Research & Grants Expo 2017

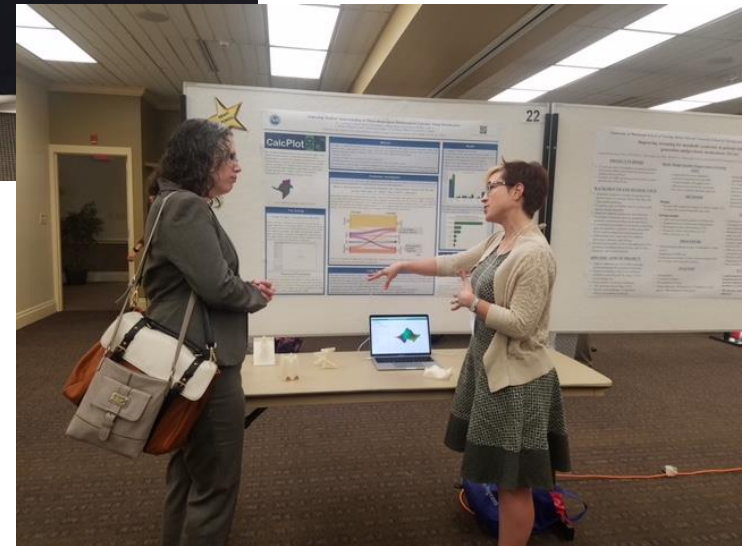# Research & Grants Expo

Research & Grants Expo

Research Posters
From
5 schools

Research Participants

Researcher	School	Researcher	School	Researcher	School
Albena Ivanova	SBUS	Jianyu Ma	SBUS	Sushma Mishra	SCIS
Ben Campbell	SEMS	Jill Maher	SBUS	Terri Devereaux	SNHS
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Carl Ross	SNHS	Jodi Potter	SBUS	Yanbin Tu	SBUS
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Applying Software Engineering Processes for Big Data Analytics Applications Development

Jameela Al-Jaroodi[1], Brandon Hollein[1], and Nader Mohamed[2]
[1]Robert Morris University, [2]Middleware Technologies Lab.

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What is Big data?

Big Data is a concept that identifies the recent trend in data growth to the point that it overwhelms the current software &hardware infrastructure.

It is defined using the Vs of big data:
➢ Volume: the amount of data
➢ Velocity: the speed at which data is generated
➢ Variety: the types of data
➢ Variability: how often data changes
➢ Veracity: the uncertainty of data

Imagine the amount of digitized data associated with only one person!

- Identification Information
- Job Information
- Personal Information
- Emails
- Financial Records
- Medical Records
- Online Profiles
- Travel
- Phone Records
- Blogs
- Social Media
- Family
- Personal Photos
- Connections
- Programs Memberships
- Videos
- School Records

Big Data Analytics Applications

Organizations have been generating and collecting data at an increasingly growing rate in hopes of finding ways to make that data useful.

Big data analytics is the applications of computational models to extract useful information from big data.

Big data analytics applications (BDAA) usually use intelligent algorithms, data mining, machine learning, and many other approximation and analysis methods.

These are usually complex and compute-intensive, thus requiring vast storage and computational resources. The Cloud can leverage some of these needs by hosting BDAA on their large infrastructures.

Software Development Processes

In software engineering, several models for software development where introduced.
Examples include:
❖ The waterfall model: traditional, inflexible and lengthy.
❖ The V model: risk oriented, relatively rigid
❖ The prototyping model: flexible, interactive, but could lead to using unfinished prototypes as product.
❖ The unified process: object-oriented, incremental, can use formal modeling like UML.
❖ The agile development model: flexible, incremental delivery of product components, allows changes in requirements.

Putting It Together!

BDAA have general requirements:
○ Domain specific requirements
○ Memory management
○ Communication and networking
○ Integrity and reliability
○ Security and privacy

and requirements unique to BDAA:
○ **Acquisition:** Where is the data coming from and how are we capturing it?
○ **Preservation**: What are the storage requirements for this data?
○ **Preprocessing**: Do we need to perform any processing on captured data before storage? What type and how?
○ **Processing**: What are the processing requirements on this data? How will it be done?
○ **Generating/Presenting Results**: What type of results are we looking for? How accurate should they be? Are there any time constraints?

Identifying data-specific requirements early and accurately helps improve the development process. Based on the characteristics of BDAA, it is important to select a flexible development process that can adapt and keep up with the high demands and dynamic nature of BDAA.

Our study shows that a suitable model for BDAA development is the Agile model:
✓ It uses incremental development, which suits the modularized nature of most BDAA
✓ It uses fast and short development cycles to produce usable product components
✓ It allows for changes and updates of the requirements throughout the development process
✓ Developers can focus on rapid design of specific components and can adapt their process for each one as needed.

BDAA Development Process?

BDAA are large, complex, and need lots of resources.

Current BDAA development projects rely on general understanding of the needed information. To-date, no clear guidelines on how to apply software development processes appropriately to BDAA development.

Like any complex software project, applying robust software engineering processes, will help improve the development process, control the project parameters and result in high quality software.

In this study we studied the available software engineering processes and the unique characteristics of BDAA to identify one or more software development processes that could be adapted to help formalize BDAA development.

Teaching in the Higher Ed Environment (THE)
Dr. Anthony Moretti and Dr. Larry Tomei
Director, CITADEL   **Vice Provost**

Provost David Jamison

Introduction

Teaching in The Higher Ed Environment (THE) explores the many facets of being a university faculty member: instructor, researcher, servant leader, mentor, grant seeker and more. The program aims to engage the participant in these various roles and strengthen their self-efficacy.

Background

THE includes sessions on educational psychology, teaching practices, selecting the right technology for teaching, establishing a research agenda, understanding the grant process, assessment, and the intricacies of non-probationary status and promotion.

All sessions are led by RMU full-time faculty, many of whom who have earned a special teaching, research or service distinction from the university.
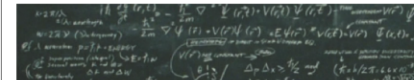
Dr. Sun-A Park discusses "Assessment"

Making THE a National Program

Why Is THE Relevant?

Graduate programs do not offer detailed "how to teach" seminars

Many universities offer only short (1- or 2-day) orientations for new faculty

More confident instructors are better instructors

Results

Because the program its in its first year, we don't have an adequate sample for rich statistical analysis.

However, anecdotal information gleaned from surveys and comments made by department heads and others, THE is a valuable resource to the institution.

Certificate of Completion Accepted for FAR

INFO or QUESTIONS

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Next Session Starts
October 2017

2017 Participants:

Ben Campbell, Eliada Griffin-El, Betsy Guimond, Jillian Harrington, Heather Herstine, Carol MacPhail, Priya Manohar, Sun-A Park, Tom Sarver, Sue Spade, Gia Tatone, Ping Wang, Chad Wertley, Jennifer Beno-Young

Wingfield Pines: Fluid Mechanics

Gavin Buxton
Science Department, Robert Morris University.

RMU ROBERT MORRIS

Introduction

The Wingfield Pines system passively treats a large flow of Fe-contaminated water flowing from an abandoned underground coal mine. The flow rate through this system can be as high as 2,267 gpm.

Here, a computer model is used to capture both the physics of fluid flow through the Wingfield Pines system and the effects of vegetation. In particular, a lattice Boltzmann shallow water equation model is used to capture the flow through the system, including a drag force on the fluid from vegetation that accumulates in the system.

Wingfield Pines

LB Model

The lattice Boltzmann model is a lattice-based method for simulating hydrodynamic flows. The simulations consist of two processes, the first being the propagation of fluid "particles" to neighboring lattice sites and the second being collisions between particles when they reach a site.
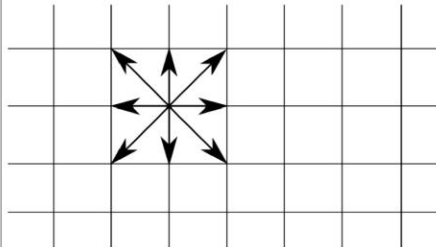
A special form of the LB model for capturing the flow in shallow waters is used.

$$f_\alpha(\mathbf{x}+\mathbf{e}_\alpha t, t+\Delta t) = f_\alpha(\mathbf{x},t) - \frac{1}{\tau}[f_\alpha(\mathbf{x},t) - f_\alpha^{eq}(\mathbf{x},t)] + \frac{\Delta t}{6c^2}\mathbf{e}_\alpha \cdot \mathbf{F}$$

$$f_\alpha^{eq} = \begin{cases} h - \frac{5gh^2}{6c^2} - \frac{2h}{3c^2}u^2, & i=0 \\ \frac{gh^2}{6c^2} + \frac{h}{3c^2}(\mathbf{e}_\alpha \cdot \mathbf{u}) + \frac{h}{2c^4}(\mathbf{e}_\alpha \cdot \mathbf{u})^2 - \frac{h}{6c^2}u^2, & i=1,2,3,4 \\ \frac{gh^2}{24c^2} + \frac{h}{12c^2}(\mathbf{e}_\alpha \cdot \mathbf{u}) + \frac{h}{8c^4}(\mathbf{e}_\alpha \cdot \mathbf{u})^2 - \frac{h}{24c^2}u^2, & i=5,6,7,8 \end{cases}$$

Vegetation is included through the drag force

$$\mathbf{F} = -gh\nabla z - \frac{1}{2}C_D\mathbf{u}(u_x^2 + u_y^2)^{\frac{1-\nu}{2}}$$

The vegetation is calculated from the flow and, in turn, influences the flow profile (potentially creating short-circuiting paths for the fluid flow)

Initial Flow
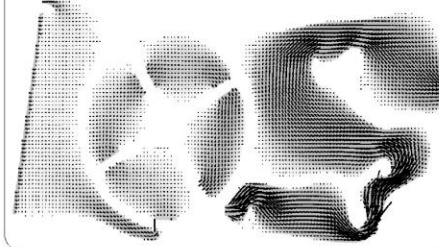
Conclusions

Above is the flow in the system "as built", with no vegetation. To the right is the flow as vegetation grows (increasing vegetation as you move from top to bottom).

Initially, only patches of vegetation exist, forcing the fluid flow into increasingly narrower preferential pathways. This short circuits the flow and reduces retention times (and, hence, the efficiency of the system at removing contaminants).

At larger concentrations of vegetation, once the system is largely saturated (to the extent that fluid can't flow past but must flow through the vegetation) the fluid spreads out. This could potentially increase retention times and the overall efficiency of the system.
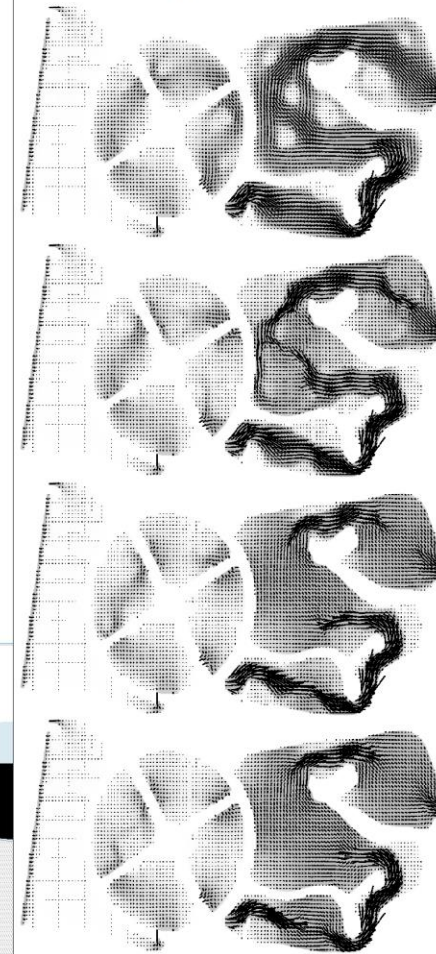
Vegetation

Low Cost Neural Interfaces For Device Control

Ben Campbell, Louis Fallon, Jordyn Gamble, James Vicheck
Robert Morris University, Department of Engineering

Introduction

Neurosky Inc. produces an inexpensive electroencephalograph (EEG) headset that can be purchased in a developer platform (~$100) or integrated into a third party product, usually in the form of a game. In this project we acquired a game called "Mindflex Duel" (~$80) which contains two headsets. The purpose of this project is to adapt the headsets from the game to serve other purposes, specifically for device control applications. This demonstration uses the EEG to make a mentally controlled musical instrument. In a previous project a student used the headset to turn on and off a light.
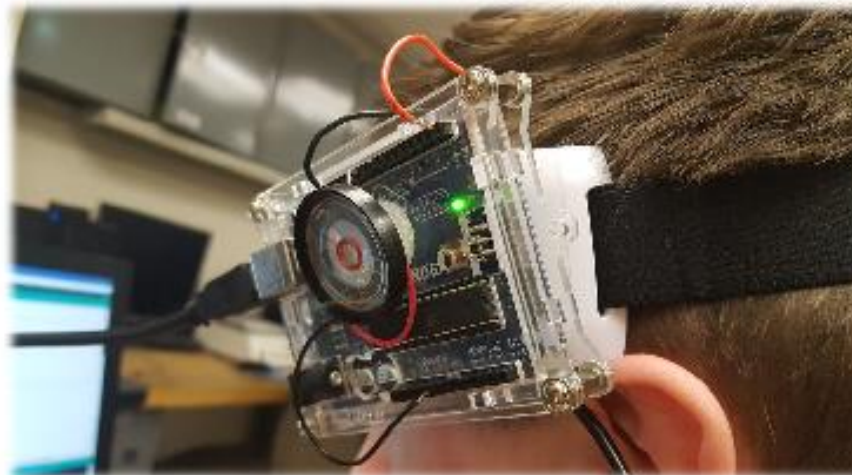
Results

The headset was able to produce a set of programmed musical notes in a steady rhythm. The pitch of the notes was determined by the EEG output. The range of possible notes can be adjusted using the mapping of the headset attention scale to the range of pitches. Relaxing would decrease the attention level and the tone would lower. Active thinking would increase the frequency.

Conclusions

The EEG headset was successfully connected to an Arduino and used as a sensor of brain activity. The brainwave output was converted to a set of musical notes controllable through the user's ability to concentrate. Further development will include a game using the musical cues produced by the attention or meditation level or some other auditory feedback system.

Methods

The Mindflex Headset reads multiple types of brainwaves. It interprets the brainwaves to determine a person's level of attention or meditation. Using an Arduino microcontroller wired directly into the transmission terminal in the headset, the values for attention were read, which range from 0 to 100. A specific musical note is assigned to a subset of numbers in the attention range. Also, a speaker is wired to the Arduino to make the musical notes audible. The resulting configuration plays different musical note as the subject's brain waves change through different levels of attention or concentration.

Code

The code is written in the Arduino IDE interface using a C++ based code. This is the main code, but there are several support libraries that must also be loaded for the program to run.

```
Brain brain(Serial);
void setup() { // Start the hardware serial.
  Serial.begin(9600); }
void loop() {
  // Packets come once per second
  // The .readCSV() function returns a string listing
  // the most recent brain data, in the following format:
  // "signal strength, attention, meditation, delta,
  // theta, low alpha, high alpha, low beta, high beta,
  // low gamma, high gamma"
  if (brain.update()) {
    Serial.println(brain.readAttention());
    int noteDuration = 500;
    int noteCount = 4;
    int thisPitch = map(brain.readAttention(), 0, 100,
        120, 1500);
    tone(9, thisPitch, 10); // play the pitch: }}
```

Acknowledgements

Office of Student Support and Community Outreach Programs
Chester D. Thompson, D.Sc.

Office of Student Support and Community Outreach Programs

BMLDI
BMLDI students spend the afternoon at the August Wilson Center enjoying numerous exhibits and other artistic works.

RMU Saudi Club
RMU Saudi club members volunteer at Triumph Church

The August Wilson Center Pittsburgh, PA
RMU students viewed the movie set Fences, toured exhibit Interpretations, and enjoyed the one man performance of "I Am Not Sam" performed by award winning playwright Michael Phillip Edwards.

The White House, Washington DC

BMLDI Annual Rite of Passage Graduation Ceremony

Convex Recoloring Problem

Ergin Erdem and Sangho Shim

Robert Morris University, SEMS, Engineering

RMU ROBERT MORRIS™

Introduction

We modify Johnson-Mehrotra-Nemhauser column generation framework for min-cut clustering and solve the convex recoloring problem on a large scale phylogenetic tree. The convex recoloring (CR) problem is to recolor the nodes of a colored graph at minimum number of color changes such that each color induces a connected subgraph.

Figure 1

A convex coloring is a coloring with each color inducing a connected subgraph. For example, the coloring below on the left is not convex because the subgraph induced by color 2 or 4 is not connected. The coloring on the right is convex and the optimal solution to the CR problem.

(a) Non-convex coloring   (b) Convex coloring
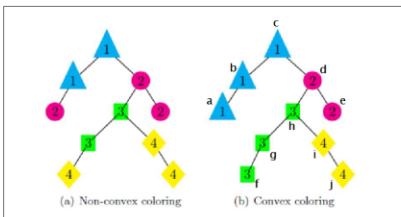
Linear Program

We solve the following linear programming model:

Master problem
Max. WZ
$s.t. \quad AZ = 1$ $Z \geq 0$

where the coefficient matrix A contains all columns $(\gamma, x)^{\mathrm{T}}$.

$A =$	γ	Color indicating columns (dual = ρ)
	x	Node indicating columns (dual = π)

The objective coefficient $W(\gamma, x)$ corresponding to a column $(\gamma, x)^T$ with $\gamma_t = 1$ is the number of the nodes with t as the initial color in the subtree defined by x. For example, the optimal solution on the right in Figure 1 is described in Table 2.

The sub-problem is to generate optimal-like columns based on dual variables (ρ, π) until all the optimal columns are collected (as in Table 2) from the population of exponentially many columns of A.

Table 2

Max	2	2	2	2	...	= 8
1	1				...	= 1
2		1			...	= 1
3			1		...	= 1
4				1	...	= 1
a	1				...	= 1
b	1				...	= 1
c	1				...	= 1
d		1			...	= 1
e		1			...	= 1
f			1		...	= 1
g			1		...	= 1
h			1		...	= 1
i				1	...	= 1
j				1	...	= 1

Results

The sub-problem can be solved to generate an optimal-like column in linear time by a dynamic programming algorithm.

Our column generation approach can solve the six large scale instances which were not solved in the linear programming model given by Chopra, Filipecki, Lee, Ryu, Shim and Van Vyve in *Mathematical Programming* First Online November 30, 2016.

We compare the performance of our column generation approach (CG) with that of the linear programming model (IP) given by Chopra et al.

CG performs well if the number of colors is large. IP does if the number of colors is small. We conclude with a hybrid method.

Application

The figure below illustrates three species by three colors on the phylogenetic tree where each end node represents a homologous protein sequence. The individuals of the tree on the left cannot be clustered into connected subtrees of one color with traditional methods. If the red color at the second end node changes into green, the phylogenetic tree can be clustered into connected subtrees on the right. The minimum number of color changes is called the recoloring distance (= 1 in this example). If the recoloring distance is large, the gap between phylogeny and taxonomy will be large and the taxonomy will need to be updated.
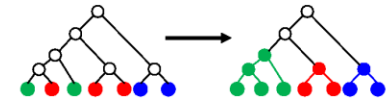
Co-authors

This is a joint work with
- **Sunil Chopra @ Northwestern**
- **Isaac Kim @ KAIST, Korea**

You may read the original working paper "Column Generation Approach to the Convex Recoloring Problem on a Tree" @ Researchgate.net

Condition-Specific Communication Tools Use and Effect on Transfers, Unplanned Hospitalizations, and 30-Day Readmissions from Long-Term to Acute Care

Terri Devereaux, PhD, Gregory Marchetti, PhD, Nancy Zionts, MBA, Valerie Watzlaf, PhD, Bambang Parmanto, PhD

Introduction

Ineffective communication between physicians and nurses leads to transfer of LTC residents to acute care, with up to 67% found to be avoidable.

A generic SBAR communication tool requires nurses to discern and organize pertinent data to report which may limit its usefulness and impact on communication.

To determine if using a condition-specific communication tool to collect and report pertinent information when a resident's condition changes decreases the number of transfers, hospitalizations, and 30-day readmissions from long-term to acute care.

Methods

Design: Quasi-experimental one group pre/post-test

Intervention: Condition-specific ACTs (CS-ACTs) for the most common reasons for transfer to acute care.

Sample: RNs (n=27) and LPNs (n=33) from a 139 bed skilled nursing/post-acute care facility.

Data: Transfers, hospitalizations, and 30-day readmissions to acute care over a 3 month period pre and post intervention implementation.

Statistical Analysis: 3 month pre/post implementation comparison of total transfers, unplanned hospital admissions and 30-day readmissions (number/average daily census) (2 proportion z-test; Fisher's Exact Test; type I error rate=.05)

Results

Pre/Post Comparison Transfers/Hospitalizations/30-Day Readmissions to Acute Care

Event	3 months pre–implementation n (%)	3 months post–implementation n (%)	Difference in proportion	95% Confidence Interval	p-value
Transfers to Acute Care	58 (44%)	32 (24%)	19.8%	(8.6, 31.1)	0.001
Unplanned Hospitalizations	44 (33.6%)	24 (18.3%)	15.2%	(4.8, 25.7)	0.004
30–Day Readmissions	16 (12%)	5 (4%)	8.4%	(1.9, 14.9)	0.011
Avoidable Transfers	34 (59%)	13 (41%)	16.0%	(6.9, 25.1)	0.001
Avoidable Hospitalizations	20 (45%)	6 (25%)	10.7%	(3.6, 17.8)	0.003

Results

CS-ACT Use When Indicated

	CS–ACT Use (n)	Proportion (%)	95% Confidence Interval
Number CS–ACTs Indicated	222	N/A	N/A
Number CS–ACTs Completed	205	92.3	(88.0, 95.5)
Number CS=ACTs Correctly Completed Compared to Number Used	204	99.5	(97.3, 100)
Number CS–ACTs Indicated Compared to Number Used	17	8.3	(4.9, 12.9)

Conclusions

- This initial study suggests that using CS-ACT tools when a change in resident condition occurs reduces transfers/hospitalizations/30-day readmissions; and when transfers did occur, they were more likely to be unavoidable, suggesting that residents were more likely to receive appropriate care in the most appropriate setting.

- All 30-day readmissions except one were from post-acute care and were related to the initial hospital discharge diagnosis, suggesting that perhaps acute care transfers to LTC are not occurring at the optimal time.

Limitations of the study were small sample size and study conducted at one facility.

CS-ACTs

Acknowledgements

- Jewish Healthcare Foundation & Pittsburgh Regional Health Initiative
- University of Pittsburgh
- All of my colleagues who have dedicated their careers to LTC

Contact: Terri Devereaux, PhD, MPM, FNP-BC
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Hill House Passport Charter School - School Wide Evaluation

Drs. Rafoth, Semich, Hansen, Donne, and DiCicco
Proposal for School Evaluation Approved for 2017 - 2018

Abstract

Hill House Academy Charter School - Grades 9-12

Hill House Academy Passport Charter School seeks external evaluator to facilitate the development of an action plan with first year implementation designed as annual school wide evaluation of program.

RMU – Education Dept. Selected

Research Questions

Questions below based on the proposal (RFP)

1. How effective is the school in monitoring and meeting students' academic skills?
2. How effective is the school in preparing students for post-high school work readiness and career readiness?
3. How well does the school facilitate students' overall social development?

Source: hhpa.k12.com

Evaluation Time Line

January / February 2017 Timeline

January/February 2017 – Stakeholder Involvement

- Meet with school administration, faculty and staff to learn more about the school culture and initiatives.
- Gather information on school curriculum, individualized learning plans (ILP), and portfolio assessment methods.
- Work with school administration and faculty to develop and assess rubrics and other student outcome assessments as needed.
- Survey staff and faculty experience at the school and conduct focus groups questions about evaluation needs.
- Hold community forums to learn about the role the school plays in the community in order to better shape evaluation.
- Meet with school administration to identify data sources in school records and create a systematic data set for collection and analysis

Source: hhpa.k12.com

Instrumentation

March 2017 Instrumentation

- Review a variety of school climate assessment tools in order to choose one that best fits the needs of the school to provide data to address school culture, student discipline, at-risk students, and non-academic needs.
- Develop any new surveys and/or focus group questions.

April 2017 Draft Plan
- Submit draft of evaluation plan to school administration and board for input and review.

May 2017 Final Plan
- Submit final evaluation plan to board for implementation in 2017-2018.

Source: hhpa.k12.com

SESS Evaluation Team

Members and Roles

- Dr. Mary Ann Rafoth, Principal Investigator
- Dr. George Semich, Project Manager
- Dr. Mary Hansen, Data Analyst
- Dr. Vicki Donne, Special Population Specialist
- Dr. Marzia Dicicco, Adviser

Source: www.pinterest.com

Sample Evaluation Implementation Timeline

Tentative Evaluation Outline

September- October 2017
- Distribute surveys to stakeholders
- Begin record reviews
- Begin structured observations & walk thru
- Begin curriculum review / documents

October-December 2017
- Conduct focus group interviews
- Continue record reviews
- Completed structured observations
- Review teacher assessment system

Evaluation Timeline Contd.

January – February 2018
- Complete data gathering
- Complete data analysis and survey review

March- April 2018
- Complete initial draft of evaluation report

May 2018
- Submit final report to HHPACS Board

The Effect of a Blended Teaching Method on Student Performance and Satisfaction in a First Accounting Course in Higher Education

Gregory Krivacek, PhD, CPA, CGMA

Robert Morris University

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Introduction

- Designing the first accounting course in higher education has been a difficult task. This course has been offered in both face-to-face and online formats.
- Educators are continuously searching for other teaching methods to promote high levels of achievement and satisfaction for this diverse group of students.

Figure #1

What is Blended Learning?

Goals of Blended Learning

- Best of face-to-face and access to connectivist-based networks
- To create a flexible and rigorous learning environment
- To allow students to engage in higher order thinking
- Create a more individualized learning experience

Research Questions

1. Is there a difference in academic performance of students who receive blended instruction versus face-to-face instruction in a first accounting course in higher education?
2. Is there a difference in satisfaction of students who receive blended instruction versus face-to-face instruction in a first accounting course in higher education?
3. What are the advantages and disadvantages of blended instruction in a first accounting course from the perspective of undergraduate students?

Methods

- Two Instructors
- Two Teaching Methods
  - Face-to-Face (Control Group: Fall Semester)
  - Blended (Treatment Group: Spring Semester)
- Performance: Pre-test and Post-test
- Satisfaction: Survey and Focus Group

Results

RQ #1 Performance

Interactions and 95.0 Percent LSD Intervals

RQ #2 Satisfaction Survey

- Measuring Course Format, Content, and Communication
- Results
  - No Statistical Significance between Groups
  - Students Equally Satisfied

RQ #3 Focus Group Themes

Participants	Themes
1, 3, 4, 5, 6, 7, 9	More flexibility of time and place
1, 2, 3, 4, 5, 6, 7, 8, 9	Technological tools easy to use, short in length, helpful
1, 2, 4, 5, 6, 7, 8	Technological tools helpful features of pause and rewind
1, 2, 3, 4, 5, 6, 7, 8	Maintained interaction
1, 5, 7, 8	Ability to reach different learning styles
1, 3, 4, 5, 6, 7	Offered the best of face-to-face and online
1, 3, 4, 5, 7	Students felt overwhelmed in the beginning
1, 2, 3, 5, 6, 7	Publisher PowerPoints not as effective as the videos

Conclusions

- Offer the first accounting course in both face-to-face and blended
- Performance varied by instructor
- Satisfaction was equally high with both methods
- Advantages with the blended instructional method
- Study fills gap in the current literature
- Blended instructional environment has potential

An Innovative Approach: Using Simulation to Teach Primary Care Gynecologic Procedures

Susan D. Hellier PhD, DNP, FNP-BC, CNE, Denise R. Ramponi DNP, FNP-C, ENP-C, FAANP, FAEN, Alexander Wrynn BSN, RN, Stephanie Garofalo BSN, RN

Background

- A variety of therapeutic and diagnostic gynecologic procedures can be safely performed in the office or clinical setting by trained and proficient providers. [1]

- Formal healthcare profession training programs may provide inconsistent exposure to procedures and learning opportunities. [2]

- "On the job" proctored experiences are non-standardized, demanding of time and resources, and are often not practical. [2]

- The evidence suggests low-fidelity simulation models may provide an adequate venue to learn procedural skills. [3]

- Simulation allows for a minimal level of competency before transitioning to performing procedures on real patients [3]

Purpose

- To assess participants' self-perceived satisfaction and confidence in applying the learned simulated skills in clinical practice.

- Through experiential learning provided in a "hands on" skills workshop setting, the clinician is given the opportunity to apply acquired knowledge in the clinical area.

Methods

- During a "hands on" skills workshop, practicing clinicians performed simulated cervical cancer screening, endocervical polyp removal, IUD removal, and an endometrial biopsy on a low fidelity gynecologic model. Using convenience sampling, each participant completed a survey designed to measure satisfaction with the workshop and self-confidence in their newly acquired skills.

- Study participants completed The National League for Nursing's Student Satisfaction and Self-Confidence in Learning Tool at the conclusion of the workshop. Reliability was tested using Cronbach's alpha coefficient: satisfaction = 0.94; self-confidence = 0.87.

Table. Participant Demographics

Characteristics	N=30 N (%)
Gender	
Female	30 (100%)
Age group, y	
20-29	3 (10%)
30-39	15 (50%)
40-49	9 (30%)
50+	3 (10%)
Years in practice, y	
0-2	25 (83%)
3-6	3 (10%)
7+	2 (7%)
Profession	
Nurse Practitioner	19 (63%)
Student	11 (37%)
Area of practice	
Family Medicine	12 (40%)
N/A-Student	11 (37%)
Internal Medicine	2 (7%)
ED/Urgent Care	2 (7%)
Other	3 (9%)

Results

- All (N= 30, 100%) of the participants agreed at the "agree" or "strongly agree" level that the model was an enjoyable, helpful, motivating, and effective method to learn.

- All (N= 30, 100%) of the participants agreed at the "agree" or "strongly agree" level built confidence in mastery of skills and obtained the required knowledge to perform the procedures in a clinical setting.

- Almost all (n = 29, 97%) of the participants agreed at the "agree" or "strongly agree" level that they knew how to obtain help with concepts they did not understand as a result of the simulation.

- All (N= 30,100%) of the participants agreed at the "agree" or "strongly agree" level that it was their own responsibility to learn what they needed to know from the simulation activity.

- All (N= 30, 100%) of the participants agreed at the "agree" or "strongly agree" level that the simulation model was a helpful resource to learn gynecologic procedural skills.

Limitations

- A large number of advanced practice student participants who have limited clinical experience.

- Collected data was self-reported.

- The sample size was small and limited to one workshop venue, which limits generalizability of the findings.

- Actual learning was not measured.

Conclusions

- Although there are acknowledged limitations, our study demonstrates that simulation is a satisfying, realistic, and confidence building method to provide gynecologic procedures education to practicing clinicians.

Further Studies

- A study is currently being conducted to determine if this simulation provides adequate retention of knowledge.

References

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RMU ROBERT MORRIS

Barriers to Implementation of Workplace Wellness Programs in the Career Fire Service

Jillian Harrington, MS, CCS, CCS-P, CPC, CPC-I, CEMC, MHP

School of Nursing and Health Sciences – Robert Morris University, Moon Township, PA

Doctoral Candidate – Creighton University, Omaha, NE

Introduction

The general health profile of firefighters tends to be poor, with many having inferior dietary habits and low levels of physical activity leading to increased risks for 'lifestyle' related conditions[1]. These conditions, such as obesity, diabetes, and high cholesterol, paired with the high stress environment of the fire service create an elevated risk for on duty cardiovascular events and line of duty death[1]. Workplace wellness programs are shown to be effective yet only about 27 percent of the nations paid fire departments implement them[2].

Study Objective

This exploratory qualitative study examined barriers to implementation of workplace wellness programs at small to mid-size career fire service organizations in the United States.

Method

Semi-structured interviews were performed with leaders from 8 career fire departments across the United States. Five departments had wellness programs in place and three departments did not. Leaders discussed wellness programs, barriers to implementation, and other concerns related to health and wellness.

Thematic Map

Results

Thematic analysis revealed four main themes: programmatic buy-in, financial matters, leadership support, and labor management. Sub-themes detailed issues and concerns faced by departments during program implementation, or that have held organizations back from pursuing programs. The major concern was buy-in, noted by each participant in the study. Financial matters were also a major concern noted by the majority of participants in the study.

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Discussion

As action research, this study involved the development of best practices. Program planning & choice, overall buy-in, finance, leadership, and labor management were all addressed with best practices noted in the figure below. Provision of sample program plans and timelines assisted departments with implementation efforts.

There has been little scholarly research on this topic to date. This research could assist departments in future wellness efforts, as well as direct additional research in career fire service workplace wellness programs.

Program Planning: Create an overall work plan to describe how organization will develop, implement, and manage wellness program over time

Program Choice: Choose plan of known level of effectiveness, not just parts and pieces of programs

Buy-In:
- Win over leaders with financial data
- Grassroots effort to bring staff on board
- Full transparency

Finance
- Work to obtain external funding plan for its use
- Collect data in order to obtain local funding
- Be sure to consider incentives in budget

Leadership
- Set "Tone from the Top"
- Administrative Support as well as leading by example

Labor Management
- Involve early, involve often
- Could be positive or negative conduit to membership

Best Practice Solutions

MAKING LITERATURE REVIEWS EASIER
Cathleen S. Jones, DSc

Research Question:
Can software make this process easier?

NVivo® is a qualitative software package which may help simplify the organization of literature reviews.

Annotated Bibliography

How to Organize Literature Reviews

Notes

Text can be sorted into Nodes

Nodes

Memos track what is learned

ARTICLE

Searches of the literature review sources can be conducted:
Word frequency
Text search
Compound queries ...

Sources can be:
-Word
-Pdf
-Audio
-Video
-Photos

Other features: annotations, mapping, modeling

Human Resource Management, School of Business

Training via Social Media
Jasmin Lin
Robert Morris University

RMU ROBERT MORRIS ™

Introduction

Using social media has become a daily task for many people in this day and age. If people spend so much of their time on social media sites, can the sites be used productively and for work purposes? The benefits of using social media as a training medium and the effects of social media on development as well as career implications will be explored.

Methods

Students were asked to follow a professional association page via their most used social media account. After 2 weeks, students were asked again to see if there is any learning occurred by simply following the professional association page. Students demographic information, such as gender, age, work experiences, personality, were collected. The perception of Social Media and the intention to use Social Media were collected and analyzed.

Please check all the social media account you currently have (48 responses)

- Facebook — 45 (93.8%)
- Google+ — 16 (33.3%)
- Twitter — 33 (68.8%)
- Instagram — 41 (85.4%)
- Pinterest — 18 (37.5%)
- Reddit — 2 (4.2%)
- LinkedIn — 40 (83.3%)
- Snapchat — 46 (95.8%)
- Tumblr — 3 (6.3%)
- Other — 0 (0%)

How often do you check your social media account? (48 responses)

- Once every 5 minutes — 8.3%
- Once every hour — 72.9%
- Once a day — 14.6%
- Once a week
- Once a month
- I don't have a social media account

Perceptions of SM DISAGREE

People tend to DISAGREE in the following statements.
- SM is the best way to help employers to find the right candidates for the position.
- Companies should monitor employees' SM account even after they left the company.

People has mixed feelings in the following statements.
- Company should check job candidates' SM account before making a job offer.
- Company should provide SM training to make sure all employees understand how to properly use SM.
- Company shouldn't monitor employees' SM due to privacy issue.

Perceptions of SM AGREE

People tend to AGREE in the following statements.
- SM is necessary in recruiting and hiring process.
- SM is an economic way to find the employees who will fit in organizational culture.
- Employees can learn skills from training via SM.
- Companies can learn what employees really think by spying on employees' SM.
- Companies need to have a SM policy to prevent employees inappropriate behaviors at work.

Intention to Use SM

People show intention to use SM in
- looking for a job.
- learning new knowledges.
- recruiting for job candidates.
- checking job candidates' SM before making a job offer.
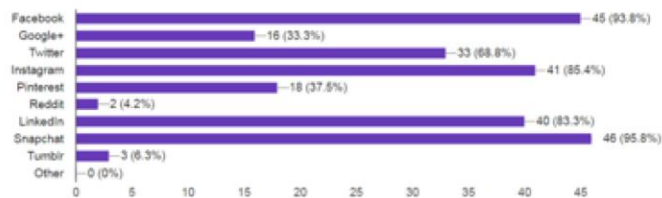
but not
- complaining a work condition.

People shows mixed results in
- use SM to communicate important HR messages to employees.
- check current employees' SM for their job satisfaction.
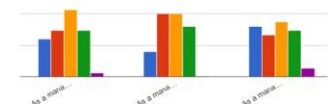- check employees who quit the job to learn their real reasons quitting the job.

Conclusions

The learning experiences from students vary.

?

Bibliography

Available upon request.

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Model Selection for Merger and Acquisition Analysis in Asian Emerging Markets

Jianyu Ma, Yun Chu
Robert Morris University, USA

RMU ROBERT MORRIS

Introduction

- Market model in event study is likely the most popular and stable approach in estimating expected normal returns.
- Standard OLS (ordinary least square) market model is well-suited in an event study under a variety of conditions.
- Release of the OLS regression assumptions, such as the non-normality of daily stock returns, has little effect on event study tests?
- We examine mergers and acquisitions deals from Asian emerging markets over the period of 2006 to 2009.
- We present evidence that the distributions of the stock returns for the bidding firm and the corresponding market portfolio are non-normal in the majority of deals.
- We use two robust regressions, the Huber regression M-estimator and the bootstrapping quantile regression with standard error, to test the efficacy of the standard OLS market model.
- The results indicate that the traditional methods of measuring abnormal returns around event windows may be flawed.
- Both Huber regression M-estimator and bootstrapping quantile regressions provide higher average abnormal returns and higher mean cumulative abnormal returns than those found by the standard OLS market model.

Data and Methodology

We extract M&A deals from Thomson SDC Platinum Database. We obtain the daily stock price of acquiring firms from the DataStream. The final sample includes 858 mergers and acquisitions deals. Table 1 describes the distributions of transactions by market and year.

For stock returns of the acquiring firm in each deal, we conduct a normality test in skewness, in kurtosis, and in both statistics jointly. Our normality test uses 120 daily returns for the acquiring firm and its corresponding market portfolio. The estimation window in our event study analysis includes the 120 daily returns as well.

The standard OLS market model (Equation 1) assumes a linear relation between the return of any security and the return of the market portfolio index.

$$ (1) \qquad R_{it} = \alpha_i + \beta_i R_{mt} $$

The estimates of αi and βi from Equation (1) help to predict a "normal" return for the days within the 5-day event window. The abnormal return (AR) is the difference between the actual return and the predicted normal return.

$$ (2) \qquad AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} $$

We run the above market model with three different specifications. We obtain three sets of expected normal returns and abnormal returns from the three different specifications and Equations (1) and (2). Based on the abnormal returns for each firm, we calculate mean abnormal returns for each day within the event window.

$$ (3) \qquad AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} $$

We sum the daily abnormal returns over different event windows to derive the cumulative abnormal returns (CARs):

$$ (4) \qquad CAR_{i(T_1, T_2)} = \sum_{t=T_1}^{T_2} AR_{it} $$

CARi is the cumulative abnormal return for sample i over the event window (T1, T2).

Table 2: Frequency of deals by market and year

The final sample of 858 deals that occurred from 2006 to 2009 in nine Asian emerging markets.

Year	China	Hong Kong	India	Indonesia	Malaysia	Singapore	South Korea	Taiwan	Thailand	Total	%
Panel A: Frequency of deals by acquiring firm's market											
2006	14	21	8	0	74	39	30	4	3	193	22.5%
2007	63	21	23	7	65	42	22	1	2	246	28.7%
2008	64	25	17	8	66	18	30	3	5	236	27.5%
2009	42	16	12	10	38	13	35	3	14	183	21.3%
Total	183	83	60	25	243	112	117	11	24	858*	
%	21.3%	9.7%	7.0%	2.9%	28.3%	13.1%	13.6%	1.3%	2.8%		
Panel B: Frequency of deals by target firms' market											
2006	19	25	9	2	69	27	29	5	7	192	22.4%
2007	65	25	19	9	63	39	22	2	2	246	28.7%
2008	67	27	17	9	57	17	30	4	8	236	27.5%
2009	41	19	12	11	37	13	33	3	14	183	21.4%
Total	192	96	57	31	226	96	114	14	31	857**	
%	22.4%	11.2%	6.7%	3.6%	26.4%	11.2%	13.3%	1.6%	3.6%		

* No acquiring firm from the Philippines per our search criteria.
** One target firm is from the Philippines. The table does not include the firm because no acquiring firm from the Philippines.

Table 1: Comparison of abnormal returns across markets for returns using three different

	China	Hong Kong	India	Indonesia	Malaysia	Singapore	South Korea	Taiwan	Thailand
Panel A: Difference of abnormal returns (OLS - M-regress)									
-2	-0.22***	-0.49***	-0.16***	-0.15*	-0.17***	-0.30***	-0.21***	0.01	-0.28
-1	-0.19***	-0.39**	-0.19***	-0.19***	-0.13***	-0.41***	-0.17***	-0.01	-0.21
0	-0.26***	-0.47**	-0.20***	-0.09	-0.15***	-0.40***	-0.20***	0.04	-0.18
1	-0.21***	-0.37*	-0.18***	-1.07	-0.15***	-0.37***	-0.23***	-0.03	-0.23
2	-0.14***	-0.38***	-0.18***	-0.12	-0.12***	-0.27**	-0.20***	-0.04	-0.18
(0, 1)	-0.47***	-0.83**	-0.38***	-0.97	-0.30***	-0.78***	-0.44***	0.07	0.41
(-1, +1)	-0.66***	-1.22**	-0.57***	-1.17*	-0.43***	-1.18***	-0.61***	0.06	-0.62*
(-2, +2)	-1.01***	-2.05***	-0.90***	-1.43***	-0.72***	-1.75***	-1.02***	0.04	-1.07*
Panel B: Difference of abnormal returns (OLS - BSQReg)									
-2	-0.15***	-0.39**	-0.19***	-0.17***	-0.17***	-0.27***	-0.26***	-0.01	-0.29
-1	-0.20***	-0.37***	-0.30***	-0.18**	-0.15***	-0.53***	-0.22***	-0.09	-0.23*
0	-0.24***	-0.48**	-0.26***	-0.20**	-0.14***	-0.47***	-0.29***	0.00	-0.18
1	-0.28***	-0.35*	-0.24***	-0.07	-0.15***	-0.36***	-0.31***	0.00	-0.21
2	-0.24***	-0.38***	-0.22***	-0.13*	-0.09***	-0.41***	-0.27***	-0.27	-0.18
(0, 1)	-0.53***	-0.83**	-0.50***	-0.28**	-0.29***	-0.83***	-0.60***	0.00	-0.39
(-1, +1)	-0.72***	-1.21**	-0.80***	-0.46***	-0.44***	-1.36***	-0.82***	-0.09	-0.62
(-2, +2)	-1.16***	-1.97**	-1.21***	-0.73***	-0.71***	-2.03***	-1.35***	-0.35	-1.09
Panel C: Difference of abnormal returns (M-regress - BSQReg)									
-2	-0.07	0.06	-0.03	0.00	0.00	0.03	-0.05*	0.00	0.00
-1	-0.01	0.01	-0.11***	-0.01	-0.02	-0.12***	-0.04	-0.08	-0.02
0	-0.02	-0.02	-0.06**	-0.29	0.00	-0.06*	-0.09***	-0.04	0.00
1	-0.08***	0.02	-0.06*	0.99	0.00	0.02	-0.08***	-0.03	-0.02
2	-0.11**	0.00	-0.04	-0.01	0.03	-0.14***	-0.07***	-0.23	0.00
(0, 1)	-0.06	0.00	-0.12**	0.70	0.00	0.05	-0.17***	-0.17	0.02
(-1, +1)	-0.07	0.01	-0.23***	0.71	-0.01	-0.17**	-0.21***	-0.15	-0.01
(-2, +2)	-0.11	0.08	-0.31**	0.70	0.01	-0.29***	-0.33***	-0.38	-0.01

The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Results and Conclusions

- Positive cumulative abnormal returns exist in two-day, three-day, and five-day event windows.
- The daily mean abnormal returns are positive and statistically significant at the conventional level for day -1 and day 0.
- The mean differences are statistically significant. The standard OLS market model produces smaller average abnormal returns than those of the two robust tests on each day in the event window.
- Huber M-estimator produces average abnormal returns that are significantly smaller than those of the bootstrapping quantile regression on day -1, day 0, and day 1, as well as in the 3-day window and the 5-day window.
- Researchers should examine features of their data and requirements of the data analysis technique to be used prior to performing those analyses.
- We recommend a robust regression, either Huber regression M-estimator or bootstrapping quantile regression, in dealing with outliers.
- It appears that the heteroscedasticity has little influence in calculation of abnormal returns for most emerging Asian markets.
- Portfolio managers and researchers should be cautious in pooling countries to increase sample size because it is likely the pooling will combine countries with different distributions.
- When we interpret the results and findings from the existing studies, we need to consider whether they address the assumptions of the models used and whether the models are appropriate to the data and problems. Failure to do so may lead to untrustworthy conclusions.

Substituting Fruit Branded Products for Real Fruit: A Descriptive Examination of At-Risk Families in the United States

Jill K. Maher, Ph.D. and Daria C. Crawley, Ph.D.
Robert Morris University.

RMU ROBERT MORRIS™ SCHOOL OF BUSINESS

Introduction

Despite popular campaigns such as Michelle Obama's "Let's Move" and governmental efforts stressing a greater consumption of fruit and vegetables as part of a healthy diet, childhood obesity findings indicate racial differences. This study investigates parental consumer behavior that lies behind children's diets—and the marketing practices that drive that behavior by examining parents' of color and White parents' understanding of the nutritional needs of children and their own understanding and purchasing of brands that are linked to fruit through signals of fruit in the brand name and/or package (e.g., Berry Berry Kix).

Methods

Self-administered Surveys

Sample: 149 ethnically diverse parents from Pennsylvania and Arizona with children enrolled in Head Start. Over a quarter of the respondents were Latino or Black, almost half unemployed, with mean incomes lower than the poverty line, and almost half were single parents.

Measures: (1) number of daily fruit servings their child consistently eats, (2) sourcing of this daily fruit serving, (3) brand purchasing behavior (4) knowledge of brand content and (5) agreement with healthfulness claims such as, "a great source of Vitamin C".

Conclusions

- Parents use non-fruit substitutes for real fruit

- Food industry must become more transparent

- Targeted educational resources are necessary for at-risk parents

- Develop better guidelines for food packaging

- Targeting along ethnic lines may not make sense; SES is a better indicator

Results

- 52% of parents incorrectly report the appropriate number of daily fruit servings for their children

- Overwhelmingly, parents erroneously report non-fruit products as sources of real fruit

- Parents believe one serving of non-fruit products such as GoGurt, Trix yogurt, Beery Berry Kix cereal, and Fruity Cheeri0s is equivalent to one serving of real fruit.

- Parents more strongly believe "Great Source of Vitamin C" and "All Natural" as healthier for their child than "Fruit-flavored" and "Made from Concentrate."

- Minimal differences between White Parents and Parents of Color

Engineering Design of Service Operations

Sanjeev Chennagiri and Dr. Priyadarshan Manohar
Engineering Department, SEMS, RMU

Problem Statement

In order to develop detailed specifications for setting up a maintenance center for a medical product, a US-based MNC has hired the services of an engineering consulting firm to design the service operations.

Abstract

Engineering consulting industry is experiencing significant changes driven by globalization. Manufacturers, suppliers, users and service centers are distributed around the world which leads to issues related different languages, quality standards, federal regulations and industry codes. In this dynamic business environment and to meet the growing needs of the business it is important to engineer the design of service operations. Thus in the present work, new service development methodologies are presented that would deliver high quality engineering consulting service reliably and efficiently to deliver value to the customer. These methodologies for engineered service design include Service Blueprinting, Process Flow Chart analysis, Process Description, Line of Visibility, Line of Customer Interaction, Line of Internal Interaction and Support Systems, and Organizational Structure. These techniques are applied to establish a global consulting business that deals with biomedical tools and devices covered under stringent FDA regulations. Several sets of standardized technical documents have been developed including quality standards, regulations and process audits, engineering change control procedures, communication, standard operating procedures and engineering drawings. The research will also propose new templates and artifacts to support the service delivery.

Stakeholder Relationship
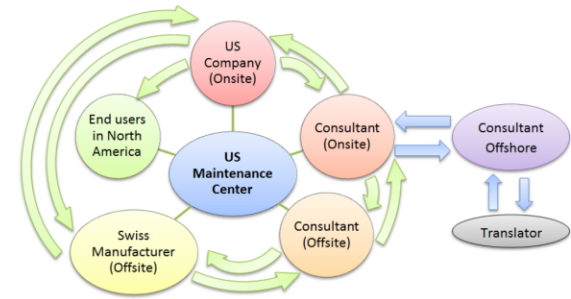
About the product

The product is a medical power tool that is used for sawing, reaming and drilling large human bones during surgery. The product can be operated from a power supply or a battery. and can be sterilized. Drills, blades and reamers are for single use .

Service Blueprint

Legends
Concurrence: US Co. approves Scope change
Manufacturer approves Technical aspects
F   Failure point

Legends
SME: Subject Matter Expert
SOP: Standard Operating Procedure
EHS: Employee Health and Safety department
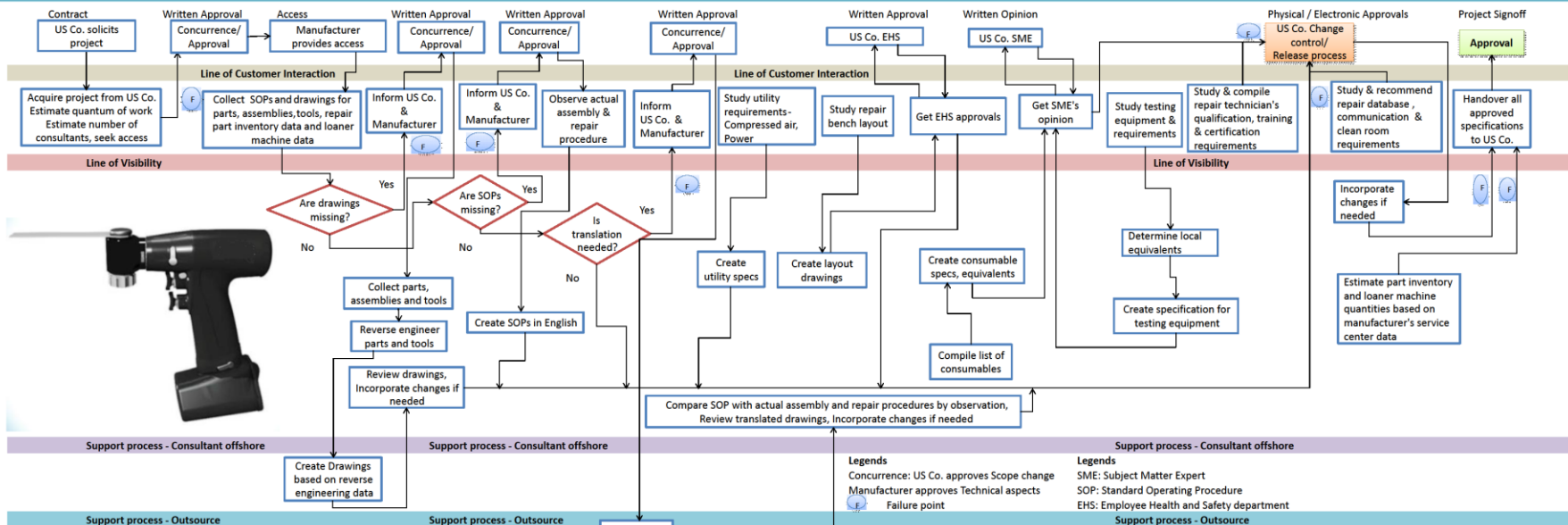
Seeking Consensus on Prebriefing: Preparing Students for Simulation-Based Learning

Donna McDermott PhD, RN, CHSE
Assistant Professor of Nursing, Robert Morris University
Doctoral Research completed at Indiana University of Pennsylvania

Background

- Gaps remain in the literature regarding prebriefing research
- Conflicting terms for simulation preparation: Briefing/Prebriefing
- Lack of knowledge about the contribution of prebriefing to student learning in simulation.

Study Purpose

- To seek consensus from CHSE experts about the prebriefing component of simulation-based learning (SBL)

Research Questions

- What is the role of the simulation educator in prebriefing?
- What is the role of prebriefing in learner success?
- What strategies are recommended for prebriefing students?

Panel Demographics

- 93% female; Mean age 53
- Represented 18 states, 2 Canada, 1 Netherlands
- 83% >6 or more years experience with SBL
- Represented all practice areas
- Incorporated INACSL standards (92%)

Methods and Data Collection

- Modified electronic Delphi study with 3 rounds of data collection using a panel of CHSE experts recruited via SSH Sim Connect (CHSE only) website
- Round 1 Qualtrics© survey link had 7 open ended questions plus demographic questions.
- Round 2 Qualtrics© survey link had 116 item statements about prebriefing directly emailed to 59 panelists of Round 1
- Round 3 Qualtrics© survey link emailed to the 36 panelists who responded to Round 2.
- Round 3 survey consisted of the 48 item statements that did not reach >70% consensus in Round 2 plus the group response to each item.
- Data management by QSR's NVivo© and SPSS ® version 22

Recommendation for Defining Prebriefing

- Prebriefing is an essential three phase process of planning, briefing, and facilitating that occurs prior to the SBL experience based upon the purpose/learning objectives of the scenario.
- Prebriefing should be planned and facilitated by a qualified simulation facilitator who is familiar with characteristics of the SBL learner regarding level, program, and profession.
- Strategies should be employed to promote learner success and confidence in the simulated experience and to encourage reflective practice in debriefing

Findings by Rounds

R1 (N=59)	• <u>4 themes:</u> Planning, Briefing, Facilitating, Importance of Prebriefing • <u>Subthemes:</u> SBL purpose and learning objectives, equipment and manikins; expectations; psychological safety; role of simulation educator; logistics; learner characteristics; strategies to prepare learners for SBL; learner success; relevance to debriefing.
R2 (N=36)	• 68 items reached >70% consensus • 100% consensus on the importance of SBL educator, orientation, establishing trust, evaluation • 18 briefing statements reached >70% agreement – orientation, trust, tone, expectations • Lack of consensus: Strategies to prepare, disclosure of specific LO, methods of prebriefing delivery
R3 (N=30)	• 48 item statements lacking agreement resent to panel. • Additional 15 statements reached >70% consensus • 33 statements lacked consensus • Strategies/methods for prebriefing – no agreement

Conclusions

- Prebriefing should be conducted by a qualified SBL educator and guided by SBL purpose and LO.
- Consider level of the learner when planning and facilitating prebriefing to promote engagement of learners.
- Prebriefing should be a planned part of SBL day agenda.
- Consider a variety of strategies to prepare learners.
- Prebriefing is vital to simulation success and may enhance debriefing and reflection.
- Prebriefing should be a component of faculty development in SBL.

Mobile Forensics and Security Project
Karen Paullet, Jamie Pinchot & Sushma Mishra
NSF Funded Project

Karen Paullet, Jamie Pinchot & Sushma Mishra

Mobile Forensics Training

The goal of the project is to implement a train-the-trainer program on mobile forensics and security.

In July 2016, 20 faculty members from Universities across the country were trained on the tools and techniques of mobile forensics and security.

Train the Trainer

University Implementation

The project is a two year train-the trainer program.

After learning through hands-on training, faculty members were able to take the newly learned skills back to implement mobile forensics and security into their curriculum.

Faculty from 14 Universities were present in which 7 Universities have implemented the learned skills as part of their cyber programs.

Mobile Forensics and Security Certificate

A new certificate in Mobile Forensics and Security have been implemented at RMU. The certificate consists of existing courses in Cyber Forensics plus the implementation of the new Mobile Security and Policy course. Currently, there are 18 students enrolled in the certificate.

Conclusions

The Mobile Forensics project currently has trained 20 faculty members with the expectation of training 50 by the end of the grant period.

Trained faculty and professionals will, in turn, be able to train additional people in the field of mobile forensics.

Faculty will be ready to implement mobile forensics as part of their cybersecurity curriculum.

Based upon an approved NSF funded grant, the project serves as a model to the cybersecurity community.

RESEARCH & GRANTS ADMINISTRATION

Searching for Grant Funding

➢ This is a time consuming but rewarding process

➢ Federal, Foundation, State/Local, Business/Industry, Professional Associations all have funds.

➢ You need to look at the organization that aligns with your concept. At times you will need to tweak your concept

➢ To search for opportunity:
- ❑ Google
- ❑ Search on-line databases
- ❑ Search Funding agency websites
- ❑ Search literature in your field for funding sources acknowledged
- ❑ Ask others in your networking societies
- ❑ Ask others in your department, your school
- ❑ Ask your Research & Grants Office

Funding Sources

- Federal
- Foundation
- State/ Local
- Business/ Industry
- Professional Associations

Grant Budget 101

➢ Preliminary budget prepared by PI

➢ Compliance Check carried by
- ❑ R & G Administration
- ❑ Finance Department

➢ Key terms
- ❑ FICA – Social Security, Medicare etc.
- ❑ Fringe – Benefits
- ❑ Indirect Cost – All salaries, Wages & Fringe – off campus rates and on campus rates
- ❑ Course Load Reduction –
- ❑ ACAD & SUM Compensation

The Grant PI …

➢ …. Must participate to a significant intellectual degree in a sponsored project
➢ …. Bears primary responsibility for all essential aspects of work being carried out
➢ …. May delegate tasks to business and support staff; but ultimately responsible for project

For more information attend one of our Information Sessions

Contact: Dr. Sushil Acharya , acharya@rmu.edu, 412-397-4023
Lisa Nauman, nauman@rmu.edu, 412-397-6227

Is Stock Market Overvalued: A Benchmarking Approach

Riza Emekter, Zane Dennick-Reem, and Robert Beaves

Robert Morris University

Introduction

Since March 2009, the stock market has made the investors very happy. The 8 year bull market may collapse on any day or can last another 8 years. A lot of investors started to be nervous with the record new heights the market discovered. We would like to help all investors to gauge the current level of market with a benchmark approach. In this research, we will benchmark stock market level to many macro and micro variables to find out whether stocks as a class over or under priced. The macro variables will be selected among a wide variety of asset classes: Currencies, fixed income securities, commodities, foreign equities, real estate. Also, we will use economic indicator variables such as GDP growth, inflation, money supply, interest rates, unemployment rates, etc. The last group of benchmark variables will be aggregated company variables: Earnings, Sales, Assets, etc..

Most active investors would use P/E ratio of the market as a quick benchmark. In these days, it is possible to see news or hear conversations referring to high level of P/E ratio. Instead of using only earnings as the benchmark, using multiple benchmarks should be helpful and give investors more confidence about their future expectations. In addition to looking at these benchmark individually, it would be also very useful to combine these benchmarks into a single benchmark to be used like P/E ratio. High P/E ratio could be justified if these two variables are affected differently from the changing economic conditions. If multiple benchmark points out the same direction, that would give investors more confidence about their forecast. It is possible that different indicators would point to different direction. However, if it is possible to combine the different indicators into a single index that could superior predictive power, that would be a very valuable tool for investors. This study targets to find such an index.

Data and Methodology

This study uses Standard and Poor's S&P 500 index (SPX) as a proxy for the stock market. Various benchmarks are used to determine whether stock prices are under or over valued for a given time period. We used the following benchmarks: 10-year Treasury bond rates, inflation (CPI), GDP, dollar index, euro, industrial production index, unemployment rate, money supply (M2), total non-farm employment, personal income, inventory to sales ratios, coincidence index, gold price, and German stock prices.

The monthly data is downloaded from St Lois Federal Reserve Bank's website. Some series go back to 1930s. Euro series naturally is the latest starting variable in the data set. Therefore, we created two groups of series. The whole group of variables starts from January 1999 until the end of 2016. A second set of data without euro, dollar index, inventory to sales ratio, and coincidence index starts in April 1968.

We started with a linear regression. Most of these variables are useful to explain the variation in the stock prices. The regression model explains the 96.6 percent of the variation in stock prices.

The significant variables are interest rates, inflation, GDP, industrial production, unemployment rate, money supply, non-farm payroll, personal income, gold prices and German stock prices.

The main motivation of this study is to find a benchmark to evaluate the level of stock market. To achieve this objective, we find the ratio of stock prices for a given month to these variables one by one and normalized this number to 1 on January 1, 2015. Also we computed the average of these ratios. Figure 1 shows the historical behavior of each benchmark. Figure 2 shows the average level of this index for each month. The index peaked on August 2000. The lowest value of the index was in the early 1980s. The index started to fall from 2001 until 2011. Since 2011, it has been rising steadily. The current level is high by the historical standard but it has seen higher levels before.

Table 2

C	49.02467***	Sample (adjusted): 1999M01 2015M01			
LOG(GERMSTOCKS)	0.270132***	Included observations: 193 after adjustments			
INV2SALES	-0.326438**	Number of always included regressors: 1			
LEADINGINDEX	0.048636***	Number of search regressors: 19			
LOG(NOEMPLOYED)	-3.61068***	Selection method: Stepwise forwards			
EURO	-0.280765***	Stopping criterion: p-value forwards/backwards = 0.5/0.5			
LOG(GOLD)	-0.23554***				
LOG(VOLUME)	-0.120658***	R-squared	0.969079	Mean dependent var	7.141878
LOG(DOLLARINDEX)	-1.510533***	Adjusted R-squared	0.966459	S.D. dependent var	0.204209
LOG(COINCINDEX)	9.291116***	S.E. of regression	0.037399	Akaike info criterion	-3.65507
LOG(GDPC1)	-3.186027***	Sum squared resid	0.24757	Schwarz criterion	-3.38459
INTEREST10YR	0.013	Log likelihood	368.7146	Hannan-Quinn criter.	-3.54554
LOG(M2SL)	-0.586945*	F-statistic	369.8221	Durbin-Watson stat	1.115696
LOG(RPERSONINCOME)	0.340586	Prob(F-statistic)	0		
LOG(INDPRO)	-0.34279				
RGDPGROWTH	0.001234				

Conclusions

This study uses various benchmarks to determine whether the stock market is under/over priced at a given time. Most of these variables are highly correlated with stock prices and therefore, explains almost all the variation in stock prices. Normalized ratio of stock prices to various benchmark variables are calculated. The average of these benchmarks shows that stock prices are overpriced. However, it did not hit the record levels yet. For comparison, the highest level of the index was 16 percent higher in August 2000 (the highest level).This benchmark was about at the current level in September 2007, May 1997, and May 1972. If we look at the individual benchmarks, GDP, Non-farm employment, personal income, and sales figures show that stock price is currently low compared to its historical level. One conclusion we can draw from these results also, the real economic variables show that the stock prices are undervalued (GDP, employment) and some monetary and financial assets show that the stock prices are overvalued (exchange rates, gold prices, other stock markets, interest rates). This study is work in progress, we will add more variables and will experiment with different combinations until we find a reliable benchmark.

Figure 1

Figure 2

Differential Effects of Two-Rate Property Taxation: New Evidence from Pennsylvania

Zhou Yang, Department of Economics & Legal Studies, SBUS

Research Funded by The Lincoln Institute of Land Policy

Abstract

Using municipality-level panel data, the study tests the theory of land value taxation. It offers the first evidence that raising the tax rate on land while lowering the tax rate on buildings leads to an increase in land value per acre. Further, this impact differs between residential land and commercial and industrial land. Residential land appears to be more responsive to changes in the tax differential than commercial and industrial land.

Background

- **Two-rate property taxation**
  - Taxing land at a higher rate than improvements
  - Land value taxation in practice
- **Property taxation in Pennsylvania**
  - The only state with two-rate property taxation in 1913
  - Implemented primarily at the municipality level

Figure 1: Two-Rate Cities in Pennsylvania

Motivation and Purpose

- **Important theory never tested**
  - Two-rate property taxation results in rising land value
- **Purpose of this research**
  - Test the theory using a rich dataset
  - Offer the first evidence regarding the impacts of two-rate property taxation on land value
  - Explore differential effects across various types of land use

Research Methods and Data

- **Estimate a dynamic panel data model:**
  $$V_{it} = \rho V_{it-1} + \delta \tau_{it}^{L} + \boldsymbol{\theta} TR_{it} + \varphi' C_{it} + \mu_i + Y_t + \varepsilon_{it}$$
  - Key coefficient
    $\boldsymbol{\theta}$: capturing the impacts of two-rate property taxation (TR_{it}) on land value (V_{it})
- **Investigate differential impacts**
  - Three outcome measures
    – Total taxable land value per acre
    – Taxable residential land value per acre
    – Taxable commercial/industrial land value per acre
  - Arellano-Bover/Blundell-Bond estimator
- **Data**
  - Land assessment data from county assessment offices in Pennsylvania
  - Property data from Zillow
  - Tax data from local tax collection agencies
  - GIS data

Results Summary

- **Effects of two-rate property taxation on land value by land use type**

Variable	All Types	Residential	Commercial& Industrial
Two-rate tax differential	0.4589* (0.2408)	1.0830** (0.4299)	0.1893*** (0.0671)

Notes: the table summarizes the result for the two-rate property tax variable (coefficient estimates are reported with robust standard errors in parentheses). Estimates of coefficients on other variables are not reported in the summary table.

- **Increased land value per acre associated with two-rate property taxation**
- **Larger impacts on residential land than on commercial and industrial land**
- **Robustness check**
  - Results staying robust

Conclusion

- **The paper provides the first evidence supporting the theoretical prediction.**
  - Two-rate property taxation leads to an increase in land value.
- **The results indicate that the impacts differ across types of land use.**
  - Residential land responds more to changes in the tax differential.
  - Findings reflect the relative elasticity of demand for residential land.
- **The study opens up new avenues for further research.**
  - Impacts depend on land development.

The Interaction Effect of Model and Viewer Body Size and Race on Advertising Effectiveness: Size Doesn't Matter

Drs. Albena Ivanova, Daria Crawley, Jill Maher, and Jodi Potter
School of Business

RMU ROBERT MORRIS

Introduction

This research examines the impact and interaction of both viewers' own body size and race, as well as the model's body size and race on viewers' identification with the model, attitudes toward the model and overall attitude toward the ad.

Theoretical Model

Observer characteristics (race and size)	H1 →	Identification with the model
Model characteristics (race and size)	H3 →	Attitude towards the model
	H2 →	Attitude towards the Ad

Methods

Self-administered Survey
4 Experimental Stimuli

Sample
244 female participants

46.9% Caucasian
48.1% African American
5.0% Other

Dependent Variables
1. Identification with the Model
2. Attitude toward the Model
3. Attitude toward the Ad

Stimulus Examples

JIMMY CHOO
WHAT **WORKS** FOR YOU   STYLE & elegance
www.jimmychoo.com

JIMMY CHOO
WHAT **WORKS** FOR YOU   STYLE & elegance
www.jimmychoo.com

Results

- In general, AA women have more favorable attitudes toward
     advertising than White women
- Viewers' own body size does not impact their evaluations.
- All women, regardless of race favor AA models.
- Model's body size does not impact women's evaluations.
- Significant interaction between model race and viewer race.

Conclusions

- Research supports earlier studies finding AA women like advertising more than White women. Future research should aim to uncover why?

- Culturally, there seems to be movement toward diversity appreciation among women.

- The advertising industry would benefit from using AA models in advertising to all women.

- The advertising industry can and should use more average sized models as women do not negatively evaluate these models or ads.

From Novice to Expert: Training Teachers in the Orton Gillingham Method of Reading Instruction

Drs. MaryAnn Rafoth, Carianne Bernadowski (RMU)
The Pierce Family Foundation
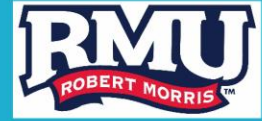
Introduction

Through a grant from the Pierce Family Foundation, ten teachers and five graduate students were trained in the Orton Gillingham (OG) method of reading instruction, which included an eight week graduate course and a 100-hour tutoring practicum with a child identified as having the diagnosis of dyslexia.

Knowledge, Confidence, Instruction Frequency

	Pre	Post	Δ
Knowledge			
How would you describe your knowledge of multisensory methods?	3.40	3.66	+.26
	3.53	3.53	+.00
How would you......explicit instruction in letter/sound correspondence?	2.53	3.33	+.80
How would you....accommodations for students with dyslexia?			
Mean	3.15	3.50	+.35

	Pre	Post	Δ
Confidence			
What is your current confidence level for helping children with dyslexia learn to identify letters	2.73	3.66	+.93
	3.46	4.40	+.94
What is your current confidence level.......learn to read word	2.26	3.26	+1.00
	2.26	3.20	+.94
What is your current confidence level......Learn to read fluently			
What is your current confidence level.....learn to read accurately			
Mean	2.67	3.63	+.96

	Pre	Post	Δ
Frequency of Instruction			
How often do you use multisensory methods for teaching reading?	3.13	3.67	+.54
	2.53	2.93	+.4
How often......explicit instruction in letter/sound correspondence?	2.80	2.73	–.07
How often....accommodations for students with dyslexia?			
Mean	2.82	3.11	+.29

Methods

This qualitative case study examined the self-efficacy of teachers who were trained and used a structured literacy tutoring program that utilized the OG method of phonetic instruction. A pre and post survey was administered that measured *knowledge, confidence, and frequency of strategy usage*. Additionally, semi-structured interviews were conducted with ten of the participants.

Results

Survey results revealed that *knowledge, confidence and frequency of strategy usage* increased after training was implemented. Specifically, knowledge in multisensory instruction and accommodating students with dyslexia increased. Likewise, confidence levels increased in four areas specifically related to teaching reading; letter identification, word reading, fluency and word identification accuracy. Finally, frequency of instruction increased in the area of multisensory methods and explicit instruction. A decrease in accommodations for dyslexia students was noted.

Semi-structured interviews revealed four themes including; *innovation in instruction, filling 'my toolbox,' less is more* and *noting in a secret.*

Conclusions

The implementation of systematic and explicit instruction is best practice in phonics instruction (National Reading Panel, 2000), and providing teachers with the time and training needed will not only benefit dyslexic children but all children in elementary classrooms. The results indicate that with sufficient training, teachers' self-confidence improved significantly. Knowledge in teaching strategies may have the greatest impact on teachers' self-efficacy, which in turn, effects instructional planning and implementation and, ultimately, student achievement. Universities can make the greatest impact by providing teachers with the tools necessary to be successful teachers of literacy.

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University of Pittsburgh School of Nursing/ Robert Morris University School of Nursing and Health Sciences

Improving screening for metabolic syndrome in patients taking second generation antipsychotic medications (SGAs)

Luann Richardson PhD, DNP (RMU); Heeyoung Lee, PhD, PMHNP (U. Pittsburgh) Melissa Kalarchian, PhD (Duquense Univeristy), Ren Dianxu MD, PhD (U. Pittsburgh)

PROJECT PURPOSE

- To increase rates of metabolic screening in patients with mental illness prescribed Second Generation Antipsychotics (SGAs)
- Evaluate an EMR prompting system used to screen patients prescribed SGAs.

BACKGROUND AND SIGNIFICANCE

- Metabolic syndrome consists of a group of risk factors known to increase risk for DM, HD, and other health problems
- A leading cause of M&M in the US in those with serious mental disorders.
- American Diabetes Association and American Psychiatric Association provide guidelines for metabolic screening in those prescribed SGAs
- A standardized procedure is warranted as screening rates for metabolic syndrome in those prescribed SGAs remains suboptimal and inconsistent.
- EMR prompts have been shown to improve screening in primary care settings.
- Multiple factors play a role in non-adherence to the guidelines including clinical inertia, lack of time, resources, and communication.

SPECIFIC AIMS OF PROJECT

- Improve adherence to ADA/APA screening recommendations for metabolic screening
- Explore feasibility of the novel electronic metabolic screening tool by using a 10-cm visual analog scal
- Assess quality of care by evaluating:
  - HC personnel knowledge of GL
  - Patient understanding of medication effects on metabolic syndrome

Multi-Modal Quality Improvement Strategy (QIS)

~Implement Electronic metabolic syndrome prompting tool into EMR
~Visual reminders throughout office
~Educational session for HC personnel
~Provision of patient education materials

METHODS

Design:
- Pre-post QIS comparison design to explore impact of a 12-week QIS on screening adherence rates.

Setting/sample:
- Semi-rural psychiatric practice in Western PA.
- Outpatients seen in behavioral health practice
- Retrospective (pre-intervention) (n=20)
- Prospective (post-intervention) (n=20)
- Office clinicians (n = 8)

PROCEDURE

- Obtain baseline adherence rates via retrospective chart review
- Integration of EMR tool
- Subsequent screening of 20 new patients prospectively for 3 months following QIS initiation

ANALYSIS

- Demographics
- T testing/Chi-Square
- Non-parametric testing
- Global adherence: 20 measures X 20 patients in each group = 400 measures in each group

RESULTS

- Global adherence to the guidelines increased significantly following the QIS ($p < 0.001$)
- On a visual analog scale of 1-10, most HC personnel rated the screening tool 4-7.
- Staff scores on knowledge of SGAs and metabolic syndrome increased following the 3 month intervention ($p < 0.05$)
- Patient knowledge also significantly increased following the QIS ($p < 0.001$).

DISCUSSION

- Screening for metabolic syndrome significantly increased in the post intervention group, indicating better adherence to the GL.
- Metabolic tool is a great idea, but changes will be made to simplify tool for easier access/flow.
- Staff & patients reported increased knowledge on metabolic syndrome & SGA use following the QIS
- LIMITATIONS:
  - Difficult to keep procedure identical with retrospective and prospective patients.
  - Difficult to keep staff motivated due to competing issues
  - Time limitation of 15 minute appointments

SUMMARY

- **A multi-modal QIS involving an EMR prompting tool was successful in improving outcomes which included adherence to metabolic GLs and knowledge of SGAs.**
- **NPs can play a central role to improving adherence!**

Remaking Education & 21st Century Skills

Principal Investigator

Dr. Mary Ann Rafoth

Grant Manager

Dr. Nathan Taylor

Partners & Community

Ohio River Consortium

+

- RMU SESS
- Avonworth SD
- Cornell SD
- Moon Area SD
- Quaker Valley SD
- Grable Foundation

Innovation

- Project-based learning
- Inquiry
- Experiential
- Robotics
- Programming
- E-fibers
- 3-d printing
- Collaboration

Transformational Learning

=

- Critical Thinking. Creativity, Problem Solving, Perseverance, Literacy, Research Skills

Data

Percentage Change in Classroom Activity and Teacher Question Behavior for Observed Classrooms

	Complexity of Observed Activities	Student Centered Activities	Complexity Level of Teacher Questioning
Baseline	35	40	40
Follow-up	73	56	75

Baseline / Follow-up

Condition-Specific Communication Tools Use and Effect on Transfers, Unplanned Hospitalizations, and 30-Day Readmissions from Long-Term to Acute Care

Terri Devereaux, PhD, Gregory Marchetti, PhD, Nancy Zionts, MBA, Valerie Watzlaf, PhD, Bambang Parmanto, PhD

Introduction

Ineffective communication between physicians and nurses leads to transfer of LTC residents to acute care, with up to 67% found to be avoidable.

A generic SBAR communication tool requires nurses to discern and organize pertinent data to report which may limit its usefulness and impact on communication.

To determine if using a condition-specific communication tool to collect and report pertinent information when a resident's condition changes decreases the number of transfers, hospitalizations, and 30-day readmissions from long-term to acute care.

Methods

Design: Quasi-experimental one group pre/post-test

Intervention: Condition-specific ACTs (CS-ACTs) for the most common reasons for transfer to acute care.

Sample: RNs (n=27) and LPNs (n=33) from a 139 bed skilled nursing/post-acute care facility.

Data: Transfers, hospitalizations, and 30-day readmissions to acute care over a 3 month period pre and post intervention implementation.

Statistical Analysis: 3 month pre/post implementation comparison of total transfers, unplanned hospital admissions and 30-day readmissions (number/average daily census) (2 proportion z-test; Fisher's Exact Test; type I error rate=.05)

Results

Pre/Post Comparison Transfers/Hospitalizations/30-Day Readmissions to Acute Care

Event	3 months pre–implementation n (%)	3 months post–implementation n (%)	Difference in proportion	95% Confidence Interval	p-value
Transfers to Acute Care	58 (44%)	32 (24%)	19.8%	(8.6, 31.1)	0.001
Unplanned Hospitalizations	44 (33.6%)	24 (18.3%)	15.2%	(4.8, 25.7)	0.004
30–Day Readmissions	16 (12%)	5 (4%)	8.4%	(1.9, 14.9)	0.011
Avoidable Transfers	34 (59%)	13 (41%)	16.0%	(6.9, 25.1)	0.001
Avoidable Hospitalizations	20 (45%)	6 (25%)	10.7%	(3.6, 17.8)	0.003

Results

CS-ACT Use When Indicated

	CS–ACT Use (n)	Proportion (%)	95% Confidence Interval
Number CS–ACTs Indicated	222	N/A	N/A
Number CS–ACTs Completed	205	92.3	(88.0, 95.5)
Number CS=ACTs Correctly Completed Compared to Number Used	204	99.5	(97.3, 100)
Number CS–ACTs Indicated Compared to Number Used	17	8.3	(4.9, 12.9)

Conclusions

- This initial study suggests that using CS-ACT tools when a change in resident condition occurs reduces transfers/hospitalizations/30-day readmissions; and when transfers did occur, they were more likely to be unavoidable, suggesting that residents were more likely to receive appropriate care in the most appropriate setting.

- All 30-day readmissions except one were from post-acute care and were related to the initial hospital discharge diagnosis, suggesting that perhaps acute care transfers to LTC are not occurring at the optimal time.

Limitations of the study were small sample size and study conducted at one facility.

CS-ACTs

Acknowledgements

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After Auctions Complete, What Will Buyers Do Next? -- A Case Study of Feedback Rating at eBay

Lei Chen, Min Lu, Yanbin Tu

RMU ROBERT MORRIS™

Introduction

While it is common knowledge that online auction feedback plays an important role in online trust building, to the best of our knowledge, the studies about eBay users' post-transaction behavior on posting feedback ratings are limited.

This case study aims to address the not-fully-explored areas such as behavior on posting feedback ratings. We firstly compare the difference between new eBay users and experienced users in terms of post-purchase feedback postings to each other. Then, we look at the general issues in the positive, negative and neutral feedback ratings, respectively. By collecting and analyzing the data from eBay, we seek to answer the following specific questions:

1. When do buyers send feedback to sellers if they would like to evaluate online auction orders and share their purchase experience?
2. Do new sellers and experienced sellers have the same chance to get feedback from buyers? Particularly, the negative feedback from buyers?
3. Who are more likely to post positive, neutral and negative feedback, respectively, new buyers or experienced buyers?
4. Are there any differences between used and new products to receive feedback ratings?
5. What are the most frequent issues related to positive, neutral and negative feedback, respectively?

Figure #1

Methods

Data Collection

We collect and use data from eBay because it is the largest online auction house with over 80% of the online auction market (Wood, Fan, &Tan, 2003). For this case study, we select three products: Sony PlayStation 2, Xbox, Nintendo consoles (these three brands dominate the game console market).

	SONY	XBOX	NINTENDO
Auction Listings	23,355	9,583	8,755
Sellers	12,289	6,361	5,413
Buyers	15,760	6,814	6,071
Bidders	54,118	26,023	17,973
Bids	253,748	118,442	85,301

Item	Total #	Ratio	%
Total # of Feedback	30626	(Total FB)/(Auction Orders)	62.26
Positive FB	28941	(Positive FB)/Total FB	94.49
Neutral FB	543	(Neutral FB)/Total FB	1.77
Negative FB	1132	(Negative FB)/Total FB	3.74

Results

#	Question and Response	Managerial Implications
1	*How many days after auction's completion will buyers post their feedback ratings?* **The average length is 15.5 days.**	Sellers might need to remind buyers of posting feedback ratings after 15-16 days if they have not done so.
2	*Do new sellers have the same chance as experienced sellers to receive feedback from buyers?* **No.**	New sellers need to put more efforts to attract or invite buyers to post feedback ratings.
3	*Is new seller more likely to receive negative feedback over positive feedback?* **Yes.**	New sellers need to improve their selling strategy and customer services. eBay, the auction house needs to help new sellers survive and succeed.
4	*Are buyers with low feedback scores more likely to post negative feedback than buyers with high feedback scores?* **Yes.**	Sellers need to take special care of unexperienced buyers to avoid negative feedback ratings from them.
5	*Are there any differences between new products and used products in receiving the three types of feedback?* **Yes.**	Selling used items does not imply more chance of getting negative feedback ratings.
6	*Does the distribution of the three type of feedback (+, 0, -) match the distribution of their associated monetary volume?* **No.**	It seems that buyers do less research/search on low-valued items and post more negative feedback ratings. When selling low-valued items, sellers need to expose full-info and provide full-scale services to buyers.
7	*Who move first in posting feedback, buyers or sellers?* **Sellers.**	Sellers choose to post their feedback ratings first as a reminder or invitation to buyers.

Figures 2-4

Figures 5-7

Conclusions

In this case study, we examine buyers' post-purchase behavior on feedback ratings to sellers. Using the data collected from eBay, we show that average time length for buyers' posting feedback ratings after auction's completion is about 15.5 days. This study finds that new sellers do not have the same chance as experienced sellers to receive the feedback from buyers, and new seller are more likely to receive negative feedback over positive feedback. It also shows that the distribution of the three feedback types does not match the distribution of their associated monetary volumes. More sellers post feedback ratings first before buyers do so. The data also show that buyers with low feedback scores are more likely to post negative feedback than buyers with high feedback scores. New products and used products have different feedback rates in the three types of feedback.

To understand issues related to feedback from buyers, this case explores the comment contents, word clouds, and word frequency charts for negative, neutral and positive feedback, respectively. It identifies common issues associated with each type of feedback. For sellers, *quick shipment, good communication, correct product description,* and *packaging* are key factors for them to earn positive feedback ratings and avoid negative feedback ratings.

Citation

Reference to this paper should be made as follows: Chen, Lei, Min Lu and Yanbin Tu (2017). After Auctions Complete, What Will Buyers Do Next? -- A Case Study of Feedback Rating at eBay. Forthcoming in *International Journal of E-Business Research*

Differential Effects of Two-Rate Property Taxation: New Evidence from Pennsylvania

Zhou Yang, Department of Economics & Legal Studies, SBUS

RMU SCHOOL OF BUSINESS™

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Using municipality-level panel data, the study tests the theory of land value taxation. It offers the first evidence that raising the tax rate on land while lowering the tax rate on buildings leads to an increase in land value per acre. Further, this impact differs between residential land and commercial and industrial land. Residential land appears to be more responsive to changes in the tax differential than commercial and industrial land.

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➢ **Two-rate property taxation**
  o Taxing land at a higher rate than improvements
  o Land value taxation in practice

➢ **Property taxation in Pennsylvania**
  o The only state with two-rate property taxation in 1913
  o Implemented primarily at the municipality level

Figure 1: Two-Rate Cities in Pennsylvania

Motivation and Purpose

➢ **Important theory never tested**
  o Two-rate property taxation results in rising land value

➢ **Purpose of this research**
  o Test the theory using a rich dataset
  o Offer the first evidence regarding the impacts of two-rate property taxation on land value
  o Explore differential effects across various types of land use

Research Methods and Data

➢ **Estimate a dynamic panel data model:**
$$V_{it} = \rho V_{it-1} + \delta \tau_{it}^{L} + \boldsymbol{\theta} TR_{it} + \varphi' C_{it} + \mu_i + Y_t + \varepsilon_{it}$$
  o Key coefficient
  $\boldsymbol{\theta}$: capturing the impacts of two-rate property taxation (TR_{it}) on land value (V_{it})

➢ **Investigate differential impacts**
  o Three outcome measures
    – Total taxable land value per acre
    – Taxable residential land value per acre
    – Taxable commercial/industrial land value per acre
  o Arellano-Bover/Blundell-Bond estimator

➢ **Data**
  o Land assessment data from county assessment offices in Pennsylvania
  o Property data from Zillow
  o Tax data from local tax collection agencies
  o GIS data

Results Summary

➢ **Effects of two-rate property taxation on land value by land use type**

Variable	All Types	Residential	Commercial& Industrial
Two-rate tax differential	0.4589* (0.2408)	1.0830** (0.4299)	0.1893*** (0.0671)

Notes: the table summarizes the result for the two-rate property tax variable (coefficient estimates are reported with robust standard errors in parentheses). Estimates of coefficients on other variables are not reported in the summary table.

➢ **Increased land value per acre associated with two-rate property taxation**

➢ **Larger impacts on residential land than on commercial and industrial land**

➢ **Robustness check**
  o Results staying robust

Conclusion

➢ **The paper provides the first evidence supporting the theoretical prediction.**
  o Two-rate property taxation leads to an increase in land value.

➢ **The results indicate that the impacts differ across types of land use.**
  o Residential land responds more to changes in the tax differential.
  o Findings reflect the relative elasticity of demand for residential land.

➢ **The study opens up new avenues for further research.**
  o Impacts depend on land development.

28 Posters were Presented!