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Journal Profile

The *Journal of Research in Business Information Systems* (JRBIS) is a national blind-reviewed, refereed publication published annually by the Association of Business Information Systems. This refereed journal includes articles from fields associated with business information systems focusing on theory, problems associated with information systems and information resources in education, business and industry, government, and the professions.

Manuscripts are selected using a blind review process. The first issue of the Journal was available Spring 2008. The Journal is listed in the ERIC Database and *Cabell's Directory of Publishing Opportunities* in Accounting, Computer Information Systems, Education, Instructional Technology, and Management.

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The readership is comprised of college and university faculty, administrators, staff, practitioners, and students engaged in business information systems or preparing for careers in fields related to information resources. The journal is distributed electronically annually to all Association of Business Information Systems members as part of conference registration or membership. The journal is also available online at http://www.abis-fbd.org.

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You are invited to submit manuscripts for publication consideration in the 2016 issue of the *Journal of Research in Business Information Systems (JRBIS)*, a national blind-reviewed, refereed journal published annually by the Association of Business Information Systems (ABIS). According to the Constitution and Bylaws of ABIS, the published articles of *JRBIS* are limited to the papers presented at the previous ABIS Annual Conference and/or published in the *ABIS Proceedings*.

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All manuscripts must be submitted electronically in Microsoft Word format. Manuscripts, citations, and references must use the style format of the 2010 *Publication Manual of the American Psychological Association* (6th edition).

Submissions should include a separate file attachment for the title page that contains the following information in this exact order:

- Title of the manuscript
- Each author's full name; position/title; institutional affiliation, including address, city, state, zip code; home, office, and cell phone numbers; and e-mail addresses (identify the main author who should receive all correspondence).
- Number of words in the article (including all parts--everything)

- Biographical paragraph (50-60 words) for each author
- Any acknowledgments or information about manuscript history (e.g., basis in a conference presentation)

The second separate file attachment should be the manuscript file that begins with the title of the article, a 50-100 word abstract, 3-5 keywords or phrases describing the focus of the article, and the body of the manuscript. **Do not include any identifying information in this file. Do not include any personal identification or institutional affiliation in this file.**

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- 10-25 double-spaced pages (3,000-6,000 words)
- 1" margins all around
- Times New Roman, 12 font-size text within article
- Bold and center primary headings, with major words capitalized
- Bold and left-align secondary headings, with major words capitalized
- No footnotes or endnotes
- No page numbers or headers or footers

Tables and figures may have varying font sizes (but must adhere to APA Style). Include tables or figures formatted and placed correctly within the manuscript.

Include the References page (Works Cited only) at the end of the manuscript, followed by any appendix information, if necessary.

All submissions will be reviewed by the editor and two reviewers, using a blind-review process. Authors will receive feedback 6-8 weeks after the initial peer review. Manuscripts will be "accepted," "accepted with minor revisions," "possibly accepted after major revision and resubmission for further peer review," or "rejected."

The editor reserves the right to edit selected/accepted manuscripts for publication as deemed appropriate and necessary for the optimization of journal publication and format. The author of the manuscript retains responsibility for the accuracy of a manuscript published in the *Journal of Research in Business Information Systems*.

To ensure your manuscript is considered for publication in the 2016 *Journal of Research in Business Information Systems*, submit manuscript by *October 1, 2015*, to marcel.robles@eku.edu.

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Developing High-Demand Skills through an Interdisciplinary Business Analytics Program

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Abstract

Graduates who are skilled in analytics-based decision making are in increasing demand. By 2018, a shortage of 140,000 to 190,000 employees skilled in analytics and 1.5 million managers who can use data to make effective decisions is expected. The ongoing integration of business analytics techniques and processes into the decision-making systems throughout industry provides academic business programs a unique opportunity for program redesign and branding. This research uses interview, focus group, and survey data to provide the foundation for designing an interdisciplinary undergraduate business analytics program. This paper presents the program's mission and objectives, expected business competency and skill development, and plans for software tools integration. Business analytic updates to business core courses are also planned to strengthen majors within all business disciplines. This method of curriculum design can be adapted and utilized in other academic curriculum design efforts.

Keywords: business analytics, data analytics, analytics talent, skills, program design, business curriculum redesign

Introduction

Business Analytics (BA), sometimes discussed under the moniker of Business Intelligence or Big Data, is driving better organizational performance. Some firms that use data-driven decision making are achieving 5 percent more productivity and 6 percent more profitability (McAfee & Brynjolfsson, 2012). Some estimates of BA value indicate that analytics can provide a $200 billion reduction in health care expenditures in the United States, a

60 percent operating margin increase for retailers, and a $149 billion savings in European government administration (McKinsey, 2011). Gartner projects that business intelligence and analytics will play an increasing role in business model reinvention (Gartner, 2013). Dan Sommer, Gartner research analyst, stated:

> We are rapidly heading towards a world of analytics everywhere. Gartner predicts that analytics will reach 50 percent of the potential users by 2014. By 2020, that figure will be 75 percent, and we will be in a world where systems of record, systems of differentiation and systems of innovation are enabling IT, business and individuals to analyze data in a much denser fashion than before. Post 2020 we'll be heading toward 100 percent of potential users and into the realms of the Internet of Everything (Gartner, 2013, p. 1).

This perceived value may be driving the growth of business analytics in organizations. A survey of 662 Chief Information Officers (CIOs) in 2011 found that 83 percent planned to integrate business analytics (IBM, 2011). Another survey the next year of 1,200 business decision makers found that 54 percent of organizations have deployed business analytics and 55 percent intend to invest in business analytics over the next two years (IBM, 2012). Columbus (2014) reports a Signals and Systems Telecom projection that the big data market (hardware, software, and professional services) will grow to $76 billion by 2020—a near 17 percent compounded annual growth rate.

The growth of business analytics functions in organizations is driving a demand for skilled people. Russom (2011) recognized a shortage of skilled business analytics professionals. The shortage appears to be growing: McKinsey (2011) anticipates a shortage of 140,000 to

190,000 highly trained analytical people by 2018, and that estimate also predicts a shortage of 1.5 million managers who can use data to make effective decisions.

Increasing demand for skilled people provides universities a unique opportunity. Information Systems (IS) programs are uniquely positioned to train business analytics professionals (Hsinchun, Chiang, & Storey, 2012). As part of a curriculum development process at a metropolitan university in the southeastern United States, this study seeks to answer the following questions.

- What business analytics skill gaps do employers detect and seek to fill in current business school graduates?
- What courses should be included in a new interdisciplinary undergraduate business analytics program curriculum?

This paper describes a three-phase research methodology used and presents data and results from each phase. The results and implications of the findings are then presented. Limitations of the research are followed by the conclusion.

Literature Review

In an environment of data-based decision making, business analytics delivers value by applying relevant measurable knowledge to strategic and tactical business objectives (Stubbs, 2011). This value-added transformation process requires that an organization view data as a resource and develop analytics practices, build an infrastructure to support business analytics, and develop a data-driven analytical culture of decision making (Kiron, Ferguson, & Prentice, 2013). Davenport (2013) identified a level of maturity in the data analytics field in which analytics has moved from simply enabling the internal corporate decision process to delivering value in customer products and services. This shift is impacting all industries:

> Today it's not just information firms and online companies that can create products and services from analyses of data. It's every firm in every industry. If your company makes things, moves things, consumes things, or works with customers, you have increasing amounts of data on those activities. Every device, shipment, and consumer leaves a trail. You have the ability to analyze those sets of data for the benefit of customers and markets. You also have the ability to embed analytics and optimization into every business decision made at the front lines of your operations (Davenport, 2013, p. 67).

Business analytics has evolved and continues to evolve as new sources of data have become available (Hsinchun et al., 2012). Initially, the data used in business analytics included structured data captured by legacy transaction processing systems and stored in relational databases. The Internet applications provided the next source of data using web-analytics, web-intelligence, and Web 2.0-based social and crowd-sourcing systems. Most recently, the increase in mobile devices, mobile device applications, and sensor-based Internet-enabled devices provide the opportunity for continued development in the field.

A business analytics platform may be assessed based on thirteen capabilities (Sallam, Richardson, Hagerty, & Hostmann, 2011). These capabilities are organized using three categories: integration, information delivery, and analysis. Integration is provided through the platform's infrastructure, metadata management, development tools, and collaboration. The platform provides information delivery through reporting, dashboards, ad hoc queries, Microsoft Office integration, and search indexes. Platforms provide analysis through OLAP, interactive visualization, predictive modeling, data mining, and scorecards. The core focus has been information delivery, but increased interest has developed in analysis and integration.

New research from the Accenture Institute for High Performance also found a critical mismatch between the supply and demand for analytics talent, which it defined as people with the ability to use statistics, quantitative analysis, and information-modeling techniques to make business decisions (Craig, Smith, Mulani, & Thomas, 2012). Current IS curriculums are helping to address the challenge of finding skilled business analytics professionals, but more can be done. The Business Intelligence Congress made the following four recommendations for business analytics programs. First, a broader range of business analytics skills should be provided. Second, an interdisciplinary approach should be used to deliver that broader range of skills. Third, instructors need better access to business analytics teaching resources. Finally, the business analytics offerings should be better aligned with practice (Wixom et al., 2011).

A review of the literature finds general guidelines for the skills that students need. Business analytics education needs to be interdisciplinary and cover analytics, information technology, business domain knowledge, and communication skills (Hsinchun et al., 2012). A more robust list of technical and analytical skills can be found in the literature, but it is not always clear how those skills were derived (Chiang, Goes, & Stohr, 2012). Other researchers highlight the need for in-depth domain knowledge, cohorts that use real data to solve real problems, and the need to be tool agnostic (Dumbill, Liddy, Stanton, Mueller, & Farnham, 2013). However, other than one study that examines marketplace demand using job postings and lists the top database, data warehouse, and business intelligence skills (Shirani & Roldan, 2009), there is little research exploring the list of skills demanded by the job market.

Research Methodology

A three-phase, mixed methods approach was used to answer the research questions in this research paper. In Phase I a qualitative approach, using face-to-face interviews with business

analytics industry professionals, was used to identify the skills gaps that employers seek to fill in current business school graduates. This step was followed by Phase II, where a focus group meeting was held with business analytics representatives to develop program goals for a business analytics undergraduate major and to design a curriculum development plan. Finally, in Phase III a survey approach was used to confirm specific skills needed by analytics professionals and to identify market demand for graduates from an interdisciplinary undergraduate business analytics program. For all three phases of research, the unit of analysis is the organization that each business analytics professional represented, and the unit of data collection is the business analytics professional who participated.

Phase I: Face-To-Face Interviews

During 2013, face-to-face interviews were held with business analytics professionals from six regional Central Arkansas organizations. The main objective of the interviews was to gain an initial understanding of how these organizations use business analytics in day-to-day operations and what business analytics skills are sought in new business school graduates.

The interview protocol included interviewing the identified business analytics professionals using a script that included semi-structured, open-ended questions. The interview questions are presented in Appendix A. Each interview was conducted face-to-face. The interviews were recorded on audio tape after seeking permission from the business analytics professionals. The interviews began with the main questions in Appendix A. Follow up questions were then used when additional information was needed from the interviewees. Typical interviews lasted 15 to 20 minutes.

Phase II: Focus Groups

In Phase II a focus group meeting was held with business analytics representatives from 15 organizations in Central Arkansas. The participants either performed or managed the business analytics functions within the following types of firms: accounting/financial services, business consultancy, insurance, IT services, and marketing. The main objective of the focus group meeting was to explore the following topics:

- Value to organization achieved through business analytics.
- Infrastructure supporting business analytics.
- Analytical tools/systems used, including business reporting/dashboards, forecasting/product analysis, data mining/optimization, and text mining.
- Infrastructure allowing cross organization collaboration/access to data.
- Use of Excel as a reporting or analytical tool.
- Skills/abilities sought in new employees working in analytics-based environments.
- Types of learning experiences perceived to be valuable for business students preparing to work in analytics-based environments.

Phase III: Survey

During Phase III of the research project, a detailed survey of business analytics professionals representing 17 organizations in Central Arkansas was conducted in 2014. The main objectives of the survey were to confirm specific skills needed by analytics professionals and to identify market demand for graduates from an interdisciplinary undergraduate business analytics program. The survey was also designed to address the following issues:

- Value of specific program objectives.
- Value of specific technical skills relating to data analytics.

- Value of potential interdisciplinary courses for inclusion in the program.
- Statistical methods with which an analytics professional should be familiar.
- Software tools, or types of tools, with which an analytics professional should be familiar.
- Corporate value provided by analytics.
- Roadblocks observed as analytics have been integrated into the decision making process.

Data Analysis and Results

The analysis of data and results are presented based on the phase of the research.

Phase I Data Analysis and Results

Once the interviews were completed, the conversations were transcribed. Dedoose (version 5.0.11), a qualitative analysis software, was then used to complete a qualitative analysis of the transcribed interviews. The main objectives of using Dedoose to analyze the interview transcripts were to better understand the demographics of organizations that participated in the interviews, to label text from the transcripts based on known topics, to determine if any new topics or ideas emerged from those transcripts, to classify topics into meaningful categories, to identify the strength of the topics by the number of organizations which discussed those topics, and to explore the relationships among topics by finding which topics occurred simultaneously during the interviews. More details about coding and content analysis are provided next.

Coding

The first step in qualitative analysis is coding of the transcribed interviews. Saldaña (2009) defined a code as a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data (p. 3).

Coding included descriptive coding, topical coding, and thematic coding. Descriptive codes refer to demographic information about the organizations that the business analytics professionals represented. The descriptive codes used in this study include organization sector, organization industry, and full-time employees in Arkansas. The descriptive codes for this study are presented in Table I.

Table I. *Descriptor Codes for Participating Organizations*

Org. #	Sector	Industry	Full-Time Employees (in Arkansas)
1	Technology	IT Services	2,000 – 2,499*
2	Financial Services	Banks	500 – 1,000**
3	Healthcare	Health Care Plans	2,000 – 2,499*
4	Services	Department Stores	2,500 – 4,999*
5	Technology	Telecom Services	1,250 – 1,499*
6	Utilities	Electric Utilities	500 – 1,000***

* Arkansas Economic Development Commission (2013)
** Estimates based on data from Yahoo! Finance (2014) and USbanklocations.com (2014)
*** SPP (2014)

The second step in the coding process was topical coding where the transcribed interviews were reviewed in detail to identify specific codes that could then be applied to the rest of the interview transcripts. This iterative process allowed for emergence of new codes, which could then be applied to the reviewed transcripts again. Table II presents the list of topical codes identified in this process, information about the number of interview transcripts containing the topical codes, and the frequency of occurrence of each code in all six transcripts.

Table II. *List of Identified Topical Codes by Frequency*

Code	Number of Interviews Containing the Code (n = 6)	Frequency of Occurrence
Acquaintance with digital media	1	1
Collaboration with IT	4	6
Data visualization	4	5
Extrapolation	1	1
Trend analysis	3	4
Data-driven decision making	5	19
Domain knowledge	5	8

Client interaction	4	8
Work experience	2	2
Quickness to respond	3	5
Competitiveness	1	1
Confidence	1	1
Detail-oriented	1	1
Likes challenges	2	2
Maturity	1	1
Multi-tasking	1	1
Professionalism	1	1
Self-motivated	1	1
Team player	1	1
Well-rounded	1	1
Work well under pressure	1	1
Communication skills	3	5
Ability to present narrative around numbers	3	10
Writing skills	2	5
Hadoop infrastructure	1	2
COGNOS	1	1
Cloud 9	1	2
MicroStrategy	1	1
QlikView	1	1
SAP	1	2
SAS	3	5
Tableau	1	3
Access	4	5
Crystal Reports	2	2
DB2	1	1
Oracle	2	2
SQL Server	4	6
Excel	5	13
IBM data warehousing	1	1
PowerPoint	2	2
Ability to read programming code	2	3
Basic statistics	5	11
Charting data	3	4
Data analysis, what-if analysis	5	18
Data mining	3	3
Data modeling	5	9
Data reporting	5	10
Database design	5	8
Database management	4	6
Drill-down data	2	3
Evaluating data credibility	3	5
Predictive modeling	3	3

Problem solving	2	2
Project management	1	1
Querying data	4	7
Requirements gathering	1	1
System analysis and design	1	1
Text mining	2	2

The third step in the coding process was pattern coding, where the topical codes identified in step two were grouped into categories based on the research questions in this study. The main goal of this study is to identify the business analytics skills that organizations seek in new business school graduates. The topical codes listed in Table II were categorized into the following pattern coding categories: business competencies, personal characteristics, technical skills, software tools, and soft skills.

Table III presents the five pattern coding categories and the topical codes that belong to each category.

Table III. *Pattern Coding Categories and Their Respective Topical Codes*

Category	Code
Business competencies	Acquaintance with digital media
	Collaboration with IT
	Data visualization
	Extrapolation
	Trend analysis
	Data-driven decision making
	Domain knowledge
	Client interaction
	Work experience
Personal characteristics	Quickness to respond
	Competitiveness
	Confidence
	Detail-oriented
	Likes challenges
	Maturity
	Multi-tasking
	Professionalism
	Self-motivated
	Team player
	Well-rounded

	Work well under pressure
Soft skills	Communication skills
	Ability to present narrative around numbers
	Writing skills
Software tools	Hadoop infrastructure
	COGNOS
	Cloud 9
	MicroStrategy
	QlikView
	SAP
	SAS
	Tableau
	Access
	Crystal Reports
	DB2
	Oracle
	SQL Server
	Excel
	IBM data warehousing
	PowerPoint
Technical skills	Ability to read programming code
	Basic statistics
	Charting data
	Data analysis, what-if analysis
	Data mining
	Data modeling
	Data reporting
	Database design
	Database management
	Drill-down data
	Evaluating data credibility
	Predictive modeling
	Problem solving
	Project management
	Querying data
	Requirements gathering
	System analysis and design
	Text mining

Content Analysis

The coding process was followed by content analysis, which included the three sub-processes of thematic coding, code frequency analysis, and code co-occurrence analysis. The

content analysis sub-process of thematic coding was used to elicit themes or analytical patterns based on the topical codes and pattern codes developed in the coding process. The content analysis sub-process of code frequency analysis is a process of identifying codes that are repeated more frequently than other codes, serving as a proxy for the importance that the interview candidates attach to those codes. The content analysis sub-process of code co-occurrence analysis involves identifying excerpts in the interviews to which multiple codes were applied.

Both content analysis sub-processes of code frequency analysis and code co-occurrence analysis were completed using Dedoose. Table IV presents code frequencies per interview transcript from Dedoose. For the sake of brevity, only the soft skills and technical skills related codes are presented in Table IV.

As seen in Table IV, the media which refers to the six interview transcripts is represented as columns, and the codes are represented as rows. At the intersection of a row and column is the frequency of occurrence of that code in that media. For example, the circled cell in Table IV indicates that the code "ability to present narrative around numbers" was applied a total of six times in the transcript from interview 1.

Dedoose allows application of multiple codes to a single excerpt from the interview transcripts. An excerpt is nothing but a quote from the interview respondent. Figure 2 displays an example of a situation where multiple codes were applied to a single excerpt.

As shown in Figure 2, a single excerpt in the transcript from interview 1 is applied the codes of "writing skills," "data analysis, what-if analysis," "basic statistics," and "querying data" codes.

Table IV. *Code Frequency Analysis*

CODE / MEDIA	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6	Total
Communication skills	3	1	1				5
Ability to present narrative around numbers	6		3		1		10
Writing skills	4		1				5
Ability to read programming code	2		1				3
Basic statistics	5		1	3	1	1	11
Charting data	2		1		1		4
Data analysis, what-if analysis	7	3	1		6	1	18
Data mining			1	1	1		3
Data modeling	1	1	1	2	4		9
Data reporting	1	2	2		4	1	10
Database design	1	2	3		1	1	8
Database management	1	1	2		2		6
Drill-down data	2				1		3
Evaluating data credibility	1		1		3		5
Predictive modeling	1	1	1				3
Problem solving			1			1	2
Project management	1						1
Querying data	4	1	1		1		7
Requirements gathering			1				1
System analysis and design			1				1
Text mining	1				1		2
Total	43	12	24	6	27	5	117

Figure 2 also shows the weights applied to each code. All codes in this research were coded from 1 through 7, where 1 refers to low importance associated with the code by the interview candidate, and 7 refers to extremely high importance associated with the code by the interview candidate.

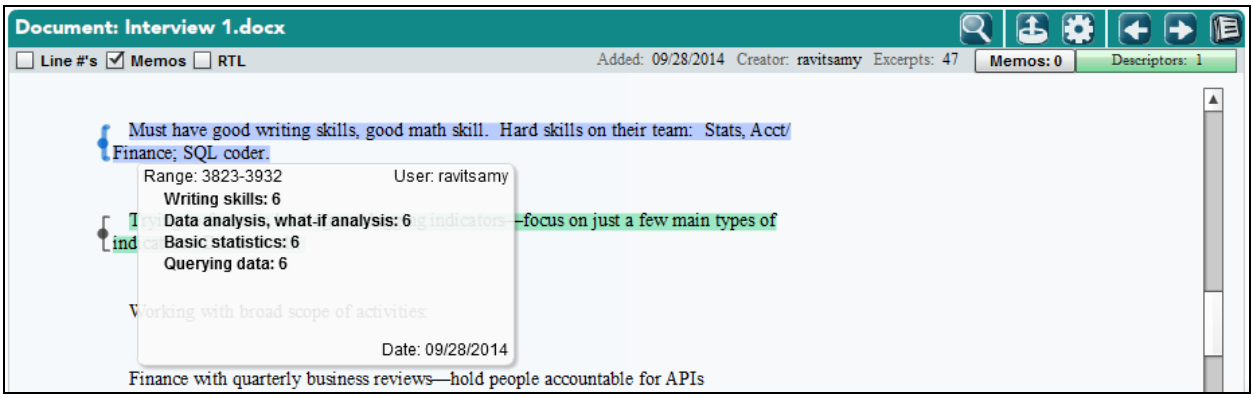

Figure 2. Application of Multiple Codes to an Excerpt in Dedoose

The next step in the content analysis is code co-occurrence. Figure 3 presents code co-occurrence as displayed in Dedoose analysis.

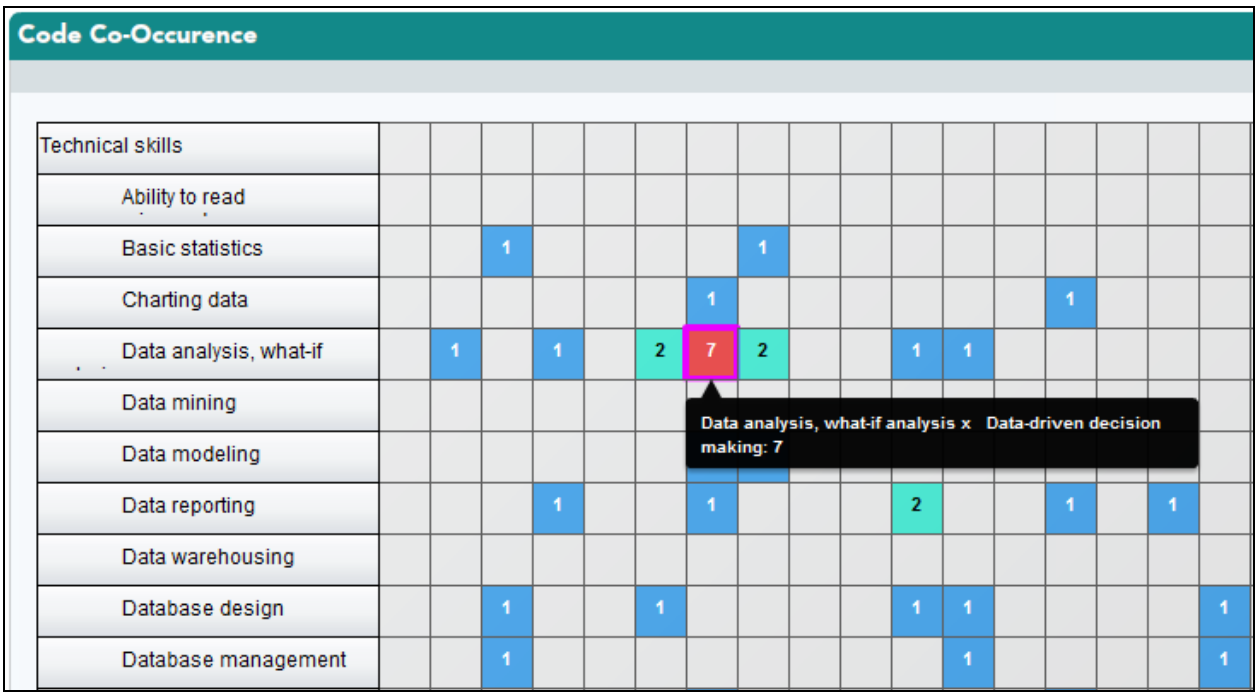

Figure 3. Code Co-Occurrence Analysis in Dedoose

As seen from Figure 3, the codes “data analysis, what-if analysis” and “data-driven decision making” co-occurred seven times in the six interview transcripts.

The main objective of Phase I was to identify the business analytics skills that organizations seek in current business school graduates. Figure 4 presents a code cloud that summarizes the results of Phase I by displaying the skills that business analytics professionals seek most from business school graduates.

Figure 4. Code Cloud for Skills Identified by Dedoose

Phase II Data Analysis and Program Design

The results of Phase II data analysis indicated a high degree of consensus among analytics professionals. Responses to direct questions asked during interviews indicated the following:

- Analytics is used extensively for customer-based decisions.
- Identifiable analytics applications include consultancy, human resource management, marketing, sales, and accounting/financial implications of decisions (valuation of change).
- Analytics is typically a joint activity of IT and analytics staff.
- The analytics team may design reports; users may themselves directly access the system, depending on issue complexity and time constraints.
- The analytics movement has involved a cultural shift within the organization regarding approach to problem solving, including data accessibility. This shift requires an ability to extend decision variables beyond data to include experience/gut reactions; legal/policy, resource, and organizational culture constraints; context knowledge; and value of the decision.

These findings were used to develop program goals for a business analytics undergraduate major and to design a curriculum development plan. Current curricula were analyzed to identify where analytics skill development was currently being developed or could be integrated; areas of needed additions were identified. The overall goal was to develop an interdisciplinary undergraduate business analytics program that delivers an entry-level employee ready to perform the job of a data analyst.

Program Mission and Objectives

Based on the observed comprehensive responsibilities and expectations of employees in analytics-based jobs, the program mission and objectives were developed.

The mission of the business analytics program is to engage students in the process of learning to master the integration of data and analysis that encompasses all

facets of business operations in an effort to strategically position an organization for success. The program prepares graduates who know the value of evidence-based decision making, can leverage data for tactical and strategic value, and can gain competitive advantage through application of knowledge in the business disciplines.

The program focuses on competency development relating to the following curricular components:

- Information Technology—understand structure, transmission, and manipulation of business data.
- Data Analysis—use analytics tools and techniques in the big data environment.
- Decision Making—apply analytics-based knowledge in a business context.

Using an interdisciplinary approach, the business analytics program applies information technology and data analysis skills to decision making in the functional areas of business—accounting, economics, finance, information systems, management, and marketing.

The following business analytics program objectives were developed:

- To effectively communicate situations, analysis, and recommendations using written, oral, and visual methods and tools
- To achieve competency in statistical methods and software tools used for data analysis
- To critically analyze business situations in sales, marketing, accounting, finance, human resources, production, and other business functions
- To develop clean context-rich data, competently model and store data, and effectively and efficiently retrieve data relevant to a decision

- To credibly persuade and willingly adapt recommendations through actively listening to decision-makers and knowing supporting data
- To understand intuition-centric versus data-centric approaches to decisions and to achieve competency in data-centric decision making

Draft Curriculum Design

Based on the foundation of identified skill development needed for the analytics work environment from Phase I, preliminary curriculum design for an interdisciplinary undergraduate business analytics degree in a business school was completed. Specific analytics tools were selected for developing the software skills identified from phase 1 of this research. These program components were further validated in phase 3 of the research.

Phase III Program Validation

In order to further validate the curricular components, a survey of analytics professionals in 17 organizations in Central Arkansas was conducted in 2014.

The business analytics program objectives rating by the survey respondents (with 3 indicating important, 4 indicating "very important," 5 indicating "extremely important") are presented in Table V on the next page.

Table VI on the next page presents business analytics related technical skills that were given a 3+ rating by the survey respondents (with 3 indicating "important," 4 indicating "very important," 5 indicating "extremely important").

The survey respondents rated the value of potential courses for a business analytics employee using a scale of 1 to 5, with 1 indicating, "not important," 2 indicating "somewhat important," 3 indicating "important," 4 indicating "very important," 5 indicating "extremely important."

Table V. *Business Analytics Program Objectives by Importance*

Program Objectives	Importance (Mean)
To effectively communicate situations, analysis, and recommendations using written, oral, and visual methods and tools	4.35
To achieve competency in statistical methods and software tools used for data analysis	4.24
To critically analyze business situations in sales, marketing, accounting, finance, human resources, production, and other business functions	4.18
To develop clean context-rich data, competently model and store data, and effectively and efficiently retrieve data relevant to a decision	4.18
To credibly persuade and willingly adapt recommendations through actively listening to decision-makers and knowing supporting data	4.12
To understand intuition-centric versus data-centric approaches to decisions and to achieve competency in data-centric decision making	3.94

Table VI. *Business Analytics Technical Skills by Importance*

Technical Skills	Importance (Mean)
Can analyze data: identify relevant data and important variables, calculate correlations and confidence levels, and interpret findings within a context	4.59
Can retrieve data: well-practiced developing and running queries that perform complex filtering, calculation, grouping, sorting, and joining	4.47
Can model data: fluent with model components (e.g., entities, relationships); competent with model concepts (e.g., normalization), and can utilize model patterns (e.g., categories, classes)	3.88
Can load data: competent utilizing the process of read, interpret, clean, contextualize, integrate, convert, and load	3.88

Results from the survey are presented in Table VII in the order of the most important courses to the least important courses that could potentially be a part of a business analytics undergraduate curriculum.

Table VII. *Importance of Potential Courses in an Undergraduate Business Analytics Curriculum*

Potential Courses	Importance (Mean)	Course Linkage (C = Core; MR= Major Required; ME = Major Elective; I = Integrated)
Database Reporting: Business Intelligence applications using contemporary techniques, complex queries, data extraction, dashboarding	4.38	MR: BINS 4350, 4351
Data Analysis with Excel: effective spreadsheet design, data importing, use of complex formulas/functions, PivotTables, what-if analysis, scenario analysis	4.35	C: BINS 3352
Data Visualization with Excel: charting, specialized formatting/visual presentation, PowerView, interactive visualization, dashboarding	4.12	C: BINS 3352, 3380; MR: BINS 4351
Database Applications: design of relational database, data modeling, visualization, SQL, data integrity	4.06	C: BINS 3305; MR: BINS 4350, 4351
Speaking: interpersonal communication, audience analysis, persuasion, small group presentations	4.00	C: BINS 3380; MR: SPCH 3320; BINS 4355
Business Communication: creation of audience-directed written communication, PowerPoint design, PowerPoint report creation, persuasive presentations	3.94	C: BINS 3380
Predictive Modeling: analytical techniques based on economic and probability theory to solve business problems; forecasting, regression analysis, and other modeling techniques	3.76	MR: FINC 4355
Legal and Ethical Issues: legal and ethical issues involving information systems security, privacy, and legal compliance	3.76	C, MR: I
Data Mining: mining object-relational databases, spatial databases, multimedia databases, text databases, and the World Wide Web	3.71	ME: IFSC 4325
Applied Econometrics: use of intuition and advanced statistical methods in data modeling (data collection, model specification, regression analysis, violations of regression assumptions and corrections, indicator variables, linear restrictions tests, and limited dependent variable models)	3.47	ME: ECON 4350
Geographic Information Systems: use of special data for problems solving (creating, acquiring, analyzing, and displaying geo-referenced information)	3.47	ME: ERSC 4421

Marketing Research: use of data for marketing decision making, involving analytical issues such as market segmentation, pricing, and development of marketing strategies; emphasis on application and interpretation of data measurement techniques (validity/reliability)	3.29	MR: MKTG 4310
Consumer Analysis and Behavior: use of analytics to analyze personal, interpersonal, and environmental forces affecting consumer decision making	3.24	ME: MKTG 3385
Supply Chain Management: quantitative techniques for designing and managing supply-chain operations, including facilities, information, inventory, transportation	3.19	ME: MGMT 4304
Statistics: descriptive statistics, probability theory, hypothesis testing, sampling techniques, regression analysis, forecasting	3.18	C: ECON 2310, 3355

Based on these findings, faculty from a business school compared the identified skills to a competency mapping of the developed curricula to assure a match between program skill development and job demands. A complete Bachelor of Business Administration degree in Business Analytics was then finalized based on the findings. The specifics of the designed curriculum are described next, emphasizing how traditional core and major courses throughout a business school can be improved by integrating data analytics skill development—courses in departments of accounting, economics, finance, information systems, management, and marketing.

Figure 5 displays the core courses and prerequisites to be completed by business analytics majors. During the curriculum evaluation process, college faculty made the decision to assure that all business majors developed an identified level of data analytics skill. The decision was made to replace the freshman-level introduction to computers with an IT Competency Exam, which tests basic Excel and Word skills often developed prior to entering the college. It was replaced with a junior-level advanced Data Analytics/Visualization course, which developed

advanced Excel and Word skills. This course is now a prerequisite for the Management Information Systems course. In addition, statistical analysis skills are developed in the core; data-based decision making will be emphasized in Business Strategy.

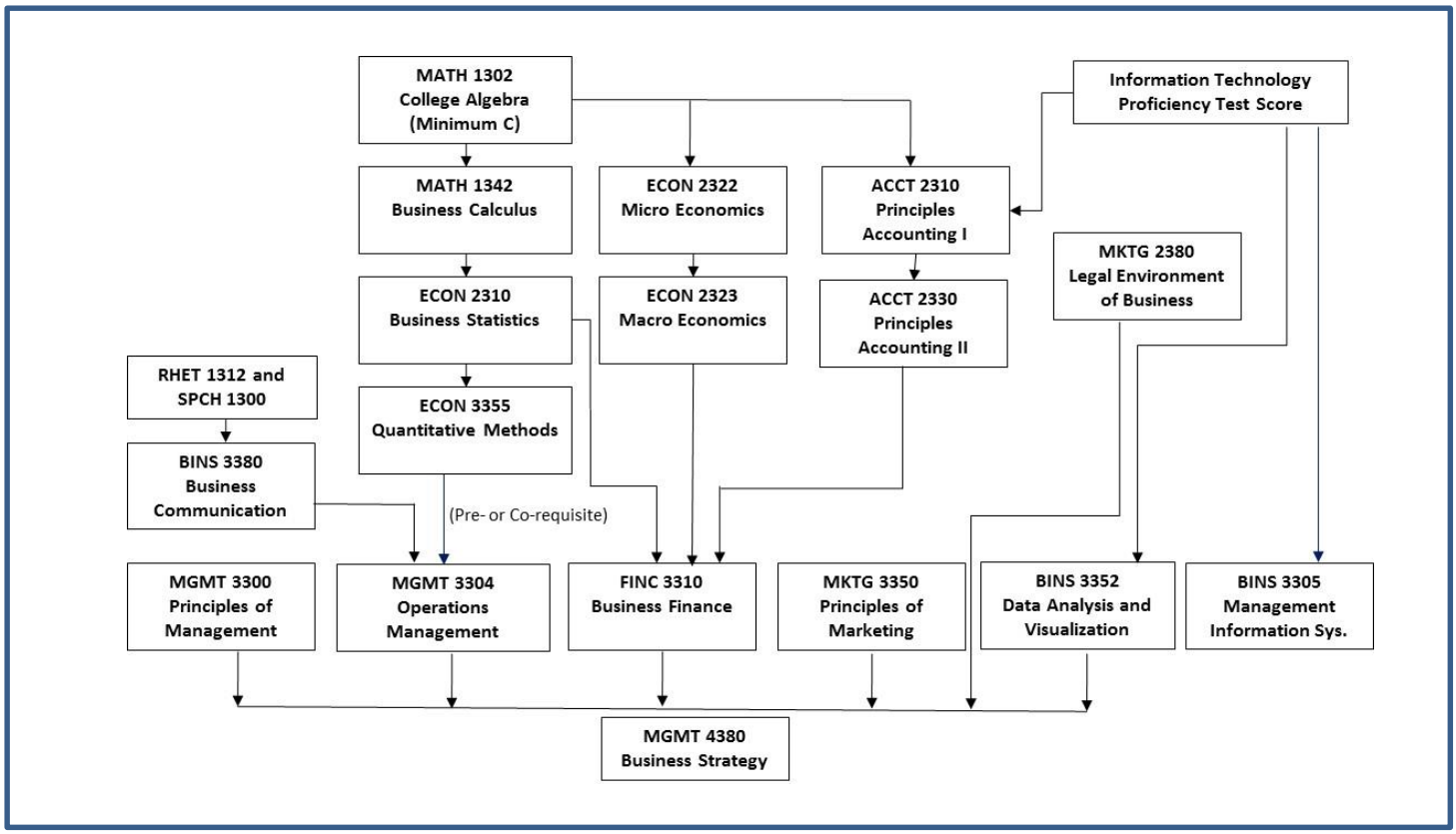

Figure 5: Core Courses and Prerequisites for Business Analytics Majors

The final Bachelor of Business Analytics degree includes the following major courses:

- BINS 4350 Business Database Management Systems
- BINS 4351Data Analysis and Reporting
- BINS 4360 Business Analytics Project Development
- FINC 4355 Predictive Data Analysis
- MKTG 4310 Marketing Research
- SPCH 3320 Advanced Public Speaking

- Electives (6 hours)
    - BINS 3392 Cooperative Education I OR BINS 4394 Internship
    - MGMT 4304 Supply Chain Management
    - MKTG 3385 Consumer Analysis and Behavior
    - One of the following:
        - ECON 4350 Econometrics
        - ERSC 4421 Introduction to GIS
        - IFSC 4325 Data Mining
        - IFSC 4345 Information Visualization

The program integrates technical and interpersonal and technical communication skill development with applications of data-based decision making across business functions. The curriculum is being developed to incorporate the use of the following analytics tools: Microsoft Excel and Access, SQL Server, IBM Cognos, and SPSS Modeler, among other tools.

Discussion and Implications of Research

The first set of findings included a list of business analytics skills that employers seek in business school graduates. The business analytics skills identified were categorized as business competencies, personal characteristics, soft skills, software tools, and technical skills. By identifying these skills categories, the researchers addressed the call by the Business Intelligence Congress (Wixom et al., 2011) to provide a broader range of business analytics skills. The skills categories identified in this research add to existing literature on the demand for business analytics skills. Hsinchun et al. (2012) identified analytical, information technology, business domain knowledge, and communication skills as prerequisites for business school graduates entering the industry to fill business analytics positions. This research adds to this literature by

including personal characteristics and software tools as new categories of skills that help create well-rounded candidates seeking to fill business analytics positions in industry. While a more robust list of technical and analytical skills can be found in the literature (Chiang et al., 2012), it is not always clear how those skills were derived. This research uses a well-defined process of qualitative analysis using interviews from business analytics professionals from a variety of industries to identify the skills those professionals seek in business school graduates. The research used primary data collection through interviews of business analytics professionals to identify business analytics skills as opposed to other researchers (Shirani & Roldan, 2009), who have used a secondary data collection approach to identify business analytics skills by examining marketplace demand using job postings.

The second set of findings identified courses that should be included in a new interdisciplinary undergraduate business analytics program curriculum. The courses identified include the following: data analytics/visualization, quantitative business analysis, business communication, management information systems, database management, data analysis and reporting, predictive modeling, market research, social media, small group communication, legal/ethical issues, and experiential capstone. This collection is a truly interdisciplinary program which involves students taking courses from multiple departments: accounting, business information systems, economics, finance, marketing, and speech communication. In addition to these departments, students can take electives from the departments of management, environmental sciences, and information science. By focusing on developing an interdisciplinary business analytics program, the researchers addressed the calls by Wixom et al. (2011) to use an interdisciplinary approach to deliver a broad range of business analytics skills to students.

The third set of findings validates and prioritizes the program objectives, the technical skills, and the potential courses in the undergraduate business analytics curriculum, thereby addressing calls by researchers for business analytics offerings to be better aligned with practice (Wixom et al., 2011).

Limitations and Future Research

The data collection for this study relied heavily on business analytics professionals who work for Central Arkansas organizations. As a result, the findings of this research have limited generalizability to the rest of the United States. Future research should focus on data collection in a wider geographic region to ensure broader generalizability of the research results.

While this research involved data collection from a wide variety of industries such as IT services, financial services, healthcare, consumer apparel services, telecom services, and utilities, the list of industries was not exhaustive. Future research should ensure that all major business analytics sectors are represented.

The data collection for this research is cross-sectional in nature even though some of the respondents were contacted for follow up questions. Future research should focus on longitudinal studies that show how the need for specific business analysis skills and the business analytics curriculum change over time.

Phase III of the research involved use of a survey to collect information from business analytics professionals from 17 organizations. Future research should ensure more responses for the survey so that Structural Equation Modeling (SEM) type analysis can be conducted on the survey data to triangulate the results from the qualitative portions of the research study.

Conclusions

This paper describes the process for designing an interdisciplinary undergraduate business analytics program based on a three-phase research methodology. In Phase I, qualitative interviews were conducted with business analytics professionals in the industry to identify the business analytics skills that are most coveted in new business school graduates. In Phase II, a focus group meeting was conducted with a larger group of business analytics professionals from reputed organizations in and around Central Arkansas to determine the program objectives and to draft curriculum for an undergraduate business analytics degree. In Phase III, the program objectives and curriculum developed in Phase II were validated using a survey of business analytics professionals from industry. Findings from the three phases directed changes within a college core and the development of a new major. The program mission and objectives were identified. Business competency and soft skill development, technical skill development, and software tools planned for integration into the program were identified. The interdisciplinary program also strengthened majors within the business disciplines.

This research directs other schools developing data analytics skills, either in a single business course or program-wide. Traditional core and major courses can integrate business analytics skills throughout. This integration can revolutionize a business school's offerings. It permits course redesign in departments of accounting, economics, finance, information systems, management, and marketing, and it permits program development or redesign.

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Appendix A – Interview Questions

- What value does your organization achieve through business analytics?
- What infrastructure does your organization have in place to support business analytics?
- Does your business analytics infrastructure allow cross organization collaboration/access to data?
- What analytical tools/systems (business reporting/dashboards, forecasting/product analysis, data mining/optimization, and text mining) does your organization use to deliver value to stakeholders?
- How does your organization use software tools such as Excel? Does it use it as a reporting or as an analytical tool?
- What skills/abilities does your organization seek in new employees working in analytics-based environments?
- What types of learning experiences does your organization perceive to be valuable for business school graduate students preparing to work in analytics-based environments?

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A Collaborative Government-Industry-University Model for Job Shadowing and Building a Pipeline of 21st Century Workforce: Phase I-A Summer Bridge Program

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Rebekah Feng, Becks Intelligence Group

Abstract

This study was the first phase of a multi-year project which aims to build a pipeline of workforce for a fast growing digital forensics profession. Phase I was a bridge program, which offered a five-day residence summer academy for high school students at an unnamed university in Oklahoma. The academy was funded by Oklahoma States Regents of Higher Education (OSRHE) to accept 35 high school students in 2014. It included job shadowing activities such as field trips, simulations, and interactions with professionals. The objectives of the bridge program were to promote career awareness, career interests, and college aspiration.

At the end of the academy, participants were administered a survey with closed-ended questions that could be answered by choosing from a list of seven-point, Likert-type scales. Quantitative data were analyzed to answer three research questions. Descriptive statistics were performed on the data and the results were disseminated. Male students self-reported higher career awareness, career interests, and college aspiration than those of female students as the result of academy attendance. The study's small sample size limited the researchers' ability to generalize results to a larger population. Future studies should build on findings of this study with a cumulative sample size and longer timeframes should OSRHE continue funding the study in subsequent years.

Keywords: Innovation, Digital Native, Job Shadowing, Model, Simulation

Introduction

Research Background

The need for computer forensics (also known as, and will be referred to as, digital forensics hereafter) professionals is becoming a national priority due to increased cybercrimes such as hacking, security breaches, and identify theft. Digital Forensics (DF), which is inter-disciplinary of forensics and criminal justice, is an indispensable tool for law enforcement to solve crimes (Nelson, Phillips, Enfinger, & Steuart, 2010). Success as a DF examiner requires knowledge of law enforcement: scientific and technological skills; and abilities to collect, preserve, examine, and document legal evidence.

Statements of Problem and Need

According to the Department of Labor, DF is now ranked as one of the top ten professions with an annual growth rate of 34% in the nation (U.S. Department of Labor, n.d.). Likewise, there is a rising demand for DF professionals in Oklahoma with an expected growth rate of 39% for the next five years (Oklahoma Employment Security Commission, 2014). Unfortunately, only a few universities offer top-notch DF degrees throughout the United States (Appendix A).

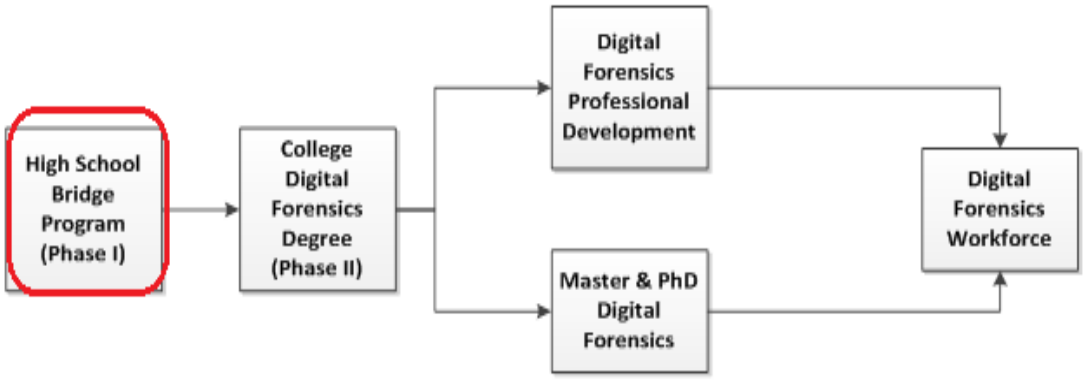
Likewise, there are very few high schools offering equivalent DF courses. For the state of Oklahoma, there is only one half-unit elective security course as part of the high school technology curricula. To fill the need for building an equitable DF workforce, the Department of Information Systems Operations Management (ISOM) and the Forensics Science Institute at the aforementioned unnamed state university in Oklahoma (referred to as University X hereafter) will offer students with double majors in ISOM and DF in 2015. Meanwhile, promoting DF

career awareness and interests among high school students with a bridge program is also critical for building a pipeline of DF workforce.

A Summer Bridge Program

The bridge program is the first phase (Figure 1) of a multi-year plan to build a pipeline and solve the workforce shortage. An external grant proposal was submitted to Oklahoma State Regents of Higher Education (OSRHE) and funding was received for University X to host a summer bridge program. The bridge program is based on a collaborative model.

Figure 1. *A multi-phase model for building the Digital Forensics (DF) workforce pipeline*



A Collaborative Government-Industry-University (GIU) Model

The GIU model fosters collaboration among five law-enforcement entities: Oklahoma State Bureau of Investigation (OSBI), Oklahoma Information Fusion Center, Edmond Police, the Criminal Justice Department (CJ) and the Forensic Science Institute, as well as the Center for e-Learning & Customized Education at University X. The GIU model provides Oklahoma educators, researchers, and high school students with access to modern-day labs, cutting-edge technology, and opportunities to interact with DF professionals. The synergized partnership allows forensics professionals, educators, and researchers to improve intellectual capital and

build a pipeline of workforce by maximizing opportunities of exploring innovative teaching and learning strategies.

Purpose Statement

While the overarching goal of the multiyear collaborative government-industry-university model (GIU) project is to build a pipeline of DF workforce, the summer academy focused on three program objectives as shown in Table 1. The bridge program incorporated various job-shadowing activities that include but are not limited to hands-on activities, field trips, interactions with DF professionals, and role playing in simulated detective offices. Participants were immersed to role-play as law-enforcement officers or DF examiner to solve modern crimes.

Table 1. *2014 Bridge Program Objectives* & *Supporting Activities*

Objectives	**Supporting Activities**
1. Promote career awareness	See Table 2 & Appendix B for job-shadowing activities
2. Promote career interests	See Table 2 & Appendix B for job-shadowing activities
3. Promote aspiration for college	See Table 2 & Appendix B for job-shadowing activities

2014 CSI Summer Academy with Hands-on and Job-Shadowing Activities

To become successful in the DF field, students also need to have knowledge of law-enforcement and technological skills. The bridge program offered a five-day residential Academy which incorporated contexts of criminal justice (CJ) and forensics programming (See Appendix B for detailed schedules). The Academy also featured an innovative and experiential learning experience using a crime scene investigation (CSI) simulation by incorporating modern-day crimes and real-life scenarios. The Academy started the program with a 911 phone call by a female college student who reported a burglary in her residence and her credit cards had been stolen. As the week progressed, academy participants were engaged in problem-solving to recover more evidence while working in teams face-to-face (F2F).

Table 2 outlines job-shadowing activities designed to immerse Academy participants in role-playing as detectives and law-enforcement professionals. Participants used avatars to conduct virtual interviews in simulated (SIM) police offices. Crime-solving activities were designed to foster critical thinking and team collaboration while learning how to process a crime scene, dust for fingerprints, collect evidence, obtain a subpoena, and submit a crime report.

Table 2. *Job-Shadowing Categories of the 2014 CSI Summer Academy*

Day#	Career Research	Hands-on & Team Collaboration (SIM & F2F)	Field Trips & Professional Interactions	Speakers & Professional Interactions	College Planning & Resources
Day1		3		1	
Day2	3	3	3		2
Day3	2	3		1	
Day4	1	4	7	1	2
Day5	1	8	1	1	1
Day6		1			1
Total	7 H	22 hours (H)	11 H	4 H	6 H

Research Questions

To determine and measure the effects of a bridge program on the Academy attendees' career awareness of and career interest in DF, a CSI-Survey (Appendix C) was designed and pilot-tested. Academy participants were administered with the CSI-Survey after completing the summer program. Quantitative data were analyzed in order to answer the following research questions (RQ). Table 3 presents proposed statistical methods for the quantitative data analyses.

RQ#1: How does a bridge program affect student career awareness in relation to gender?

RQ#2: How does a bridge program affect student career interest in relation to gender?

RQ#3: How does a bridge program affect student college aspiration in relation to gender?

Table 3. *Analytical Method for the Proposed RQs*

RQ#	Instrument	Dependent Variable	Analytical Method
RQ1	CSI Survey	Career awareness	Descriptive statistics
RQ2	CSI Survey	Career interests	Descriptive statistics
RQ3	CSI Survey	College aspiration	Descriptive statistics

Literature Review and Theoretical Framework for the Bridge Program

Educators across the nation assert that critical problem solving, innovation skills, information social media, technology skills, life-long learning, and career skills must be fully realized in order to better prepare college students for their successful participation in the highly competitive global economy (Dede, 2011; Franklin, 2011; Siberman, 2007; Springer International Handbook of IT, 2011). To build a bridge-way between high schools and colleges, the summer academy was based on the theoretical framework of the 21st Century Teaching and Learning Model (see Figure 2 on the following page).

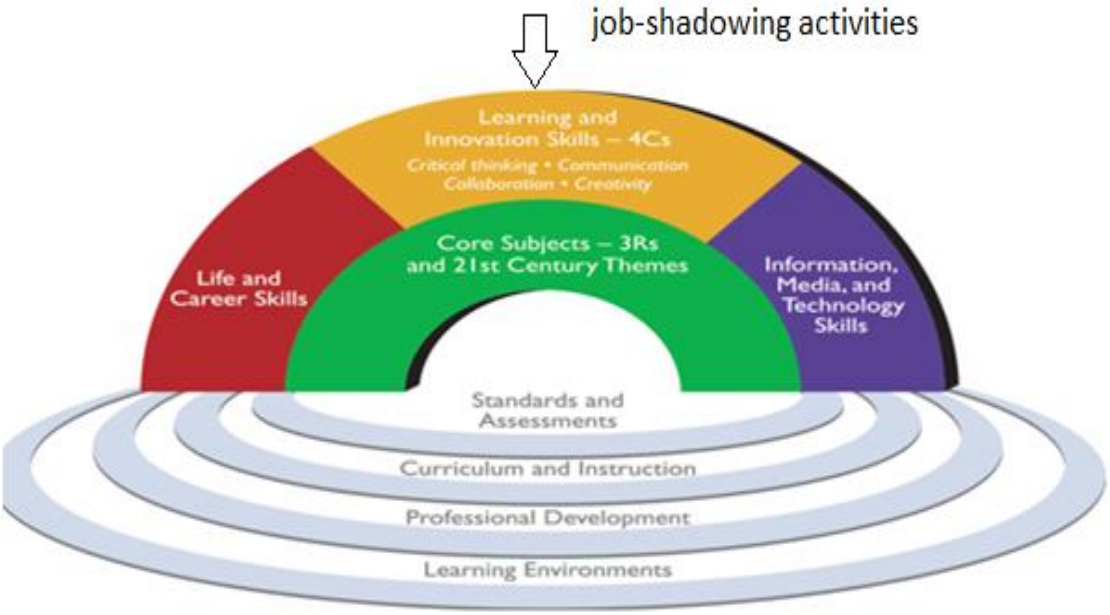
Job-shadowing activities and simulated learning environments with real-world scenarios were incorporated into the academy programming. High school students were engaged in active learning to construct knowledge and skills of critical thinking, communication, collaboration, and creativity that are needed to participate in the future workforce successfully (National Research Council, 2012).

I. Critical Thinking Skills for Solving a Modern-day Crime

Creating effective learning modules to promote critical problem-solving skills requires trial and refinement, ideally conducted in the range of contexts where they will be used to maximize ecological validity (Tuzun et al., 2009). Further, transformative learning can only occur when students are immersed in authentic learning environments with contextual real-world

scenarios. These "authentic" learning environments provided high school students with project-based, role-playing, and hands-on approaches to acquire inter-disciplinary knowledge and critical problem-solving skills during their attendance at the CSI Summer Academy.

Figure 2. *A 21st Educational Model and Framework*



II. Communication Skills for Immersing in Simulation

Simulated technologies can provide higher education a cost-effective venue for exploring, creating, and reusing permanent learning objects when they are too expensive or impossible to achieve in traditional classroom settings (Crellin & Karatzpimo, 2010). Three-dimensional (3-D) virtual environments allow learners to collaborate in a simulated "real-world" setting, engage learners in problem solving, and enrich learning experiences (Bell, 2011). Table 4 presents projects which were funded by the National Science Foundation (NSF) to incorporate 3-D simulation and promote student interests in learning science, technology, mathematics, and engineering (STEM). The integration of online 3-D multi-user virtual learning environments can engage students in solving "real-world" problems, encourage social interactions, and promote collaboration between participants.

Table 4. *Using 3D Simulation to Promote Career Interests in STEM Fields*

Institute	Project Description	Reference
Harvard University	NSF: A Virtual River City for K-12 students	Allen & Seaman, 2011
Ohio University	NSF: Virtual science lab simulations	Schiller, 2011
Dartmouth University	A virtual community emergency responders	Manlow, Friedman, & Friedman, 2010
EDUCAUSE	Simulated learning environments	Dede, 2011

III. Collaboration – Team and Social Construction of Knowledge

Immersive simulation can offer opportunities to be on the frontier of academic research and social learning. Social learning theories help researchers understand how people learn in social contexts while forming learning communities and collaborative teams (Vygotsky, 1978). Hence, the philosophy underpinning the use of simulated learning environments in education is that knowledge creation is a collaborative rather than an individual pursuit and that there is not a correct, definitive, or single pathway to knowledge (Lent & Brown, 1994). High-school students (referred to as participants hereafter) are assigned to work in teams during their attendance at the summer academy. Team collaboration fosters social construction of knowledge when participants are encouraged to share information and construct knowledge as part of the learning process (Manlow, Friedman, & Friedman, 2010; Vygotsky, 1978). Furthermore, the collaborative experience allows students to engage deeply due to the presence of individual student avatars who are immersed in simulated environments to role-play digital forensics examiners and law-enforcement professionals.

An important aspect of the bridge program is that it offers information about how to conduct job-shadowing in a virtual environment. This potentially opens new possibilities for students to experience previously “difficult-to-access” fields of study. Moreover, these simulated

learning environments emphasize the social and temporal aspects of communication processes in team interaction. Effective implementation of a 3-D coordination mechanism in virtual teams can reduce conflict and social loafing because the visual space allows team members to "see" what others are doing (Bronack et al., 2008). Hence, time can be spent communicating critical task-related information to increase equitable contribution to a team project (Halse et al., 2011).

IV. Creativities – Digital Presentations

Academy participants were encouraged to reflect on what they learned throughout the Academy week by documenting daily how they applied critical thinking skills to uncover additional evidence, learned to communicate via simulated technologies, and collaborated with team members to solve a modern-day crime. Students were also encouraged to use mobile apps or innovative technologies to create digital presentations of their findings.

On the last day of the Academy, each team presented their findings and shared their learning journey with a panel of judges (consisting of faculty members). Parents and caregivers were invited to attend the presentations at the academy graduation. A panel of four CSI staff members with extensive Criminal Justice backgrounds role-played as judges, as participants of teams shared how they solved the case and presented evidence.

Methodology for Data Collection and Analysis

Target Population and Sample Population

The target population included any students in grades 9-12 who were Oklahoma residents attending 256 high schools across the state of Oklahoma. School types can be public, private, online, and home schools. The sample population was set to 35 high school students by Oklahoma State Regents of Higher Education (OSRHE) due to budget constraints. Out of 85

students who applied, a computer program was used to select 35 participants randomly. See Appendix D for participants' demographics.

Instruments & Data Collection

The bridge program used the CSI-Survey, *Immersive Environment Survey* (IES), to collect both quantitative and qualitative data. Quantitative data were derived from close-ended questions that participants self-reported by selecting answers from any of the predefined Likert-type scales (i.e., *strongly disagree, disagree, undecided, agree, and strongly agree*). The CSI-survey instrument was pilot-tested with a reliability of 90.

Discussion

To answer the first research question (RQ), "*How does a bridge program affect student career awareness in relation to gender?*," quantitative data were derived from the CSI-survey. Table 4 summarizes participants' responses after attending the Academy. Data analysis suggests that male students gained more career awareness than female students.

Table 4. *Career Awareness*

Survey Question (Q)	Males	Females
Q#4: I am aware of career opportunities in science and/or technology.	6.4	5.9
Q#7: I am aware of career opportunities specific to forensics.	5.8	5.8
Q#10: I understand what DF professionals do.	5.9	5.8

To answer the second RQ, "*How does a bridge program affect student career interest in relation to gender?*," quantitative data were derived from the CSI-survey. Table 5 summarizes participants' responses as the result of attending the Academy. Data analysis suggests that male students became more interested in science and technology than female students. However, female students became more interested in digital forensics than male students.

Table 5. *Career Interest*

Survey Question (Q)	Males	Females
Q#6: I am interested in pursuing a career in science and/or technology.	6.1	5.6
Q#9: I am interested in pursuing a career in forensics.	5.3	5.5

To answer the third RQ, "*How does a bridge program affect student college aspiration in relation to gender*?," Table 6 summarizes the findings. Data analysis suggests that male students gained better understanding than female students about college planning and financial resources.

Table 6. *College Aspiration*

Survey Question (Q)	Males	Females
Q#17. I better understand the process of college planning.	5.8	5.7
Q#18. I better understand scholarship & grant opportunities for college.	6.1	5.8

In sum, the exploration of the data, male participants had greater returns in career awareness, interests, and college aspiration than did female participants. The result aligns with the existence of cultural forces that can often constrain female interest and participation in science and technology.

Scope, Limitations, and Future Study

This study has several limitations. First, the sample size was small and all participants came from the same state. Although the bridge program targeted high school students attending 256 high schools across the state of Oklahoma, the approved budget by the Regents for only 35 participants limits the sample size. Second, the study also employed convenience sampling by choosing from a pool of students who self-selected and applied for the summer academy. Third, the time span of the Academy was only one week.

Therefore, the scope, sample size, geographic boundary, and time constraints of the study hindered the researcher's ability to generalize the results to a larger population. Future studies with larger sample size should build on findings of this study to probe deeper how a bridge program affects student career awareness and interests. Hence, given the overall dearth of female science and technology (S&T) professionals, bridge programs like the CSI Summer Academy could prove to be an integral link to increasing female representation in the S&T workforce.

Leadership Implications, Intellectual Merits, and Broader Impacts

Today's millennial generation, who grew up with immersive games, the Internet, and social networks, prefers learning through more interactive methods that are available to them anytime and anywhere. However, many traditional educational institutions still use text-based lectures as the primary method to delivering learning content. Educational institutions must join forces with industry and government entities quickly to respond to changes that are upon educators in how, where, and why today's students learn.

While emerging technologies may not address all educational challenges and will not replace all traditional teaching methods, the bridge program can continue to provide K-12 teachers and college professors a platform that provides educators with global access to emerging technologies, simulated learning environments, and effective e-learning resources.

Findings from the CSI bridge program provided educators with significant knowledge for how to enhance teaching and learning effectiveness with innovative technologies. Insights from the bridge program also contributed to the discovery of a transformative model that allows institutional administrators, policy makers, grant seekers, and the research community to better support educators and inspire students.

This Phase I bridge program provides avenues for researchers to explore innovative teaching strategies, simulate authentic learning environments, create effective cyber-enabled learning resources, and improve technological infrastructure in order to better recruit today's students into the highly skilled and rewarding forensics profession. Future study of Phase II GIU collaborative model will provide insights on how universities with educational resources and innovative infrastructure have the potential to transform education, increase degree conferred, improve the intellectual capital in Oklahoma, and build an equitable workforce in the nation.

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Appendix A

Schools in the U.S. with Computer Forensics Programs

College/University Name	Distinction	Location
Boston University	Digital forensics is offered through online M.S. in Computer Information Systems, on-campus M.S. in Compute Science, and hybrid Graduate Certificate in Digital Forensics programs	Boston, MA
Champlain College	SC Magazine named the school's online bachelor's degree program in computer forensics and digital investigations the 'Best Cyber Security Higher Education Program' in 2013	Burlington, VT
University of Alabama at Birmingham	Hosts the Center for Information Assurance and Joint Forensics Research	Birmingham, AL
University of Maryland - University College	The M.S. in Digital Forensics and Cyber Investigation is intended for mid-career professionals who don't need GRE or GMAT scores to apply	Adelphi, MD
University of Rhode Island	Recognized as a National Center of Academic Excellence in Information Assurance Education by the National Security Agency and the Department of Homeland Security	Kingston, RI

Source:

http://education-portal.com/articles/List_of_the_Best_Computer_Forensics_Schools_in_the_US.html

Appendix B

2014 CSI Summer Academy Program Overview

Date	7/25/2013	7/26	7/27	7/28	7/29	7/30
Time	**Fri (Day1)***	**Sat (Day 2)***	**Sun (Day 3)***	**Mon (Day 4)***	**Tue (Day 5)***	**Wed (Day 6)**
8:00 AM		**Breakfast (Buddy Cafeteria – See the University Map)**				
9:00 AM		Edmond Police	STEM Workshops & Career Opportunities (B-109, B-107)	OSBI – Headquarter (Meet at B-113 by 8:45am) Beth Miles & Amy Morgan	SIM: X-Examination Suspect #1 & 2 (B-107, B-109)	Post-test (B-107, B-109)
10:00 AM						Team Presentations & Academy Graduation (B-113)
11:00 AM						Adjourn
12:00 PM		Lunch (Buddy Cafeteria)		Lunch	Lunch	
1:00 PM		FBI Speakers (Room#113)	DNA (B-113) (James Creecy)	OSBI – Edmond (Kelly Jackson)	College Planning Research; Finalize Team Presentation & Crime Evidence Submission (B-107, B-109)	
2:00 PM		Crime Scene (Teams 1,2,3)	Forensics Science Institute & Labs			
3:00 PM	Registration – at the Suite					
4:00 PM	Orientation: Colleges & Programs – (Room# 113)	Finger Print Dusting (Teams 4&5)	Podcasting (B-113)	SIM: X-Examination Witnesses Teams 1-3 in B-107; Team 4 & 5 in B-109		
5:00 PM	**Team Briefing & Assignments (Meet at B-113)**					
5:30 PM	**Dinner (Buddy Cafeteria –See the University Map)**					
6:30 PM	Scenario Briefing (Room#113)	Podcasting (B-113)	how to obtain data podcasting	Preliminary Report	Rocky – Edmond PD (B-113)	
7:00 PM	CSI related Movie (B-113)	Virtual Detective Interview Room Tutorials (B-113)	Scavenger Hunt at the Library (Room #226) by Christine Edwards	Fitness Center (See the University Map)	**Team Report Submission**	
9:00 PM	**Retire to Suite/Dorm Rooms**					
10:00 PM	**Lights out**					

Appendix C

An Excerpt of the CSI Academy Survey

Please indicate the extent to which you agree or disagree with the following items.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I am aware of career opportunities in science, technology, engineering, and mathematics (STEM).	○	○	○	○	○	○	○
I enjoy learning STEM.	○	○	○	○	○	○	○
I am interested in pursuing a career in STEM.	○	○	○	○	○	○	○
I am aware of career opportunities specific to forensic science.	○	○	○	○	○	○	○
I am confident that I will be able to succeed in a STEM field.	○	○	○	○	○	○	○
I am interested in pursuing a career in forensic science.	○	○	○	○	○	○	○
I understand what professionals in forensic science do.	○	○	○	○	○	○	○

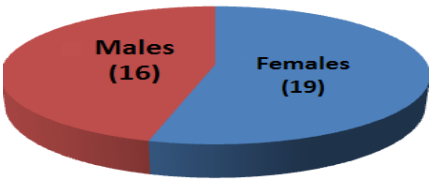
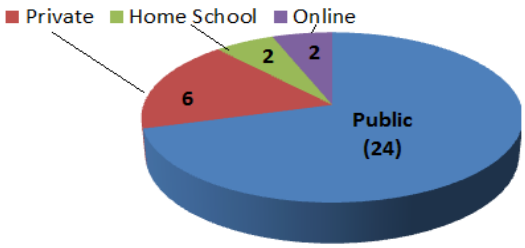
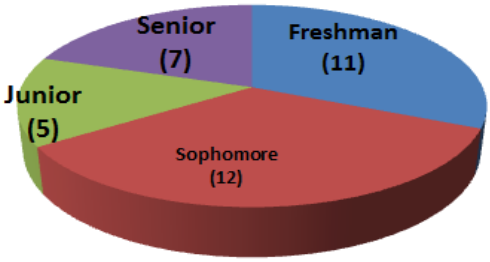
	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I enjoyed working on a STEM project as part of a team.	○	○	○	○	○	○	○
I gained a better understanding of how forensic science works.	○	○	○	○	○	○	○
I learned more about how STEM are conducted.	○	○	○	○	○	○	○
The field trips were beneficial to my learning.	○	○	○	○	○	○	○
The process of solving a real problem/crime was interesting.	○	○	○	○	○	○	○
I better understand the process of planning for college.	○	○	○	○	○	○	○
I better understand scholarship and grant opportunities available for college.	○	○	○	○	○	○	○

Appendix D

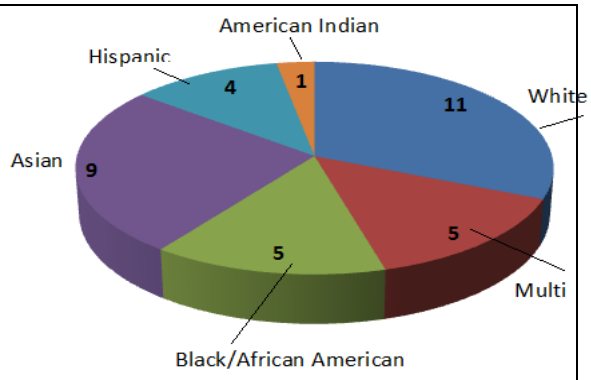
Demographics of CSI 2014 Summary Academy Participants

This section is based on affirmative data that were presented in the Participant Report. A strategic student recruitment and selection process was adopted to broaden Science & Technology participation by socio-economic populations that are underserved by the community. Out of 85 applicants, 35 students were selected. Table C-1 suggests that the CSI 2014 cohort was very diverse, representing six ethnicity groups from 32 high schools in 14 Oklahoma counties.

Table C-1. ***Demographics of 2014 CSI Cohort***

Category	Sub Categories	Percent	Frequency Count (Not Percentage)
Gender	Females	**54%**	
	Males	**46%**	
School Type			
	Public	**71%**	
	Private	**17%**	
	Home School	**6%**	
	Online	**6%**	
Grade Level			
	Freshman	**31%**	
	Sophomore	**34%**	
	Junior	**14%**	
	Senior	**20%**	

Ethnicity		
	White/Caucasian	**31%**
	Black/African American	**14%**
	Multi	**14%**
	Asian	**26%**
	Hispanic	**11%**
	American Indian	**3%**



Dr. Joselina Cheng has worked in the information technology industry for 20 years as a project manager, in which she designed, developed, and implemented software for Fortune 500 companies. In 2000, Dr. Cheng joined the academia with a vision to transform higher education by incorporating a strategic government-Industry-university (GIU) model and applying innovative technologies in her teaching, research, and community services. Dr. Cheng is the creator of over 100 tutorials, author of 13 journals, and primary investigator for over 20 grants with a total budget of $1.2 million. She is also the recipient of a Vanderford Leadership Award, Faulty Merit Credit award, Barnabas Fellowship, Desire to Learn Excel Impact Award, and a dozen of Distinguished Research Awards.

Rebekah Feng, President of Becks Intelligence Group, is a program evaluator for federal and state grants. She holds a Master's degree in Business Administration from the University of Maryland University College. Prior to forming her LLC, she was a Textbook Supervisor who oversaw a Textbook Department generating approximate to 6 million annually. While in college, she worked as a research assistant and co-presented papers in several international conferences. She formed an LLC for a doctor at the University of Oklahoma Health Science Center. She was also a recipient of six scholarships and Outstanding Management Student Award. She was the President of Human Resource Society. She was chosen by the Oklahoma State Regents of Higher Education, Oklahoma Scholar Leadership Enrichment Program OSLEP to attend Sustainability Summer program at Oklahoma University.

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Round Two—Blind, Peer-Reviews Received: 2/13/15, 2/23/15, 3/3/15

Online Integrity: Student Authentication in an Online Course

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Abstract

Faculty members who teach fully online courses increasingly face the issue of verifying that the student completing an assignment or taking an online exam is actually the student who is enrolled in the course. Accrediting agencies have recognized that online testing and verification of student identity is becoming increasingly important. New guidelines have been developed by The Council of Regional Accrediting Commissions (C-RAC) which indicates that the Southern Association of Colleges and Schools (SACS) and other regional accrediting agencies will be expecting institutions to do more in regard to online student authentication to ensure that the student who enrolls in a class is the one who completes the work in that class.

Keywords: Online Education, Student Authentication, Academic Integrity, Online Faculty

Introduction

Distance education has been around for more than 100 years and has progressed from print-based or correspondence study to radio, television, audio or video recordings, and on to video conferencing and computer-mediated instruction (Wang & Gearhart, 2006). In 2000, Dooley and Murphy stated that delivery via the Internet was relatively new and challenging for higher education institutions. Most would agree that even though delivery via the Internet might no longer be considered "relatively new," it can still be considered challenging.

According to Gearhart (2010), "One of the issues that has been around as long as there has been distance education is the issue that the student registered for the course is the student doing the work" (p. 60). Faculty members who teach fully online courses increasingly face the

issue of verifying that the student taking an online exam is actually the student who is enrolled in the course. Miller and Young-Jones (2012) surveyed 639 students to compare cheating on assignments in online classes to cheating in face-to-face classes, but the study did not investigate whether the student enrolled in the online class was the student completing the work. Rowe (2004) stated, "The prevention of plagiarism has been the subject of much attention, but insufficient attention has been given to other problems of dishonesty in online assessment" (p. 1).

Winneg (2014), founder of multiple software solutions to ensure student authentication and secure online testing, suggested that measures to ensure online integrity should be decided and implemented by the institution rather than its faculty members. The authors of this paper are not suggesting that institutions should necessarily dictate the use of specific authentication, but rather suggest the benefits of having the availability of authentication options. Authentication will likely become a significant discussion for both the purposes of governmental funding and institutional integrity.

Review of Literature

Academic Integrity Online

Online education has presented new challenges not only for students, but also for faculty. The issue of knowing who is doing the work in an online class is still a large problem. Online testing and verification of student identity is becoming increasingly important.

Student lack of academic integrity, also considered cheating, has become one of the reasons some academicians are reluctant to embrace online education. Academic integrity is a topic of major importance regardless of whether a student is an online or traditional campus student. Education seems to be one of the few places that people do not want to get their money's worth. Instead of taking advantage of the instruction provided and learning the

material, some students would prefer to take a dishonest approach to earning a good grade in a course. Hoshiar, Dunlap, Li, and Friedel (2014) stated that there is a great need, "for faculty members to be aware of the existence of substitute course takers and the importance of online course design to uphold the quality of online education" (p. 340).

The degree to which student dishonesty exists could range from looking at notes during an exam to having someone else complete the course for the student. Watson and Sottile (2010) suggested evidence that cheating in online courses was no more prevalent than cheating in on-campus courses. Miller and Young-Jones (2012) conducted a study of online and traditional students to compare cheating behaviors. Their findings indicated that students felt it was easier to cheat in online classes. They found that students who take a combination of online and traditional classes are more likely to cheat in online classes. However, they found that students who took only online classes cheated less than other students. This was along the same lines of research by Williamson (2009) whose study found, "both students and teachers perceived that cheating was more frequent in virtual classrooms. But self-reported instances of actual cheating were significantly higher among traditional students than they were among online students" (p. 9).

Miller and Young-Jones (2012) further explained their findings with "the population who take only online classes are older, take more academic integrity responsibility, and cheat less" (p. 143). It was also noted in this same study that traditional campus students were "more likely to turn in work done by someone else, complete work for someone else, give/receive inappropriate help, use a false excuse, or submit previous work in subsequent classes" (p. 144).

Institutional Implications: Government Guidelines and Regulations

The Association to Advance Colleges and Schools of Business (AACSB) recently has devoted much research to the upsurge in online education delivery. Bisoux (2014) wrote "as new technologies and pedagogies emerge, more schools are blurring the lines between online and on-campus education – and, in the process, offering online experiences that could rival, and in some cases surpass, those offered face to face" (p.17). However, according to Larkin and Shwiff (2014), rampant online cheating is one of the many challenges for online education that needs to be addressed as it threatens the educational process. Higher education accrediting agencies have developed guidelines to ensure that the integrity of online education is acknowledged thereby assuring quality in online delivery.

The C-RAC has developed new Interregional Guidelines for the Evaluation of Distance Education (Online Learning). These new regulations, called the Nine Hallmarks of Quality, expand the number of standards specific to online education from 22 to 55, and they have been adopted by all seven of the regional accrediting organizations.

One of the most challenging is the ninth hallmark. The ninth hallmark, as seen below, suggests that SACS and other regional accrediting agencies will be expecting institutions to do more in regard to online student authentication to ensure that the student who enrolls in a class is the one who completes the work in that class.

Hallmark: The institution assures the integrity of its online offerings.

Analysis/Evidence:

> The institution has in place effective procedures through which to ensure that the student who registers in a distance education course or program is the same student who participates in and completes the course or program and receives the academic credit. The

institution makes clear in writing that these processes protect student privacy and notifies students at the time of registration or enrollment of any projected additional costs associated with the verification procedures. (NOTE: This is a federal requirement. All institutions that offer distance education programs must demonstrate compliance with this requirement.):

- The institution's policies on academic integrity include explicit references to online learning;
- Issues of academic integrity are discussed during the orientation for online students;
- Training for faculty members engaged in online learning includes consideration of issues of academic integrity, including ways to reduce cheating;
- *Institutions are encouraged to consult Best Practice Strategies to Promote Academic Integrity in Online Education

  *Best Practice Strategies to Promote Academic Integrity in Online Education, prepared by WCET and available at http://www.wcet.wiche.edu/learn/student-authentication

The Inspector General of the U.S. Department of Education (2011), Kathleen S. Tighe, highlighted the growing vulnerability of online education to financial fraud, thus leading to greater expansion of regulations and oversight of online learning. Dr. Belle Wheelan of SACSCOC said at a conference regarding these guidelines that it will become a big issue for higher education institutions in the near future. Case in point is that the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) lists first in the Guidelines in the Application of the Principles of Accreditation to Distance and Correspondence Education the following requirement:

At the time of review by the Commission, the institution must demonstrate that the student who registers in a distance or correspondence education course or program is the same student who participates in and completes the course or program and receives the credit by verifying the identity of a student who participates in class or coursework by using, at the option of the institution, methods such as (1) a secure login and pass code, (2) proctored examinations, and (3) new or other technologies and practices that are effective in verifying student identification.

The inspector general for investigations from the U. S. Department of Education, William Hamel, expressed concern that his department is "not keeping pace with technology." Students, according to Hamel, are able to take advantage of the "anonymity of the Internet," and that both educators and regulators need to find ways that student identity can be verified (Mullins, n.d.).

An example of online diligence by two educators revealed a financial fraud that could have amounted to more than $200,000. The faculty members noticed that several online students had the same address and phone number. In addition, these same students were not participating in the course. Next these same students withdrew from the class. Investigations found this was actually a ring of 23 students. In scams such as these often a ringleader recruits people to be "students" by allowing their personal information and Social Security numbers to be used to enroll in courses. This same information is then used to apply for federal aid. In return for using these recruited students' information, these recruits receive a portion of the money (Asimov, 2014).

Implications for the Professor

Obviously fraud is a concern from a financial perspective for all taxpayers. It is estimated that $800 million to $1 billion a year is fraudulently paid to financial aid scams

(Asimov, 2014). This, however, is only one aspect of concern to most professors. Perhaps of equal importance to the professor is that the student who receives the credit for the class is, indeed, the person who is doing the work in the class. Historically, professors teaching courses that prepared students for stringent exam-based certifications, such as those entering the nursing profession, either required students to come to the main campus for testing or required the student to arrange a live proctor to verify the identity of the student and oversee the student completing an exam. The question arises as to whether technology has now developed to the point that these types of live proctoring practices are now antiquated. With the true distant student, is it feasible to expect a student to come to campus to take exams?

With the proliferation of online learning, the two simple questions – "Who are you?" and "How can you prove it?" – are requiring increasingly sophisticated means of identification and authentication (Smedinghoff, 2012, para 1). Technological solutions are becoming commonplace; Apple's new iPhone 5S "will be the first widely popular gadget to incorporate a fingerprint scanner as a security measure. It likely won't be the last" (Pagliery, 2013, para 1). Exam security technology, in which a webcam captures and records the student's environment as he or she completes the exam, is a fee-based service that requires the student or the institution to pay on a per exam basis. Some online exam proctoring services such as ProctorNow have proprietary 360 degree webcams that also have a fingerprint scanner to identify the exam participant.

In April 2011, the White House released a "National Strategy for Trusted Identities in Cyberspace" (National Strategy, 2011) that described digital authentication methods that would be portable across different systems and entities. Privacy will be a consideration in solutions adopted to verify student identity (Gearhart, 2010). Although more instructors of online students

are skeptical that the work submitted is actually completed by the student who is enrolled, authentication systems are still in development, with newer forms of authentication such as biometrics not commonly used in education (Hoshiar, Dunlap, & Friedel, 2014). Though there are already some types of test proctoring options available, the literature does not yet provide an indication of how many schools take advantage or require these options or how successful these options have been shown to be.

Methods and Procedures

Purpose of the Study

This study sought to determine who the faculty are who teach online in terms of age, gender, ethnicity, and experience; what are the attitudes of faculty in regard to the difficulty of teaching online; and whether or not faculty felt that academic integrity came into question for online students. In addition, the study sought information as to whether test proctoring was provided by the institutions of respondents and further, whether test proctoring was required for online courses.

Participants of the Study

Participants of the study comprise a convenience sample from members of the Federation of Business Disciplines organization. No discriminating question was asked to separate undergraduate from graduate faculty.

Procedures

A survey was developed to gather information from faculty on their current practice in regard to online teaching and the proctoring of exams for online classes. The survey was administered online through Qualtrics survey software. Email invitations to participate in the study were sent based on the membership rolls from the 2013-2014 conference year.

Findings

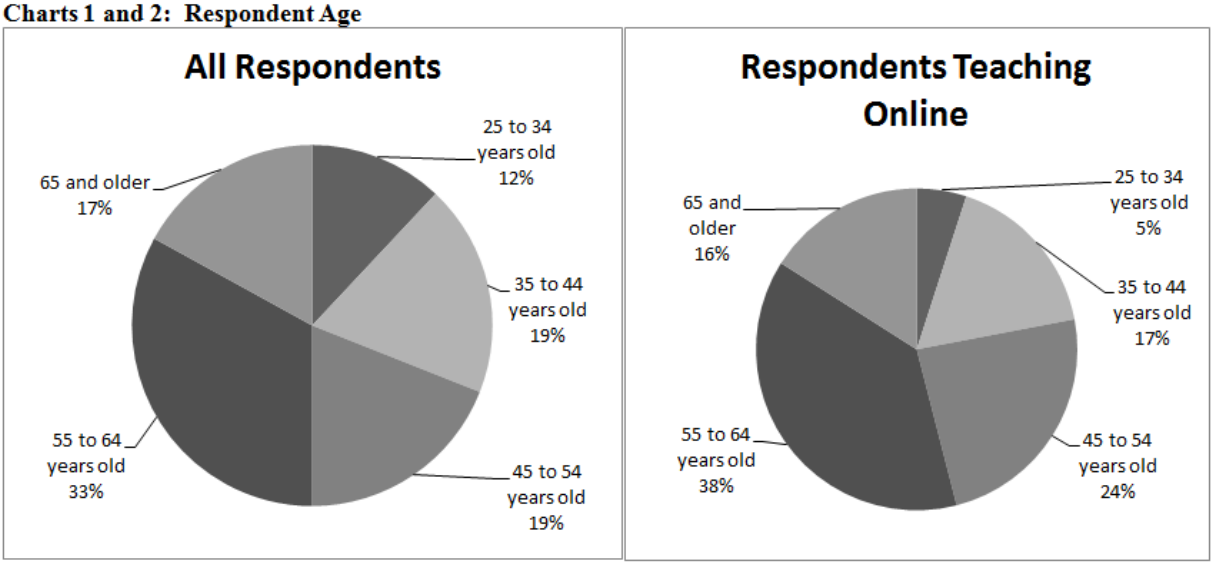
A total of 166 participants responded to the online survey. The total group (166) comprised 74.8% Caucasian, 11.8% Asian, 5.1% Black/African American, 2.8% Hispanic/Latino, 5% Mixed and Other.

For the online testing questions, 88 of the 166 respondents indicated they teach online. The ethnic makeup of the online teachers was similar to the overall makeup with only the Hispanic/Latino showing a notable difference with none (0%) of the respondents of the online total as opposed to the 2.8% of the overall total.

Gender composition comprised 93 males (56%), 68 females (41%), and 5 no gender (3%) for the total group (n=166). The number, when filtered for the online faculty only, was similar with 53.4%, 42%, and 4.5% respectively.

Respondent age breakdown is shown in combined Charts 1 and 2. As shown here, the largest discrepancy in this study from all respondents to the respondents who teach online is in the 25 to 34 year age with fewer of the total teaching online as compared to all respondents.

Charts 1 and 2: Respondent Age



More than half of the respondents had been teaching 15 years or more. When looking at the teaching experience of those taking the survey, the largest total percentage (23%) fell in the 20 – 29 years of teaching. When filtered for only those who teach online, the largest total percentage remained in the 20 – 29 years of teaching, but the percentage increased to 33%.

Respondents to the survey were also asked their academic rank. When looking at those faculty members teaching online courses (n=88), the largest number were at the rank of full professor (39.8%). The others were associate professor (19.3%), assistant professor (25%), lecturer/instructor (9%), and adjunct/other (6.8%).

All participants (n=166) were asked if they felt teaching an online course was harder to teach, easier to teach, or about the same difficulty. The responses from those who teach online differed to some degree from those who do not teach online classes (n=88) as shown in Table 1.

Table 1: Responses to: Do you feel that teaching an online course is harder, easier, or about the same level of difficulty as teaching an on-campus course?

Online Teaching	N	Harder	Easier	About the Same	Missing
Yes	88	65.9%	6.8%	27.3%	0%
No	78	39.7%	9.0%	23.1%	28.20%

This question was answered by 100% of those who indicated they teach online. Of the 88 respondents who teach online, 65.9% indicated that they felt it was harder to teach online. Only 6.8% of those who teach online felt it was easier. For the group who do not teach online, 28.2% declined the opportunity to answer the question, but only 39.7% indicated they felt it was harder to teach online.

The question was asked, “If you teach an online course, do you require students to travel to the campus for testing?” Of the 88 who indicated they teach online, 11.4% required students

to come to campus for at least one exam. An additional 22 respondents indicated that they do require tests be proctored, but they do not require that test proctoring occur on campus.

All participants (n=166) were asked if the question ever arose in their own minds whether the person doing the work in an online class was actually the person who was receiving credit for the course. There were 45.3% who indicated that it was a question that definitely arose, 20.9% probably yes, and an additional 17.4% who indicated that it was somewhat a concern. Only 16.3% indicated that they probably or definitely did not have the question of whether, as the survey stated, that "the person getting credit for the course was the actual person doing the work in the class" arise in their own minds.

Participants were asked if their institution offered a technological solution (online proctoring) for online courses. From the total group (n=166), 114 respondents answered this question. Of those responding, 63.2% indicated no technology proctoring was offered. Of those who indicated they teach online (n=88), 82 answered this question, and 63.6% indicated that no such option was available at their institution. A follow-up question asked if the institution were to offer a technological solution such as online proctoring, would they choose to have students use the service. Eighty-seven of the 88 online faculty members responded. Of those, 45.8% said, "Definitely yes," 34.9% said, "Probably yes," 12% said, "Maybe," and only 7.2% said, "Probably not."

Conclusions

Despite the number of years online education has been around, many issues still need to be addressed and resolved. Based on the results of this survey, few faculty members feel that teaching online is easier than traditional on-campus teaching. A much higher percentage of

those respondents who teach online consider teaching online harder than on-campus teaching (65.9%) than those respondents not teaching online (39.7%).

Results indicated that online teaching is not being relegated to the younger, less experienced, or lower academically ranked faculty. The largest numbers were aged 55-64, those who had taught 20 or more years, and were at the rank of full professor.

Only 36% of those surveyed require that exams be proctored either on campus or in some other manner. It does appear from the responses that if a technological solution to test proctoring were made available, the number of those requiring test proctoring would rise. Results indicated that there is a concern on the part of faculty of whether the student who is registered for the course is, indeed, the one doing the work in the class.

Recommendations

Both institutions and faculty need to look ahead to how they will address the identification requirements of online students. The reason for this is at least two-fold. An important reason is that the government may likely begin mandating more stringent identification. The government wants to make sure the money being provided to educate students is being used for its intended purpose. Further, the government wants to ensure that the money goes for that particular student to receive an education.

Undoubtedly, the institution and faculty members would agree with the government's concern for student identification; however, one would hope that their desire would go further than just the possibility of financial fraud. Institutions of higher education and their faculty members take pride in their graduates. When students leave an institution of higher learning, they represent their alma mater. Obviously, the person who is receiving the degree is the person for whom the money was paid to earn the degree, so no *financial* fraud has occurred. Perhaps as

important, if not in some ways more so, institutions and faculty want to know that the person who walked across the stage and received that diploma gained the knowledge that accompanied it to go out and use that knowledge for the betterment of him or herself and society as a whole.

It is recommended that faculty be given the tools to utilize test proctoring to add validity to the degrees earned by the online students they teach without causing an undue burden to the online students. At a minimum, in cases where online test proctoring is not currently a viable option, it is recommended that institutions provide faculty with training on ways to combat academic dishonesty by the design of exams that will discourage such practice and the inclusion of assignments that will make this type of behavior much less viable. The authors of this study agree with Hoshiar et al. (2014) that "Institutional policies and procedures, professional development and training, and technology support services are fundamental to the effectiveness of student authentication and authenticity in online learning" (p. 343).

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Examining Students' Perceptions about the Educational Use of Technology

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Abstract

Technology has changed the landscape of education. Students in this digital age have grown up with technology; however, was this technology available to them in the secondary school setting (Stein, 2013)? What were the students' perceptions of technology for educational use? This study sought to determine the answers to these questions. Findings are reported in aggregated form using descriptive statistics.

Keywords: Millennials, Entering Freshmen, Educational use of Technology, Secondary School

Introduction

"Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road."—Steward Brand

"Young people today have lots of experience … interacting with new technologies, but a lot less so of creating [or] expressing themselves with new technologies. It's almost as if they can read but not write."— Mitch Resnick

The traditional-age students who are entering institutions of higher education are reported to be the digitally literate generation. Born between the years of 1981 and 2001, this group of students is labeled the Net Generation or Generation Y. This group is also sometimes referred to as millennial students or "Millennials" (Berk, 2009; Emeagwali, 2011; Jones, 2007; Oblinger & Oblinger, 2006; Skiba & Barton, 2006).

Millennials have grown up surrounded by technology and are perceived to be technologically advanced (Ajjan & Hartshorne, 2008; Black, 2010, Prensky, 2007). Stein (2013)

reported that about 80 million Millennials live in the United States, which makes them the largest population segment by age group. In some cases, Millennials bring their laptops or mobile devices to educational settings rather than paper and pen (Duis, 2013; Glenn & D'Agostino, 2008). These Millennials have been born in an age where technology along with the access to vast amounts of information are readily available, easy to use, mobile, and consumer-oriented. It would seem that these students are "wired" to technology.

Technology provides Millennials with instant answers to questions they don't even know they have. These questions can now be answered "on the go" with the vast amount of mobile technology available to the majority of users. Technology has moved at a very rapid pace in their lifetimes and it appears they have kept up. These students have witnessed the large cell phone from the 1980's become miniscule—and with more computing power than the system that put the first man on the moon. Moreover, in the classroom, teachers are attempting to integrate these innovative technologies to create new and exciting strategies and techniques to grab student attention and hold their interest.

Studies have shown that the majority of secondary school students say they are bored on a daily basis during class (Emeagwali, 2001; Stein, 2013). It is very difficult for teachers in secondary schools to compete with the fast-paced, instant gratification environment that these Millennials are used to. Instructors in secondary schools are struggling with ways to keep students engaged in the classroom. Traditional engagement techniques do not seem to have the desired outcome for this group of students. The lecture format especially does not seem to work for Millennials (Emeagwali, 2011). This lack of engagement may be due to students being constantly entertained by some device or social media or by sending an average of 88 texts per day (Stein, 2013). This behavior may be a reflection of the way these students are "wired" or

adapting to their surroundings just as prior generations were (Stein, 2013). As an attempt to integrate the technological environment required by this group into the daily school setting, secondary schools have adopted technology at different levels of funding and implementation. Some schools have been more successful at integrating technology than others. Rural schools with lower tax bases may not be able to afford current technology for every classroom; and since technology is changing daily, most schools simply cannot remain current. Secondary schools are not alone in this struggle as higher education institutions are struggling to manage this fast-paced change in technology as well (Chen & Denoyelles, 2013).

Purpose and Design of Study

This study focused on recent high school graduates who entered a small, regional public university as freshmen in the fall of 2012.The researchers sought to describe the students' perceptions about the educational use of technology in the secondary schools from which they had recently graduated.

In a 2013 study at this same small regional university, Wright, McDonald, Kilcoyne, and Champion determined that 93% of entering freshmen surveyed felt mastering technology was important to their studies and career. It is assumed these students are all tech savvy and use, at a minimum, computers and/or mobile devices for personal use on a daily basis. Only the students' personal use of technology was reported in the 2013 study.

The current study attempted to take a closer look at the fall 2012 entering freshmen to determine the students' levels of exposure to technology in the secondary school classroom for what was considered "educational purposes." The data are reported by dividing the entering freshmen into two groups—the 2012 high school graduates are referred to as Entering Freshmen 2012, and those who graduated between 2000 and 2011 are referred to as Other Millennials.

Other Millennials were then divided further into two groups covering a smaller span of time for a more detailed analysis of some of the questions. Specific questions from the survey instrument were analyzed and reported using descriptive statistics.

Instrument

A survey instrument using adapted items from the Fortune 500 company CDW's 2011 CDW-G 21st Century Classroom Assessment Tool (CDWG, 2011) was developed for a previous study by Wright et al. (2014). The 2011 CDWG questionnaire is an assessment tool designed to assess students' perceptions about technology used in both secondary and higher education and is free to download. The assessment was originally developed by O'Keef & Company. An adaptation of the 2010 version of this survey also was used by researcher Karen Martin-Jones (2011) in her dissertation study directed by major professor Dr. Lisa Gueldenzoph Snyder of North Carolina A&T State University. That study also looked at Millennials and their use and perceptions of technology. Results from the 2014 study by Wright et al. were further analyzed to produce the specific data needed for this current study. A copy of the adapted survey used for the original study can be provided upon request.

Population

The accessible population was 222 students enrolled in the introductory computer applications course (BUAD 1800) during the fall 2012 semester. Of the 222 enrolled students, a total of 181 elected to participate in the survey. Of those, 81 or 45% graduated in the year 2012. Another 80 or 44% graduated between 2000 and 2011 and 20 or 11% graduated prior to the year 2000. The data for the 81 Entering Freshmen 2012 and the data for the 80 Other Millennials was extracted for comparison purposes to conduct this study. The students who graduated prior to

the year 2000 were not included, as technology was not a common part of education in the classroom prior to 2000 (Dunn, 2011).

Discussion of Findings

During the fall of 2012 those university students enrolled in the School of Business Introduction to Computer Applications course (BUAD 1800), both face-to-face and online sections, were surveyed. Students were asked to voluntarily submit answers to the survey. Students enrolled in face-to-face sections were given the online survey in class, while students enrolled in online sections were asked to submit their online surveys by a specific due date. The survey was prepared using Survey Monkey and results were downloaded to an Excel spreadsheet. Data were analyzed to answer the specific questions of this study.

To determine the students' perceptions about the educational use of technology in the secondary school setting, students were asked several questions pertaining to technology use in their high school. This current study focused on the following questions (1) How often was technology used for educational purposes? (2) Where was technology used for educational purposes? (3) From a list of educational technologies, what technologies were available for the students to use for educational purposes?

The first question reported was asked as follows: "For the purposes of learning, how often did you use technology to do any of the following?"

- Create assignments, projects, writing samples, etc.
- Collaborate with other students on assignments, projects, writing samples, etc.
- Communicate with other students
- Collaborate with my teachers on assignments, projects, writing samples, etc.
- Communicate with my teachers

- Research topics of interest/assigned topics

Students were asked to select every day, several times a month, rarely, or never. The results for the students reporting every day or several times a month are shown in Table 1.

Table 1 – Question 1 Results

Answer Options (Every day or Several times a month)	**Entering Freshman (2012)** **n=81**	**Other Millennials (2000-2011)** **n=80**
Create assignments, projects, writing samples, etc.	77.9%	76.3%
Collaborate with other students on assignments, projects, writing samples, etc.	51.9%	56.3%
Communicate with other students	74.1%	63.4%
Collaborate with my teachers on assignments, projects, writing samples, etc.	49.4%	60%
Communicate with my teachers	54.3%	63.4%
Research topics of interest/assigned topics	85.2%	81.3%

Over half (54.3%, *n*=81) of the Entering Freshmen 2012 group indicated that they used technology to communicate with their teachers and 74% (*n*=81) indicated they used it to communicate with other students at least several times a month. Almost 78% of these students reported using technology at a minimum of several times a month to create assignments and 85.2% used technology at least several times a month to research topics of interest. The majority of these students used technology at least several times a month for learning purposes.

When compared to the Other Millennials group, the results were very similar, with the percentages actually being a little higher in some areas. More than 76% of this group used technology at a minimum of several times a month to create assignments and 81.3% to research

topics of interest. These results showed that more than 50% of these students used technology at least several times a month for the listed activities.

Using technology for learning is only one aspect of this study. The second question addressed where the two groups of students were using the technology. Ninety-three percent (93%) of the Entering Freshmen 2012 group reported using technology at home, which is similar to the 94% reported in the CDW-G 2011 21st Century Classroom Report (2011). Sixty-five percent (65%) said they used technology during class and in the school library while only 21% used technology during study hall. These results appear to suggest that there was some technology available for the majority of the Entering Freshmen 2012 in high school. When compared to the Other Millennials group, the researchers found some differences. More than 85% of this group reported using technology at home. However, only 46.9% used technology during class, with only 18.5% using technology in study hall and 55.6% in the school library. It would seem from these results that technology was not as readily available in the secondary schools for the Other Millennials.

Breaking the Other Millennials into groups consisting of smaller spans of years, 2000 – 2006 and 2007 – 2011, produced results consistent with expectations again suggesting technology offerings have changed at secondary schools throughout the given years. Approximately 90% of the 2007-2011 group reported using technology at home, with 78% of the 2000-2006 group reporting the same. More than half (51.7%) of the 2007 – 2011 group reported using technology during class, and 22.4% of this group reported using technology during study hall. The 2000-2006 group had different results, with 39.1% reporting using technology during class and 18.5% using technology in study hall. These results would suggest that not only has the availability of technology in secondary schools grown throughout the years, but also

availability of technology at the students' homes has changed as well. In other words, those who graduated more recently will have had more exposure to technology, as would be expected.

The third question focused on what types of educational technologies were available for the students' use. The results of this question were reported in a previous study for the entire sample group (*n*=181). However, this study focused on only the defined two groups, Entering Freshmen 2012 and Other Millennials. The students were given a choice of 20 items. The results can be seen in Table 2 on the next page.

Approximately 65% of the Entering Freshmen 2012 reported having Internet access at school with only 37% reporting access to personal computers. Interactive whiteboards were available to 46% of this group. Although these three types of technology led in both groups, Entering Freshmen 2012 and the Other Millennials, it can be seen by these results that not as many people in the Other Millennials group had access to technology in secondary school. The Other Millennials group had 51.3% reporting Internet access, with only 26.3% reporting personal computers and 27.5% with interactive whiteboards.

In a follow-up question, 51% of the Entering Freshman 2012 reported that their school encouraged them to use technology throughout the day, with only 32.5% of Other Millennials reporting the same result. About half (50%) of Entering Freshmen 2012 reported their teachers regularly assigned classwork or homework which required the use of technology, and again only 38.75% of Other Millennials reported the same result. These results appear to support the assumption that times are changing, and high schools are attempting to move forward with the use of technology. However, only 40.7% of Entering Freshman 2012 felt their high schools understood how they wanted to use technology as a learning tool, which is somewhat higher than the 36.25% reported by the Other Millennials group.

Table 2 – Question 3 Results

Answer Options	**Entering Freshman (2012)**	**Other Millennials (2000-2011)**
Wireless network/Internet	65.4%	51.3%
Personal computer (e.g., laptop, tablet, netbook, desktop)	37.0%	26.3%
iPod/MP3 player	12.3%	2.5%
E-reader device (e.g., Kindle, Nook, Sony Reader)	7.4%	5.0%
Media tablet (e.g., iPad, Samsung Galaxy)	9.9%	0.0%
Smartphone (e.g., BlackBerry, Droid phone, iPhone)	12.3%	5.0%
Video and/or Web conferencing	18.5%	11.3%
Digital content (e.g., online books, material available online for download in electronic form)	16.0%	8.8%
Open source applications (e.g., Google Apps, Open Office)	24.7%	17.5%
Blogs/wikis	9.9%	3.8%
Podcasts/vodcasts	6.2%	1.3%
Course management system (e.g., Blackboard, Jenzabar, Moodle)	28.4%	21.3%
Student response systems (a.k.a. “clickers” or learning response systems)	17.3%	10.0%
Off-campus network access	12.3%	8.8%
Interactive whiteboards	45.7%	27.5%
Recorded class lectures	7.4%	6.3%
Access to social networking sites (e.g., Facebook, Twitter, LinkedIn)	9.9%	3.8%
Instant message/video chat (e.g., AIM, Gchat, Skype)	7.4%	0.0%
Virtual learning, which delivers education to students who are not physically in the same location as the teacher and/or other students	21.0%	15.0%
Multimedia content streaming	8.6%	5.0%

Conclusions

The findings appear to suggest that those students graduating in 2012 and beyond will be better prepared to use technology in their higher education studies due to previous experience. While there remains the issue of schools keeping up with current technology, secondary schools have increased the use of technology in the classrooms to enhance the learning environment. These results support the need to use technology in the higher education setting. Higher education institutions should continue to seek information from entering freshmen about their exposure to and use of technology at their secondary schools. This feedback should be used to enhance teaching strategies used in the classroom by professors as well as providing opportunities for students to use various types of technology in and out of the classroom. Technology will continue to advance and with that will come a greater demand for innovation in the higher education classroom.

Further studies should focus on how to transfer these technology-savvy students and their knowledge acquired in secondary schools into the higher education institution. Moreover, it is critical to understand if a gap exists between the entering students' prior knowledge and use of technology and the higher education use of technology. Higher education institutions should capitalize on this acquired knowledge and help students grow not only in their content areas, but also in the technology field.

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Strategies for the Virtual Team: Improving Team Effectiveness

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Abstract

Online/distance learning has created the need for different approaches for students to work in teams. For online/distance learning students, the main method of communication for team members is asynchronous, which makes it extremely difficult for students to build trust among team members. As most universities make learning management systems such as Blackboard or Desire 2 Learn available to all faculty, students in both face-to-face and online courses have technological resources available for assistance in a virtual team process. This study focuses on strategies used by instructors to improve online team effectiveness.

Background

Being able to work in team environments is a skill that is increasingly in demand in the workplace. Educators agree that preparing business students to work in teams effectively is a challenge. In face-to-face classes, issues include formulating the team, deciding how much class time should be used toward team development, and designing assignments and projects that are the best for a team environment. During the implementation phase of virtual team assignments, instructors need to be careful to instruct groups, and let them know that the instructor is not there to be an enforcer, but is only there to ensure that the technology is working correctly (Schaefer & Erskine, 2012). Another important criterion to ready students for working in a virtual team is to require students to analyze cases, brainstorm project ideas, or make decisions and communicate those decisions virtually (Schaefer & Erskine, 2012). Even with the best design from the instructor, conflicts over involvement and the end product occur. Conflicts often happen over meeting schedules for a team to work outside of a face-to-face class. Even though face-to-face

teams have conflicts, team management is far more complex in virtual teams, because detailed planning is crucial, and schedule management is key (Rad, 2002).

With the advent of online and distance learning, working with teams has necessitated various approaches. In a face-to-face class, students frequently see their team members, judge their participation and interest in the class, and determine if others have a similar interest to succeed in the course. This awareness builds trust. In the online course, trust is harder to develop. All the student may know about fellow team members is their names. McFadzean and McKenzie (2001) suggested strategies involving individual activities, paired activities, and activities in small groups to get students to know each other and develop a level of trust. If students have an opportunity to get to know their team members and feel free to state their opinions, without fear of undue criticism, they may begin the process of trusting those other team members (McFadzean & McKenzie, 2001). Even with trust being more difficult to achieve in online and distance learning, Rad (2002) asserted that virtual teams may be more convenient for working professionals; and these teams may, in certain instances, produce better quality submissions than their face-to-face counterparts deliver.

As most universities make learning management systems such as Blackboard or Desire 2 Learn available to all faculty, students in both face-to-face and online courses have technological resources available to assist in a virtual team process. Some methods used to communicate in virtual teams, within a learning management system include email, chat, blogs, team meeting space, and discussion boards. To achieve the best virtual team experience, all methods employed within a class experience need to be confined to the members of the team, without the fear of interruption or intrusion from other class members who are not in the team. Without careful monitoring and swift correction of issues, conflict can be a serious issue with virtual teams, when

viewpoints are different among team members and team members have perceived incompatibilities (Pursel, 2009). To mitigate conflict, the instructor needs to be able to monitor transmissions within each team in order to troubleshoot conflicts. Another way to learn how fellow online students think is to read their postings to discussions or other assignments. Tools such as online blogs may encourage students to deeply explore issues in the course and clarify their opinions (Pearson, 2010). If students are allowed to choose their online teams, they may feel more confident in their team members if they have a better understanding of their beliefs and work processes (Gabriel, 2004).

Instructors should help students learn how to work in virtual teams and provide them with opportunities to practice asynchronous as well as synchronous methods to communicate with team members. Student learning should include developing the ability and the opportunity to choose appropriate technology for a specific task to help students gain experience that frequently is required when they enter the business world. For this study, a class exercise employing a variety of tools, including the university's learning management system, Facebook, Twitter, instant messaging, Skype, and email, were assigned to help students select an appropriate technology for their virtual meeting and to report on the results. Many of the students were unhappy with the technology that was selected by their team members, which caused additional conflicts. These conflicts included frustrations when some team members were late to the meeting, Internet connection issues occurred, and there were interruptions when members from other teams entered the wrong online meeting (Schaefer & Erskine, 2012).

Due to an increase in businesses with multiple national as well as international locations, many organizations are using technology to facilitate group meetings. Schaefer and Erskine (2012) acknowledged a disconnect between the technology requirements used by businesses

versus technology used by students for their college class assignments. So, the question becomes: What are business college instructors doing in the classroom?

Purpose

The purpose of this study is twofold: (1) to determine whether business courses are using virtual teams in either a face-to-face or an online environment, and (2) to examine the strategies used for effective team success in virtual meetings.

Procedures

A survey was distributed to 617 members of the Association of Business Information Systems (ABIS) and some other affiliated groups of the Federation of Business Disciplines (FBD) to assess the use of virtual teams in face-to-face and online environments. The survey was designed to explore the use of learning management systems and other applications for students to work virtually. In addition, respondents were asked to share strategies they have used to promote team effectiveness in the virtual workspace.

The survey was distributed in October 2014 with 44 responses to the first email. A second email was sent which resulted in an additional 22 responses. The response rate was 9.85% with 66 completed responses. Part of the low response rate may be that many faculty do not use either teams or virtual teams when teaching their classes.

Findings

The survey results were analyzed with the following results.

As shown in Figure 1 on the next page, the largest response (42% of the respondents) was that students may choose to use virtual meetings.

For this question, a virtual team can be defined as a team that meets using electronic means such as discussion, chat, or other method that does not require a face-to-face meeting.

Figure 1. Do you teach a class (or classes) where students are encouraged or required to meet virtually?

#	Answer		Response	%
1	No, my classes do not use virtual team meetings.		19	29%
2	Yes, my students may choose to use virtual meetings		28	42%
3	Yes, my students are required to use virtual meetings		19	29%
	Total		66	100%

When asked what format was used when virtual teams were involved, the highest response was with online classes (37%), followed by both online and face-to-face classes (31%), hybrid courses with some online and some face-to-face meetings (19%), and face-to-face classes (13%).

In describing the number of projects or assignments that were used by virtual teams in a semester, 62% had 1 or 2 projects or assignments as shown in Figure 2 on the next page.

Figure 2. How many projects/assignments do your virtual teams do in a semester or other course term?

#	Answer		Response	%
1	0		3	6%
2	1-2		32	62%
3	3-4		12	23%
4	5-6		1	2%
5	More than 6		4	8%
	Total		52	100%

In discussing the formation of virtual teams, two options were the most popular at 38% each. These options were 1) students choose to sign up for teams, and 2) the teacher selects teams based on a criteria. The third option of random selection was chosen by 23% of the respondents.

Another question on team formation related to the size of the team. The most popular size choice was four members, with 39% of the respondents choosing that size, followed by five members selected by 31% of the respondents, three members with 20%, two members with 6%, and more than five with 4%.

Virtual teams often are evaluated by the instructor. Some instructors use more than one method of evaluation as shown in Figure 3 below. Only 12% of the respondents in this study related that they do not evaluate the virtual team. The highest measure of evaluation indicated by 78% of the respondents was the quality of the finished team project or assignment.

Figure 3. How do you evaluate the virtual team? Check all that you use.

#	Answer		Response	%
1	Participation in team discussions, chats, etc.		18	35%
2	Student reflection paper about team process		13	25%
3	Team evaluation form completed by team members		34	67%
4	Quality of the finished team project or assignment		40	78%
5	Do not evaluate the virtual team		6	12%

Strategies used when working with virtual teams varied widely. Although some instructors encouraged students to meet virtually but did not provide much guidance or information, many other respondents offered specific strategies to improve the virtual experience. Those specific strategies offered include:

1. Explain to students how important being able to work on a virtual team is in the workplace.
2. Have team members develop a team charter or organizing document that delineates the policies and methods of team operations. Someone should be assigned as the team commander with final responsibility for the quality of the project.

3. Use many deliverables (or activities) along the way to help teams with the progress of the project and to have something to work on together. This might be a team charter, status updates, drafts, etc.
4. Suggest multiple methods to communicate, such as discussions and chats, and have students choose the ones they prefer.
5. Offer options for removing team members such as firing a member. This provides an incentive for all to work together.
6. Teach students how to use the technology prior to requiring its use. Instructors cannot assume all students know how to share documents and work in different formats.

A final open-ended question asked what issues or problems do instructors have with students working in virtual teams? Some key responses are listed below:

1. Online classes often have a higher dropout rate, and teams sometimes lose members before the projects actually get started.
2. Uneven knowledge of and possession of the technology.
3. Students may wish to use technology that the teacher does not have access to; and therefore, the instructor cannot monitor the team's progress.
4. Uneven work effort across the team.
5. Students who are free-riders.
6. All of a student's contributions are at one time instead of throughout the project.
7. Working in virtual teams is challenging, and many students have had no prior experience in the online environment before.
8. Lack of communication among team members.

9. Issues with students trying to schedule meetings and communicating across time zones.

Strategies for Team Effectiveness

The researchers have used the following strategies to enhance the virtual team experience for students who have the opportunity to work in a virtual team environment:

1. Form teams as early as possible in advance of a project.
2. Assign small team-building activities such as discussions, chats, short assignments, etc.
3. At the beginning of the team process, tell students that they will be evaluated by team members.
4. If possible, give some individual assignments that will relate to the team project. Each individual shares the work with the team.
5. Assign intermediate due dates. For example, each team member must do research and post it to the team discussion/shared workspace by a certain date.
6. Only after the intermediate date can team members start assembling information. This guarantees that each team member gets a chance to participate.
7. Ask members to post periodically to the team discussion board. This shows their involvement in the project.
8. Pick an official channel of communication – team discussion, team chat, or some other option. The instructor uses this channel to assign team points.
9. Try to determine the underperformers on teams as the projects progresses.
10. Offer a mid-project chance to evaluate team performance.

11. Make arrangements to remove underperformers from teams or adjust points based on student evaluations.
12. If everyone gets the same points, no matter the work level, you will find inconsistency in team commitment.

A team evaluation is a great way to foster participation by all virtual team members. Things to remember when developing this evaluation include:

1. Provide a numbering system.
2. Provide a way for written feedback.
3. Ask each student to evaluate the team and his or her own performance.
4. Some students will under-evaluate the participation they have given.
5. Other students will over-evaluate the performance.
6. Compare the scores and comments across the team to award final points.
7. Consider bonus points. Example: Would you like to nominate ONE person from your team for going beyond what was expected on this project? They could be the leader, the person who provided inspiration, the one who made you laugh. You may nominate yourself. You must give reasons why you think the person should receive extra points.

Conclusions

Working in a virtual team environment can be an increasingly important skill for future business graduates, as companies are placing a higher level of importance on virtual work. Even though organizations have increased their communication channels to include virtual team environments, business faculty are somewhat mixed in their approach to virtual teams. As evidenced from responses from this research, some faculty only encourage the use of virtual

teams, while others require it. The use of virtual teams still appears to be in an early stage of adoption by the majority of business faculty in this study. Therefore, additional information about helping students use virtual teams effectively may be of value to faculty.

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