person communication. For other forms of communication, the number of students (14 total) who said they used each is as follows: phone — 13; e-mail — 10; instant messaging — 7. None of the students used chat

rooms, discussion forums, wikis, blogs, or Facebook/My space. Student-created on-line repositories of study materials were frequently used.

When students were asked about communication methods with faculty, they agreed that e-mail is effective for asking questions, but communication with a faculty member is the last resort after trying to figure it out with peers. No students wanted to use a scheduled chat room for communication with faculty. They said chat rooms are inefficient and confusing, and it takes too long to get the response to your question. No students wanted to use a discussion thread/forum. Students who want to contact faculty often ask questions between classes or in laboratories.

c. Online Resources, Including Case Studies

In general students would like to see clinically oriented case studies that provide integration of content that they have already learned. If case studies are assigned and required, time needs to be allotted in the curriculum and the submission should be worth points. Students were asked which types of online materials they had used, and the most popular (with number of students using, out of 14, in parentheses) were: practice exam questions (14), Web-based tutorials on specific topics (13), online animations (12), online case studies (12). When asked about priority for implementation of new online resources, the highest rated categories were practice exam questions in an interactive format (with explanations), online case studies, online animations, examples of application/problem-solving, activities to practice applying content and improve recall.

IV. SUMMARY/CONCLUSIONS

A. Challenges and Benefits of Transition to Blended Learning Model

In general, faculty are enthusiastic about enhancing content delivery and support the concept of blended learning. Through the discussions in this process a number of challenges to developing more online materials were identified, including:

Faculty time

Faculty technology skills

Understanding of types of online resources most likely to enhance curriculum and individual student learning with or without expansion

Institutional resources for technology support

Copyright restrictions and creation or finding appropriate Creative Commons images and diagrams

Systematic plans for implementation, technical maintenance, updating content materials

Faculty agreed that more online learning materials, created to target difficult concepts and complement lectures, would be very beneficial. The online materials developed for Year 1 medical school courses could also be adapted for use in subsequent years, either as review for students or a framework for delivering more advanced content. It will take more time initially to transition to a blended learning model, but after online materials are created, faculty time could be used more effectively in interactive group formats, with less time spent in large lecture. It was anticipated that the outcome would be enhanced learning by all students in varied environments & from varied backgrounds.

B. Characteristics and Benefits of Repository for Re-Usable Learning Objects (RLO)

Discussion of a repository led to preliminary planning of a searchable multimedia database that would contain (1) individual re-usable learning objects (e.g. images, diagrams, animations, digital audio/video lecture recordings) and (2) modules or collections of RLOs for self-instructional use, packaged in different ways for students at different levels of training. The repository would be a source of copyright-free materials for faculty to use in lecture or online modules in multiple courses taught at different medical school levels. Some of the materials would be used directly by students, linked from course websites, as part of the blended curriculum. Individual images, diagrams, or animations could be obtained from Creative Commons materials submitted to sites such as Health Education Assets Library, MedEd Portal, or MERLOT, or could be created by MSU individuals. The existence of an easy-to-use, well-indexed repository would greatly facilitate the faculty efforts to design open educational resources.

C. Outcomes Of BSDLI Process

The student survey results were very important in consideration of prioritizing strategies for blended learning, since there is a constraint on the resources available. As a result of the outcomes of the online survey and the focus group discussions, the emphasis will be on development of online materials that better illustrate difficult concepts, e.g. through animations, and provide students with the opportunity to practice application of concepts in a clinical context as well as better learn concepts and facts with interactive practice questions.

During the year-long process, faculty became more involved in discussions of best practices, sharing ideas, developing intentional strategies for enhancing pedagogy, and working with instructional designers. They became much more aware of the issues of copyright restrictions for online use of materials. Faculty agreed that a searchable multimedia repository of images, re-usable learning objects (animations, online modules, etc.), and lecture recordings would be very valuable in curriculum delivery with online resources. They became more aware of both the challenges and the benefits of moving toward a blended curriculum, and how online resources could be effective in classes at remote sites.

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VII. ABOUT THE AUTHORS

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DANCING WITH A BEAR: ONE UNIVERSITY'S EXPERIENCE WITH EVALUATING BLENDED LEARNING

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ABSTRACT
The 2008 Sloan Blended Workshop evaluation track provided participants with ideas, methods, and resources with which to design and evaluate their courses, programs, and blended initiatives. The many questions that arose from participants at the Workshop provided the motivation to document our University's evaluation experiences at course, program and institutional levels. This paper presents our lessons learned including successes and challenges, with developing and conducting a longitudinal impact evaluation.

KEYWORDS
Blended Learning, Evaluation

I. INTRODUCTION

With more than 75% of adults in the United States using the Internet [1], and 55% of those having high speed Internet connections [2], it is easy to understand why universities are turning to blended learning to better serve the needs of their students. Estimates are that nearly 55% of institutions are offering blended courses with that figure continuing to increase [3]. These courses seem to offer the best of both worlds, preserving face-to-face contact in a reduced seat time format, while allowing faculty to creatively use Web resources in instruction.

What constitutes "blended learning" varies widely in the literature. Allen and Seaman describe blended learning as a course with 30–79% of the instruction delivered online [4]. Niemiec describes UIC's blended courses as those which contain 25–74% online content [5]. Picciano [6] presents a continuum from face-to-face (with no Web components) with fully online courses at the opposite extreme. Blended courses are those in the middle containing some face-to-face and some web instruction. Unfortunately, while there are many who are incorporating blended learning into their instruction, fewer faculty and researchers evaluate their experiences in these varied instructional environments. Given the myriad definitions, technology resources and instructional styles that are being used in these courses, there is clearly a significant need for research on how, when and where these course components work.

The 2008 Sloan Blended Workshop (http://www.uic.edudepts/oce/blended/workshop/index.htm) evaluation track provided participants with ideas, methods, and resources with which to design and evaluate their courses, programs, and blended initiatives. The many questions that arose at the Workshop provided the motivation to document our evaluation experiences at course, program and institutional

levels. This paper presents our university's experiences, including successes and challenges, with developing and conducting a longitudinal impact evaluation.

II. THE UNIVERSITY OF CENTRAL FLORIDA DISTRIBUTED LEARNING IMPACT EVALUATION

The University of Central Florida (UCF) began offering fully online courses in Fall 1996 in part to provide access to students during a period in which classroom growth could not keep up with enrollment growth. The University determined that resources would have to be committed for this initiative to be successful; as a result, units were established to handle faculty development (http://cdws.ucf.edu/), marketing, registration, and scheduling (http://www.online.ucf.edu/cdl/) and research (http://rite.ucf.edu). That the university invested funding indefinitely confirms the vision of the initial administrative planners and their determination to make this work for students.

The university offered blended courses the following year (1997) after an evaluation finding that 80–90% of online students were also enrolled in face-to-face courses. The image of a "remote" student who reclusively took online courses has never occurred at UCF.

Dr. Charles Dziuban was recruited to design and conduct the evaluation of the new online course initiative. Funding was initially included for release time for Dr. Dziuban, and a doctoral student (the author) as evaluators, and a small expense budget. The Distributed Learning Impact Evaluation began with an institutional perspective centered on providing necessary assessment data to university administrators. However, as the evaluators began interacting with faculty, they found many who requested support for their classroom-based research. In a university culture that valued the Scholarship of Teaching and Learning (SoTL), providing support for faculty teaching research was added to the organic mission of this initiative. In 1999, the Research Initiative for Teaching Effectiveness (RITE) became a formal department with a modest budget that continues today. RITE personnel include the Director (Dziuban) and Associate Director (Moskal), office manager and 2–3 graduate assistants. A small travel budget also funds RITE travel and is used to assist faculty presenting at conferences.

Since its inception, RITE has been a dynamic and evolving unit, incorporating both institutional and individual classroom research perspectives. In that time, we have compiled a number of revelations and lessons learned regarding this quickly growing mode of instruction. We have found that many of these courses are also being supported by fellow researchers at other universities.

In planning the distributed learning impact evaluation, we knew that our evaluation would assist faculty on our campus who were involved with planning, design, and the development of online and blended courses. The focus from the beginning was to examine the impact these courses have on both faculty and students. As we began planning the evaluation, we developed a number of principles that have held throughout the longitudinal study:

- Evaluation must be objective.
- Evaluation should conform to the culture of the institution.
- Uncollected data cannot be analyzed.
- Data do not equal information.
- Qualitative and quantitative approaches must complement each other.
- We must show an institutional impact.

- Our results may not be generalized beyond UCF.

Evaluators have preconceived biases and ideas, some based on anecdote, as to what "results" we hope to find, but from the beginning we stressed the importance of bringing "all the news" not just the good news. In evaluating these courses, we need to know what does not work and what works well from a technology, instructional, and context standpoint to inform faculty and administrators. We also knew that our evaluation had to be designed with UCF in mind. In interacting with other university researchers, we quickly discovered that there were endless designs occurring, based on college size, support, needs, and so forth. We were not concerned with generalizing our results beyond our campus, but rather increasing quality in these courses for both faculty and students. Any generalized results were "icing on the cake" and we have made a point of interacting with researchers from other campuses to learn from them. Perhaps the most significant principle has always been to gather data whenever possible. Our motto is "you can always choose *not* to analyze data you have collected, but you can never analyze what you *do not* collect." Too often evaluation is an afterthought which makes it challenging, if not impossible, to deliver any results in a timely fashion. By working with other departments on our campus--Institutional Research, Data Mining Institute, Computer Services and Telecommunications, Faculty Center for Teaching and Learning—we have been able to collect large amounts of data and develop trends across time. We also do not rely on quantitative data exclusively, but collect qualitative information as well. While institutional datasets containing large amounts of data, such as student enrollment, grades, ratings of instruction, allow for sophisticated statistics, they do not reveal what is happening in the classroom and what works well. Through open-ended responses on student and faculty surveys, interviews and focus groups with blended participants, we often find *why* things are going well or not.

Finally, we make a point of interpreting our data and often disseminate results across our campus. Administrators rely on us to provide a snapshot analysis of the data which are presented at semester meetings with deans and in weekly lunches with directors of units involved with blended learning. However, faculty are also kept informed through new faculty orientations, summer and winter workshops, and presentations to each group who participate in the faculty development program provided to those teaching online or blended courses.

In gauging impact of online and blended courses, RITE's approach was to determine the impact on faculty and students. Figure 1 shows the design of UCF's distributed learning impact evaluation. The initial framework for the design has continued, with refinement and additions, through the years.

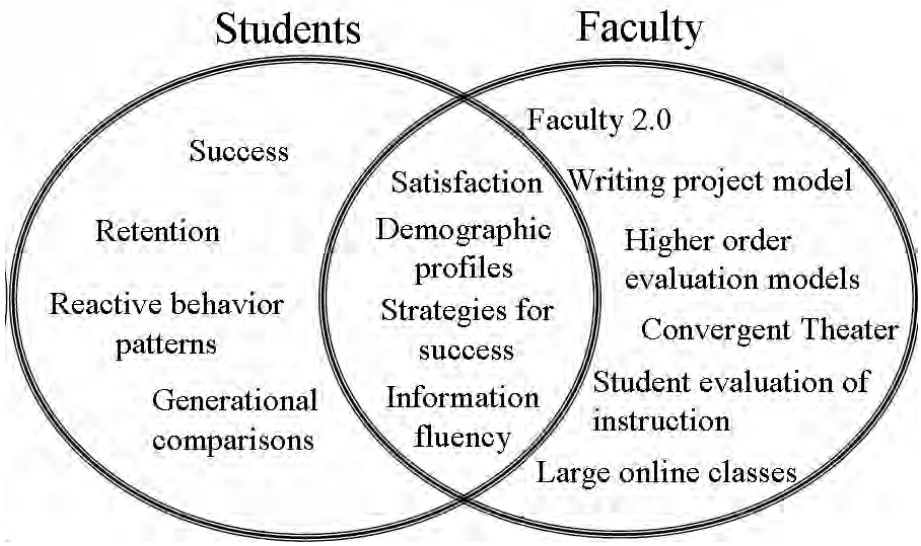

Figure 1. UCF's Distributed Learning Impact Evaluation design

A. Student Satisfaction

Through the years, RITE has administered four student surveys and has conducted student focus groups to measure student attitudes toward blended learning. Early on, surveys were mailed to students and entered into the Statistical Package for the Social Sciences (SPSS) by student assistants. Many faculty continue to use this method for their in-class surveys. As the technology became available to administer online surveys, we found a means that eliminated the need for data entry of large numbers of returned surveys. However, we have found that the online surveys (and student ratings of instruction) have lower response rates than their paper counterparts. For students (and faculty), it is too easy to ignore an e-mail request or a link on the course web page. One strategy has been to provide 'gentle reminders' to encourage students to respond. More recently we have found that targeting large classes, in which faculty are willing to provide extra credit incentives, helps us obtain more responses, albeit with a certain amount of bias depending on the course and teachers. Bias is always a concern with surveys, however. Therefore, our approach has been to gather data whenever we can. Through repetition, we have found fairly stable results. For instance, students have been consistently positive about blended courses and report that these courses make it easier for them to complete an education while juggling career, family, and other responsibilities.

An additional measure of satisfaction has been the student evaluation of instruction form, administered near the end of each semester in each course. These data are maintained and disseminated by our Computer Services and Technologies Department. Due to the size of these datasets—the current dataset we are researching contains 1.2 million records—we have worked with the UCF Data Mining Institute to develop models for what students find is "excellent" and "poor" instruction. Using the expertise of these data mining statisticians has allowed us to use more sophisticated decision tree analyses such as Classification and Regression Trees (CART). This technique allows us to identify classification "rules" for an instructor who received an Excellent, Very Good, Good, Fair, or Poor overall rating. For instance, 96% of students who indicated faculty were Excellent at facilitating learning and communicating ideas (two items on the student rating of instruction form) also gave the instructor an Excellent overall rating. Table 2 shows the percentage of Excellent ratings for each modality overall, and for those fitting this rule. We found that these models consistently hold true across departments and modalities.

Table 1. Student Ratings by Modality: Overall and for Those Rated as Excellent in Facilitating Learning and Communicating Ideas

Course Modality	% Excellent overall	% Excellent within rule
F2F	42.0	92.2
Enhanced	44.0	92.3
Blended	40.6	92.0
Online	55.4	92.7
Interactive TV	20.9	86.7
	N=709,285	N=235,745

B. Student Success and Withdrawal

Often, the initial question that occurs regarding any change in instruction is "is it as good as…" Within the context of web courses, the standard was thought to be face-to-face courses, but on our campus there are no "pure" face-to-face courses any longer. As online and blended courses have grown, faculty have begun incorporating web components into what used to be considered face-to-face sections. Many sections are now only offered as blended, or fully online, and many others use online resources such as discussion groups, Web resources, testing, etc. From a research standpoint, locating course sections of differing modalities to compare has become impossible because Web course instruction is as varied as the instruction that occurs in what has been considered a typical face-to-face course.

Grades, therefore, constitute the only course measure that is common across all departments and colleges. However, grades and grading practices also vary widely due to instruction and assessment philosophical differences across various disciplines and faculty. To gain reliability, in lieu of comparing specific grades, we measure *success* defined as an A, B, or C grade. This tactic has provided us with a less specific, but much more reliable measure of student performance.

We also examine student success and withdrawal rates for various demographics groups: by ethnicity, gender, race, generation, department and college, for example. We collect these data from the institutional database with help from our Office of Institutional Research, carefully omitting students' personal information. Because we have examined these data since 1996, we are also able to document trends that deviate from the norm and because we now have a significant dataset we can use more sophisticated analyses such as decision trees. Figure 2 illustrates an example of using decision trees to examine these data by generation and course level.

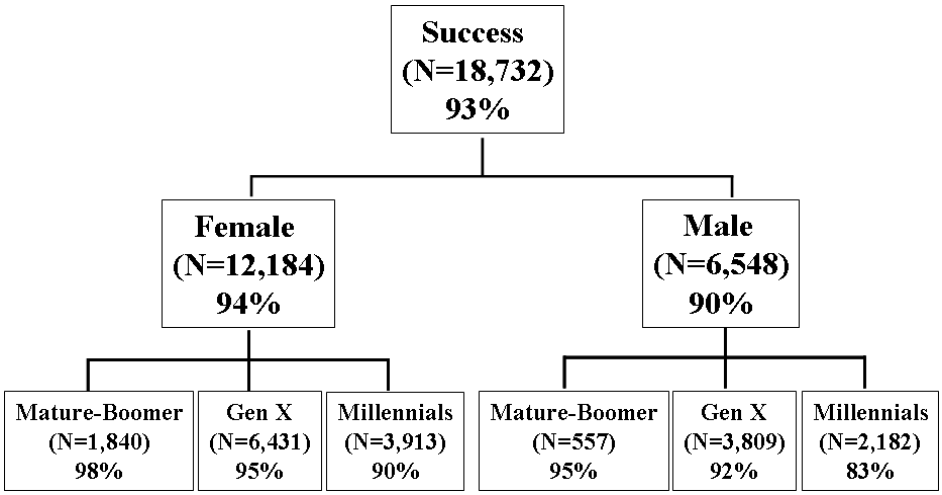

Figure 2. Student Success Rate by Gender and Generation

C. Blended Faculty

UCF's Center for Distributed Learning monitors college and department shifts in faculty teaching online and blended courses. This information is disseminated to deans and department chairs on a semester basis and used for planning purposes.

Faculty demographics and satisfaction are also routinely monitored by RITE through surveys and data collected from course and WebCT rosters of those teaching blended courses. Like students, faculty report that they like the convenience and interaction in blended courses, but also express concern with academic dishonesty and workload associated with online courses. We find that faculty are more than willing to share their successes and concerns and we provide opportunities for them to give us more than Likert feedback regarding what they like and dislike about Web teaching (Table 3). This type of information is disseminated regularly at new faculty orientations and faculty development workshops. It is also used by Course Development and Web Services in planning their training sessions for faculty new to Web teaching, and faculty are provided with strategies for dealing with challenges that may arise in this instructional environment.

Table 2. Open-Ended Comments From Faculty Describing Positives and Less Positives in Web Teaching (N=56)

Positives		Less Positives	
Flexibility of time	26%	Requires too much time	35%
Interaction with Students	26%	Lack of face-to-face contact	18%
Convenience of location	19%	Technical problems	14%
Enjoy technology	11%		

D. Faculty Research

Gathering institutional, college, and department data has served UCF well, providing support for accreditation reviews and institutional effectiveness, and for informing faculty and administrators about what works well and what does not regarding blending learning. However, from an individual faculty standpoint, the most important data involves what is occurring in his or her course. So, early on we decided to provide support for faculty to do pedagogical research in their courses. Often, faculty have

ideas for research questions, but either lack the background in statistics and research or lack the time and support to do the grunt work. We provide help for both. We help faculty work out a research design; develop or locate survey protocols, if necessary; work through the Institutional Review Board (IRB) process; help locate articles for literature review; collect and analyze data; and produce quality charts and graphs. We do not write manuscripts, but we do have an editor that can review work, and we help faculty locate appropriate journals to publish their work. All of this is free to faculty and becomes their intellectual property. The caveat is that the research must be specific to pedagogy and we caution them that if they are tenure-track to insure that this will help them in that endeavor as some must publish in discipline-specific journals for tenure and promotion.

This strategy has worked very well with faculty and resulted in many publications that might not otherwise be produced. It also allows RITE to connect faculty who are working in similar instructional areas, but might be in different disciplines; e.g., several faculty interested in using *Second Life*: one in Accounting, one in Education, and one in Chemistry.

This faculty support has led to a number of creative research projects including:

1. Using constructive engagement to improve learning by allowing students to participate in evaluation of self and peer work [7].
2. Examining the effect of paradigm of the discipline on the online learning environment [8].
3. Investigating quality assurance strategies for effective online learning [9].

Most faculty who use RITE's services need only one aspect of the research continuum and many have benefitted through presentations and publications in their disciplines. Scholarship of Teaching and Learning (SoTL) is also promoted and rewarded on our campus and faculty who do research on pedagogy are now eligible for SoTL rewards. Faculty who are interested in research to improve their instruction are the best and brightest and the academy benefits as a whole when promoting publications and presentations from the most creative faculty on campus.

III. CONCLUSION AND LESSONS LEARNED

Since 1996, UCF's evaluation activities have evolved into today's initiative. Twelve years have provided us with many trials, errors, and lessons learned. The title of this article relates to our favorite Russian parable that we quote to others frequently: "*When you dance with a bear, you can't quit when you are tired…*" We enjoy sharing our trials and tribulations with other researchers almost as much as we enjoy learning from them. Here are some of the lessons we have learned:

Keep it simple. Our evaluation began with two people and a lot of questions and ideas. We started with a student survey and it grew from there. As online and blended courses grew on our campus, questions arose from anecdotal comments from faculty, students, instructional designers and administrators involved with online and blended learning. We listened and incorporated issues which arose into our research questions from which our evaluation design has evolved. As new questions arise, our evaluation evolves. But, starting simple was critical to our initial success. A simple, successful evaluation trumps a complicated, impossible design, every time.

Find existing data. There is a limit to available resources (namely time, money, and expertise) in every research design. We learned early on that there were data available that were collected and maintained regularly on our campus. Utilizing existing data eliminates collection time and cost. For instance, student

and faculty data are maintained by each university. On our campus, our Office of Institutional Research maintains these databases and will work with faculty or departments who need data for research. Student evaluations of instruction are also available on our campus. We work with Computer Services to collect these data as well. It would be impossible for us to gather these data on our own, but it has immensely enriched our impact evaluation.

Learn from others. In addition to working with other departments who collect data, we also look to others on our campus who have expertise that we do not. For instance, we have learned a great deal from our Data Mining Institute about working with large datasets. The field of data mining is relatively new and did not exist when we began our evaluation. After years of collecting student success and withdrawal rates, as well as student evaluations of faculty, we began looking for alternatives to analyze large datasets. Data mining has allowed us to develop useful models with these data. These techniques enhance the general statistics we continue to utilize.

There are many experienced researchers on campuses, and many who are interested in collaborating. Faculty who might not have research or statistics expertise can turn to those in departments such as Educational Research, Statistics and Psychology for help. Our office, as well as our Faculty Center for Teaching and Learning will provide assistance or connect faculty with those who can assist them.

There are also many external resources available and researchers who are eager to share their experiences. What are others doing in evaluation? What have they learned? We frequently peruse the literature for ideas on how to improve our evaluation. We freely share our survey instruments and research design and it has been our experience that other researchers are as willing to collaborate. Organizations such as Sloan-C are invaluable in providing both resources and collaborative opportunities. The Sloan-C pillars (Learning Effectiveness, Access, Cost Effectiveness, Student Satisfaction, and Faculty Satisfaction), for instance, provide an excellent model for evaluation [10].

Find the message in the data. Data by itself is not information. For your evaluation to be credible, it has to inform and have an impact. Whether it is class, program, or institution-based, we provide analyses in graphical form, clearly delineated for the stakeholders at hand. Clarity of results is essential (particularly for administrators) as your audience, whoever they may be, will have limited time and limited interest. They also may have no or minimal expertise in your area of research, or already have preexisting ideas and biases. Knowing your audience is always critical to success.

Make an impact. Design the evaluation for your course, program, initiative, and/or university. Disseminate the results to others, especially to decision makers. Evolve as the initiative evolves. A static evaluation in an evolving setting will not inform, and will quickly become obsolete. An early evaluation finding that the majority of fully online students also were enrolled in face-to-face classes contributed to the university's decision to pursue blended courses to maximize classroom space. An early finding that blended faculty were having to spend significant face-to-face time helping students with technology issues led to orientations being offered to students, a CDROM of tutorials and plug-ins, and help desk support. Through regular meetings of UCF's CIO, Directors of Course Development and Web Services, the Center for Distributed Learning, and RITE, and meetings with deans, evaluation results are used to inform and ultimately affect online and blended course practice. This iterative process has helped UCF to address issues and successes quickly and has contributed to student and faculty satisfaction (and ultimately participation) in Web courses.

Iteration is invaluable. We find that we always can improve on our effort. We pilot test surveys with colleagues, student assistants, etc., because we want to be clear and to ensure that what we are asking will answer our questions. We feel that every survey we have administered can be improved, and that any ambiguities become crystal clear as soon as we obtain all the data. Unfortunately, that is too late for the current iteration, but it certainly justifies the need to repeat data collection whenever possible. Each class of students is unique, and while we can never be certain that our results are not just an anomaly for the current sample, repeating allows us to gain confidence in the reliability of our findings.

Dancing with a bear like evaluation involves a reflective and iterative approach. Incorporating our lessons learned into each new generation of evaluation design enhances the relevance of our work for faculty, students, and the academy.

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V. ABOUT THE AUTHOR

Patsy Moskal is the Associate Director for the Research Initiative for Teaching Effectiveness at the University of Central Florida (UCF) where she has been a faculty member since 1989. She received an Ed.D. from UCF specializing in Instructional Technology and Research Methods and holds BS and MS degrees in computer science. Since 1996, she has served as the liaison for faculty research of distributed learning and teaching effectiveness at UCF. Patsy specializes in statistics, graphics, program evaluation,

and applied data analysis. She has extensive experience in research methods including survey development, interviewing, and conducting focus groups and frequently serves as an evaluation consultant to school districts, and industry and government organizations. She has also received funding from several government and industrial agencies including the National Science Foundation and the Alfred P. Sloan Foundation. She has co-authored numerous articles and chapters on blended and online learning including the *Handbook of Blended Learning Environments*, *Educating the Net Generation,* and *Blended Learning: Research Perspectives*.

THE SLOAN-C PILLARS AND BOUNDARY OBJECTS AS A FRAMEWORK FOR EVALUATING BLENDED LEARNING

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San Diego State University

Charles Graham
Brigham Young University

Chuck Dziuban
University of Central Florida

ABSTRACT

The authors contend that blended learning represents a boundary object; a construct that brings together constituencies from a variety of backgrounds with each of these cohorts defining the object somewhat differently. The Sloan-C Pillars (learning effectiveness, access, cost effectiveness, student satisfaction, and faculty satisfaction) provide a foundation for the evaluation of asynchronous learning networks that works equally well for the evaluation of blended learning environments. The Pillars and a simplified model of a learning system, focus on inputs, processes, and outputs, and provide the framework for a case study of blended learning design and evaluation in a 500-student section of an Introductory Psychology course. Results of a multi-method evaluation of this course indicated very high levels of both learning effectiveness and student satisfaction. The article concludes with the suggestion that blended learning may represent a black swan, a high-impact, unpredicted, and rare event that highlights the limitations of our ability to reliably predict the future in any arena, including online learning environments.

KEYWORDS

Blended Learning, Sloan-C Pillars, Boundary Object, Evaluation, Student Satisfaction, Black Swan

I. BLENDED LEARNING MODELS

Most advocates of blended learning characterize it (metaphorically) as an amalgam of face to face and online environments; however, the relationship between those two anchoring modalities does not appear to be as straightforward as originally thought. For instance, many definitions that grapple with arbitrary combinations of in-class and online time (60%—40% etc.) have fallen prey to problems such as passing score issues in measurement – that is what do we do with those entities that reside in that random zone around cut scores. In addition we must confront the opportunity costs arising from misclassification errors that invariably come with arbitrary, albeit well intentioned categorical decisions. In terms of the definition problem Paul Simon [1] warns us, “You know the nearer your destination, the more you're slip slidin' away.” This ambiguity is a particularly important issue for evaluation and assessment because in the process of determining an “effect size” blended learning is not a well behaved nominal category in the way that face to face and online modalities seem to be. Blended learning embraces wide variation and great diversity—a challenge for research but highly advantageous for teaching and learning.

However, establishing an effective classification scheme for blended learning is important because without such metrics gauging its impact becomes difficult, if not impossible. Fortunately there is work in this area. For instance, Graham [2] approaches the problem by organizing blending from a value added perspective. He examines instructional blends and finds organic categories that explain how they interact with the learning environment. His *enabling* blend responds to the current student generation in higher education and its needs for access, convenience, and flexibility. His *enhancing* blend recognizes the potential for blended learning as a means to augment and improve learning arrangements while *transforming* blends change, in a fundamental way, the teaching and learning process and the pedagogy underlying them.

Picciano, [3] in proposing his multimodal model of blended learning, suggests that the motivation for developing the modality lies in its potential to: assist students, support faculty, maximize facilities, and respond to social needs. He goes on to argue that certain strategic and logistical elements become vital to the process: infrastructure, faculty development, instructional design, and student support. Through this foreshadowing he proposes his blending with purpose model that generates its components from the multiple elements: course content, social and emotional development, the dialectic and questioning, higher order student assessment, collaboration, co-creation of content and reflective practice.

II. BOUNDARY OBJECTS

Both the Graham and Picciano evaluation models [2, 3] resonate with the work of the sociologist Susan Leigh Star on boundary objects: elements or constructs that bring constituencies together but find each cohort defining the object differently. Consider this definition by Bowker and Starr [4].

> "[boundary objects]…are those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use and become strongly structured in individual-site use. These objects may be abstract or concrete… Such objects have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities."

The Sloan-C Pillars [5] constitute another framework that can be considered a boundary object because of their appropriation by different communities for the purpose of evaluation and assessment. Although initially developed as a basis for assessment of Asynchronous Learning Networks (ALNs) [6], the pillars have also been used with traditional on-campus courses [7], and are increasingly being used as a framework for evaluating blended learning environments [5, 6]. This paper will describe and provide a case example of how the Sloan-C Pillars can be used as a framework for evaluating blended learning environments.

III. EVALUATING LEARNING SYSTEMS

Both traditional and online learning systems have their own traditions of evaluation and assessment. Perhaps the simplest model of a learning system contains inputs, processes, and outputs (see Figure 1). An input to a learning system is something that is put into it in order to achieve a particular outcome. Some input examples include things like the characteristics or prior knowledge of the learners, the attitudes of the faculty, or the resources available for course redesign. Processes are actions within the system that are designed to bring about certain changes or outcomes. Examples of outcomes might be

grades or graduation rates. While many of the inputs and desired outcomes are shared between the online and on-campus communities, processes used to reach the outcomes tend to vary widely.

Blended learning incorporates processes of both online and face-to-face instruction. The combining of these defines new processes themselves that can often require more complex ways of thinking about evaluation and assessment. For example, in a face-to-face classroom setting, faculty can assess student satisfaction by observing students' in-class engagement and non-verbal cues. In an online setting student engagement might be assessed by observing the number and quality of posts to a discussion board or students' promptness in completing assignments. In a blended learning environment, faculty can leverage the "best of both worlds" by combining such face-to-face observations with robust tracking tools that are part of many course management systems. For example, faculty might track student submissions of weekly online quizzes and send e-mails automatically to students who fail to complete such assignments in a timely manner. In conjunction with face-to-face observations of these same students in the classroom setting, faculty are more fully equipped to evaluate and assess student progress in the course.

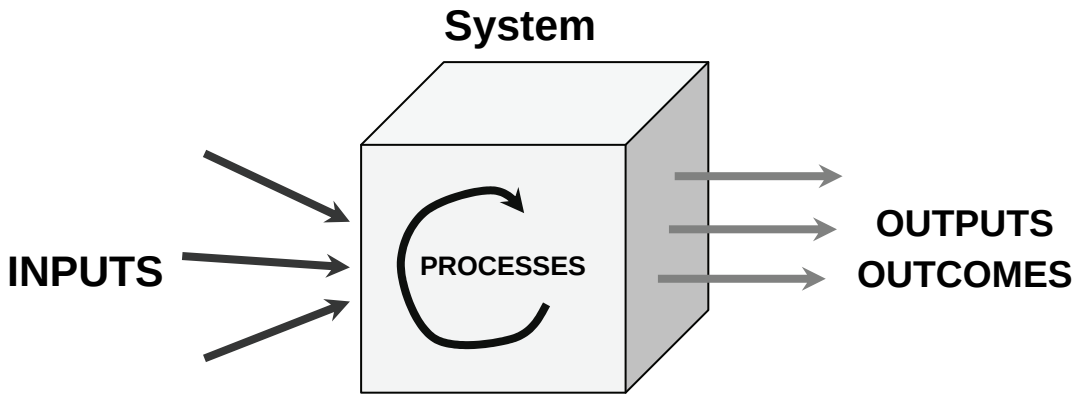

Figure 1: A simplified model of a learning system

IV. THE SLOAN-C PILLARS

The Sloan-C Pillars provide a framework for considering inputs, outputs, and processes involved in the quality implementation of asynchronous learning networks (ALNs) [6]. This framework can also be used to evaluate the implementation of a blended learning system. The five pillars (see Figure 2) are (1) learning effectiveness, (2) access, (3) cost effectiveness, (4) student satisfaction, and (5) faculty satisfaction.

Figure 2. Sloan-C Pillars of the Quality Framework
(image source: http://www.sloanconsortium.org/effective/index.asp)

These pillars are categories for helping us to think about important inputs, processes, and outputs that impact blended learning environments. The framework is a good fit for assessing implementation because the first three pillars in the framework correspond to the three primary reasons why people adopt blended learning: (1) to improve learning effectiveness, (2) to increase access and flexibility, and (3) to increase cost effectiveness [2]. Figure 3 is a template provided on the Sloan-C wiki that shows the five pillars each divided into inputs, processes, and outputs. This template can be used to begin documenting what variables should be measured in each dimension to effectively assess the quality of a blended learning implementation. Additionally, common measures between blended, online, and face-to-face modalities provide a platform for comparison and continual improvement.

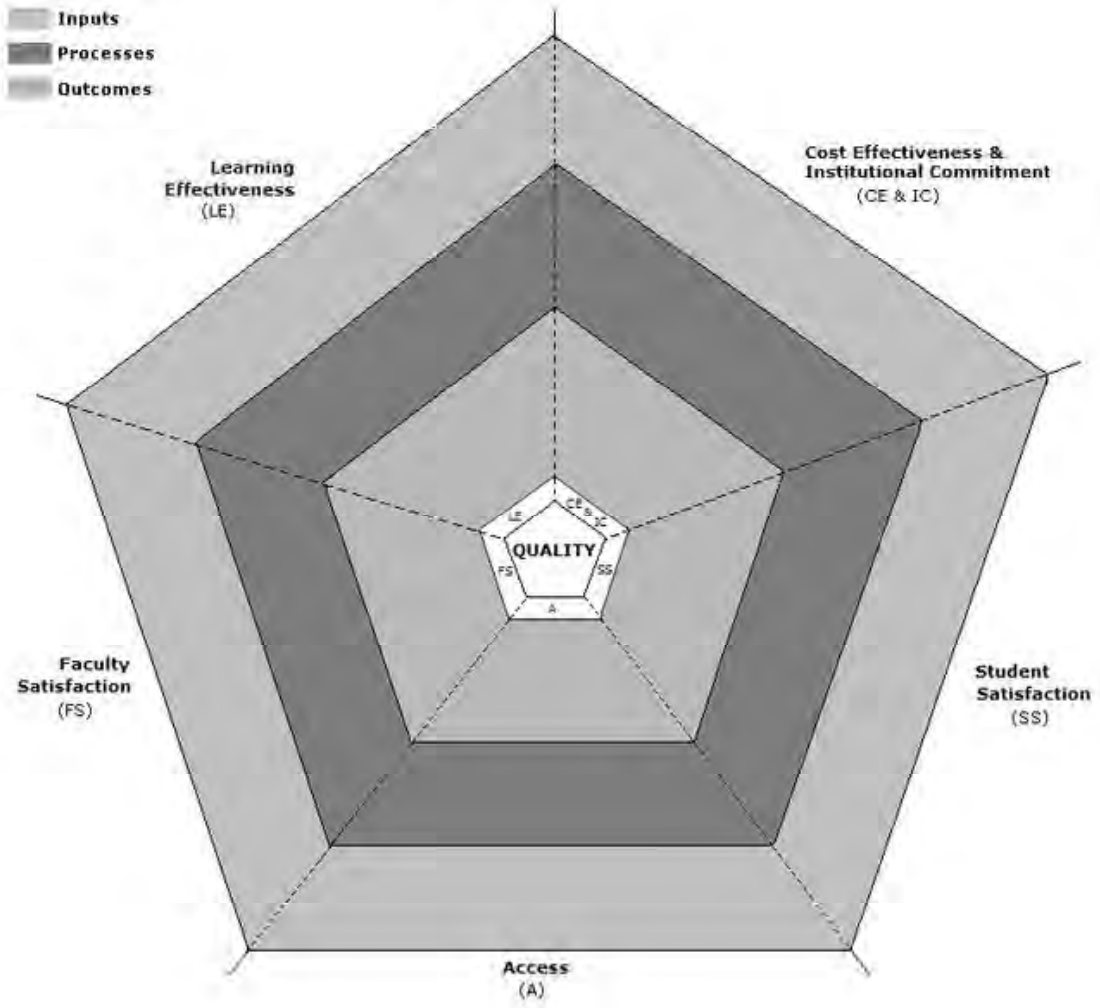

Figure 3. Process, Outcomes, Inputs model for evaluating quality practices (image formerly at: http://www.sloan-c-wiki.org)

A. Measuring Outputs

Identifying and measuring the outcomes of a blended learning system is the most important task. While both *direct* and *indirect* measures of an outcome can be collected, there is an increasing push by accrediting agencies for universities to gather *direct* evidence of student learning (Middle States Commission on Higher Education, 2003, and SACS). For example, when measuring learning effectiveness, a direct measure of learning could be scores on an exam, a course project, or a performance assessment. Indirect measures of learning could be course evaluations, percent of time spent in active learning, or a measure of student engagement. Typically the most important direct outcomes of learning effectiveness are the growth in knowledge, skills, and dispositions.

B. Measuring Inputs

Measuring inputs to a blended learning system can also be important, especially if outcome comparisons will be made with online or face-to-face courses. Inputs related to learning effectiveness might include student characteristics, learning styles, technology competencies, etc. Knowing the inputs will help in

understanding whether or not meaningful comparisons can be made on learning outcomes. Also, measuring inputs can provide needed information for designing appropriate processes. For example, if you know that many students enrolling in blended learning courses have very low technology skills, you can compensate for that up front with tutorials and other help.

C. Evaluating Processes

The processes in a blended learning system entail the design and implementation of the course or program itself. Similar to all complex learning environments, it is important to have a mechanism for formative evaluation built into the system so that continual and recursive improvements can be made. Rarely will a blended learning design be perfect in the first iteration. As instructors select the blend that meets their purposes (e.g., learning, access, and/or cost effectiveness) they should collect formative data so that improvements can be made that are based on data-driven evidence that facilitates incremental improvement.

The remainder of this paper will use a case study to demonstrate how assessment and evaluation of blended learning in a large enrollment course has led to continual improvements.

V. CASE STUDY: BLENDED LEARNING IN A LARGE ENROLLMENT COURSE

A. Description of the Course

Blended learning is a viable pedagogical option for faculty regardless of course enrollment. Although most blended learning courses typically have enrollments well below 100 students, this case study will demonstrate the effectiveness of a blended learning approach to the teaching of an Introductory Psychology course at San Diego State University (SDSU) with an enrollment of 500 students. Such large-enrollment introductory courses have become increasingly common at SDSU and other large state universities, as these institutions struggle with the convergence of growing enrollments and shrinking budgets. Introductory Psychology at SDSU has been taught in a 500-student lecture format since the Fall 2004 semester. The blended learning Introductory Psychology course was first offered during the Fall 2006 semester.

The Sloan-C Pillars provided the foundation for redesigning and evaluating this large-enrollment blended learning course. Specifically, the impetus for redesigning the course in a blended learning format was the desire to improve Learning Effectiveness (LE). As the redesigned course evolved, however, the benefits for students with respect to both Access (A) and Student Satisfaction (SS) also became quite clear.

The blended learning Introductory Psychology course at SDSU represents an *enhancing* blend within Graham's [2] model, with a focus on blended learning as a means to augment and improve learning arrangements for students. The redesigned course replaces 45% of traditional face-to-face instruction (lecture, demonstrations, and "clicker" activities) with synchronous sessions delivered via the Wimba Live Classroom, a web-conferencing tool for education that is integrated into the SDSU Blackboard system. Synchronous online sessions make this course design relatively unique, as most blended learning courses employ asynchronous online activities [8]. Typically these synchronous online sessions, "attended" live by approximately 30% of the 500 students enrolled in the course, involve a variety of activities, including mini-lectures (less than 15–20 minutes at a time), demonstrations, videos, and polling questions to assess student learning and student opinions. All synchronous online sessions are archived (recorded) and made available to students for the remainder of the semester.

The face-to-face class meetings for the blended learning Introductory Psychology course include numerous course design strategies to engage the learner and increase active learning in the large lecture hall. For instance, a student response system (a.k.a. "clickers") is utilized extensively in these face-to-face class meetings. "Clicker" activities range from (1) ConceptCheck questions designed to assess student learning of lecture content to (2) demonstrations designed to bring course content to life in the classroom setting (e.g., demonstrations of phenomena related to memory) to (3) the use of Mazur's [9] Peer Instruction approach to the assessment of student learning in the classroom. This Peer Instruction approach to the use of "clickers" involves the following sequence of activities: (1) pose a conceptual multiple choice item with at least two commonly selected answers, (2) reveal the students' responses to the item, but do not reveal the correct response, (3) instruct the students to collaborate with their classmates in order to arrive at the correct response, (4) re-ask the same multiple choice item, and (5) reveal the students' responses, along with the correct response. These various "clicker" activities provide a rich way to index Learning Effectiveness (LE)—well-designed "clicker" assessments are reflective, contextual, and authentic. Student feedback regarding the use of "clickers" in these ways in this Introductory Psychology course has been extremely positive.

B. Evaluation Protocol

In conjunction with the initial roll-out of this blended learning Introductory Psychology course during the Fall 2006 semester, a formal evaluation protocol was developed to assess the effects of this course redesign on a number of variables, including student learning (LE), student access (A), and student satisfaction (SS) [10]. Thus, the Sloan-C Pillars provided the foundation not only for the redesign of this course but also for the evaluation of this redesign.

The multi-method approach to evaluation of the course included the following: (1) a mid-semester formative evaluation (the "How's It Going?" survey, administered online via Survey Monkey), (2) in-class observations by trained graduate students in the Educational Technology program at SDSU, (3) the Individual Development & Educational Assessment (IDEA) Student Ratings of Instruction survey [11], (4) end-of-semester student focus groups, (5) end-of-semester departmental course evaluations, and (6) course grades. This formal evaluation protocol has been renamed the SDSU Evaluation Toolkit and will be shared with other campuses within the California State University (CSU) system.

In terms of the simplified model of a learning system outlined above, much of the focus of the evaluation of this blended learning Introductory Psychology course was on outputs or course outcomes. Data from three of the six parts of the evaluation protocol are reviewed here: (1) the IDEA Student Ratings of Instruction survey, (2) end-of-semester departmental course evaluations, and (3) course grades. In each case, comparisons are presented between the blended learning Introductory Psychology course described above and a traditional, face-to-face version of the same course taught by the same instructor. This traditional, face-to-face course covered the same content as the blended learning course, with the major difference being the replacement of approximately 45% of normal "seat time" with the online activities described above.

C. IDEA Survey Data

Data from the IDEA Students Ratings of Instruction survey point directly to both Learning Effectiveness (LE) and Student Satisfaction (SS), permitting comparisons between the blended learning (BL) and traditional, face-to-face (F2F) sections of Introductory Psychology.

Table 1 presents comparisons between the BL and F2F sections for both the first (Fall 2006) and second (Spring 2007) semesters of these redesigned courses. Comparisons are presented for student ratings of the following: (1) progress on course objectives identified by the instructor, (2) overall quality of the instructor, and (3) overall quality of the course. Data are standardized scores with a mean of 50 and a standard deviation of 10. Scores of 63 or higher fall into the highest 10% of scores for all classes in the national IDEA database.

After trailing the F2F section ratings slightly during the first semester (Fall 2006), ratings for the blended section were the same or higher during the second semester (Spring 2007). Both in comparison to the F2F section and even more importantly, in comparison to the data from thousands of courses in the IDEA database, these student ratings of the BL Introductory Psychology course indicate very high levels of Learning Effectiveness (LE; progress on course objectives) and very high levels of Student Satisfaction (SS; excellent teacher and excellent course ratings).

Item	BL Fall 2006	F2F Fall 2006	BL Spring 2007	F2F Spring 2007
Progress on course objectives	70	73	77	77
Excellent teacher	65	68	69	68
Excellent course	62	72	73	71

Table 1: IDEA Survey Data for BL and F2F Sections of Introductory Psychology (standardized scores: mean = 50, standard deviation = 10)

D. Departmental Course Evaluation Data

Data were also collected via standard end-of-semester departmental course evaluations administered by the SDSU Department of Psychology. These data assess directly the Sloan-C Pillars of Learning Effectiveness (LE) and Student Satisfaction (SS). Table 2 presents these data for both semesters for both the BL and F2F sections. Ratings were on a five-point scale from 1 (very poor) to 5 (outstanding). In a way that parallels the IDEA survey data, these departmental course evaluation data indicate some initial differences between the BL and F2F sections during the first semester (Fall 2006), differences that largely disappear during the second semester (Spring 2007).

Item	BL Fall 2006	F2F Fall 2006	BL Spring 2007	F2F Spring 2007
Course contribution to broadening knowledge and understanding of the content	4.1	4.3	4.1	4.3
Summary rating of the course	4.1	4.4	4.1	4.2
Extent to which the instructor's presentation style contributed to learning	4.5	4.6	4.6	4.6
Extent to which the testing process contributed to learning the material	3.7	3.9	3.9	3.9
Extent to which the instructor was responsive and helpful	4.0	4.4	4.3	4.4
Extent to which the instructor	3.9	4.3	4.2	4.3

stimulated interest in the subject				
Summary rating of the instructor	4.4	4.6	4.5	4.5
Mean for all items	4.1	4.4	4.2	4.3
Response rate	68%	73%	60%	68%

Table 2: Departmental Course Evaluation Data for BL and F2F Sections of Introductory Psychology (scale: 1=very poor to 5=outstanding)

E. Course Grades

Figure 4 presents data on students' course grades. These data combine the grade distributions for both semesters (Fall 2006 and Spring 2007) for both the BL and F2F sections. These data reveal higher rates of A's and B's in the F2F section versus the BL section (47.5% vs. 40%) and higher rates of D's and F's in the BL section versus the F2F section (28.4% vs. 19.5%). Thus, despite positive ratings of both Learning Effectiveness (LE) and Student Satisfaction (SS) from both the IDEA survey and the departmental course evaluations, students in the BL section of Introductory Psychology performed slightly worse overall in terms of course grades.

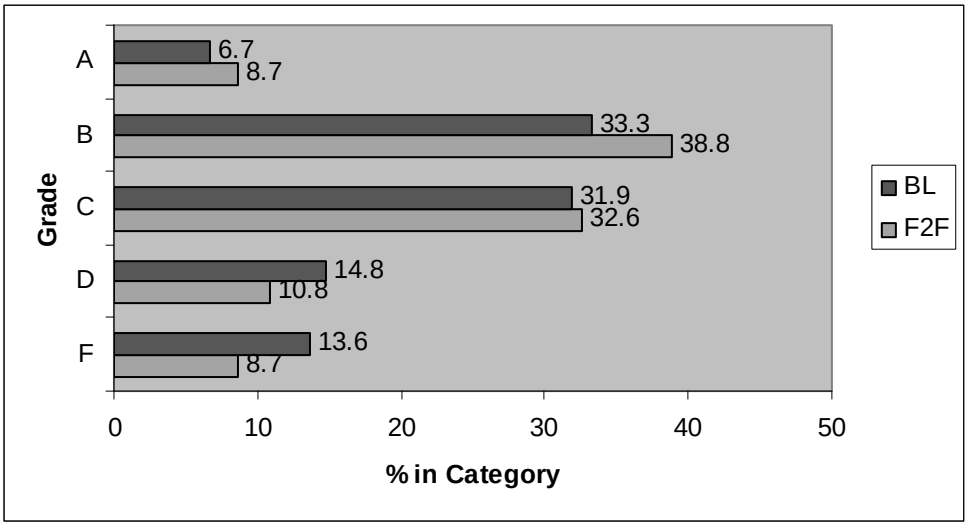

Figure 4: Course Grades for BL and F2F Sections of Introductory Psychology (Fall 2006 and Spring 2007 semesters combined)

Interestingly, however, when an even longer viewpoint is taken of these course grade comparisons, evidence of the convergence between the BL and F2F sections noted above for both the IDEA ratings and the departmental course evaluation ratings does emerge. Figure 5 presents the latest summary data for all four semesters during which both the BL and F2F sections of Introductory Psychology have been offered. These data paint a more equal picture of the grades achieved by students in these two courses.

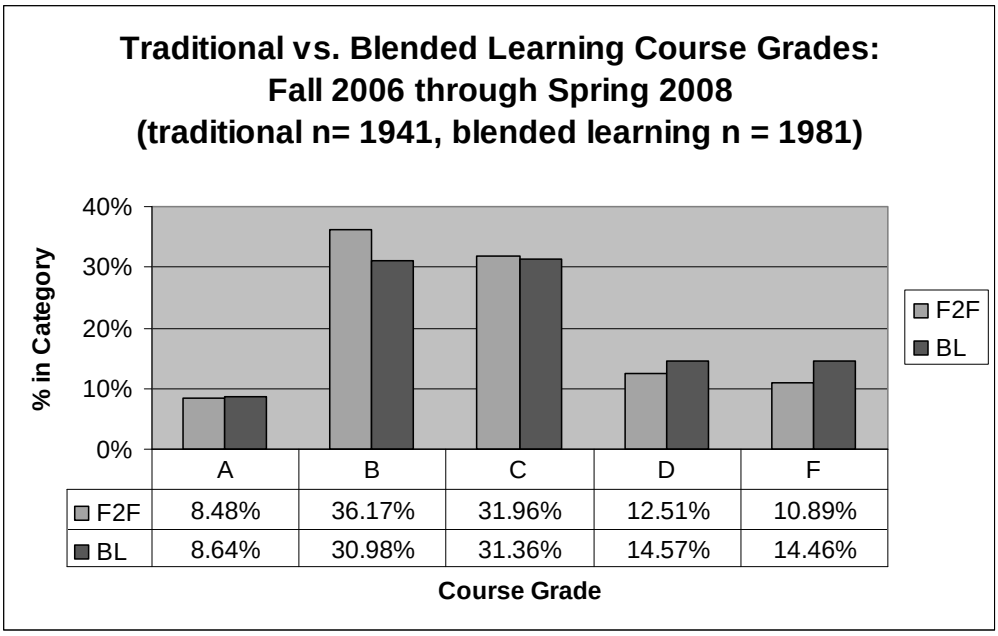

Figure 5: Course Grades for BL and F2F Sections of Introductory Psychology (Fall 2006 through Spring 2008 semesters combined)

F. Lessons Learned

The experiences of the instructor for Introductory Psychology at San Diego State University highlight a number of significant lessons learned for the adoption of a blended learning approach to teaching a large enrollment course. First, it is abundantly clear that the Sloan-C Pillars provide an indispensable framework for both redesigning and evaluating large-enrollment blended learning courses. The Pillars focus on (1) learning effectiveness, (2) access, (3) cost effectiveness, (4) student satisfaction, and (5) faculty satisfaction; all of which represent targets for course redesign efforts and after such redesign efforts have taken place, targets for formal evaluation of these efforts. Second, assessment and evaluation of blended learning can lead to continual improvements within blended learning courses. Much of the data reviewed above point to continued refinements over several semesters that appear to improve student ratings of learning effectiveness and student satisfaction. Third, in a related way, data from such evaluations of blended learning inform the iterative process that is course (re)design. Armed with these sorts of data, instructors and other important stakeholders can target for continuous improvement parts of their current course designs that are not effectively meeting goals related to the Sloan-C Pillars. Finally, the experiences at San Diego State with this Introductory Psychology course point to the conclusion that blended learning occupies the "Sweet Spot" for maximizing these Sloan-C Pillars – learning effectiveness, access, cost effectiveness, student satisfaction, and faculty satisfaction. Designed well and evaluated thoroughly, blended learning can indeed offer the best of both worlds – the face-to-face and online learning environments.

VI. CONCLUSION

The Sloan-C Pillars, when viewed as boundary objects for evaluation bridge the online and face-to-face environments by integrating multiple learning domains and changing the nature of evidence by expanding assessment options. The pillars respond to the current realization that valid evaluation and assessment evidence is evolving from a posture of objectivity to one of reflectivity; from non-contextual frames to contextual examples and from constructed protocols to ones that reflect organic authenticity. Blended

learning requires the interaction of multiple communities of practice (face-to-face, asynchronous learning environments, instructional design and pedagogy, learning theory, and assessment, for example). The pillars intersect with all these cohorts and serve as the mediating elements for new and evolving educational environments.

Student satisfaction is an excellent prototype showing how the pillars become boundary objects in blended learning, providing value added community intersections. Certainly satisfaction responds to students becoming active participants in the evaluation of their educational experiences and their own assessment of learning. They express their satisfaction or lack of it in a number of ways; for instance, responding to evaluation forms that index multiple characteristics of their courses and instructors. On these surveys their comments provide the basis for an evaluative narrative. Rating courses and instructors is by no means the only way students express themselves about quality. They vote by choosing to register for or avoid courses taught by certain instructors. They publish their own evaluations through a number of channels including student government and social organizations. In addition, every campus has a functioning "gossip" network where instructors' reputations are passed along multiple student cohorts. Most recently, the emergence of ratemyprofessors.com takes the expression of student evaluation of instruction to another level. For better or worse, that website creates a world wide forum for students to evaluate courses and instructors and communicate their ratings to an audience of astounding size. Course evaluations radiate to social networking sites, such as Facebook and MySpace. Students are able to "Twitter" friends on their cell phones, telling them what is happening in their courses in real time. YouTube serves as a student satisfaction forum where students have posted videos of instructors in the act of teaching. Although this paragraph focuses on student satisfaction, it seems clear that each pillar may be deconstructed into a boundary object.

Another reasonable assumption is that the concept of blended learning itself can be thought of as a boundary object that is used by many different communities in slightly different ways. For example, from the perspective of the distance learning community, blended learning is a way of describing the addition of face-to-face (f2f) encounters, like a program orientation or a student teaching experience that compliment the core instruction that is done online. For the traditional campus-based community, the concept of blended learning often implies the movement towards the effective use of technology in teaching, accompanied by a reduction of in-class seat time. In the corporate training world, blended learning can denote the innovative use of many different kinds of technologies and learning modalities, including face-to-face classroom instruction and self-paced independent online learning. Despite some of the definitional fuzziness (that drives academics crazy), there is enough plasticity in the blended learning concept that it can be of benefit to multiple communities.

Boundary objects, communities of practice and blended learning share an important interactive relationship. Communities of practice have individuals who reside at the core of the practice, as well as individuals who function at the boundary of the practice. This seems to be the case in blended learning and its evaluation. Importantly, these boundary individuals have broad interests—participating in multiple communities, but not locating themselves at the core of any of them. They play an extremely important role, however, in the development of emerging educational trends, such as blended learning; serving to transfer and pollinate ideas across communities, eventually evolving into boundary objects themselves. Those within the field of instructional technology seem particularly suited to this role because they interact regularly with multiple communities of practice, especially in blended learning.

Finally, to put this study in perspective, one must understand that blended learning's impact on higher education may well be what Taleb [12] identifies as a *black swan*: a life-transforming event, unpredicted, that results from the continuing uncertainty in our environment. The fundamental point is that the effect

of asynchronous learning networks was not predicted by any empirical models. Early adopters will offer historical perspectives attempting to backfill a narrative about the planned and systemic nature of online learning; however, its beginnings were spontaneous, unpredictable, and chaotic. (Nobody predicted Google. Nobody predicted Harry Potter). Consider Steven Johnson's characterization of a black swan that is relevant to blended learning.

"History has its epic thresholds where the world is transformed in a matter of minutes—a leader is assassinated, a volcano erupts, a constitution is ratified. But there are other, smaller, turning points that are no less important. A hundred disparate historical trends converge on a single, modest act–some unknown person unscrews the handle of a pump on a street in a bustling city–and in the years and decades that follow, a thousand changes ripple out from that simple act. It's not that the world is changed instantly; the change itself takes many years to become visible. But the change is no less momentous for its quiet evolution." [13].

Like all *black swans*, the impact of blended learning is potentially monumental—permanently changing how students interact with higher education and the manner in which they express their satisfaction with it. As this current *black swan* plays out there may be another looming on the horizon that is equally unforeseen. However, for the present, blended learning has established a culture of sustainability in higher education, providing accessibility to the most diverse student population in history; with the unanticipated side effects of raising students' expectations and their standards for learning as well. As a result the Sloan-C pillars are emerging as an authentic evaluation and assessment framework because they resonate with both the face to face and online modalities-maximizing their potential for effective teaching and learning.

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VIII. ABOUT THE AUTHORS

Mark A. Laumakis, Ph.D. is a Lecturer in the Department of Psychology at San Diego State University (SDSU). He also holds the position of Faculty in Residence in Instructional Technology Services at SDSU. In April, 2008, he was the recipient of an SDSU Top 25 Award, given to members of the SDSU community who have made transformational contributions to the mission of the University, for his innovative uses of technology in his 500-student sections of Introductory Psychology. He was also chosen as the 2008 Favorite Faculty Member at SDSU by a student poll of the SDSU *The Daily Aztec* readers. He received his A.B. in psychology and sociology from Duke University and his Ph.D. in clinical psychology from the University of Southern California.

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