ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

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March 2020
San Antonio, Texas

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CONGRATULATIONS!

Recipients of the ABIS 2020 Federation of Business Disciplines Distinguished Paper Award

Faculty and Student Communication
Eddie Horton
Northwestern State University

CONGRATULATIONS!

Recipient of the 2020 FBD Outstanding Educator Award

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ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

Association of Business Information Systems

ABIS 2020 Program Overview

Thursday March 12, 2020

7:30 a.m. – 10:00 a.m.	**8:00 a.m. – ABIS & ABC – SWUS Joint Breakfast**
	8:30 a.m. - ABC-SWUS & ABIS Joint Session –
	Best Paper Presentations
10:30 a.m. – 11:45 a.m.	Session B: **Teaching Analytics**
11:45 a.m. – 1:30 p.m.	**Lunch on your own**
	***Executive Board Meeting**
1:30 p.m. – 3:00 p.m.	Session C: **Information System Tools and Techniques**
3:30 p.m. – 5:00 p.m.	Session D: **Impacts of Social Media**
5:30 p.m. – 7:00 p.m.	**FBD Presidential Welcome Reception**

Friday March 13, 2020

7:30 a.m. – 8:30 a.m.	**ABIS & ABC – SWUS Joint Breakfast**
8:30 a.m. – 10:00 a.m.	**ABIS Business Meeting * All Members Welcome ***
10:30 a.m. – 12:00 p.m.	Session F: **Improving the IS Curriculum I**
Noon – 1:30 p.m.	**Lunch on your own**
1:30 p.m. – 3:00 p.m.	Session G: **Improving the IS Curriculum II**
3:30 p.m. – 5:00 p.m.	**Roundtable Discussion of IS Topics**

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 12, 2020
(Thursday)

7:30 a.m. – 8:30 a.m.	ABC/ABIS

ABC – SWUS and ABIS Joint Breakfast

All ABC-SWUS and ABIS presenters and members are invited to enjoy a delicious breakfast

ABC-SWUS or ABIS Association Name Badge REQUIRED for Attendance at Breakfast

8:30 a.m. – 10:00 a.m	ABC/ABIS

SESSION A **ABC-SWUS and ABIS Joint Session**

Co-Session Chairs/Association Vice Presidents and Conference Chairs:
Kayla Sapkota, Arkansas State University-Beebe
Richard Kumi, University of Arkansas at Little Rock

ABC-SWUS Best Paper:
Augmented Reality in Business Communication Classes
Ashley Hall, Stephen F. Austin State University
Carol Wright, Stephen F. Austin State University
Amanda Smith, Lufkin Independent School District

ABIS Best Paper:
Faculty and Student Communication
Eddie Horton, Northwestern State University

10:00 a.m. – 10:30 a.m.	Exhibit Hall - Market Place

FBD Coffee Break

Please make plans to visit the exhibits for information on the latest books and newest educational technologies. Let our exhibitors know how much we appreciate their presence and continued support!

Great Door Prize Drawings take place at **10:15 a.m.** in the Exhibit Area. *Must be present to win.*

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 12, 2020
(Thursday)

10:30 a.m. – 11:45 a.m.	ABIS

SESSION B **Teaching Anlytics**

Session Chair: **Marsha Bayless**

Framing the Concept of Data Analytics: How to Prepare Information Systems Students for the Business Environment
Marsha Bayless, Stephen F. Austin State University
Jamie Keith Humphries , Stephen F. Austin State University

Big Data Text Mining in Professional Communication: An Integrative Review and Gudelines
Aimee Kendall Roundtree, Texas State University

Role of Business Communication Faculty in Preparing Business Analytics Graduates for the Workplace
Robert Mitchell, University of Arkansas – Little Rock

ANT Ethics in Communication: An Integrative Review and Framework
Aimee Kendall Roundtree, Texas State University

11:45 a.m. – 1:30 p.m	**Lunch on your own…**

ABIS Executive Board Meeting and Luncheon – By Invitation Only – ABC/ABIS Lunch

1:30 p.m. – 3:00 p.m.	ABIS

SESSION C **Information Systems Tools and Techniques**

Session Chair: **Sherry Rodrigue**

Information Systems Project Management for Mobile App Development
Randall McCoy, Northwestern State University

Pedagogical Guide for Integrating R with Tableau to Perform Basic Statistics
Richard Kumi, University of Arkansas - Little Rock

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 12, 2020
(Thursday)

3:00 p.m. – 3:30 p.m. Exhibit Hall - Market Place

FBD Coffee Break

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3:30 p.m. – 5:00 p.m. ABC/ABIS

SESSION D **Impacts of Social Media**

Session Chair: **Marcel Robles**

Using Tweets for Data Analysis: An Examination of Tweets in Presidential Politics 2020
Shane Schartz, Fort Hays State University
Ron Rohlf, Fort Hays State University

Social Media and Its Impact on Employees
Marcel Robles, Eastern Kentucky University
Lazim Islam, Eastern Kentucky University

Enhancing Team Formation and Function Through the Use of Sociograms
Lucia Sigmar, Stephen F. Austin University
Marsha Bayless, Stephen F. Austin University

WeChat in China: A Case Study of Technological Innovation in Business Communication
Yong-Kang Wei, University of Texas – Rio Grande Valley

5:30 p.m. – 7:00 p.m. Exhibit Hall - Market Place

FBD Presidential Welcome Reception

Everyone is invited to attend this FBD conference-wide social event. Visit with long-time friends and make new ones as you enjoy light appetizers and live music. A Cash Bar is available and a limited number of drink tickets will also be distributed. Stop by to relax and wind down from the day's conference activities before heading out to other association and cultural events, dinner, or historic sites.

Enjoy your evening in San Antonio!

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 13, 2020
(Friday)

7:30 a.m. – 8:30 a.m.	ABC

ABIS and ABC–SWUS Joint Breakfast

All ABIS and ABC – SWUS presenters and members are invited to enjoy a delicious breakfast

ABIS or ABC-SW Association Name Badge REQUIRED for Attendance at Breakfast

8:30 a.m. – 10:00 a.m.	ABIS Business Meeting

SESSION E ABIS Business Meeting * All Members Welcome *

Session Chair/ ABIS President: Shane Schartz

All members are invited to join us for our annual business meeting.

The meeting agenda includes:

Election of Officers and Executive Board positions
Discussion of topics related to our Journal of Research in Business Information Systems (JRBIS)
Information and discussion on next year's conference
General discussion on topics introduced by general membership

10:00 a.m. - 10:30 a.m.	Exhibit Hall - Market Place

FBD Coffee Break

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For a premier publishing opportunity, check out the peer-reviewed FBD Journal at https://www.fbdonline.org/journal

All FBD conference participants are eligible to have their work considered for the low submission fee of $40.

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 13, 2020
(Friday)

10:30 a.m. – 12:00 p.m.	ABIS

SESSION F Improving the IS Curriculum I

Session Chair: **Jason Powell**

Developing an Instructor Manual for a Computing and Technology Interdisciplinary Capstone Course.
Breanna Lane , Cameron University
William Carney, Cameron University
Feridoon Moinian, Cameron University
Mike Estep, Cameron University
K. David Smith, Cameron University
Chao Zhao, Cameron University

The Faculty Perspective of Cheating in the Classroom in 2019
Lori Soule, Nicholls State University
Sherry Rodrigue, Nicholls State University
Betty Kleen, Nicholls State University

Towards Micro-Experiences in Experiential Learning with Study Abroad Activities
Jason Powell, Northwestern State University
Sarah Wright, Northwestern State University
Begona Perez-Mira, Northwestern State University

12:00 p.m. – 1:30 p.m.	**Lunch on your own**

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Contact us at: ABIS.FBD@gmail.com

Association of Business Information Systems

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 13, 2020
(Friday)

1:30 p.m. – 3:00 p.m. ABIS

SESSION G Improving the IS Curriculum II

Session Chair: **Curtis Penrod**

Immersive Technologies: A Review of Use in K-16 Education and Business
Carol S. Wright, Stephen F. Austin State University
Amanda Smith, Lufkin Independent School District
Ashley Hall, Stephen F. Austin State University

Teaching Excel's Boolean Functions
Daniel D. Friesen, University of North Texas at Dallas

Excel: Powerful Predictor or Pointless Prerequisite? An Examination of the Effect of Excel on Success in Statistics
Curtis Penrod, Northwestern State University
Mary Edith Stacy, Northwestern State University
Lily Pharris, Northwestern State University
Mary Beth Tarver, Northwestern State University

3:00 p.m. - 3:30 p.m. Exhibit Hall - Market Place

FBC Coffee Break

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Great Door Prize Drawings take place at **3:15 p.m.** in the Exhibit Area. *Must be present to win.*

ASSOCIATION OF BUSINESS INFORMATION SYSTEMS

March 13, 2020
(Friday)

3:30 p.m. - 5:00 p.m.	ABIS

SESSION H Round Table Discussion of IS Topics

This is a special session for members to discuss current information systems topics in a round table format. Members are encouraged to attend and gain insight into current issues regarding information systems, and to share their expertise with the group.

Topics include: Business/Data Analytics Programs, Online Teaching, Increasing Enrollments, and Research Methods.

Topic Facilitator: Richard Kumi

Make plans to join us in Galvenston for our 2021 conference.
♦♦♦

48th Annual Conference
March 17-20, 2021
Moody Gardens Galvenston
Galvenston, Texas

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FACULTY AND STUDENT COMMUNICATION

Eddie Horton, Northwestern State University

ABSTRACT

Communication between students and faculty is essential, yet there are major differences in the way students and faculty approach communication. There is a disconnect in communication between students and instructors, especially in traditional brick and mortar schools. Studies have shown that a disconnect exists, and approached the faculty on this topic, but little research has focused on student views of this topic. The purpose of this qualitative single case study was to explore the reasons for the disconnection in communication between students and instructors at traditional universities. This study is built around the theoretical framework of the communication process and the uncertainty reduction theory. In this study, ten students and ten faculty were interviewed to explore the disconnection.
Keywords: communication, communication disconnect, faculty communication, student communication, social media, communication framework

FACULTY AND STUDENT COMMUNICATION

For a student to be successful in a class, whether online or in a traditional format, communication with the instructor is essential. Communication begins at the beginning of the course with the distribution of a syllabus and does not end until final grades are posted and accepted (Thompson, 2007). Students maintain communication with faculty in the classroom, as well as by utilizing office hours, email, and in some cases, social media.

Any time there is communication there is a chance for a communication breakdown. In the case of communication with faculty and students, communication can break down in a variety of ways. When communication fails, a breakdown in the transfer of information occurs, which can lead to missed assignments, hurt feelings, and misunderstandings (Kowalski, 2008).

THE PROBLEM

There is a disconnect in communication between students and instructors, especially in traditional brick and mortar schools. In early studies, D. Smith and Minnick (1996) showed that there is a disconnect in communication and in a more recent exploration, Carlson (2013) confirmed that this communication disconnect still exists. Educational leaders at traditional schools have been reluctant to embrace new technologies; this reluctance can lead to students leaving these schools in search of online or hybrid options (Mansour & Mupinga, 2007).

The general business problem was that, as students leave the traditional university for a nontraditional online education, the revenues they could generate are lost. Considering that most states have already cut higher education spending, this can lead to disastrous consequences for a university (Chakraborty, 2009). This loss of students and revenue ultimately leads to job cuts and possibly even school closures. On a broader scale, students pursuing nontraditional online education or moving elsewhere to complete their education can affect an entire region or state due to a loss in revenue and potential reduction in the qualified workforce.

PURPOSE OF THE STUDY

The purpose of this qualitative single case study was to explore the reasons for the disconnection in communication between students and instructors at traditional universities. The study population included students and faculty at a traditional university. Each participant was to focus on a single communication event with a student or faculty member.

The subjects were students and faculty from a traditional university in Louisiana who were interviewed to identify reasons for a communication disconnection between students and instructors. The primary research instrument for this study was an interview. Secondary data included available syllabi to determine if communication preferences are mentioned. A syllabi review was limited to those made available by the instructors.

COMMUNICATION PROCESS AND THE UNCERTAINTY THEORY

Modern theories of communication begin with a discussion of the communication process. Communication itself is a process by which information exchange takes place between a sender to a receiver (James & Cinelli, 2003). In the modern communication process, the sender and receiver may not be individuals, but could be a computer or could be persons using some electronic means. James and Cinelli (2003) identified the communication process in five steps. First, the sender has some piece of information to transmit. Second, that information is encoded in some way so that it can be sent. Encoding can be verbal, whereby an idea is shared from a person, or nonverbal, perhaps encoded in an email. Third, some channel must exist to transmit the message. This can be a voice, if the sender is talking to someone, or by means of an email server for electronic communications. Fourth, the receiver must receive and decode the message. Finally, the receiver acknowledges receipt of the message (James & Cinelli, 2003). Figure 1 illustrates the communication process.

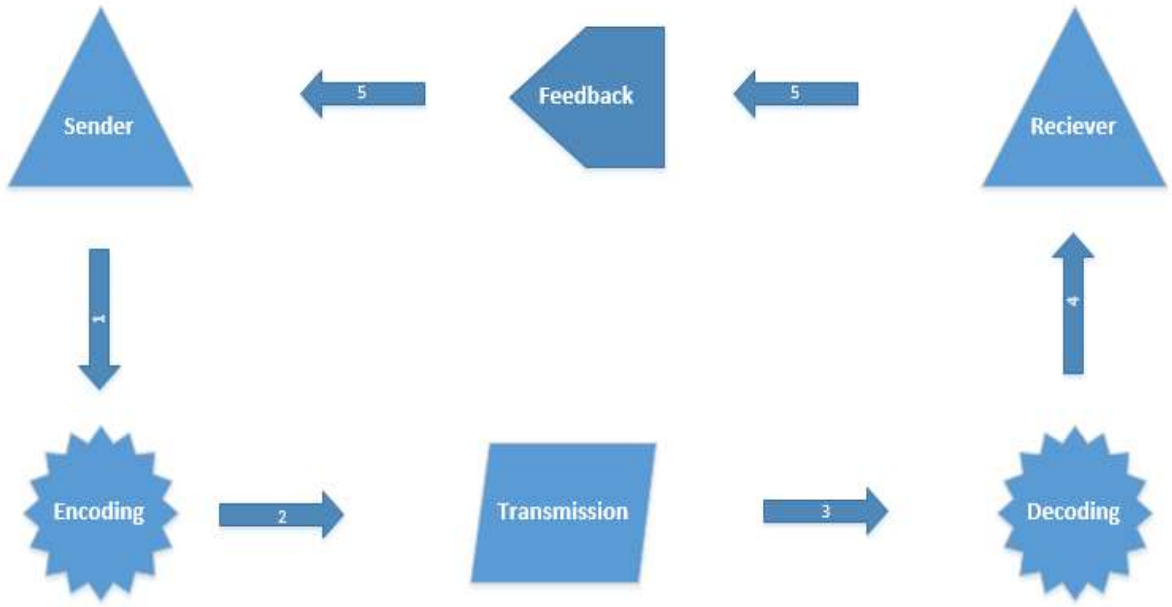

Figure 1. A graphical representation of the communication process. Adapted from James and Cinelli (2003).

Many barriers can exist that interrupt the communication process (James & Cinelli, 2003). In verbal communication, a breakdown can occur in encoding or decoding the message if the sender and receiver speak different languages. Electronically, the channel can breakdown if the technology fails. A breakdown can also occur based on assumptions, beliefs, gender, or age (Adamkova, 2014). In face-to-face communication, these breakdowns can be both verbal and nonverbal. With electronic communication, this can occur if the participants do not adhere to rules such as netiquette.

The uncertainty reduction theory describes three ways uncertainty affects communication (Kramer, 1999). This theory, first developed in 1975, states that uncertainty in communication exists and, in some situations, cannot be controlled or understood. The first part of the theory explains that, as communication increases, uncertainty in communication decreases (Kramer, 1999). In a classroom setting, uncertainty in communication is very high on the first day when students meet the instructor. Uncertainty is high because they do not know the expectations or styles of that instructor. As the class continues, the students learn more about the instructor causing the students' level of uncertainty to decrease. In this case, an example of an uncontrollable aspect could be student motivation (Kittrell & Moore, 2013). Regardless of what the sender does, if the receiver is unwilling or unable to receive the message, effective communication cannot take place.

Uncertainty is unavoidable, but it can be mitigated to an extent (Kittrell & Moore, 2013). In a classroom, the student can mitigate uncertainty about the instructor by gathering information about that instructor before the course begins. This information can be gathered from peers or from internet sources such as Ratemyprofessor.com, a site that allows students to write reviews of their instructors for others to view. Extra information, however, can lead to miscommunication if the student misinterprets that information (Crago, Eriks-Brophy, Presco, & McAlpine, 1997). An example of this miscommunication might be that some students post negative reviews of an instructor simply because they failed the course.

The communication privacy management theory discusses information from the perspective of the sender wanting to keep some information public and some private (Frampton & Child, 2013). With electronic communication being such a driving force, this theory becomes important because a receiver can form a biased impression of a sender or information before the communication is even sent. An illustrative example of this is information found on a Facebook page. If a student views the personal page of an instructor and determines that the instructor is overly religious, the student may form a bias against this instructor even though no communication has taken place. Another issue with electronic communication exists in that it can be stored indefinitely, and security breaches can make potential private exchanges public. Facebook, as an example, retains information for an indefinite period of time and reserves the right to sell some of that information to third parties (Facebook, 2015).

These theories can be used to define how communication takes place and discuss some ways communication can breakdown. With the communication theory and the

uncertainty theory as a framework for this project, it becomes clear where communication fails between students and instructors and suggests some actions both students and instructors can take to mitigate the communication disconnection. By improving the student-faculty relationship, retention will remain higher as more students succeed in their academic endeavors

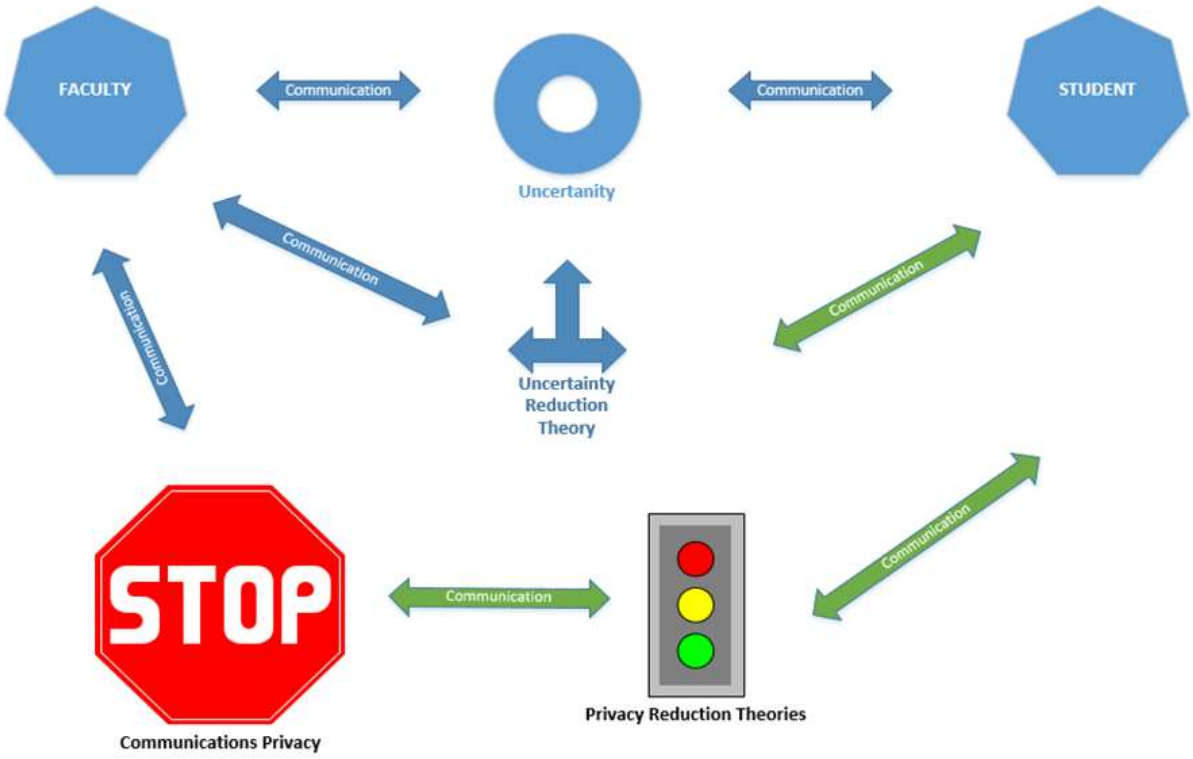

Figure 2. Faculty and student communication.

Figure 2 illustrates faculty and student communication and communication theories as a conceptual diagram. Uncertainty is a factor that can interfere with communication (shown as the blue circle). By applying the principles of the uncertainty reduction theory, avenues of communication and communication effectiveness can be increased. Another factor that affects communication is identified by the communications privacy theory. Once privacy reduction theories are applied, more avenues of communication are open. Hindered communication is noted by the blue arrows, and unhindered communication is represented by the green arrows.

RESEARCH QUESTIONS

The following research questions and sub-questions were developed to qualitatively explore the communication disconnection:

RQI. What are the reasons for the disconnection between students and instructors at a traditional university?

RQ2. What measures can be taken to reduce the communication disconnection between students and instructors at a traditional university?

Six sub-questions narrowed the focus but left open the primary questioning of the reasons for disconnection in communication (Schram, 2006).

SQ1. In communication with faculty and students, where does communication break down at a traditional university?

SQ2. How do privacy issues affect communication between students and instructors at a traditional university?

SQ3. How do factors such as age, gender, and ethnicity affect communication between students and instructors at a traditional university?

SQ4. What aspects (if any) of social media can be used to prevent the breakdown of communication between students and faculty?

SQ5. How does availability affect communication between students and faculty?

SQ6. How do communication barriers change when faculty provide additional availability outside of traditional office hours?

SIGNIFICANCE OF THE STUDY

Students are leaving traditional universities in very large numbers, many without a degree and with a high level of student debt (Dwyer, 2015). In one study, Waldron (2012) indicated that as many as 46% of students entering a four-year program fail to graduate within six years. Some reasoning behind this can be described with the "just a number" effect, by which students feel they are just part of a larger system and go largely unnoticed. In 2011, researchers at Harvard listed the "just a number" effect as the fifth most common reason that students leave school (Dwyer, 2015). Much of this effect can be alleviated with proper communication between students and faculty.

By alleviating the disconnect in communication between students and faculty, the cycle of students feeling they are just a number can be eliminated. Faculty can use this information to ensure that students do not feel like a "number" in a class, and therefore feel more invested in their education. Keeping those students happy will help them realize their education and future goals, which will ultimately help the university, by increasing graduation numbers and completion scores, ensuring the university a better opportunity to survive and grow.

It is also important to note that this information can be beneficial to the student as well. If the students are provided information on the challenges faculty encounter when communicating with them, they can explore other avenues to ensure proper communication takes place. When both parties understand how the other communicates, effective communication can be increased significantly.

A BRIEF REVIEW OF THE LITERATURE

Effective communication requires success from both the sender and receiver of the message, and many things can contribute to a breakdown in the process (Quilliam, 2008). In face-to-face communication, breakdowns can occur in body language, such as eye contact and vocal inflection

(Quilliam, 2008). Not all communication takes place in a way that body language or vocal inflection can be measured—such is the case with email and social media. In fact, more than 90% of students use at least some form of electronic or social media (email, Facebook, or an LMS) for communication (Bart, 2011).

How one communicates can be altered by previous experiences (Lengruber, Carvalho, & Louzada, 2015). The researchers looked at how a set of nursing students communicated with patients who had mental health issues. The researchers found that those students who had been exposed to someone with a mental health issue earlier in life (i.e., a family member or schoolmate) were able to more easily communicate with some mental health patients. This could also be true for student-faculty communication when dealing with special needs students. Teachers with previous experience dealing with special needs students will probably be more prepared to communicate with such students in future communications.

ELECTRONIC COMMUNICATION

Electronic communication is by no means the only form of communication. Lacono et al. (2006) recently suggested that, in some cases, electronic communication is not the best method. Here, the researchers explored communication of those with complex communication needs, such as the impaired, and found that in some cases non-electronic aids (i.e., flashcards, pictures, or communication boards) aided more in communication. Lacono et al. hypothesized that this may be because these more traditional methods of communication are far less likely to fail than electronic communication. Of 163 individuals interviewed in the study, 73% requested the traditional communication aid as a backup/failsafe when electronic communication failed.

Sussman and Sproull (1999) explored a very interesting topic of electronic communication: the delivery of bad news. While their research is somewhat outdated, it offers some very interesting conclusions. Sometimes, communication is used to deliver bad or negative news. This is often not a pleasant task for the communicator who is delivering this news (Sussman & Sproull, 1999). In a study of 117 participants, the researchers determined that those who presented negative news using electronic means, even if those means were real-time (which in 1999 meant some kind of chat program, as text capable phones were not readily available), had a negative view of the communication and felt the same sensations as those presenting the same news face-to-face (Sussman & Sproull, 1999).

COMMUNICATION BARRIERS

Keles (2013) discussed communication that may arise when different cultures are brought together. In this work, the researcher explored how communication affects a group of European exchange students who were placed in Turkey for an exchange program. There is quite often a higher level of anxiety when people from different cultures communicate because people tend to have a basic desire to be with people who are more like themselves (Keles, 2013).

Eksteen and Basson (2015) explored differences in the way people communicate. In their research, they explored ways of teaching communication strategies to pharmacy students, based on the personality type of a patient, as determined by the Myers-Brigs Type Indicator (MB TI). The

MBTI locates people on four dimensions based on their preferences.
The four dimensions of the MBTI test are designed to identify a person's individual personality along four dimensions (Eksteen & Basson, 2015). The first dimension, introversion versus extroversion, represents the balance between the inner self and the outer world. The second dimension, sensing versus intuition, represents the balance between facts and detail versus patterns and possibilities. The third dimension, thinking and feeling, reflects a focus on logic and analysis versus personal values and priorities. The fourth and final dimension, judging versus perceiving, represents structure and control versus flexibility and spontaneity.

FACULTY-STUDENT INTERACTION

Several factors can contribute to students missing important emails, including the simple overload of messages they may receive. Depending on the learning management system (LMS) in use an instructor may set the system to send an email to the student if anything changes in the course (Roblyer et al., 2010). While this isgreat in theory, it could potentially lead to several messages being sent each day. With so many messages, it is common for the student to simply delete them, thus missing the one important message from the instructor. Another factor that can affect student email is spam. Scholars have estimated that 88% to 90% of all email on the Internet is spam; of that, approximately 19% slips through spam filters and into inboxes (Fogel & Yarmish, 2012). Because students are not checking email appropriately, they often miss important classroom issues. This leads to the student failing the course, or worse yet, dropping out of the institution. This ultimately leads to lower enrollment and hurts the university through the loss of revenue.

Arkilic, Peker, and Uyar (2013) discussed the importance of information technology and collaborative learning. The researchers conducted a survey to determine preferences of communication based on demographics. Part of the research was designed to explore the idea that most e-learning systems lack a collaborative component (Arkilic et al., 2013). For the most part, a student is alone in an online class in that they do their work, turn it in, and move on.

Arkilic et al. (2013) looked at computer-supported collaborative learning (CSCL) and how it can be integrated into an online class for a better experience. The researchers discovered that among the collaborative tools explored, instant messaging and shared directories were the most useful tools, followed closely by a private discussion group and a collaborative document management system. These tools could also be useful for faculty and student communication. For example, an instructor could have the student post a paper on a collaborative system such as Google Docs. The instructor could then grade the paper, making notes for the student to make revisions. This could also be used in student-to-student communication when a group paper is required, and students could access the paper to work on their own parts.

Duta (2015) addressed communication barriers in communication between students and instructors. The researcher indicated that a prime issue in student-faculty communication is the fact that faculty generally believe that messages sent reach the sender with the same meaning as was intended, This is not always the case, as students often misinterpret messages from faculty (Duta, 2015). In a survey conducted by the researcher, lack of feedback was

determined to be one of the major causes of communication barriers. If the faculty member is late, or provides poor feedback early on in a course, the student is far more likely to not pay attention to communication later in that course.

Other barriers exist in communication between students and instructors including disinterest in the subject, physical barriers, perceptual barriers, language barriers, and gender barriers (Duta, 2015). Many of these do not have single-response solutions. For example, a physical barrier such as noise outside of a classroom because of construction elsewhere on campus, cannot always be solved. Many barriers do not have simple solutions.

DESIGN

For student participants, the interview began with an exploration of a communication issue experienced with a faculty member in the past. Students were given a guarantee that the faculty member they spoke about would not be informed of the interview and that all personal data from both the student and faculty member would be stripped in the results. The student was asked to describe, in detail, the experience. The student was then asked what could have been done to mitigate or eliminate the communication issue. This led to a discussion of factors that may or may not have influenced the communication issue. Finally, a more general question as to what advice they would give a faculty member to make communication with students easier was asked. The eight questions are as follows:

1. You mentioned that you've had a communication issue with at least one faculty member in the past. Tell me about that experience.
2. What could you have done to eliminate or mitigate much of the communication issue you had with that faculty member?
3. In your opinion, where does communication with faculty and students tend to break down the most?
4. Do privacy issues affect your ability to communicate with faculty? If so, how?
5. Were age, gender, or ethnicity factors in your communication breakdown with a faculty member? If so, please explain
6. Could faculty use of social media aid in the prevention of communication issues between students and faculty? If so how?
7. Do communication barriers change if faculty provide additional methods of communication outside of traditional office hours? If so, please explain.
8. What one piece of advice would you give faculty that you feel would make communication with a student easier?

For faculty participants, the interview was much the same. The eight questions faculty asked were as follows:

1. You mentioned that you've had a communication issue with at least one student in the past. Please tell me about that experience.
2. What could you have done to eliminate or mitigate much of the communication issue with that particular student?
3. In your opinion, where does communication with faculty and students tend to break down the most?
4. As a faculty member, what are your personal expectations of privacy? Do you feel that helps, hinders, or has no effect on communication with students?
5. In what way could age, gender, or ethnicity have been a factor in your communication breakdown with this particular student?

6. How might faculty use of social media help mitigate communication issues with students?
7. How could the addition of communication methods outside of traditional office hours will help break down communication barriers?
8. What one piece of advice would you give students that you feel would make communication with a faculty member easier?

FINDINGS

Analyses of course syllabi received from faculty members along with faculty members' and students' transcribed interviews revealed the following five primary themes: (a) communication breakdowns, (b) privacy concerns when communicating outside of traditional academic platforms, (c) demographic variables, (d) social media platforms as mitigating tools for communication problems, and (e) advice. Although faculty members and students made comments related to each of the primary themes, different subthemes emerged for each group within the primary themes.

RQ1: What are the reasons for the disconnection between students and instructors at a traditional university? Findings from an analysis of the syllabi and interviews with faculty and students revealed that both groups identified similar but distinct explanations for the disconnect between faculty and students. While both groups identified that there were some significant problems with effective communication, faculty members had a higher rate of agreement regarding the reasons for communication problems than students did. Accordingly, most of the faculty members attributed the problems with communication to students not listening to instructions as well as not reading emails in their entirety; however, some of the faculty members acknowledged that they might not be disseminating information as effectively as they should be. This assertion was further confirmed through an analysis of the syllabi received from the faculty members, which revealed that only one faculty member had specifically identified the most efficient means of communication. In a similar nature, some students attributed the problems with communication to students being hesitant to approach faculty members with problems. Although faculty members believed that they were effectively communicating their willingness to speak with students, many students did not feel that this was the case.

Despite the congruence of faculty members' assertions regarding their willingness to communicate with students, the analysis of syllabi that students received showed only one faculty member specifically mentioning to the students that they should not hesitate to ask any questions at any time. The syllabi revealed that the University does not have a set email policy for syllabi to go along with other standard requirements such as the classroom civility statement or Title IX information. Some colleges have policy set by the dean, but this University does not have a standard for classes. Further analysis of the syllabi also revealed that only three faculty members specifically mentioned the turnaround time on emails that students should expect. One faculty member from the Department of Criminal Justice had this policy:

Official Communication: I convey information concerning this course in class, by email, by phone, and by posting same on the Course Updates and Information link of the Moodle Homepage. Students are

individually responsible for timely acquiring such information by attending class, regularly accessing their NSU emails and the Course Updates and Information link, and providing accurate preferred phone numbers and emails. Failure to do so is no excuse for not acquiring the information.

A faculty member from the College of Business and Technology had this policy:

> *This course uses Moodle as a course management system. You should check Moodle at a minimum of every 48 hours to see if there are changes. I will use NSULA email for communication. You should check your email at least every 48 hours. I strongly suggest you set email up on a phone so you can check it more often. I also STRONGLY suggest you sign up for my remind service (next post).*

In both examples, there is an expectation that students should reply quickly, but there is no expectation of how quickly the faculty member would reply.

Ultimately, insight into what participants believed were the primary contributing factors to the disconnection between faculty and students can be found by analyzing the advice each group gave to the other. Specifically, the advice responses indicated that each group's perspectives were generally one-sided, with faculty members believing that they were doing their best to communicate with the students, while students were more inclined to feel that faculty members were not approachable or willing to accept changing communication platforms.

Communication breakdowns. There were two communication breakdown subthemes that emerged from interviews with faculty members: not reading or listening and basic communication. Sixty percent of the interviewed faculty members identified that communication breakdowns with students were primarily related to students not thoroughly reading the emails sent to them or not listening to information delivered in the classroom. For instance, one faculty member made the following comment: "They do not read all of the directions, and then, in my particular case, they didn't even hold out what they wrote against what my example was." Since communication breakdowns can occur on both sides of the aisle, the remaining 40% of faculty members attributed the breakdown in communication to basic communication issues that were either related to the students or problems identified on their side. Accordingly, one faculty member mentioned, "Once you've done something a few times you make assumptions, and so you forget to communicate, or you overlook communication."

Interviews with the students revealed disparate explanations for communication breakdowns with professors; however, one subtheme emerged related to emails. More specifically, 20% of students made comments related to professors having a slow response time to emails, while another 20% referenced difficulties with interpreting emails. Two students specifically mentioned that sending and receiving was where the breakdown occurred, with one commenting that waiting a couple of days for a response to a question was frustrating. Another student commented, "It really breaks down over email because it's not very easy to discern what you want from an email compared to like a phone or even face-to-face". Bearing similar sentiments, a student remarked that breakdowns arose when communicating "anything via technology."

The remaining six students had differing perspectives on what caused breakdowns in communication. One student attributed the breakdown in communication to a failure of the faculty to understand that students may have other responsibilities demanding their time on top of classwork. In contrast, the three other students believed that a primary cause for the breakdown in communication was related to hesitancy on the students' part to approach professors and communicate effectively. As one student explained, "They don't communicate clearly to the faculty, and I think a lot of the professors are not -- they are not mind readers and they don't ask the right questions to the faculty member." Another student attributed communication breakdowns to issues related to the availability of the professors, while one student believed that breakdowns in communication occurred outside of the classroom when personal issues enter into the conversations.

Advice. The final question from the interview guide was designed to gain further insight into what advice participants would give to help remedy communication problems between faculty and staff. As such, the overriding theme that emerged from the faculty members' comments (70%) was for students to be assertive and communicate with their professors when they have problems or questions. As explained by a faculty member, "If you're having a problem, contact the professor immediately. Do not wait until the 11th hour."

In contrast to the faculty members' general agreement on advice to students, the students' advice to faculty members was a bit more scattered. Three themes emerged from students' recommendations to faculty members: more open/approachable, embrace technology, and offer encouragement. Table 1 outlines excerpts from students' statements regarding the ways in which faculty members could mitigate the disconnect with students.

Privacy concerns when communicating outside of traditional academic platforms. When speaking about encountering students in private situations outside of the university, all faculty members indicated a willingness to engage in conversations; however, the content of what they were willing to discuss varied. More specifically, three participants indicated that while they would be willing to discuss general topics, they would not feel comfortable discussing the student's personal academic situation. One faculty member commented, "For me, it's largely content-driven." Conversely, five faculty members stated that they had no problems with discussing students' private academic information in a public setting outside of the university. For example, a faculty member stated, "Anytime they're ready, I'm ready."

Overall, most students (70%) indicated that they had no privacy concerns when encountering faculty in a public situation off-campus; however, almost one-third of the students (30%) distinguished between social and official discussions. More precisely, seven students revealed that they had no problems with discussing official or private matters with their professors in public, while three students felt that official matters should only be discussed through official means. As one student remarked, "I do feel comfortable, as a matter of fact, this semester I saw my adviser and I walked up to her when she was available and introduced myself." Another student stated, "Social conversation, but I won't bring up work topics with them."

Demographic variables. Findings from

faculty and student responses to the inquiry related to whether gender, ethnicity, or age contributed to communication breakdowns revealed some rather interesting similarities and differences between the two groups. One of the similarities noted during the analysis of the transcripts was that four individuals from each group felt that age played a significant role in communication breakdown. Another commonality found between the groups involved each group having one individual who indicated that communication problems were not necessarily related to ethnicity, but rather to language barriers associated with nationality. As such, nationality, as a demographic variable, was added. While the faculty only had two individuals who did not attribute communication problems to demographic variables, 50% of student participants indicated that they could not identify any communication problems associated with demographic variables.

RQ2: What measures can be taken to reduce the communication disconnection between students and instructors at a traditional university? After a thorough review of both faculty members' and students' responses, both groups identified social media as having the potential to mitigate problems with communication; however, neither group gave much insight into the appropriate means through which to accomplish this. A minority of participants in both groups thought Facebook would be an appropriate forum for communicating, with most in both groups preferring to keep their social lives separate from their professional or academic lives. Since faculty members were generally more inclined to prefer traditional methods of communication and students expressed a desire for immediacy with response times, the comments that suggested setting up official social media groups as a method of mitigating communication problems might be worth further exploration.

Social media platforms as mitigating tools for communication problems. Both faculty and students indicated that there were several ways in which Internet platforms could aid with mitigating communication issues, especially outside of traditional office hours; however, most respondents in both groups indicated that professional communications should be reserved for platforms other than Facebook. For instance, while some faculty members (30%) indicated that social media platforms could potentially mitigate some communication issues, most (70%) were more comfortable using traditional academic methods of communicating. This finding was echoed by the interviews with students, specifically in relation to keeping the personal separate from the academic. Only 30% commented that Facebook would be an acceptable way to alleviate communication problems, while 70% believed that other forms of social media platforms would be more appropriate. Table 2 offers some examples of faculty and student responses regarding using internet platforms as mitigating tools for communication problems.

EVALUATION OF FINDINGS

To answer the first research question regarding what causes the disconnect in communication between faculty members and students, findings indicated that while faculty members and students identified similar problems with communication, they attributed the disconnect to somewhat different reasons. As far as 60% of faculty members were concerned, students were not engaged enough when listening to instructions and information when it was delivered in the classroom, nor did they read instructions and information thoroughly when it was delivered via technological

means. Regarding the in-class communication breakdown that faculty members attributed to students not listening, the methods that the professor is using to communicate the information may be part of the problem, specifically nonverbal communication (Quilliam, 2008). The breakdown in face-to-face communication may occur through an individual's body language, eye contact, and vocal inflections, thereby indicating that students may not necessarily be solely to blame. Furthermore, Duta (2015) found that students were less likely to pay attention to a professor's message in the classroom if that professor had a history of being late and giving poor feedback.

Although it may appear as though students do not check their emails or read them thoroughly, researchers have indicated that this may not necessarily be related to them ignoring emails or not reading them in their entirety (Roblyer et al., 2010). Rather, students may simply be overwhelmed with emails, which can lead to them inadvertently deleting an important email from their professor (Roblyer et al., 2010). Fogel and Yarmish (2012) explained that since approximately 88% to 90% of emails are spam, it might be easy to unintentionally miss important emails. Moreover, when it comes to 40% of students who attributed communication breakdowns to misunderstanding the messages in emails, Duta (2015) confirmed that students do misinterpret information delivered via emails.

While findings from this study revealed that 40% of both faculty members and students attributed communication breakdowns to age differences, the literature review only offered one study related to age, which indicated that a breakdown in communication may occur due to age (Adamkova, 2014). Nevertheless, the literature review did offer some insight into this study's finding regarding the one student and faculty member who cited nationality as a contributing factor to the communication breakdown they encountered. According to Keles (2013), when individuals from different nationalities have opposing primary languages, a communication breakdown is more likely to occur. Keles explained that not only can fundamental communication issues arise when people who do not share a primary language attempt to communicate with one another, but that the meanings behind certain idioms might be misinterpreted, which only exacerbates communication breakdowns. To ensure that all students understand what is being communicated, Nimoh (2010) recommended that professors should speak clearly and slowly, as well as have their students who are from a different region with a different language repeat the information that was delivered.

Another interesting finding regarding the contributing factors to the communication disconnects between students and faculty members were gleaned from the advice that each group gave to the other. More specifically, while faculty members believed that they were doing their best to convey their willingness to be approached regarding academic issues that students might be encountering, students were less inclined to feel that professors were approachable. Although the literature reviewed did not specifically address issues related to professors' perspectives versus students' perspectives, it did offer some insight into why students might be apprehensive about approaching their professors. This finding was confirmed by Florescu and Pop-Pacurar (2016), who asserted that students' fear of making mistakes was one of the primary contributing factors to poor communication

between professors and students. Blume et al. (2013) also found that students who had higher levels of communication adaptability were more comfortable with interacting with their professors during class and outside of class. Mizrachi and Bates (2013) similarly asserted that many freshman students have difficulty with communicating effectively because college is their first time on their own, which ties into the communication adaptability aspect that Blume et al. highlighted.

Findings from the theme of social media platforms as mitigating tools for communication were most relevant to the second research question. Findings revealed that while most students and faculty members agreed that professional and social platforms for communication should be kept as separate and distinct entities, they did acknowledge the potential for social media platforms to help mitigate communication problems. Neither the students nor the professors, however, could offer a succinct method with which to accomplish this. Wilson (2013) echoed these findings by identifying that although students and faculty members might have Facebook accounts, they fail to use them in a collaborative or educational context. Wilson also identified that while students and faculty members usually have Dropbox accounts, neither used them in a collaborative manner. In contrast to Wilson's assertion Sheldon (2016) found that professors who spent more time on Facebook were more likely to be Facebook friends with students who displayed similar social media behaviors, which improved communication. Sheldon (2016) also found that professors were more willing to become Facebook friends with students after they had graduated. This finding was echoed by one professor in the current study, who commented, "If you graduate and you think we have some things in common and we should perhaps be in contact via Facebook, send me a friend request."

Findings from the current study further identified that 70% of professors preferred more traditional means of communication, such as email, Moodle, and other university-developed platforms. Meanwhile, 70% of students were more willing to incorporate social media into their communication regimen, as long as it was separate from their personal lives. This finding is in line with the communication privacy management theory, which identified the importance of keeping the private life separate from professional life (Framptom & Child, 2013). As such, despite the available technological resources to improve communication between faculty and students, neither group has managed to identify the best way to utilize these means of communication to enhance their ability to communicate with one another. Triangulation of the interview responses from the professors and the syllabi they distributed to students further revealed that only three faculty members communicated to their students the expected response time for emails, which may contribute to students' frustrations regarding turnaround times on emails.

IMPLICATIONS

Overall, findings from this study identified differing explanations from professors and students regarding the reasons for the communication disconnect between students and instructors at traditional universities. The reasons mentioned by students specifically included emails and the perceived approachability of the professor While professors also mentioned emails, their responses were in stark contrast to the students' comments. Findings from this

study also addressed the specific business problem related to instructors being unaware of the reasons for the communication disconnect by offering insight into students' perspectives. It should be noted that the literature reviewed for this study not only influenced the formulation of the research questions but also how the findings were interpreted. Indeed, while findings from this study were generally supported by the literature, the one deviation from the literature was the specific qualitative focus on the communication disconnect between students and faculty members in a traditional brick and mortar university classroom, as most of the literature reviewed relied on findings from surveys.

RECOMMENDATIONS FOR FUTURE RESEARCH

Findings from this study indicated that more research is warranted in a number of areas. Specifically, more qualitative research is needed in relation to faculty members' and students' perceptions of the contributing factors associated with communication breakdowns.

Another area of research highlighted by this study involves the ways in which students and professors use available technology. For example, findings from this study and others have indicated that while both professors and students see value in social media, they are more inclined to draw a distinct line between the professional domain and the private domain (Frampton & Child, 2013). It could be beneficial for more research to be conducted to determine the best way to utilize social media and whether the incorporation of these methods of communication would hinder or improve communication between students and faculty members. Further research could also be expanded to see if these problems differ in a predominately or fully online university.

In addition, due to the single case study nature of this investigation, one of the primary limitations was an inability to generalize the results to a broader population. As such, further research should utilize a multiple-case study design that implements a qualitative approach at more than one brick-and-mortar university to investigate the communication disconnect between students and instructors. Furthermore, to address the limitation of this study related to the general questions posed by the researcher, findings from this study could be utilized to develop research questions during the design phase of future studies that are aimed at understanding the communication disconnect between professors and students at traditional universities.

CONCLUSION

This study has offered insight into the role that social media might play in mitigating communication problems between professors and students, with members in both groups identifying that while social media had the potential of alleviating some of the communication problems, it should not be the primary method of communication. Accordingly, faculty members and students were more inclined to draw a distinct line between the private sphere and the public sphere, as evidenced by 70% of both students and faculty members specifically mentioning that social communications should be separate from professional ones. Nevertheless, students were more willing to entertain the idea of incorporating some form of social media into their academic lives than faculty members were.

In conclusion, findings from this study revealed that both students and faculty members at traditional universities were extremely cognizant of the communication disconnect between them; however, neither group was able to articulate a solution to the problem. It was determined by both groups that, while technological advancements have made communicating outside of office hours easier, that didn't necessarily translate to better communication.

Ultimately, more research exploring the ways in which social media can be acceptably used to mitigate communication between students and faculty is warranted.

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DEVELOPING AN INSTRUCTOR MANUAL FOR A COMPUTING AND TECHNOLOGY INTERDISCIPLINARY CAPSTONE COURSE

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ABSTRACT

Several years ago, a regional Oklahoma university's Department of Computing and Technology instituted a service-learning Interdisciplinary Capstone course. The course was designed as a collaborative project betweenstudents in the Computer Science, Information Technology, and English Technical Writing programs. To date, students in the course have completed twelve projects for various clients including a metropolitan city, a regional hospital, and the United States Department of Defense. While all projects have been completed free of charge, the estimated costs of final systems produced in the course has ranged from $35K–$100K. During the spring 2018 Capstone course, several faculty members in the Department of Computing and Technology noted that the faculty teaching the course were within a few years of retirement and, in order to maintain this one-of-a-kind program, a manual for the course was created. One of the Technical Writing students was chosen to complete this manual. This study documents those efforts and showcases the manual.

INTRODUCTION

A regional university in Oklahoma offers a four-credit-hour Interdisciplinary Capstone course to majors in its Department of Computing and Technology which features a "real life" experience in software design for regional companies or government entities. The project includes students from Computer Science (CS) and Information Technology (IT) degree paths, along with two or three English major interns from the Department of English and Foreign Languages to provide Technical Writing (TECH) support in the project design.The goal is for students to practice skills learned in the classroom in an authentic workplace setting. Bloomquist (2015) notes that internships and service-learning are often criticized for a lack of academic rigor. Therefore, the Capstone course was designed to provide a critical service-learning experience, incorporating ideas found in Molee, et al (2010) which suggest that any type of service-learning must go beyond the basic skill level to allow reflection and understanding. This critical service-learning requires students to recognize and understand the technical, social, and economic structures they are asked to work within. The aims of this critical service-learning approach include the development of authentic relationships between the university, the workplace, and the community, so that students can understand not only the procedures that go into software development, but how software development affects stakeholders within and outside the organization they are performing these tasks for (Carney, 2014). Campbell and Oswald (2018) suggest that, to be successful, internships and service-learning experiences must afford students opportunities for deep reflection, a systemic understanding of the needs of the workplace,

and perspective on how their efforts serve the mission of the organization.

For over five years, the university has offered this opportunity to its upper-division students in the Department of Computing and Technology and the Department of English and Foreign Languages. Most recently however, with retirement on the horizon for at least two of the faculty members responsible for the Capstone course, the faculty recognized there was a danger of losing the tacit knowledge of how to put together such a course every year. Baumard (1999) notes that institutions that can identify, collect, and harness procedures are those that have a better chance to excel in any environment as these are organizations that can more fully utilize the expertise of their members. Indeed, the notion of expertise itself has changed in contemporary organizations; expertise can now be seen as something distributed throughout an organization. The loss of employees with specific knowledge of how to perform certain tasks creates a learning curve for any institution. Fidalgo, et al. (2015) suggest that employee turnover is a problem of knowledge management. Bordum (2000) considers the modern institution as a "learning organization" and considers the transmission and acquisition of institutional knowledge within that organization as its most important task. The faculty members responsible for the Capstone course were quite naturally concerned about a potential loss of this information through turnover, attrition, and retirement.

Ambrosini and Bowman (2001) suggest that research in institutional and tacit knowledge assumes that the archiving and preservation of knowledge is difficult to measure, andthat techniques such as conceptual mapping, observations, and interviews would seem the most logical ones for the preservation of this knowledge. Thus, one of the English major TECH participants who had served on three iterations of the Capstone course (one with a local medical center and two with the United States Army) composed a manual for faculty members who might design and teach the Capstone course in the future. Using documentation previous capstone projects had archived, as well as information obtained through interviews with faculty members, the student was able to use the expertise developed through participation in the project to develop a set of instructions and procedures.

METHODOLOGY AND RESULTS

Over a period of 16 weeks, the student chosen to write the manual gathered information and designed a working manuscript for the future instructors of a Capstone course. The ultimate goal of the instructor's manual was three-fold: (1) provide easy-to-follow steps for future faculty teaching the course; (2) present credible and useful results and procedures; and (3) be written in such a way as to be understandable to faculty, students, and the client.

During the semester, the student gathered appropriate information from Capstone professors, as well as from professors' syllabi. Although it is a combined Capstone course, the faculty members from each discipline provide syllabi to students in their respective disciplines (for example, CS faculty to CS majors, and IT faculty to IT majors). Each syllabus had to be separated and then merged together into one, conjoined manual. The information from each of the relevant disciplines (CS, IT, and English TECH) were given their own headings in the manual for simple

navigation. The student created logical headings and sub-headings for all the information and attempted to use a consistent vocabulary to encourage clarity, conciseness, and consistency throughout the manual. This was accomplished through interviews with the faculty members, as well as a careful reading of the course syllabi and archives from previous projects. All deadlines were met for the project. A draft of the instructor's manual was delivered to each professor and the head of the Department of Computing and Technology for review. A final copy was then made ready for publication.

The manual is presented as Appendix 1 in this study.

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Appendix 1
User Manual for Capstone Course

SCHOOL NAME
DEPARTMENT NAME

A Guide to a Successful Final Capstone Project

Abstract

This is a manual for Information Technology, Computer Science, and English instructors. It is a guide for a collaborative, interdisciplinary team endeavor, where students deliver a successful software application to a real client for the final Capstone project.

Contents

Introduction: An Overview of the Course

The Information Technology (IT) and Computer Science (CS) combined Capstone course is designed similar to a working software company. Instructors limit intrusion when working with student teams, but make themselves present whenever necessary. Students will work in two teams to solve, create, and implement a software application for a client. Each team will devise an individual solution. The course emphasizes critical thinking and analysis for business decision-making to prepare students for a job environment outside of the classroom. The Capstone course will demonstrate functional knowledge and skill with emphasis on professional communication, teamwork, and comprehensive utilization of computing knowledge obtained in previous courses.

Objectives

This is an official description of objectives for the IT section of the combined Capstone course:

1. Team work – Students will work as an effective, collaborative team of IT, CS, and technical writers, while being overseen by the Chief Officers (faculty).
2. Ethical Standards – Apply ethics when creating software.
3. Computer Languages – Effectively use a high-level technology language.
4. Written Communication – Properly document all steps and communication exchanged between client, teammates, and Chief Officers.
5. Oral Communication – Effectively communicate with the client about software through In-Progress-Reviews (IPR) and a Final Presentation of a working software application.

Information Technology (IT)

The IT Capstone course is offered during the spring semester (January-May). The IT instructor is considered the Chief Executive Officer (CEO). The CEO oversees the following duties:

1. Finding a Client
2. Client Agreement
3. Announcements
4. System Architect (software)
5. Blackboard

Finding a Client

The process of finding a client begins as early as September or early October of the fall semester. The client must be willing and capable of working with the Department at the University. They must have the desire to receive a potential working software application that benefits them and/or the company in which they are employed. This could include applications that will better organize information or applications that will make their work easier and more efficient:

- Example – A regional hospital software application that organizes potential recipients of bone, tissue, and other implants. The application contains different tables and charts that organize information.

The client must agree with a hands-on partnership between the course (instructors and students) and themselves (individually and/or company). NOTE: be aware of potential circumstances that may arise from the client that may be out of that individual's control. Also, alert the client of the potential circumstances that may arise from the University that may be out of the course's control:

- Example 1 – The client may work in a government setting where the situation of a government shutdown may arise. Therefore the client may not be able to attend meetings and/or continue with the project until further notice.
- Example 2 – The University may be inclined to enforce an inclement weather day for the safety of students and staff.

Although situations as such will be rare, being aware of potential situations is crucial to running the course as a company.

Client Agreement

The Client agreement contains the components of Capstone-to-Client and Capstone-to-Chiefs.

Capstone-to-Client

As discussed in Finding a Client, the CEO must sell the idea to the client. Once agreed, the client becomes contracted to the Capstone course and agrees to participate in the 16-week course as a client.

As a mock-software company, the CEO will use virtual dollars to help students understand the virtual costs present in developing the application. Project leads will keep track of the price of each student (employee) and the number of man-hours each student puts forth each week. Occasionally, and at any given time, any Chief Officer may ask the team lead "how many virtual dollars are spent?" or "how many man-hours has _____ put forth this week?" It is necessary to alert the client of this aspect of the course so they may ask the same questions. As the receiving customer of the application, they have a right to know.

Capstone-to-Chiefs

Once the client has agreed to partner with the Capstone course, the idea must be sold to the fellow Chief Officers, consisting of faculty from CS, English, and Cyber Security (as available):

- The CS instructor must agree to the project idea, as well as agree to collaborate and combine Capstone courses. This instructor will serve as the Chief Information Officer (CIO).
- The English instructor must agree to the project idea, as well as agree to collaborate and provide an appropriate amount of technical writing interns (TECH) from the English department. This instructor will serve as the Chief Documentation Officer (CDO).

- If a Cyber Security faculty member is also available, they may be appointed as a Chief Security Officer (CSO).

Once agreements from the client and fellow Chief Officers are made, work on the syllabi begins. This typically takes place in November of the fall semester.

Announcements: Kickoff

The final in-session week of the fall semester, the IT instructor will send an email announcement to all enrolled Capstone students for Assignment #1:

- Assignment #1: Submit a resume applying for a position in the Capstone course. Students will be given a list of different positions to apply for: Project Lead, Project Deputy, Team Lead, Business Analyst, Security, etc. that will construct a working software team. Students will also provide a cover letter and skills inventory list.

Assignment #1 is sent in the late fall before the Capstone semester begins in the spring. This allows enrolled students to apply early to Capstone Enterprises as they would an actual software company. Students will understand the feel of the Capstone course before it has officially begun.

Once the spring semester Capstone course begins, the following is initiated:

Week One:

- Two competing team Project Leads are chosen by CEO
- CEO takes identifying resume and makes non-identifying copies
- CEO provides Project Leads with non-identifying resumes
- Project Leads in managerial role negotiate to choose team members
- Non-identifying resumes given back to CEO by each Project Lead
- CS is integrated into classroom setting
- TECH Writers and Editor are integrated into classroom setting
- CEO assigns students to their appropriate teams via identifying resumes
- Identifying resumes handed to assigned TECH Writer for editing.
- CEO provides brief project description

Week Two:

- Interview preparation for entire team
- Interview with client
    - Students ask client questions to better understand requirements, needs, and preferences from application
    - Students must act professional and give lasting impression to client. It is students' initial meeting with client, as well as client's first time meeting students

NOTE: The client should be encouraged to participate in more face-to-face meetings with the

students and be more present during class time on days other than professional scheduled meeting days. Explain to the client that the result is generally a better project.

System Architect (Software)

The CEO grants student access to the Computer Aided Software Engineering (CASE) tool System Architect. Project Leads will be asked to provide a list of names and titles of those that need access to the software.

- Example – Project Lead, Project Deputy, Team Lead, Team TECH Writer, TECH Editor

Blackboard As a Resource

The Blackboard learning management system is the primary way to keep in contact with all enrolled students in the Capstone course, as well as the TECH Writers and Editor. The CEO will set up and maintain all Blackboard correspondence. All announcements will be posted directly to Blackboard by the CEO.

Announcements

Blackboard announcements are effective ways to remind students of deadlines and upcoming meetings with the client.

Folders

Since the Capstone course is a combined CS and IT course, one Blackboard account will be sufficient. Students will find documents pertaining to both groups on the site. The CEO may set up folders for both CS and IT documentation. Assignments, lecture materials, and exams will also be accessed via Blackboard. Client information, project info, and correspondence regarding the project must always be accessible for students. If the client provides a PowerPoint, or any other form regarding information about the project, it can be uploaded to Blackboard for student access.

Although client information will be accessible via Blackboard, the Project Lead will have all team member information. It will be up to Project Leads and their Deputies to stay in contact with fellow team members.

Syllabi

The syllabi for both the CS and IT sections will be in individual folders pertaining to the combined course. The syllabi will contain descriptions of the course as a company, outcomes from the course, objectives-problems the client has, how the developed software provides a solution, scheduling, and implementation with milestones.

Documentation: Tips, Tutorials, Templates, and Tirades

Blackboard is also an effective resource to upload tips, tutorials, templates, and forms for the Capstone students. Also, if the IT or CS instructors are alerted of any job opportunities for

graduates, the instructors may post links into Blackboard with information:

Tips

- Provide students with tips to improve implementing software, presenting in front of the client, scheduling in an efficient manner, etc.
- Tips for creating successful deliverables based on the Statement of Work

Tutorials

- How to videos – DFD's, Use Case, etc.
- MySQL
- Accessing MySQL in Lab using PUTTY and TOAD
- SQL Tutorial
- PHP Tutorial
- HTML Tutorial
- Data Types

Templates

- IPR Rubric
- IPR PowerPoint
- Team Contract
- Statement of Work
- Skills Inventory

Tirades

- Group Removal Request Form – In any instance when a member of a team is not performing at a satisfactory level or is failing to perform as a member of the group, the other group members may fill out the removal form to fire an individual from the said team.
- Team Member Evaluation Form - Both personnel evaluation and team evaluation

Milestones

The Milestone list assures students are on an evenly, well-rounded track for development. Milestones consist of both events and deliverables and are suggested to be turned in, updated after each IPR, and completed during the Final Presentation. IT has 7 Milestones with two IPRs:

Milestone #1: Team Creation

- Resumes
- Skills Inventory
- Team Contract

Milestone #2: Project Planning (Initial)

- Initial Client Interview

- Initial Project Planning
- Statement of Work
- Client Contract

Milestone #3: Data Modeling

- Conceptual Models
- Logical Model
- Repository Information
- Project Planning

Milestone #4: Process Modeling (Revised and Updated)

- Simple DFD
- CS Develops Testing Protocol
- Context-level DFD
- IPO Chart
- Process Hierarchy Chart
- Project Planning

IPR #1

IT, CS, and English TECH students, Chief Officers, and the client attend the IPR. The first IPR delivers the plan and initial back-end steps that have been created, thus far. It includes DFD's and Use Case (completed) and future testing plans. The presentation is done orally and preferably done with PowerPoint. Students are encouraged to rehearse and maintain professionalism when delivering the first IPR.

Milestone #5: Alternatives

Students take learned objectives from the IPR and make alterations to current stages of development. Any changes or concerns from the client at this point are addressed.

- Alternative, Evaluation, and Recommendation
- Project Planning (updated)

Milestone #6: Physical Models

- Physical Data Model
- Security Design (with approval)
- Database Size, Usage Map
- Repository Information
- Project Planning

IPR #2

IT, CS, and English TECH students, Chief Officers, and the client attend the IPR. The second IPR delivers a semi-completed, but working database demonstration. Security will take partial

control in delivery. Security will deliver what tests they have accomplished, what is yet to be completed, failures and passes, and risks encountered. The client may question software based on a demonstration. New altercations may arise. However, this is typically nothing drastic, except in rare instances. NOTE: In rare instances when client is unsatisfied with the demonstration and software thus far, the Chief Officers may need to meet with Project Leads and the client, individually.

Milestone #7: Testing and User Manual

- Testing based off test plan
- Application User Manual

Milestone #8: Implementation and Final Presentation

- Output-Input Processing
  - Tables
  - Relationships
  - Input Forms
  - Switchboard/Menu System (Look and Feel)
  - Reports (Web-based)
  - Working Queries
- Working Database with functionality
- Middleware
- Design
- Implementation
- Collects (Dues and Expenses)
- User Manual
- Final Reports for client
- Project Leads evaluate teams and themselves
- Team Leads evaluate individual team members and themselves
- Final Presentation (Scheduled on Final day of Capstone class; IT, CS, English TECH combined)

Framework: What Will Work?

The Systems Development Life Cycle (SDLC) Waterfall Model is the initial framework followed for the combined Capstone course. This method allows for students to follow the appropriate Milestones addressed. However, recent knowledge has made the class aware of using the Agile SCRUM Model. Although SCRUM would be more efficient and ultimately a more popular fit in an actual software company environment, the Waterfall Model has been efficient in a class environment. SCRUM has not yet been attempted in the classroom environment, particularly due to the time constraints for students and the semester:

SDLC Waterfall Model

- Requirements

- System Design
- Implementation
- Integration and Testing
- Development of System

Computer Science (CS)

The purpose of integrating a CS team with the IT team is to create a comprehensive software project. The software will be completed through team effort, professional communication, and computing knowledge. The project will involve the use of multiple programming languages. The outcomes are to implement a working program. Students will need to use and compare data structures and algorithms to solve problems. Problems may arise relating to operating systems and networking that students will need to solve. Communication is significant for students to efficiently deliver problem-solving software solutions.

Objectives

This is an official description of objectives for the CS section of the combined Capstone course, instructed by the CIO:

1. Understand efficiency of team work
2. Demonstrate communication skills
3. Apply computing knowledge
4. Create a comprehensive software application that involves multiple computing languages
5. Analyze client's requirements
6. Apply CASE tools to design software
7. Implement the design to create software solution using, but not limited to, high-level programming languages, code comments, ReadMe, and design files
8. Apply testing techniques (verification and validation) and skills to test each artifact and integration of these artifacts
9. Deliver a working project to client

Milestones

The Milestone list assures students are on an evenly, well-rounded track for development. Milestones consist of both events and deliverables and are suggested to be turned in, updated after each IPR, and completed during the Final Presentation. CS has five Milestones:

Milestone #1: Team Creation

- Resumes
- Team Contract
- Client Interview

Milestone #2: Project Design

- Conceptual Project Design

Milestone #3: Programming Skills

- Programming Skills Test
- Project Physical Design

Milestone #4: Project Implementation

- Interface Design and Implementation
- Connection to SQL Server
- SQL Queries

Milestone #5: Evaluation, Testing, and Delivery

- Testing and Modification
- Project Leads evaluate teams and themselves
- Team Leads evaluate individual team members and themselves
- Delivery of Project to Client (Day of Final for Capstone, includes IT and English TECH)

English Technical Writing Interns (TECH)

The Department of English and Foreign Language partners with the combined CS and IT Capstone Course to offer English student interns experience in working in a professional environment for TECH writing and editing. The course is offered as either a Directed Writing course or as a Writing Internship course. TECH Writers and Editors will perform a series of tasks provided to them by Project Leads and Team Leads. Overseen as a software company, the Capstone course will offer professional TECH documenting and revising experience. This will include experiencing the pressure of time-constraints and demonstrating professional communication skills through writing and oral presentation.

Planning

Planning begins in October after the project has been sold to the English Department. After agreement, the CDO determines how many TECH Writers are needed (depending on the amount of CS and IT Capstone students enrolled), and if more than one TECH Editor is necessary. Once the configuration of how many English TECH students are needed, the CDO begins the recruitment process. The CDO will continue to attend meetings with the other Chief Officers and the client to stay aware of any and all new information that may arise.

Recruitment

Recruitment of students begins during the final weeks of the fall semester, or the semester before the Capstone course is in session. The internship will be offered as a 3-credit hour course. Outcomes of the internship are as follows:

- Resume building
- Experience in a professional work environment
- Time management – working within strict time constraints
- Organization skills

A prerequisite for the writing internship will be an English TECH writing course. This prerequisite course will teach students the basic principles of effective communication in a professional setting. Some basic objectives of the prerequisite are:

- Grammar mechanics
- Style
- Collecting, organizing, presenting, and documenting information in formal reports and documents
- Develop a sense and understanding of professionalism

TECH Editor

There is one TECH Editor that oversees both TECH Writers for the individual teams. Unlike the TECH Writers, the TECH Editor will not be a part of either specific team, but rather a part of both teams. The TECH Editor aids and assists TECH Writers if any questions or concerns arise. If a TECH Writer desires a second opinion on any documentation, they can go directly to the TECH Editor. Project Leads discuss any problems that occur with their TECH Writer's quality of work or effort with the TECH Editor before going to any Chief Officers. If the TECH Editor cannot solve the problems that may occur, then a Project Lead and Editor may go to the Chief Officers for assistance to solve any problems.

The TECH Editor may want to guide the TECH Writers in accomplishing documentation of Milestones as deadlines approach. The TECH Editor is present for both teams when initiation of the User Manual begins.

The TECH Editor is present as much as possible during class meeting times for direct communication and assurance with the TECH Writers and other members of each team. They are also present during the Initial Client Interview, both IPRs, and the Final Presentation. If either, or both, teams rehearse oral presentation for either, or all, of the above listed, the TECH Editor may want to be present for rehearsals.

TECH Writers

There are typically two TECH Writers: one for each of the divided teams. The TECH Writer for each team oversees all documentation regarding the project. Since all documentation is required to be kept and filed for the client and the CEO, a TECH writer assures that all spelling and editing mistakes are corrected and accounted for. Documentation includes, but is not limited to:

- Emails
- Memorandums
- Statement of Work
- Team Contracts
- IPR PowerPoint Slides and Rehearsals
- Application User Manual

Although this is not the TECH student's Capstone course, the priority is at a high level to maintain a strict schedule. Assurance that all documentation is completed in a timely matter regarding the Capstone course is the TECH Writer's highest concern. A rough, but thorough schedule for TECH Writers is:

1. Resumes and cover letters
2. Team contracts
3. Team questions for client at initial client interview
4. Statement of Work
5. Memorandums and emails to client
6. Questions and PowerPoint slides for both IPR's and Final Presentation
7. Definitions and written instruction on System Architect
8. User Manual

NOTE: All documentation for each team must go through the team's TECH Writer. All documentation will be kept, organized, and filed throughout the course of the project.

Figures

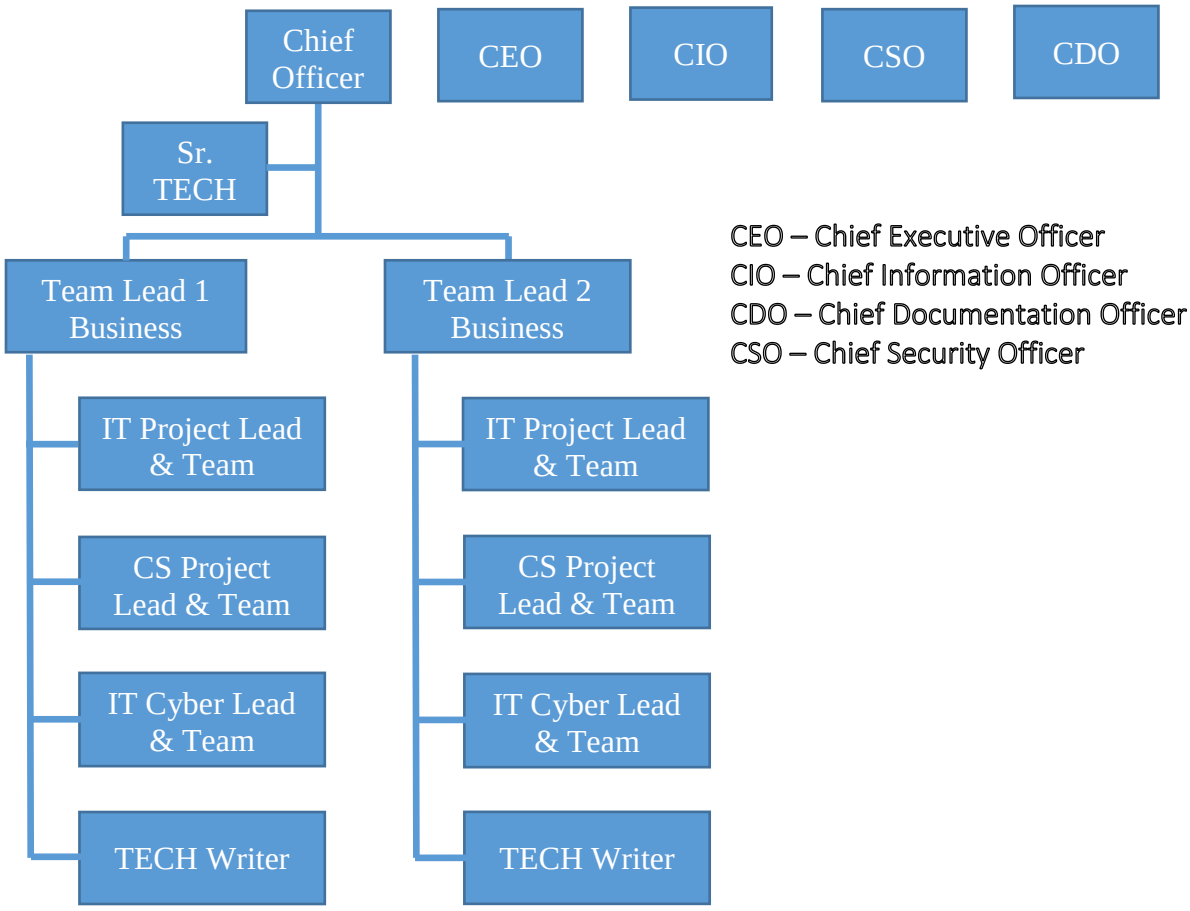

Figure 1: Organization chart of members in the Interdisciplinary Capstone course

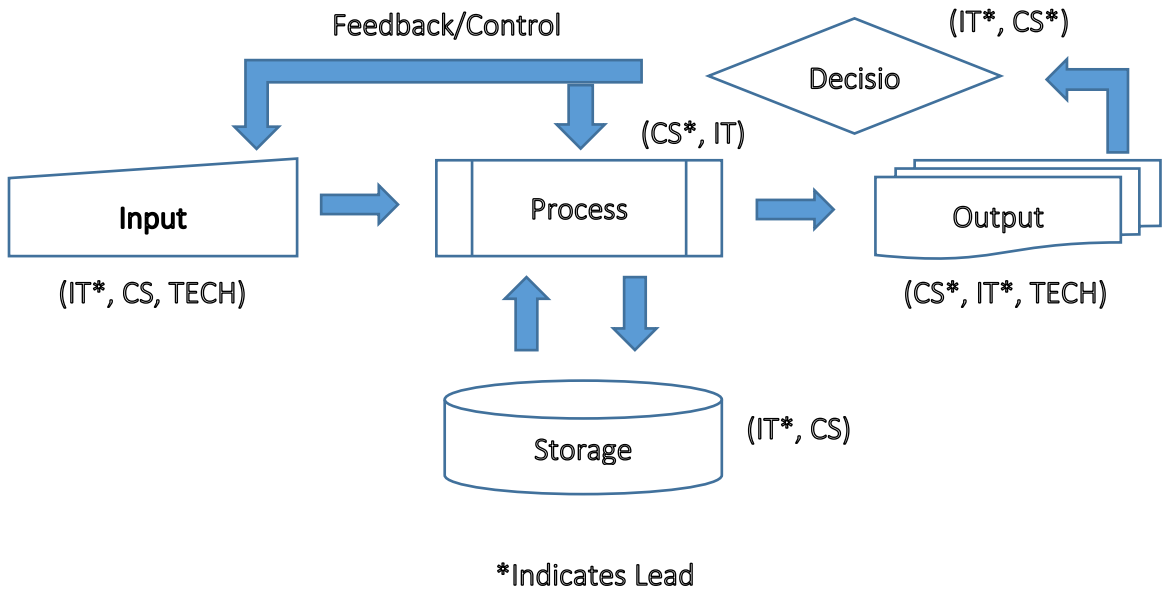

Figure 2: Responsibilities for teams of Interdisciplinary Capstone course

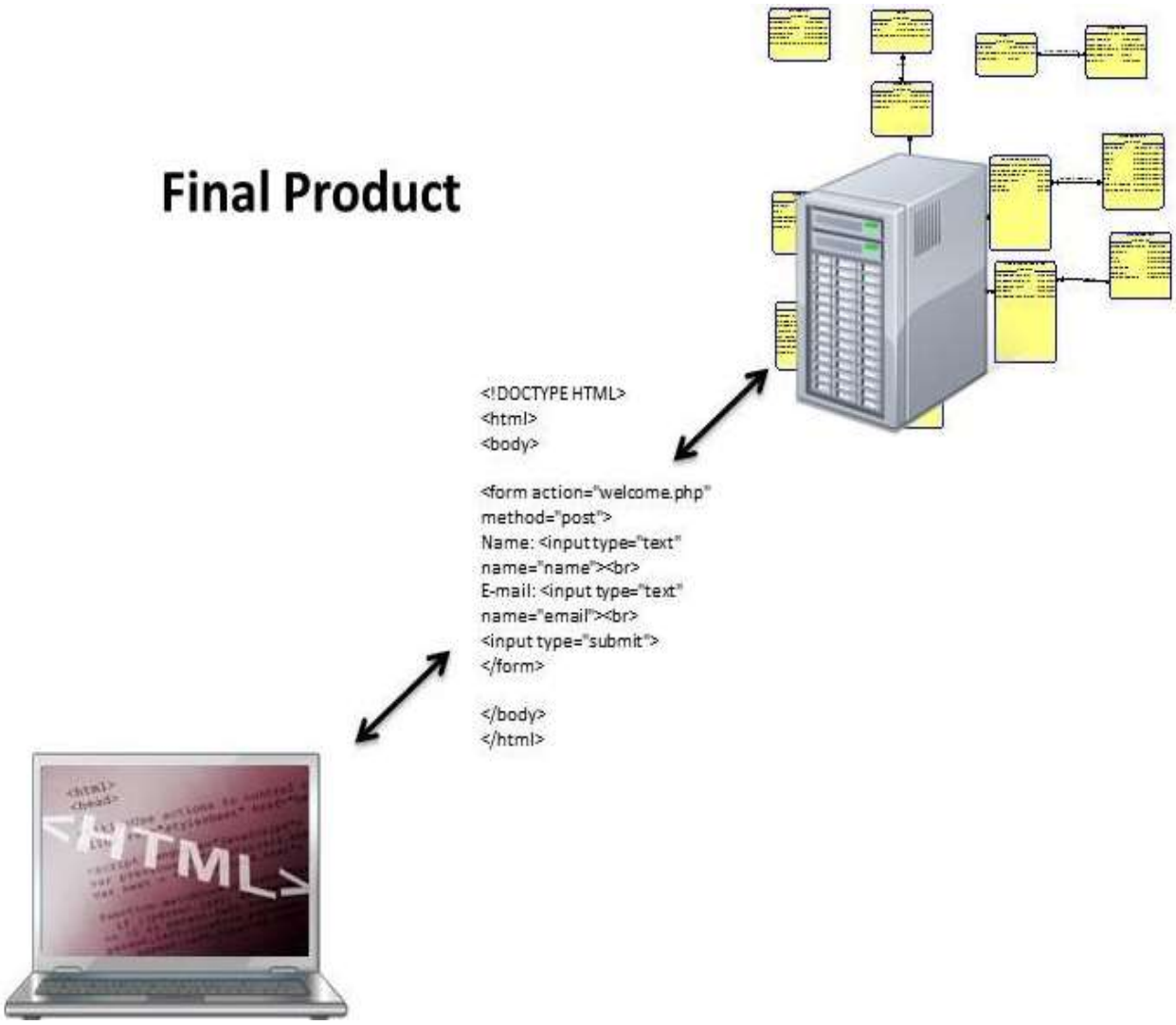

Figure 3: Final product example as a software application relating to a server

Final Presentation

The Final Presentation is held on the day of the scheduled Final Examination for the Capstone course. During the Final Presentation, both teams will:

- Demonstrate a working software application
- Deliver all Security test reports
- Deliver User Manual and all documentation collected (up to date and organized)
- Update the client on all work done between the back-end and front-end of the application

Student presentations to the client and participating faculty are usually held in a room on campus with adequate projection facilities and that is large enough to house all participants. The room is reserved ahead of time by the CEO. Those encouraged to attend include staff from the University Administration, Department of Computing and Technology, English Department, and local press sources.

The Final Presentation is considered the most professional of all the meetings between students and client, students and staff, and students and the University. Dress and behavior are to be professional and taken seriously. The delivery of the software application does not just represent the student's team work abilities, knowledge of computing languages, and communication skills, but also represents the University and its staff. NOTE: If student teams do not deliver a working application by the deadline, consequences may be initiated at the discretion of the Chief Officers.

Post-Capstone

The after effects of the combined Capstone course are both relieving and pride-filled. Students work 16 weeks, putting in tremendous amounts of man-hours to develop a software application for a real client. The endeavor includes strict requirements and delivery within a crucial timeframe. For their efforts, students are presented with letters of recommendation from the client and/or the company the client represents. Graduating students move on to work for industry software companies, bringing professional experience in understanding how such companies operate. By faculty combining resources of IT, CS, and English departments, students gain critical insight into the actual world of software development.

TEACHING EXCEL'S BOOLEAN FUNCTIONS

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ABSTRACT

A popular puzzle is used as a vehicle to teach Excel's Boolean logic functions within the context of optimization. Outcomes are discussed.

INTRODUCTION

Microsoft Excel is the spreadsheet product that is most often encountered by our students. It is used for modeling, and analyses of many types. It contains substantial mathematical and number-management functionality. And it is readily available in a majority of business offices. Kassoff and Valente (2007) report that "in 2001 there were an estimated 45 million end-users of spreadsheets or databases…." Valente, et al. (2007) report that "an estimated 55 million people used spreadsheets in 2005…."

Burning Glass Technologies is a privately held software analytics firm that analyzes job postings and position listings. They have developed a list of "baseline" skills, that is "skill[s] consistently requested in job ads across broad swaths of industries and occupations…." (Bittle, 2015). One of the summary graphics from the report shows that Excel skills rank #5 overall in terms of frequency of requests in published job advertisements. Bittle drilled down a bit to show that Excel skills for both Finance and Clerical & Administrative positions rank 2 in the frequency of appearance in job ads. The rank is 3 for both Human Resources and Research, Planning, & Analysis types of positions (Bittle, 2015). By this measure, Excel skills are clearly in high demand.

A State of Texas initiative forced a revision to our BBA curricula; in the ensuing revision process, our faculty engineered an "instructor's choice" section into the advanced statistics course (now an elective). As a faculty member assigned to teach that course, I elected to include modeling skills into my syllabus. This was an opportunity to incorporate additional Excel skills into a formal course.

The remainder of this paper consists of discussing the teaching materials used in this initiative, the process used, and the outcomes that I encountered.

TEACHING MATERIALS

My primary concern was to include a tractable portion of modeling techniques into a portion of an elective statistics course. The students already purchase a textbook and I did not want to inflict another purchase on them. Fortunately, most students have access to Excel and the instructor can access Excel in the classroom. I decided, somewhat arbitrarily, to teach a standard linear programming problem as an introduction to Excel's Solver add-in, followed by a more advanced optimization.

Solver was developed for Microsoft by Frontline Systems. Frontline has developed other optimization software capable of solving problems many times larger and more complex than the Solver included in Excel. The web-site for Frontline provides a wealth of information about optimization, including the use of genetic algorithms and simulation (solver.com, n.d.).

For the more advanced optimization, I adopted a case that I utilized in a forthcoming paper, Paterson and Friesen (2020). Aside from convenience, I was curious about teaching Excel's Boolean logic functions. The problem treated in the forthcoming paper is based on a puzzle that I thought would make an interesting teaching case.

Excel contains a fair number of logic functions, including the Boolean operators: AND, OR, NOT, and XOR. These functions return the answers TRUE or FALSE. Boolean operators used in conjunction with IF, a function that relies on arguments that are evaluated as either TRUE or FALSE, can yield powerful results.

A cursory examination of teaching materials does not reveal much emphasis on Excel's Boolean operators; this is particularly true of the pedagogical texts used to teach spreadsheet modeling. Barlow (2005) does not discuss those functions. Neither do Albright and Winston (2017). Meredith, Shafer, and Turban (2002) use the OR function in a single application, that being the programming to enable Excel to decide whether or not to reject a null hypothesis. Liengme (2013) provides a brief discussion of their use, mainly from the standpoint of identifying items that meet conditions. Brady and Monk (2004) devote two pages to explaining the use of AND and OR functions as components of IF functions that are fixing the appropriate interest rate based on economic conditions. Myerson and Zambrano (2019) use AND functions as a means of counting particular outcomes in Monte Carlo simulations or flagging them. It should be noted that that text is primarily used in teaching graduate students. Here was another argument for using my own case: there is a clear absence of a good teaching problem in the literature.

Is knowledge of Excel Boolean logic functions useful? The literature is unclear on this question. Sartain (2018) lists AND and OR as among the "most popular" Excel functions but she does not elaborate on how that condition is defined or established. She author notes that IF is also a popular function, one that can make use of AND and OR operators within IF arguments. Writing for the MAX PRODUCTIVITY column in PC World, Sartain (2015) gives a tutorial; the example allows the user to identify items in a list that meet certain conditions. In a similar article, Paul (2018) does not mention Boolean functions at all.

There are a fair number of reports about using Excel Boolean logic functions for educational and assessment-related purposes. Santo, et al. (2014) investigated computer self-efficacy and learning behavior in high school students who use interactive learning modules. One of the three modules used in their study was based on Boolean logic and operators. Singh, et al. (2013) designate several of the Excel logic functions for the purpose of assessing spreadsheet efficacy.

THE PUZZLE PROBLEM

Paterson and Friesen (2020) consider the Bridge and Torch problem—a puzzle that has been treated in the literature as a mathematical optimization problem using both integer programming and dynamic programming approaches. The variation that we explore in this paper is defined below (Gribakin, n.d.).

> Dangerous crossing**.** Four creatures *A*, *B*, *C* and *D* come to a river at night. The bridge is very thin and narrow, and can only hold any two of them at a time. Besides, it is dark and they need to keep their torch on while on the bridge. It takes *A* one

minute to cross the bridge, *B* - 2, *C* - 5, and *D* - 8 minutes. Can they all cross to the other side if the batteries in the torch last only 15 minutes?

In addition to appearing in the literature with some frequency, the problem has been used by interviewers for high technology companies (My Tech Interviews, n.d.) The applicant who encounters this puzzle in an interview must be able to quickly work through the logic of the puzzle in order to propose a viable, preferably optimal, solution (there are multiple optimal solutions).

Puzzles can be fun class projects, for several reasons. First and foremost, to report that a puzzle is used during job interviews is interesting and it may be motivating. Second, many puzzles become widely discussed in the literature. Consider the example of Sudoku. An ABI/INFORM search using the search term "Sudoku" yields 4,612 hits. The EBSCOhost Academic Search Complete database yields 363 hits in peer-reviewed sources.

The Bridge and Torch problem has a fair body of literature associated with it. Rote (2002) proves a lemma that defines the optimal solution as having N-1 forward moves and N-2 backward moves. With N= 4 crossers, the problem can be optimally solved in 4-1 = 3 forward moves and 4-2=2 backward moves.

In one approach to the problem, Paterson and Friesen (2020) define a solution as a vector of 5 numbers, with each number representing a pair or a single walker. This structure is shown in Table 1. Given 4 single walkers, there are 6 possible pairs. Thus, there are 3,456 possible solution vector values. But only a much smaller subset consist of *allowable* solutions. Each solution vector has a time associated with it. By defining a set of logical assessments, Solver can be instructed to find the minimum time from the *allowable* solutions by using the onboard genetic search algorithm.

Table 1
Problem Solution Structure

ARC	ID-Number
First Pair (forward)	
First Single (backward)	
Second Pair (forward)	
Second Single (backward)	
Last Pair (forward)	

The ID-Number can be either a Pair-ID-Number, of which there are six, or a Single-ID-Number, of which there are four. Tables 2 and 3 show those definitions of pairs (forward) and singles (backward) along with the times (determined by the slowest member of the pair):

Table 2
Possible Pairs

Pair-ID-Number	Name	Time
1	A,B	2
2	A,C	5
3	A,D	8
4	B,C	5
5	B,D	8
6	C,D	8

Table 3
Possible Singles

Single-ID-Number	Name	Time
1	A	1
2	B	2
3	C	5
4	D	8

Of course, the logic of what makes an allowable solution must be defined, which is where the Boolean functions come in.

After solving the problem multiple times, I felt that the best approach to asking students to define logical constraints was to create a template that showed resulting outcomes for the process of moving all four walkers across the bridge. As evidence of my reasoning, consider that the first time that I solved the problem, my pseudo-code to ensure that the second pair was allowed was:

=AND (OR {2nd Pair Member 1 = 1st Walker, AND [NOT(2nd Pair Member 1= 1st Pair Member 1), NOT(2nd Pair Member 1 = 1st Pair Member 2)] }, OR{ 2nd Pair Member 2 = 1st Walker, AND [NOT(2nd Pair Member 2 = 1st Pair Member 1), NOT(2nd Pair Member 2 = 1st Pair Member 2)] })

Valente et al. (2007) made the following observation when they asked students to write a nested IF statement to assign a grade based on a score; it applies here as well:

> This formula has three major problems. First, it is all but unreadable, which makes it error-prone. Second, it is difficult to write. When a similar example was used in an assignment for business students at a class given by one of the authors, 60% of the students were unable to come up with the correct formula. Third, the formula is completely hardwired in terms of the ranges used ….

Creating the template involved fairly heavy use of Excel's text manipulation functions, and since I did not want to spend time teaching those, the students and I agreed to using the template in creating logical functions to optimize the problem. This approach is well-aligned with results showing improved outcomes for students who both were required to use Excel and received "problem-specific instructions" (He, 2011). This template is shown in Table 4.

In this table, the Solution Vector is manipulated by Solver to minimize the Time. Lookup functions in the spreadsheet find the identities of the pairs and singles. Students can insert their constraint formulations into the gray area, thereby creating corresponding Boolean statements that return TRUE or FALSE. I added an IF statement to return a 0 for a TRUE and a penalty value for a FALSE. Summing the penalties led to a constraint total that was incorporated into Solver to flag unacceptable solutions, that is, solutions that violate one or more constrains and will, thus, will not work.

PUZZLE PROBLEM SOLUTION

Being able to distinguish between acceptable and unacceptable solutions allows Solver to try different solutions but keep only the acceptable ones. In class, I offered the following possible constraints subjects although there are others (this led to a discussion of Necessary vs Sufficient):

1. First Single ok, that is the First Single must be a member of the First Pair

- =OR(E5=E4,E5=F4) this function returns TRUE if one argument is true.

2. Second Pair ok, that is the Second Pair has no unacceptable members,
   - =AND(E6<>I5,F6<>I5) this function returns TRUE if both arguments are true.
   - The term <> is Excel's version of "not equal to."

3. Second Single ok, that is the Second Single has an acceptable member,
   - =OR(E7=E6,E7=F6,E7=I5)

4. Last Pair ok, that is the last pair doesn't include walkers who have already crossed.
   - AND(E8<>LEFT(I7,1),E8<>RIGHT(I7,1),F8<>LEFT(I7,1),F8<>RIGHT(I7,1))

The first two were discussed in some detail while the second two were discussed only conceptually.

The optimization is straightforward and simply stated:

Minimize solution time
Subject to the sum of the logic statements = 0
ID-Numbers are integers between 1 and 6.

The solving method for integer programming problems is Evolutionary.

Excel often requires a minute or longer in order to find the solution. And, as with all search procedures, there is no guarantee of finding a global optimum. Increasing the mutation rate, population size, and time allowed can improve likelihood of finding a global optimum.

DESCRIPTION OF METHODOLOGY

This procedure was vetted through our research board. I adopted the following procedure:

1. Assess pre-course spreadsheet self-efficacy, including existing familiarity with Boolean Operators.
2. Introduce the operators AND, OR, NOT by demonstrating their use in identifying observations that conform to given conditions. Also teach use of IF and VLOOKUP.
3. Present a Study Problem, a standard linear programming application.
4. Present Bridge and Torch Problem and develop solution strategy. Assign development of logic. Assess logic skills.
5. Assess post-project reflections.

RESULTS

I implemented this teaching topic in several sections of business statistics courses. The difficulty encountered at the outset is that of a small sample sizes: total equals 9. While the small sample size disallows meaningful statistical analysis, this sort of exploratory investigation benefits from the opportunity to very closely monitor the students' efforts and behaviors.

Step 1.
Pre-course spreadsheet self-efficacy information was gathered using the instrument shown in Exhibit 1. Summarizing:

- Summing the first seven scores yields the following values: 18, 19, 20, 23, 23, 26, 27, 28, 28 out of a maximum of 28.

- 4 out of 9 report using spreadsheets once per week while 5 out of 9 report not using spreadsheets.
- 6 out of 9 report first using spreadsheets in high school with 2 out of 9 first using spreadsheets in college. One out of nine
- 3 out of 4 report not encountering Excel's Boolean logic functions.

On the whole, this group of students perceives their self-efficacy favorably although the previous exposure to Boolean logic functions is limited.

Step 2.
This step was initiated by developing and demonstrating a small decision support system whereby a list of several hundred neighborhoods were filtered by specifying different urban economic indicators. Further demonstrations using a spreadsheet file of automobiles were also completed.

Step 3.
A standard three variable linear programming problem was presented and solved over the course of two weeks. Students were required to submit an Excel file with their solution. In terms of functionality, the scores ranged from 50% to 100% complete, with an average of 75%. This was disappointing, given the number of demonstrations both in class and in office.

Step 4.
Over three weeks, the Bridge and Torch problem was discussed with logic development strategies and solution template distributed. Students were assigned the task of submitting an Excel file containing their optimized model. This step has not been completed by all students; thus, the analysis is ongoing. Preliminary indications are that the first three logical constraints are correctly implemented. This is encouraging! The fourth constraint, was successfully implemented; however, the student definitely took the long approach by testing the answer against the all possibilities.

Step 5.
Students were assigned a 1-2 paragraph reflection document. Preliminary analysis indicates that (1) Excel is a new experience to many students; (2) Solver is a new experience, and a challenging one, for most students. Item (1) is surprising to me. I am recommending that we reexamine our curriculum.

DISCUSSION AND CONCLUSION

Self-perception of spreadsheet efficacy may be higher than warranted. This statement is based on the summary of self-efficacy from Step 1 and results from Steps 4 and 5. I am of the opinion that the lack of familiarity with Excel / Solver tools are inhibiting the process of learning and applying Boolean logic functions.

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Exhibit I

Self-Efficacy Pre-Course Assessment

Name: _____ Date: _____

Circle the Single Best Answer for Each Question

1 = strongly disagree, 2 = slightly disagree, 3 = slightly agree, and 4 = strongly agree.

I feel confident about :

1. ...formatting the rows and columns of a spreadsheet 1 2 3 4
2. ...naming the columns and rows in a spreadsheet 1 2 3 4
3. ...entering appropriate formùlas for calculation in a spreadsheet 1 2 3 4
4. …entering data in a spreadsheet 1 2 3 4
5. ...editing previous spreadsheet files 1 2 3 4
6. …printing out the spreadsheet 1 2 3 4
7. …saving a spreadsheet file 1 2 3 4

several times a week = 1; once a week = 2, 1-3 times a month = 3, and do not use = 4.

8. During the previous 3 months, I used spreadsheets 1 2 3 4
9. My first experience with Excel was (mark the single best answer)

First used before high school	First used in high school	First used in college	First used at home	First used on a job

10. I have previously studied / used Excel's Boolean logic functions: AND, OR, NOT.
    Y N

Table 4
Solution Template

			Who's Crossing?				Who's on the	
	Solution Vector	Time	Walker 1	Walker 2			other side?	
first pair	1	2	A	B			AB	
first single	1	1	A				B	
second pair	6	8	C	D			CDB	
second single	2	2	B				CD	
last pair	1	2	A	B			ABCD	
	Time	**15**						
CONSTRAINTS								
1				TRUE	0			
2				TRUE	0			
3				TRUE	0			
4				TRUE	0			
			constraint total		0		=	0
					LHS			RHS

THE FACULTY PERSPECTIVE OF CHEATING IN THE CLASSROOM IN 2019

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ABSTRACT

The issue of student cheating in the academic environment is one faculty deal with continuously. Technology has certainly opened many new avenues for students who choose to cheat to earn higher grades in the traditional, face-to-face classroom as well as in online classes. Studies over the past ten years such as those by Sayed et al. (2015) and Simkin et al. (2009) agree that students appear to engage in academic dishonesty because of the desire to succeed and make good grades, and the opportunities that exist to do so with a minimal chance of getting caught and/or minimal punishment. To further compound the problem of extensive cheating in the college environment, The New York University *Dispatch* attributed the rise in student cheating to both an increasing workload and changing work ethic in the Millennial and Gen Z students (What impact is technology having on student cheating?, 2018). This paper reports the findings from a fall 2019 faculty survey at a mid-sized public university in the south related to student cheating with technology in the traditional classroom as well as in online classes.

INTRODUCTION

Cheating in a college classroom is not a new topic. For decades, research has been done on why students cheat, how students cheat, and what instructors can do to encourage academic honesty and discourage cheating. In more recent years, the research has expanded to include the use of technology to enable students to cheat, both in the classroom and in online courses. However, most of the research is focused on cheating in online courses and plagiarism. The researchers, who are CIS faculty in a public university, struggle with student cheating supported by new technology and questioned whether faculty across campus faced similar issues.

STATEMENT OF THE PROBLEM

The issue of student cheating in the academic environment is a nation-wide problem at both public and private institutions. Faculty deal with it continuously, and technology advances constantly offer students new strategies to cheat in the traditional, face-to-face classroom as well as in online classes. This study specifically collects information on the current faculty perspective of cheating in the classroom at a mid-sized public university in the south. The study will address the following questions.

1. Do faculty apply different levels of cheating penalties based on value of the assignment or exam?
2. Do faculty perceive administration supports the commitment to reduce cheating among students in their academic studies?
3. What "cheating with technology" scenarios/technology have faculty individually observed in their classes?
4. What technology do faculty specifically ban in their classrooms during exams?

5. Do faculty employ any electronic device that can detect unauthorized technology use during class or an exam? (both in face-to-face environment and in online instruction)
6. Where does dealing with student cheating fit on the scale of negative aspects of their classroom teaching?
7. Are there differences in faculty responses based on gender, college/discipline, years of teaching, or level of courses taught (first year and sophomore courses; junior and senior courses; graduate courses)?

LITERATURE REVIEW

The statistics for cheating on college campuses are alarming. According to Open Education Database, in an informal poll from 2007, 60.8% of the 30,000 students responding reported that they cheated on an assignment or exam. Of the same students, 16.5% reported that they did not regret doing so. Students felt the reward of the action, such as scholarships, awards, internships, higher grades, and other incentives, justified the action. In a poll conducted by Fordham University, results revealed that cheaters averaged a GPA of 3.41, while non-cheaters averaged 2.85, again showing the reward of cheating (8 Astonishing Stats on Academic Cheating, n.d.). The New York University *Dispatch* attributed the rise in student cheating to both an increasing workload and changing work ethic in the Millennial and Gen Z students (What impact is technology having on student cheating?, 2018).

Cheating is not isolated to college students. The majority of the students that cheat in college begin in high school. According to a study by the Ad Council and Educational Testing Service (ETS), between 75% - 98% of college students who confessed to cheating reported that they had cheated in high school (8 Astonishing Stats on Academic Cheating, n.d.). Astonishingly, the same Ad Council and ETS study reported that only 41% of Americans and 34% of college officials considered academic cheating a serious issue. This, along with the statistics that show 95% of cheaters don't get caught, may make instructors wonder why they should worry about cheating at all (8 Astonishing Stats on Academic Cheating, n.d.). If colleges and universities are to maintain accreditations, uphold academic integrity, and sustain a competitive edge, administration must consider academic cheating a serious issue. In a 2011 Pew Study, 1,055 presidents of two-year and four-year private, public, and for-profit colleges and universities were surveyed. Of those surveyed, 55% stated that plagiarism had significantly increased over the last ten years, and 89% of those said that computers and the Internet have played a major role. The survey also included 2,142 college student ages 18 and older. Of the recent college graduates, 57% reported using a laptop, smartphone or tablet computer in class at least sometime. However, most colleges and universities do not have documented guidelines on the acceptable use of technology in the classroom. Of the presidents surveyed, 41% said students were allowed to use laptop and portable devices during class, 56% stated that the decision was left up to the individual instructor, and only 2% stated that the use of such devices was prohibited (Parket, Lenhart, & Morre, 2011).

Nearly 20 years ago, Caruana cited a study that found that business students had a much higher cheating rate than those in engineering sciences and humanities (Caruana, Ramaseshan, & Ewing, 2000). The 2012 survey from

BestCollegeReviews.org also stated business students in its list of students identified as cheaters, as well as athletes, fraternity and sorority members, younger students, and unprepared students with large workload (Cheating in High-School and College the Numbers, n.d.). In 2009, Simkin and McLeod discussed the link between cheating in college and cheating in the workplace. The same year, the Association for the Advancement of Collegiate Schools of Business (AACSB) updated their accreditation requirements to include business ethics as a formal and required component of a school's undergraduate degree program (Simkin & McLeod, 2009). A 2014 study of accounting faculty in North America looked at both the impacts of technology on academic dishonesty in accounting programs and the faculty's perspective of the dishonesty. The study stated that reported incidents of academic dishonesty had increased over the past five to ten years, citing rapid adoption of new technologies, such as smartphones and wearable smart devices, as well as social media and online information as part of the cause. Forty-two percent of the 389 faculty responding reported exam cheating in their classes, while 45% felt appropriate university policies had not been adopted. The study also noted that the academic dishonesty took place at all levels of the program, not just the introductory courses (Sayed & Lento, 2016).

Studies agree (Sayed et al.,2015) and (Simkin et al., 2009) that students appear to engage in academic dishonesty because of the desire to succeed and make good grades, the opportunities that exist to do so with a minimal chance of getting caught, the small to non-existent penalties at some institutions for such actions, the reluctance of many faculty to accuse students of such actions either without solid evidence or due to amount of paperwork and hearings that follow the accusations, and the possible change in the moral cultural as to what constitutes cheating and its being seen as a victimless crime. In an April 2019 interview with Dr. Jeff Appling, Associate Dean of Undergraduate Studies at Clemson University, he stated that he was caught off guard with the types of cheating he had to deal with when he initially took the position in 2005. Today, nothing surprises him, but he notes that many professors feel that dealing with cheating is 'the worst part' of the job (Simon, 2019).

A quick 2019 Google search on "How to cheat on a college exam" produced 32,400,000 hits including 412,000 how to videos on the topic. Academic research on technology used to cheat in the classroom (Jones, et al., 2008; Sirkanth, et al., 2013; Bachore, 2014; Bain, 2015; and Sheets, et al., 2009) discusses many devices that may be common knowledge. Some of the more common techniques/devices include programmable calculators, mobile phones, smartphones, smart watches, invisible ink pens, and wireless receivers. Programmable calculators are not new; they allow students to store formulas, periodic tables, and history of previous calculations. However, newer versions also allow Wi-Fi and Bluetooth connections, allowing students to connect to the Internet and each other. In addition, an instructor may also have to question if the device is actually a calculator at all, as new cell phone covers allow a cell phone to look like a standard calculator. Once the instructor is not looking, a section can be removed to review the phone's screen with full capability. Mobile phones allow students to text and communicate with each other during exams and take pictures of exams to share with others. Some also have the capability of recording a lecture so a student can listen to it during the exam with

an earpiece. Smart phones take it a step further and allow students to connect to the Internet, store multiple documents and even when out of sight may still be communicating with them in other ways via a smart device such as a smart watch.

Watches have had 'smart' capabilities since the 1990s, but it was not until 2015, when Apple produced the Apple Watch, that watches could run applications and connect to Wi-Fi. The Apple watch, Samsung Galaxy, and Fitbit may be common watches instructors know to look out for. However, other smart watches are disguised as generic watches, with a blank screen. When the instructor walks away, they can switch modes and connect to the Internet and other Bluetooth devices. Many of the new technology tools used seem more like spy gear--Bluetooth pens, glasses and watches that work together to only reveal the information with the correct glasses, and wireless earpieces and microphones to ask questions and receive answers while in an exam. While faculty may be on the lookout for these high-tech tools, they may overlook the water bottle right in front of them. Students have long forgone the technique of writing notes on the inside of the water bottle label. Today, they use templates of the labels to mimic the label but it actually contains notes, formulas and information to assist on the exam (Sirkanth, Asaduzzzman, & Asmatulu, 2013).

Some faculty do use technology themselves to catch technology-facilitated cheating instances. One such device that instructors can use to combat some of the modern technology tools that students are bring to exams is called the Pocket Hound. The Pocket Hound is a handheld device that signals when active cell phone transmission is taking place. Faculty can walk around the classroom and the device will signal and vibrate at it picks up cell phone signals (Tomaszewski, n.d.). Numerous proctoring tools also exist to catch cheating instances in an online testing environment. Some schools, such as the authors' institution, have standardized on a specific proctoring tool the entire university uses for online courses. No such standardization exists on what is done in face-to-face classes. No matter what lengths faculty may take to eliminate technology-facilitated cheating opportunities, in all likelihood they will always "run behind" new technology-facilitated capabilities.

This small review of the literature related to college student cheating illustrates that the problem will not magically go away and that new ways to cheat with technology are constantly emerging. The College of Business CIS instructors conducting this research project have questioned whether faculty across other disciplines within their University have similar outlooks on dealing with college-student cheating with technology and whether there are lessons to be learned from other faculty experiences and perspectives. These concerns have led to a planned two-phase research project over the next year. Phase one includes a survey of faculty at the researchers' university; results of this survey are reported in this paper. Phase two of the research will be conducted following analysis of the faculty survey and will include a survey of students at the researchers' university; results of the phase two survey will be reported in a separate paper in future years.

RESEARCH METHODOLOGY

During the 2019 fall semester, the authors designed a survey to be administered to faculty in all disciplines within their university. The University's Human Subjects Institutional Review Board reviewed the study plan and survey design and granted approval to proceed with the dissemination of the survey. Faculty were emailed a link to the survey created in Qualtrics. In addition to capturing demographics of faculty participants to facilitate analysis, this survey addressed issues such as frequency in reporting cheating incidents, level of cheating incidence that drives reporting "up the chain" of academic administrators, what types of electronic devices they have found students using to cheat, what technology they recognize and ban during exams, whether they personally use any electronic devices to help catch cheating activities, and their perspective of where student cheating ranks in relation to negative aspects of teaching as a profession.

DATA ANALYSIS

Of the 273 full-time faculty members at the researchers' university, 99 responded to the survey for a response rate of 36.2%. Gender, college, and years teaching were used as independent variables for the study. Characteristics of the survey respondents are summarized in figure 1 below.

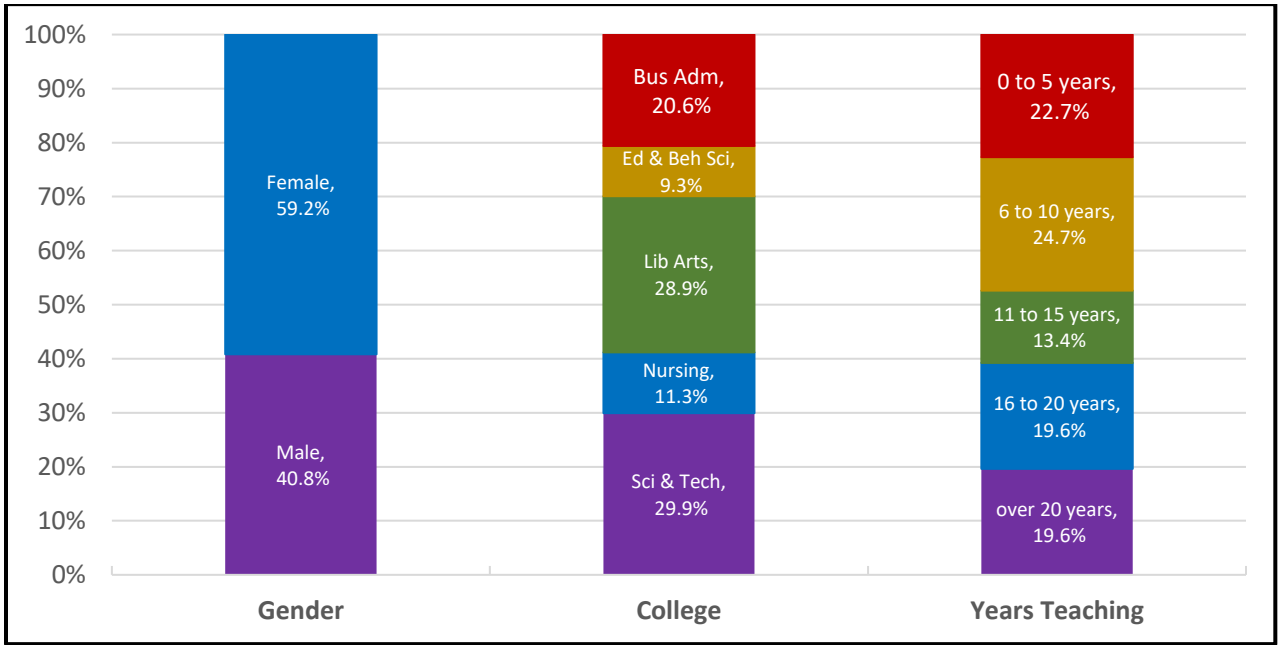

Figure 1. Summary of Responding Faculty Characteristics

In summary, most of the respondents are female (59.2%), Sciences and Technology faculty (29.9%), and have been teaching for 6 to 10 years (24.7%). When combining the more experienced faculty of 16 years of more, they represented 39.2% of the respondents. The Liberal Arts faculty are the second largest group to respond, 28.9%, followed by Business Administration faculty (20.6%). The smallest responding college is Education and Behavioral Sciences (9.3%) and those faculty in their "middle years" of teaching, 11 to 15 years at 13.4%.

The variety in level of courses taught is displayed in figure 2 below. Most faculty,

40.8%, teach all levels of undergraduate courses. Teaching lower-level undergraduate courses along with graduate courses or teaching only graduate courses were the two lowest percentages, both at 2%. The percentages of faculty teaching just lower-level undergraduate courses (17.3%), teaching the entire spectrum of courses, freshmen through graduate (16.3%), and teaching upper-level undergraduate courses (13.3%) were close in size. The remaining faculty (8.2%) taught upper-level undergraduate and graduate courses.

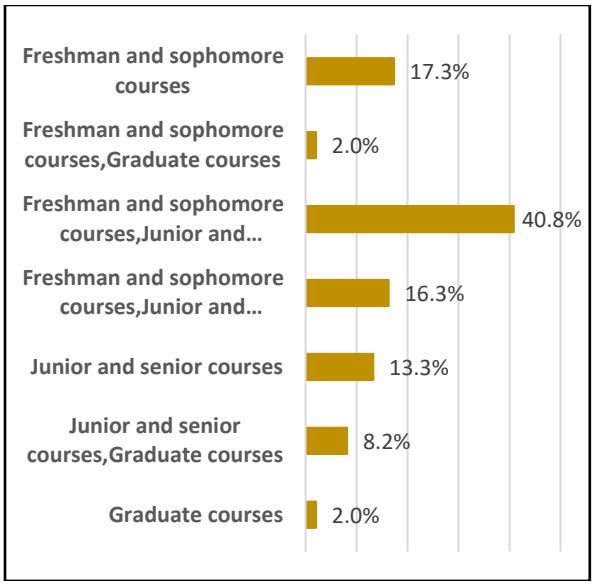

Figure 2. Levels of Courses Taught

The mean and standard deviation for each of the dependent variables were computed (see table 1). The questions used a five-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) for answers choices. Of the five questions, "*I take appropriate actions when I find or suspect a student of cheating*" had the highest mean (*M* = 4.39, *SD* = .806) while the dependent variable "*The level of cheating penalty is based on the values of the assignment or exam*" had the lowest (*M* = 3.25, *SD* = 1.207).

Table 1. Mean and standard deviation of dependent variables

Question	N	Mean	Std Dev
Cheating is a problem in my classroom and/or on our campus	99	3.49	1.014
I take appropriate actions when I find or suspect a student of cheating	99	4.39	.806
The level of cheating penalty is based on the values of the assignment or exam	99	3.25	1.207
Administration supports the commitment to reducing cheating among students in their academic studies	99	3.57	.971
Dealing with student cheating falls within the negative aspects of your classroom teaching/job duties	99	3.72	1.050

Independent Samples t-tests and Analysis of Variance

Independent samples t-tests were conducted to gender, college, and years of teaching. All tests were conducted to the .05 level of significance. Relating to the five questions on the survey, hypotheses (H1-H5) were formulated about the differences in the mean of the dependent variables by gender. One hypothesis in this grouping was found to be statistically significant. The hypothesis was do male faculty feel the same about the statement "*Dealing with student cheating falls within the negative aspects of your classroom teaching/job duties*" as female faculty members? Males had a mean of 3.38 while females had a mean of 3.97. Equal variances were not assumed (sig. = .023) and the hypothesis of equal means was rejected (sig. = .009).

Table 2. Independent Samples t-test grouped by age, N=99

Hypothesis	Met Test Assumption	Test Outcome	Sig. Level
H_o: Mean of *"Dealing with student cheating falls within the negative aspects of your classroom teaching/job duties"* for Males = Mean of "*Dealing with student cheating falls within the negative aspects of your classroom teaching/job duties*" for Females	Yes, equal variances not assumed	Reject H_o	.009

Using the independent variable **college**, five ANOVA tests were established, where the Likert-type statements were the factors and **college** was the variable. None of these five hypotheses were found to be statistically significant. Another five ANOVA tests were established using **years teaching** for the variable and the Likert-type statements as the factors. None of these five hypotheses were found to be statistically significant.

Open-ended Responses

The survey also asked faculty to identify specific situations in their classroom where they observed students attempting to cheat using some form of technology. Faculty were asked the open ended question, "*What 'cheating with technology' scenarios/ technology have you observed in your classes?"* Forty-nine of the 99 overall respondents, just under 50%, responded to this question. The responses are displayed in figure 3. Most of those responding listed more than one use of technology, and often times some were used in conjunction with others. For instance, several faculty stated the use of cell phones and smart watches to access the internet or screen shots of notes during an exam. Of those responding, the most identified technology stated was cell phones. Twenty of the 49 who provided example situations, or 40.82% have witnessed students attempting to cheat with cell phones. This includes using the cell phone to access the internet, review saved pictures of notes, taking pictures of quizzes or exams, and listening to notes with the use of earbuds.

Plagiarism is the next most stated observation. Many of the scenarios did not necessarily take place during class or an exam, but with work submitted. Copying and pasting work from the internet, not properly citing work from online sources, and plagiarizing essays was stated by 22.45% of faculty. In addition, 16.33% of faculty listed submitting another student's work as their own by submitting files, copying other's discussion posts, or trying to screen shot another student's work and submitting it as his/her own. Math faculty, music faculty, and foreign language faculty listed the use of online sites and apps to assist with course material and exams. Apps such as Mathway, Socrates, and Shazam were mentioned.

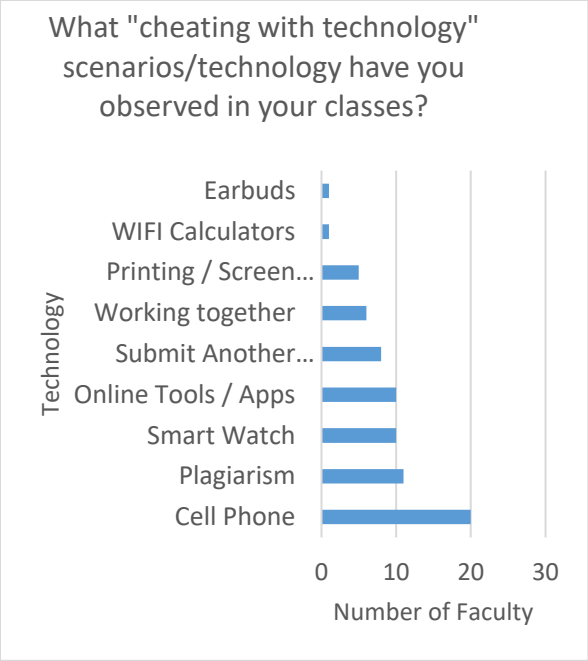

Figure 3. "Cheating with Technology" Observed in Classroom Responses

Banned Technology

Faculty were also asked, *"What technology do you specifically ban in your classroom during exams (check all that apply)?"* They were given the options to select from of Smart Watches, Phones, Earphones, Advanced Calculators, and Other where they could list other items they banned during exams. Eighty-one of the 99 overall respondents, or 81.2%, responded to this question. The responses are displayed in figure 4. Of those responding, 96.3% ban cell phones during exams, while 59.2% ban smartwatches. Earphones were also noted by 54.3% of those responding. Advanced calculators, including the more complex graphing calculators and WiFi calculators were listed by 40.7%. Of the 19 faculty citing other technology, 47% listed computers, laptops and/or IPad. Five stated that they banned all electronics from exams, requiring all bags to be placed in a special location and only paper and pencil on the desk during an exam.

Figure 4. Technology Banned in Classroom during Exams Responses

CONCLUSIONS AND FURTHER RESEARCH

Cheating in the classroom environment is not a new concept. Literature review statistics show that more than half of college students reported that they have cheated on assignments or exams and that this is a nationwide problem that crosses all disciplines in a university environment. It is a challenge that both administrators and faculty recognize and struggle to handle.

In a fall 2019 survey of all full-time faculty at the researchers' university, 36.2% took time to complete surveys; the respondents represented a good mix of males and females, faculty in all five major academic colleges, and faculty with various years of teaching experience. The researchers are interpreting this as an acknowledgment that many faculty deal with student cheating issues and wanted to share their opinions and comments.

As noted by one survey respondent's open comments, sometimes students may still use old fashioned ways to cheat: *"Old school -*

attempting to "swap" exams or writing their friend's name on their exam and vice versa." Another survey respondent noted a situation that, "*at least one student admitted that her mother "helped" her with her written answers."*

More recently, rapid developments in technology have facilitated the many creative ways students can now use to cheat on assignments and exams. The addition of technology such as cell phones with cameras, recording and play back capability, and internet access, along with smart watches and WiFi throughout most campuses have made the task of finding cheaters more challenging for the college professor.

The responses from the survey show that faculty strongly agree (4.39 mean on a 5-point scale) that they are taking the appropriate actions when they find or suspect a student of cheating. The other four questions related to cheating being a problem (mean =3.49), levels of penalty based on values of work (mean = 3.25), administration supports commitment to reduce cheating (mean = 3.57), and dealing with cheating falls within negative aspects of job duties (mean = 3.72) were all between neutral and agree means. Only one significantly different response emerged when Independent sample t tests were conducted—female faculty agreed more strongly than male faculty that dealing with student cheating fell within the negative aspects of their teaching duties.

If the responsibility to stop or deter students from cheating falls primarily on the faculty member, and is not directed by the university's administration, then students may be getting mixed signals on the university's position on cheating. Now that faculty have shared their input, further research will be conducted at the researchers' university on the student's perspective. This could include how students perceive the university policies on cheating, what students perceive as cheating, what have students witnessed as cheating, what are their thought regarding grades and cheating, and what cheating students have participated in.

This study's focus was primarily on cheating in the traditional college classroom. However, several of the responses from faculty specifically stated situations of students cheating in online classes. Others depicted both online and traditional students using collaboration technology and working in groups on individual assignments and quizzes. Another aspect for further research could focus on online courses and programs, again looking at both faculty and student perspectives.

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SOCIAL MEDIA AND ITS IMPACT ON EMPLOYEES

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ABSTRACT

As a new generation of employees begins to enter the workforce, individuals must be aware of new sets of challenges. One of those challenges is the effects of social media networking sites on an individual's ability to receive a job offer. More often than not, people do not always think about how their social media accounts (specifically Facebook and LinkedIn) affect how employers perceive them. As social media networking sites become an essential part of background checks for future employees, it is important for college students to be aware of how employers perceive their social media content.

SOCIAL MEDIA, RECRUITING, HIRING, AND FIRING

As the Internet changed how Human Resources interacted with future employees, researchers began to examine how employers used social media sites to examine applicants. Brown and Vaughn (2011) examined how often employers view social media accounts of their job applicants. According to a 2009 survey by CareerBuilder, 45% of 2600 hiring managers reported searching social media networks to search for job applicants. This was a 22% increase compared to the 2008 data (Brown & Vaughn, 2011). With this data, the authors examined the potential misuses of utilizing social media as a screening process for job applicants. Some of the potential risks included "… perceptions of invasion of applicant privacy, lack of clearly identifiable theoretical constructs used in the screening process, and the absence of data to support that the information used in screening is job relevant" (Brown & Vaughn, 2011, p. 220). Additionally, Brown & Vaughn (2011) questioned whether it is possible for employers to develop a standardized process of viewing social media accounts across all job applicants. Should there be a standardized process of viewing social media accounts across all fields? How should this standard be created? Others may argue that a picture of a job applicant drinking does not hold the same concerns in the field of business as it does in the field of education. Further, what are the legal implications of a type of standard for the employers?

Brown and Vaughn discussed this type of legal implication by identifying a scenario within the city of Bozeman, Montana. In 2009, city officials required all applicants to, "… provide user names and passwords for any and all, current personal or business Web sites, Web pages or memberships on any Internet-based chat rooms, social clubs or forums, to include, but not limited to: Facebook, Google, Yahoo, YouTube.com, MySpace, etc." (2011, p. 221). The city defended their position by stating it was a part of their background check investigations. When examining this situation, employers must think about applicant's privacy rights should they wish to use social media checks as part of their background check processes.

While the situation in Bozeman, Montana, occurred in 2009, the legal implications surrounding social media networking sites are still being questioned today. Schieber

examined a case with the Equal Employment Opportunity Commission; whereby, job seekers filed charges against Facebook and nine employers. The case focused on how employers used Facebook's technology to exclude women from company job postings for positions such as truck driver and window installer. Advertising campaigns appeared to "… have violated federal law, which forbids employers and employment agencies like recruiting firms to discriminate on the basis of gender, among other categories" (2018, para. 4). While the companies could have easily aimed ads to women as well, they did not. However, some employers argued that their tactics are a part of a broader campaign to be more inclusive by using different social media sites to reach different audiences (Schieber, 2018). While it is important for employers to use different social media outlets to reach job seekers, employers must be aware of how they are reaching their target audiences. While employers may have a target audience in mind, they must make sure they are not discriminating against certain groups.

While the job seekers in Schieber's research were aware of employer misuse of social media in recruiting job applicants, many young adults are not always aware of how social media can impact their chances of being hired with an employer. Drouin, O'Connor, Schmidt, and Miller (2015) examined young undergraduates and their opinions regarding social media and its usage by employers. The authors conducted a study with 442 undergraduate students at a Midwestern university. Students were given a 5-question survey:

1) A person's Facebook or Twitter account should not be used to make hiring or firing decisions.
2) It is acceptable for a teacher (k-12) to post a picture on her Facebook site of her holding a beer during a vacation to Ireland.
3) If a teacher (k-12) engages in lewd behavior [legal definition provided] at a bachelor or bachelorette party, and someone posts and tags pictures of that teacher online, the teacher should lose his or her job.
4) People should be able to post pictures of private events (e.g., parties) without threat of losing their jobs, even if those pictures contain lewd behavior [legal definition provided].
5) I fear that some pictures/videos posted of me will hurt me in my job search (p. 125).

The students were asked to rate each of these statements on a 5-point scale (1=strongly disagree and 5=strongly agree. Forty-two percent (42%) of participants indicated that they believed "… social media should not be used for hiring and firing decisions" (Drouin et al., 2015, p. 126). Additionally, 53% of participants agreed that it is "…acceptable for a teacher to post a picture of herself holding a beer on a social networking site" (Drouin et al., 2015, p. 126). The participants in this study did not appear to understand fully how an inappropriate post could influence their employers' perception of them. These types of photos could result in disciplinary action by some employers. Davidson, Maraist, and Bing (2011) examined these kinds of disciplinary actions when using different social media networks (such as Facebook, LinkedIn, and Twitter).

Davidson and others (2011) included some real-life examples about how social media content has affected employees in their workplace. For example, an employee's Twitter rant caused him to be fired from his

job, while another college graduate was not hired because the company saw her binge-drinking pictures on Myspace. These scenarios illustrate how Human Resources (HR) Departments can perceive social media content of job candidates and employees. While the authors argued that HR Departments should not solely rely on information from social media networking sites for termination or disciplinary actions, they recognize that companies still have decision-making power when it comes to the perception of job candidates and their social media content. Many students do not understand this type of decision-making power by employers and their perceptions of prospective job candidates' social media content.

Bridgstock (2019) identified how undergraduate students do not utilize social media networking sites to the best of their abilities for job searching. While university-aged students (18-24) comprise the largest portion of social media users, they do not use social media for professional purposes as much as they should. Bridgstock (2019) relied on additional studies to support her argument that "… students lack the professional skills" to use LinkedIn (p. 144). While companies continue to use LinkedIn and other social media sites heavily for recruitment, college students must be equipped with the necessary skills to use these websites effectively.

In order to equip students with the necessary skills to use these sites effectively, some researchers are examining how students and job seekers perceive themselves and their own content online. El Ouirdi, Segers, El Ouirdi, and Pais identified two types of self-disclosure techniques by job seekers: inappropriate self-disclosure and career-orientated self-disclosure. The results of their study indicated that respondents with high professional image concerns increased their levels of career-oriented self-disclosure (2015, p. 9). Further, the authors argued that it is important for both job seekers and employees to monitor their self-presentation on social media. Job seekers can monitor their self-presentation on social media by creating beneficial content on their LinkedIn profiles.

Chiang and Suen (2015) identified ways that users can establish beneficial content that will help how recruiters perceive them. Out of several LinkedIn features (i.e., profile picture, profile summary, experience, volunteer experience, projects, languages, publications, education, discussion posts, recommendations), the authors were able to identify specific features that resulted in a positive perception by recruiters, including credibility for specific presentation categories, especially when recruiters view the job candidate as qualified for the job. These results were important as it informed job seekers the importance of establishing credibility within their LinkedIn profiles.

While the disconnection between employers and job seekers will remain, researchers can all agree that it is important for college educators to teach the importance of using social media networking sites as part of their students' job search as well as understanding the potential harms of social media sites (Alexander, Mader, & Mader, 2019). Countless stories illustrate how social media can affect one's job search. For example, Broussard (n.d.) described a situation in which her Facebook settings were set on private for her boss; so, when her boss tried to write "Happy Birthday" on her Facebook wall, she was not able to see it. From this awkward scenario to an inappropriate Twitter post to a newsworthy Facebook page to crude jokes, employees can lose their jobs from many different avenues due to their social media content (Parris, 2015).

While there are countless horror stories about social media, there are also success stories about social media helping people land their jobs. Many authors stressed the importance of having an active LinkedIn presence (Lacy, 2011). Being an active LinkedIn user can be established in many different ways, such as creating a professional image to sharing expertise on an issue to engaging in group discussions (Smith, 2013). By building a solid LinkedIn network with co-workers, personal contacts, and potential connections, people may have higher chances of receiving job offers (Adams, 2012). Even though many job seekers have heard the negative impacts of social media, it is also important to recognize the positive results of connecting with employers on social media.

SOCIAL MEDIA AND THE FUTURE

The sources within this literature review focused on three main aspects of social media and the future of employees: 1) how employers engage with prospective employees on social media, 2) how employees understand the ramifications of their social media content to their employers, and 3) the problems that can exist for employers using social media as a tool for hiring and firing employees. While the literature does not always agree, researchers provided important information for prospective employees. A constant agreement does exist that more needs to be done in colleges and universities to prepare students for the workforce using social media appropriately and effectively. Today's students do not understand how to use social media sites such as LinkedIn effectively. While many colleges and universities are teaching students about the implications of posting bad behaviors on social media, more education should focus on how to use these social media sites in a positive way. Educators must prepare students to use social media effectively to compete in the global workforce. As technology continues to impact how companies recruit and hire, students must become fully aware of the positive and negative effects of their social media presence in their job searches.

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PEDAGOGICAL GUIDE FOR INTEGRATING R WITH TABLEAU TO PERFORM BASIC STATISTICS

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ABSTRACT

Analytics and business intelligence are becoming necessary for businesses and organizations to be competitive, consequently, the demand for employees with analytical skills is also increasing. Many universities and colleges are introducing analytics courses into their degree programs and curriculum. Majority of the analytics programs include courses in data visualization and Tableau is one of the leading tools for teaching data visualization.

Tableau is a powerful data visualization tool that enables non-technical users to analyze, interpret, explore and visualize data for decision-making. One major drawback of Tableau is the inability to perform some basic statistical analysis, such as T-Test and multiple regression. The goal of this instructional guide is to provide step-by-step instructions on how to integrate R into Tableau and invoke R functions in Tableau to perform basic statistics, such as T-Test and multiple regression analyses.

An instructional guide on the integration of R and Tableau can facilitate the teaching of basic statistical concepts using Tableau. This guide will also inform students on how to integrate Tableau with R and perform statistical analysis in Tableau by invoking R functions.

INTRODUCTION AND BACKGROUND

Business analytics and evidence-based decision-making are necessary for many organizations and businesses to be competitive. Thus, the demand for employees with analytics skills is increasing and many colleges and universities are revising, updating, and changing their curriculum to produce graduates with analytics skills (Gorman and Klimberg, 2014; Ransbotham, Kiron, and Prentice, 2016).

Many of the analytics programs include some data visualization courses, and most often these courses are taught using Tableau. Tableau is a graphical tool for performing ad-hoc exploration and analysis of data sets. Due to the user-friendly graphical interface and intuitive drag and drop features, Tableau enables non-technical users to analyze and explore data on their own (Murphy, 2013). Tableau's data visualization tools improve decision-making by enabling users to query, blend, explore, discover, and then analyze and present data in new and compelling ways(Ko and Chang, 2012). Tableau shifts ownership of analytic work from technical experts or data analysts to the average user.

Tableau is increasingly becoming a leading tool for teaching data visualization in institutions of higher learning. The popularity of Tableau in academic programs stems from the academic programs that Tableau Software Inc provides for universities and colleges. Through these academic programs, Tableau Software Inc. provides a full one-year user license to use Tableau for instructional purposes. The free licenses encourage universities, colleges, and instructors to use Tableau in the classroom to teach data visualization.

Additionally, the cloud version of Tableau is freely available with minor limitations. These benefits and incentives make Tableau an important instructional tool in many analytics programs. Students around the world get Tableau Desktop and Tableau Prep Builder for free and instructors can use the free license request process to get access and include Tableau in teaching data visualization (Tableau Software, 2019)

PEDAGOGICAL GOALS

Despite the versatility and intuitive user interface, Tableau is unable to perform certain statistical functions. A notable absence is T-Test and F-Test statistical analysis. These concepts are fundamental to many statistical analyses and techniques. T-test analysis is fundamental and important in descriptive statistics; however, Tableau does not have the capabilities to perform this analysis. Furthermore, Tableau's ability to perform regression is limited to simple regression and cannot perform multiple regression with more than one independent variable.

Notwithstanding these limitations, Tableau is flexible and can seamlessly integrate with other software packages and leverage functionality in other software packages, including R and Python. Thus, Tableau can leverage its integration features to extend its capabilities to perform analysis not built into Tableau. The purpose of this instructional guide is to demonstrate how to integrate R into Tableau and use Tableau to teach basic statistical concepts such as T-Test and multiple regression using Tableau.

R SOFTWARE AND TABLEAU

Tableau Desktop can connect to R through calculated fields and take advantage of R functions, libraries, packages, and models.

You can also import datasets from R directly into Tableau without using functions or calculated fields . Calculated fields dynamically invoke the R engine and pass values to R via the Rserve package and the outputs of the analysis are returned to Tableau. Most of the capabilities and functionality in R can easily be integrated into Tableau.

Tableau version 2019.1.0 64-bit version has four built-in functions that can call specific R functions. The built-in Tableau functions are:

- SCRIPT_REAL( )
- SCRIPT_STR( )
- SCRIPT_INT( )
- SCRIPT_BOOL( )

These functions are distinct only in the type of result they return: a real number, a string, an integer, or a Boolean. The arguments you pass into each of these functions include R-language scripts and function calls. You can pass one or more arguments to R, which are then passed dynamically via Tableau. If there are mixed types (e.g. mixed number and text values), it can be returned as a string using SCRIPT_STR. For example, you can pass the GPA of students and major for each student. In most cases, a single variable output is returned to Tableau. However, the function calls can also return data frames from R, one column at a time.

To integrate R into Tableau, a few tasks must be performed in both R and Tableau for the two applications to communicate and for Tableau to invoke R functions and receive output of function calls from R These are the steps that must be performed in R

STEPS IN R

1. **Download and Install R.** .
2. **Download and Install Rserve package.**

You must install a Rserve for Tableau to connect to in order to utilize the new script functions. In the R console, enter the following commands: I have included comments to indicate the purpose of each line of code

```
install.packages("Rserve")
        ## install the Rserve package
library(Rserve)
        ## load the Rserve libraries
Rserve( )
        ## Start the Rserve service
```

Once you have successfully installed packages, loaded the libraries, and started the Rserve service, R is ready to communicate with other software packages, including Tableau

STEPS IN TABLEAU

Complementary steps are necessary in Tableau to integrate R with Tableau. Launch the Tableau application and follow the steps below to confirm that Rserve is running and ready to accept connections from other software packages, including Tableau. In Tableau follow the steps listed below

1. In the Help menu and select "Settings and Performance"
2. Select "Manage External Service Connection".
3. Enter a server name of "Localhost" (or "127.0.0.1") and a port of "6311".
4. Click on the "Test Connection" button to make sure everything runs smoothly.

You should see a successful message, indicating that the connection from Tableau to Rserve is successful and you can invoke functions from R in Tableau. Click OK to close the External Service Connection dialogue box .With a successful connection to the Rserve, you can create calculated fields in Tableau that utilize the SCRIPT_* functions to invoke R functions and display the output of the functions in Tableau. This instructional guide demonstrates how to perform T-Test and multiple regression in Tableau by invoking functions from R and displaying the output in Tableau.

T-TEST

A T-test is a univariate hypothesis test, used when the standard deviation is unknown, and the sample size is small. The *t*-test can be used to compare means and to determine if the means of two sets of data are significantly different from each other. Among the most frequently used *t*-tests are:

- A one-sample test that compares the mean of a population to a sample mean
- A two-sample test that compares the means of two populations. **Student's *t*-tests** is normally used when the variances of the two populations are assumed to be equal;
- The Welch's *t*-test is used for independent samples to compare the means of two non-overlapping samples

For example, the Welch's T-test can be used to compare the Scholastic Aptitude Test **(**SAT) scores from University A and University B to determine if the SAT scores from the two universities are different. You can accomplish this task in Tableau with the following steps

1. Click on Analysis in the menu bar and then select Create Calculated Field

2. Type in a name for the Calculated Field and type the following code

```
SCRIPT_REAL(                    //
function to invoke R functions
"ttest<-t.test(.arg1,.arg2);    //
invoking the t-test function
ttest$p.value",                 //
Returning the p-value as a real number

SUM([SATA]),
        //Aggregate the data to be sent to R,
represent .arg1
SUM([SATB])
        //Aggregate the data to be sent to R,
represent .arg2
)
```

The results or output will be a real number representing the p-value from the T-Test conducted to compare the average SAT score for university A and university B. Table 1 displays the output generated by a Welch Two Sample t-test in R. You can specify in your code how you want the output and what output you want from the analysis in Tableau. In the example above, the code retrieved only the p-value. In the multiple regression example, the code demonstrates how to retrieve multiple values from the output generated by R

Table 1: Welch Two Sample T Test R Output

```
        Welch Two Sample t-test

data:  mydata$sat_A and mydata$sat_B
t = -0.027729, df = 87.223, p-value = 0.9779
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.8550279  0.8314985
sample estimates:
mean of x mean of y
 12.75490  12.76667
```

This is the output of a Welch's T-test in R and you can retrieve the values in the output using the appropriate parameter. The code example used ttest$p.value to retrieve the p-value. You can retrieve the t statistics using the ttest$statistics

MULTIPLE REGRESSION

Multiple regression analysis is a statistical technique used for predicting a dependent variable from the known value of two or more independent variables, - also called the predictors. It is a statistical technique that simultaneously develops a mathematical relationship between two or more independent variables and an interval scaled dependent variable. As a predictive analytical tool, multiple linear regression is the most common form of linear regression analysis used to explain the relationship between one continuous dependent variable and two or more independent variables. Although Tableau is able to perform regression, it is limited to simple regression using trendlines and cannot perform multiple regression analysis.

The example below demonstrates the code for multiple regression analysis in Tableau. The example uses a data set with 5 variables; tuition, student-faculty ratio, faculty pay, fulltime faculty, and enrollment. The multiple regression analysis estimates tuition using four variables, student-faculty ratio, faculty pay, fulltime faculty, and enrollment. . In Tableau you will

1. Click on Analysis in the menu bar and then select Create Calculated Field
2. Type in a name for the Calculated Field and type the following code

```
SCRIPT_STR
(
"mydata <- data.frame(cbind(tuition=.arg1,
SFRatio=.arg2, FacPay=.arg3,
Fulltime=.arg4, enrollment = .arg5));
fit <- lm(tuition ~ SFRatio + FacPay+
Fulltime + enrollment,data=mydata);

paste(summary(fit)$coefficients[,""Pr(>|t|)""
][2],
summary(fit)$coefficients[,""Estimate""][2],
sep=""**"" )",

SUM([Tuition]),
SUM([SFRatio]),
SUM([FacPay]),
SUM([Fulltime]),
SUM([enrollment])
)
```

In the example of multiple regression, R returns a vector with a set of information about the regression model. Part of the output in the vectors is displayed in Table 2. I converted a part of the output into a string and used the SCRIPT_STR to display the output as a string in Tableau. The script filtered the output to only return the estimates of the coefficient and the p-value for the student-faculty ratio. In this example, the code used the SCRIPT_STR because parameters from the output are concatenated to create a string. The first part of the code defines the model and the parameters for the model. The code uses the paste function to combine the p-value and estimates of the coefficient into a string and return the string value to Tableau

Table 2: Multiple Regression Output from R

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  5.514e+03  8.154e+02   6.763 2.62e-11 ***
sfRatio     -4.371e+02  2.640e+01 -16.561  < 2e-16 ***
facPay       1.635e-01  9.737e-03  16.788  < 2e-16 ***
fullTime     4.244e+01  6.269e+00   6.770 2.49e-11 ***
enrollment  -1.467e+00  1.283e-01 -11.436  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2775 on 797 degrees of freedom
Multiple R-squared:  0.5518,    Adjusted R-squared:  0.5496
F-statistic: 245.3 on 4 and 797 DF,  p-value: < 2.2e-16
```

This is part of the output of multiple regression in R and you can retrieve parts of this output to display in Tableau. The sample code retrieved the p-value and the estimates for the first independent variable sfRatio. You can, for example, retrieve the r-square with this line of code summary(fit)$r.squared
You can also retrieve the F- statistics with this line of code
summary(fit)$fstatistic

CONCLUSION

Using this instructional guide, instructors can teach statistical concepts, such as multiple regression and T-Test, using Tableau and students can learn about how Tableau integrates with R. More importantly, basic statistical concepts, such as hypothesis testing, can easily be integrated into the curriculum and still use Tableau as a tool to teach these concepts. The instructional guide provides students with the opportunity to appreciate the capabilities of R and Tableau integration. Furthermore, student can use Tableau to master basic statistical concepts that will help them understand concepts such as p-value, which is a central concept in many statistical analyses and necessary to interpret many of the statistical output generated in predictive analytics.

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