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Designing a Leveling Course in Business Analytics for an MBA Program

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Abstract

This paper details the steps one university took to create an appropriate leveling course in business analytics for a general MBA program. A survey of the faculty teaching in the MBA program along with best practices from a literature review guided the curriculum development. Student end of course surveys, faculty reflection, along with current and emerging technologies will be utilized to modify and improve the course in future iterations.

Keywords: Data, MBA, analytics, pedagogy

1. INTRODUCTION

The demand for business analysts, data analysts, data scientists, data curators, and other data related jobs has been skyrocketing over the past decade (BLS, 2024). In response to industry demands, the academic community has been creating certificates, baccalaureate degrees, master's degrees, and other data related programs. This paper addresses development of a leveling course for a general MBA program at a medium-sized US university. Students entering the MBA program come from a myriad of backgrounds necessitating the development of a leveling course in business analytics. This course covers data literacy, data extraction, data cleaning, descriptives, regressions, visualizations, and special topics related to data manipulation in current business settings. This course gives the faculty in the MBA program a foundation upon which to build discipline-based (finance, accounting, marketing, and operations) analytics during the semester when their course is taught. This leveling course is a first year requirement of all entering MBA students. This course also exposes the students to the modern software tools of the business analyst, for example, Excel and Tableau.

2. LITERATURE REVIEW

Business Analytics vs. Data Analytics
With any emerging discipline it can take some time for terminology to evolve and the area of 'analytics' within business is no exception. For years, the terms 'business intelligence' or 'informatics' were common but since the late 2010's, terms such as 'data analytics' and 'business analytics' continue to be more common amongst higher education programs. Current research suggests that these are subdisciplines of the data and management science disciplines, but

Topic			2020	2021	2022
Number of Masters	New Data Science CIP Code		160	271	1208
	New Data Analytics CIP Code		344	530	2889
Projected Job Growth Rate	35%	2023 Median Salary	$108,020		

Table: 1 Data on data analytics and data science degrees granted and job growth

much disparity is still found throughout university degree programs (Power et al., 2018).

For the purpose of this paper, business analytics involves the use of statistical analysis, data mining, and predictive modeling to transform data into actionable insights that inform business decisions. It focuses on leveraging data to improve business processes, enhance decision-

making, and drive strategic initiatives (Galit & Peleg, 2023).

Data analytics encompasses the techniques and processes of examining raw data to uncover patterns, correlations, and insights. It includes various forms of analysis such as descriptive, diagnostic, predictive, and prescriptive analytics, and is applied across numerous domains,

including business, healthcare, and social sciences (Davenport & Redman, 2023).

There are key differences that are important to keep in mind when developing curriculum which are:

Scope and Focus:
Business Analytics: Specifically aims at improving business performance through data-driven insights, focusing on metrics like revenue, operational efficiency, and customer satisfaction.
Data Analytics: A broader discipline that applies to various fields and aims to analyze data for insights that can inform decisions in diverse contexts.

Application:
Business Analytics: Utilized for business-related problem-solving and strategic planning, often employing business intelligence tools and performance dashboards.
Data Analytics: Employed in a wide range of scenarios, from academic research to public health, using general analytical techniques to interpret data.

Methods and Tools:
Business Analytics: Commonly uses business-specific analytical tools, software, and techniques such as customer segmentation, market analysis, and financial modeling.
Data Analytics: Utilizes a broad array of analytical methods and tools, including statistical software, machine learning algorithms, and data visualization platforms.

In summary, the distinction between business analytics and data analytics lies in their specific applications and focus areas. Business analytics is a specialized subset of data analytics aimed at

improving business outcomes, while data analytics serves as an overarching term for analyzing data across various domains to extract meaningful insights.

3. CURRICULUM DEVELOPMENT

Curriculum development in the area of analytics is a hot topic due to the increase in the number of analytics programs in the university arena over the past decade. The projected growth rate of data related jobs, and the increase in the number of master's degrees in data related areas are shown in Table 1 (Pierson, 2023; BLS, 2024).

Academics are concerned with curriculum models for analytics programs, course structure and sequencing, and aligning curriculum with current and emerging industry needs. Baccalaureate programs, master's programs, as well as undergraduate and graduate certificates have curriculum guides published in the literature (Paul and MacDonald, 2020, Bačić, et al., 2023; Danyluk and Leidig, 2021; ACM and IEEE, 2020). Skills assessment and analysis of industry needs for recent university graduates have been performed (Stanton and Stanton, 2020; Dong and Triche, 2020; Radovilsky and Hegde, 2022) and a comparison between curriculum and industry needs was illustrated by Dong and Triche (2020). Many of these papers involve survey research, either a survey of faculty, program curriculum, job postings, or course topics.

Bachelor's and Master's Programs
The curriculum model committee headed by Danyluk and Leidig (2021) discussed the knowledge areas (KAs) a data science graduate should have at their disposal. The list is

computing focused with KAs in presentation and visualization; programming, data structures and algorithms; and computing and computer fundamentals. They also recommend KAs that would be applicable to all areas of data (scientist, analyst, curator) such as data mining; data privacy, security, integrity, and analysis for security; and data acquisition, management, and governance. Paul and MacDonald (2020) structure their model as an "analytics road map" that has six areas to master:
Prerequisites – Microsoft Office, general mathematics and statistics preparation
General Business Skills – Communication and leadership
Analytics – Descriptive, predictive, and prescriptive
Software – software recommendations for analytics
Electives – courses to establish a mastery area (healthcare, risk management, geospatial)
Experiential – Practicum, internship, or capstone project

Both curriculum models illustrate the synergy between computing and analytics. In fact, the tie-in between the two fields is so great that Urbaczewski and Keeling (2019) wrote about MIS departments transitioning to Analytics departments. A timeline is presented in their work that would describe the current state of analytics as in its 3rd metamorphosis.

Undergraduate and Graduate Certificates
Answering the demands of industry for more data professionals, Clayton and Clopton (2018) created a four course sequence that rewards the student with a certificate in data analytics. The courses selected

1. Introduction to Data Analytics
2. Principles of Data Communication and Visualization
3. Applications of Data Analytics
4. Analytics Capstone

align with the more general model of Paul and MacDonald (2020) discussed in the previous section.
In the graduate arena, Bačić, et al. (2023) redesigned an existing certificate to include redesigned elective courses around the central data and database systems classes. These redesigned courses updated the Data Analytics Graduate Certificate to include courses in visualization, econometrics, analytics, forecasting, programming, and a domain specific elective. After the renaming of the certificate and the refreshing of the elective courses, their department has experienced a four-fold increase in the number of certificates awarded during the seven-year reporting period.

Evaluating Curriculum versus Industry Needs
Alignment of curriculum should involve standardized curriculum models, advisory boards, and industry needs surveys. Dong and Triche (2020) compared curriculum mentions of key words to job posting mentions of the same key words. The top five results from each are given in Table 2.

Job Posting	Curriculum
Excel	Programming Skills
Database Management	Database Management
Business Knowledge	Application Development
Communication	Foundation
Collaboration	Predictive Analytics

Table 2: Top five job posting versus curriculum mentions of key words

A visual of the dataset is given in Graph 1 and illustrates the differences between what employers' desire in an entry-level candidate and what university curriculum from business analytics and data science programs advertise in curriculum documents (Dong and Triche, 2020). The entire comparison table is illustrated in Graph 1. Points above the $y = x$ line indicate skills that appear more often in curriculum than in job advertisements, while those points below indicate skills employers desire that are lacking in the curriculum. The legend indicates skill categories as defined by Dong and Triche (2020).

Graph 1: Job posting versus curriculum mentions of key words (See Appendix A)

Another study (Stanton and Stanton, 2020) identifies "four broad categories of skillsets for analytics professionals" (p. 148) from the literature review and findings in their research. These categories, with examples, are:
Credentials – degrees, prior experience, certifications
Hard Skills – data analysis, programming, data visualization
Soft Skills – communication, teamwork, problem solving
Software Skills – Python, SQL, R, Excel, Tableau

These skills also appear in Graph 1, connecting the two studies' results. Stanton and Stanton (2020) go on to illustrate the cross-disciplinary nature of data studies by presenting a jobs list

harvested from LinkedIn on April 20, 2019, with position titles like data science, data analytics, healthcare analytics, social media analytics, retail analytics, and HR/talent analytics (plus more). This list of seventeen job types from across the business analytics spectrum listed 533,062 jobs with 143,929 (27%) listed as entry level jobs. These results make the point that "data is, and for the foreseeable future, will continue to be, one of the most significant disruptive forces in worldwide commerce" (Stanton and Stanton, 2020, p. 138). Analytics and analytics jobs are appearing across the business spectrum as businesses attempt to use the massive amounts of data they collect to improve processes and cut costs.

Finally, many corporate interests (Forbes, Coursera, Dice, TechTarget) in their whitepapers list the most promising skills to secure a job as a data analyst/scientist. While these whitepapers have an industry slant, the main skillsets required have been captured in Graph 1, stemming from job listings and academic curriculum documents.

The topic of analytics in the curriculum (Bachelor's, Master's, Certificates and Minors) has been well-documented. However, a general outline of what MBA students need as an analytics leveling course has not. This research proposes a course structure that will prepare MBA students with the ability to incorporate analytics into their coursework throughout their time in the MBA program. By incorporating the major skillsets desired by industry into the curriculum, the students will benefit from seeing analytics used in their courses (management, human resources, finance, economics, accounting, marketing). The students will also gain a thorough understanding of where analytics can be deployed in the business ecosphere.

4. METHODOLOGY

Through student requests, faculty conversation, and advisory board feedback, the business school at a medium-sized public university identified the need for a foundational course in business analytics for their MBA program. Faculty teaching in the program found that students did not have the same level of analytics preparation when starting the MBA program.

To begin the study, a survey was deployed to faculty teaching in the MBA program which identified skills that the faculty would like all students to have when entering their class. The survey was open-ended to enable the faculty to decide what skills they desire in students rather than giving them a list of skills to select from. The results from the six faculty teaching in the MBA program are given in Table 3.

Topic	Percent of Respondents
Critical Thinking	100%
Excel Skills	83%
Predictive Analytics	67%
Data Cleanse	67%
Data Visualization	33%
Data Scrape (Web)	33%
Analytics (Cluster)	33%
Decision Making (Data driven)	33%
Text Mining	33%

Table 3: Survey results from MBA faculty

From these results, the analytics faculty put together a topical course outline and proposed it to the MBA faculty. The resulting outline is given in Table 4.

Topic Area (Weeks to Cover)	Tools Needed	Topic SLO's
Data Types (1) NOIR	Internet Excel	Define the data types used in business analytics
Data Acquisition (2)	Internet Excel	Locate, select, and import data in various formats and from varied sources
Data Cleansing (2)	Excel	Demonstrate the ability to cleanse data sets using appropriate methodologies
Data Visualization (3) Descriptive Statistics Hypothesis Testing	Excel Tableau	Demonstrate the ability to generate meaningful visualizations utilizing business data
Predictive Analytics (3) Time Series Multiple Regression Logistic Regression	Excel Real Statistics Tableau	Demonstrate the ability to utilize predictive analytics for business forecasting
Cluster Analysis	Excel	Demonstrate the ability to perform

(2)	Real Statistics Tableau	and interpret cluster analysis in a business application
Text Mining (1)		Recommend appropriate uses for text mining for business applications
Machine Learning (0.75)		Recommend appropriate uses for machine learning for business applications
Artificial Intelligence (0.75)		Recommend appropriate uses for artificial intelligence for business applications
Ethics (0.5)		Demonstrate the ability to make ethical decisions concerning data acquisition, data cleansing, data analysis, and data visualization
Total Weeks (16)		

Table 4: Proposed topics, tools, and SLO's for Business Analytics

In addition to the topics listed in Table 4, each module should emphasize:
• Excel usage and skills
• Critical thinking – making sense of the data, data manipulations, and results to include:
  - Produce meaningful results in the business context
  - Present clear and concise findings in the business context
  - Answer questions about the data in the business context

The last two weeks of the course will be reserved to discuss ideas surrounding emerging techniques and tools for data analysis. The objective of these "special topics" is to make the students aware of topics they might utilize in the modern enterprise. These advanced topics are not for the general MBA graduate to become proficient at, that would be for the analytics graduate student, but to give the general MBA student a window into the possibilities of data in the modern enterprise.

Now, all students take the MBA leveling course "Business Analytics" in their first year of study in the MBA program.

5. RESULTS

In general, the majority of MBA program students are employed full-time, necessitating an educational framework that optimally supports their professional growth. A critical aspect of program design involves aligning courses with both industry demands and student interests. In this paper, we propose and implement such a strategy within the CISB 501 Business Analytics course of our MBA program.

Course Description
(CISB 501 Business Analytics**)**: This course provides a comprehensive overview of business analytics with a focus on critical thinking, data acquisition, and data visualization. Students will explore a range of topics including data types, data cleansing, and predictive analytics, using tools such as Excel, Tableau, and Real Statistics. The course covers essential techniques for data visualization, including the creation of meaningful visualizations and dashboards, as well as advanced topics like predictive analytics, cluster analysis, and text mining. Students will learn to utilize these techniques for business forecasting, decision-making, and ethical considerations in data management. Additionally, the course introduces the applications of machine learning and artificial intelligence in business contexts. Throughout the course, students will engage in practical exercises involving data modeling, processing, and strategic visual encoding. They will also critically evaluate visualization designs and make informed decisions about visual representation, including color choices and encoding methods.
By the end of the course, students will have developed transferable skills applicable to various data visualization tools and software, preparing them to effectively analyze and present data in a business setting.

The first three methods, listed below, have been applied alongside exams, simulations, and assignments. The fourth method will be applied in the next semester.

Utilization of Relevant Information and Datasets
Students can leverage datasets from their workplace such as healthcare, risk management, social media, and other business-related data sets and then apply course concepts to analyze this data effectively. This approach not only enhances engagement but also develops practical

skills crucial for career advancement, such as data-driven decision-making and problem-solving.

Open Discussion
Another pivotal method involves allowing students to explore topics of personal interest or challenges encountered in their professional roles. By sharing these experiences within the class, students not only contribute diverse perspectives but also collaboratively develop innovative solutions. This fosters a rich learning environment where practical insights from various industries improve theoretical learning.

Case Study Analysis
The integration of up-to-date case studies, curated by instructors, provides a platform for students to apply learned theories to real-world scenarios. This method encourages critical thinking and enables students to propose and discuss solutions in a supportive peer-learning setting. Additionally, students are encouraged to bring their workplace challenges to class discussions, enhancing the learning experience through shared expertise and diverse perspectives.

Application of AI in Assignments will be applied next semester (Fall 2024)
Students will be tasked with applying AI techniques to analyze complex issues relevant to their field of study or industry. This hands-on approach not only familiarizes them with AI technologies such as machine learning algorithms and natural language processing but also encourages them to critically assess the effectiveness and accuracy of AI-generated solutions.

Evaluation and Innovation
After implementing AI solutions, students are prompted to evaluate the outcomes comprehensively. This evaluation involves assessing the strengths and limitations of AI models deployed, identifying potential areas for improvement, and exploring alternative methodologies or enhancements. By engaging in this iterative process, students not only deepen their understanding of AI applications but also cultivate innovative thinking and adaptive problem-solving skills.

Interactive Learning Environment
The integration of AI in assignments fosters a collaborative and interactive learning environment. Through discussions and peer feedback sessions, students can exchange insights, share diverse perspectives, and collectively refine their approaches. This collaborative learning process not only enhances the quality of solutions but also enriches the learning experience by leveraging collective knowledge and expertise.

6. STUDENT FEEDBACK AND COURSE IMPROVEMENT

To refine the course, a survey was conducted with students upon completion, featuring open-ended questions to capture their perspectives in detail. The responses provided valuable insights into both the strengths of the course and areas for potential improvement. The survey focused on two main questions, which helped highlight the most effective aspects of the course and gather suggestions for enhancing its structure and content.

What were the most effective aspects of this course?
The survey results highlight several key strengths of the course, particularly the hands-on activities and the use of Tableau. Many students valued the interactive nature of the course, emphasizing that the practical exercises and step-by-step Tableau guides were instrumental in helping them learn effectively. The hands-on activities, especially those involving Tableau, were frequently cited as the most valuable component, with students finding them essential for grasping the material and applying it to real-world scenarios.

Students also praised the professor for active communication and the effective use of tools that made the learning experience both engaging and relevant. The modules and quizzes were well-received, with feedback indicating that they were beneficial for understanding the program and reinforcing learned concepts.

However, some students suggested that while the course excelled in teaching how to use Tableau, there could be more emphasis on utilizing data to create and communicate effective visualizations. Overall, the course was recognized for its practical approach and the valuable skills it provided, which effectively prepared students for real-world applications in business analytics.

What changes would you recommend to improve the course?
The survey results revealed mixed feedback regarding the course structure and delivery. While the professor's understanding of the challenges associated with learning Tableau—a new tool for many students—helped alleviate some concerns, the feedback also highlighted a desire for a more

rigorous curriculum, in line with the course's master's level designation.

Additionally, students suggested increasing opportunities for structured discussions, which they believed would enhance comprehension and foster greater collaboration among peers within the MBA program. Although the course content and delivery were generally well-received, these areas were identified as key opportunities for further enhancement to enrich the overall learning experience.

Generally, the students enjoyed and appreciated the course. Many found that the subject matter and software tools were current and relevant to the modern work environment. Table 5 gives a summary of the student responses collected on the end of semester student evaluation form.

Total Responses	209	
Median of Medians	4.00	
Total Average	4.24	
	Strongly Agree	97 = 46.41%
	Agree	82 = 39.23%
	Neither Agree nor Disagree	17 = 8.13%
	Disagree	10 = 4.78%
	Strongly Disagree	3 = 1.44%

Table 5: Summary of student responses, 1=Strongly Disagree, …, 5=Strongly Agree

7. CONCLUSIONS

Any course, after running the first time, needs adjustment. Some of the adjustments for this course have been pointed out (the addition of AI for example), others will follow based on discussions with colleagues and faculty in the MBA program. It is proposed to survey the faculty in the MBA program in two years (upon program completion of this initial cohort through CISB 501) to evaluate if the quality of the students' quantitative abilities has improved. For example, are the students now using more visualizations and quantitative results in their other coursework? Are the instructors able to move through the baseline quantitative methods more quickly due to the students having completed CISB 501?

Answers to these, and other questions, will form the basis for future curriculum modifications for the leveling course in business analytics for the MBA program.

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APPENDIX A

Graph 1: Job posting versus curriculum mentions of key words