

Developing a Data Analytics Concentration for a Master of Liberal Arts Program

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Abstract

This paper discusses the need for Data Analytics in liberal arts education and recounts an ethnographic journey to developing such a program. It is submitted that future liberal arts master's programs need to embrace tenets of data analytics to remain relevant. This work describes how a Data Analytics Concentration was developed and implemented as part of a long-standing traditional Master of Liberal Arts program. This cross-disciplinary program has students take required and elective courses from diverse fields with the goal of solving a central focus question. The area of inquiry is developed with the assistance of the program coordinator and is related to the professional experiences and aspirations of students. Rather than developing a professional analytics competence, this concentration is designed to give the students the tools and competencies they need to answer their liberal arts focus question using Data Analytics. This work provides insight into the challenges in developing, implementing and evolving the program.

Keywords: Liberal Arts, Data Analytics, Concentration, Education, Data-centricity.

1. INTRODUCTION

This paper discusses the need for Data Analytics (DA) in liberal arts education and recounts the work of developing a DA concentration for a Master of Liberal Arts (MLA) program.

The traditional liberal arts program in question displays an interdisciplinary focus. Students take required and elective courses from diverse fields such as history, the social sciences, literature, and other disciplines with the goal of solving a central focus question. The area of inquiry is developed with the assistance of the program coordinator and is related to the professional experiences and aspirations of students.

In discussing the need for analytics in liberal arts education, it is helpful to examine tenets of the

epistemology of knowledge. Karl Popper (2005) suggests that advancement of knowledge is largely a process of trial and error, the result of falsification and testing. Thomas Kuhn (1997), on the other hand, envisions a world of revolution and paradigm shifts. Although one was a historian, and the other a scientist, both have varying thoughts on the progression of knowledge that are at odds with each other. It is submitted that the reality of knowledge progression is likely somewhere between the two; periods of small evolutionary changes with falsification and testing followed by paradigm shifts that radically change the way things are done.

Such a reality is evident in the world of information systems. Practices and technology evolve, followed by occasional revolutionary

technologies or paradigm shifts that change the way business is done. These seem to happen every decade or so...the relational database, the personal computer, networking and distributed systems, the Internet, cloud computing, and data analytics.

Information Systems and Data Analytics are separate but related disciplines. Information Systems is widely accepted as leveraging technology to solve business problems. Data Analytics consists of analyzing historical data to describe, predict, detect or prescribe outcomes. They are not the same, yet they have a lot of touchpoints centered around data. Paradigm shifts, revolution and evolution affect both disciplines, as well as the liberal arts. All of these fields increasingly revolve around the data, and all are affected by paradigm shifts.

Paradigm shifts also apply to the liberal arts – Kuhn himself was a historian. Examples include the past Age of Enlightenment in the 17th and 18th centuries where it was thought that human reasoning could discover truths about the world that could be used to improve the lives of humankind (Bristow, 2010), and the current focus on social justice where differences in thought spark the culture wars (Hartman, 2019).

Social and cultural paradigm shifts also have their roots in the liberal arts as we shift from a knowledge-based perspective to a data centric perspective. Without embracing data, it will become increasingly difficult to harness the curiosity and critical thought necessary to move into the future. It is thus necessary for Data Analytics to become a part of a liberal arts education.

For those interested in a data science career, the entry level has traditionally been a master's degree or Ph.D. in statistics or computer science. More recently, the huge demand for practitioners in the field has led to an increasingly large number of educational programs at the bachelor's level. However, this is not what is needed to integrate Data Analytics into a liberal arts master's program.

Whether equipped with a bachelor's degree, master's or Ph.D., data science practitioners are still quants – they use complex models and algorithms to conduct complex data analysis. This is almost anathema to a liberal arts practitioner.

The liberal arts master's student increasingly requires proficiency in using analytics tools to

answer liberal arts questions, to facilitate curiosity, to enable critical thinking, to demonstrate theses or to falsify refutations. Unlike data science where the analysis is the end; in liberal arts, the analysis is the means.

The goal of this project is therefore not to make the MLA student an expert in Data Analytics, nor is it to Make DA competencies the focus of studies. It is instead to give the MLA student a modicum of competence to facilitate stimulation of their intellectual curiosity, to encourage critical thinking, and to obtain the proficiency to use DA in a project to answer big focus questions.

This kind of thinking led to development of the DA concentration in the MLA program, with the end result being giving MLA students a modicum of DA competence to facilitate their goals.

2. LITERATURE REVIEW

In *New directions for computing education: Embedding computing across disciplines* (Fee, Holland-Minkley & Lombardi, 2017), the authors describe new ways of including computing education in cross-disciplinary programs. Their focus is, "to help our students solve problems with computing, not just to prepare them for careers in technology" (p. v). They note that institutions are collectively finding new ways to integrate computing education into the broader curriculum. Schneider and Sigelman (2015) note that adding practical or technical skills to a liberal arts degree leads to increased compensation and career development.

Havill (2019) discusses a Data Analytics program that embraces the liberal arts. In addition to the typical Data Analytics curriculum of math, computer science and analytics courses, students are required to take three to four courses in one of 7 applied areas as well as a summer internship. This gives students experience in various specific areas. The author notes that the program is more successful than expected, and that it has been found to attract students who are less quantitative in nature and would not otherwise major in a quantitative field. Cowling et.al. (2022) finds that application of DA to the liberal arts is best accomplished through broad exposure.

Dunaway (2017) discusses a Data Analytics and decision-making course designed for liberal arts majors. She notes that liberal arts students with analysis competencies in addition to their workforce specific skills increase their marketability and earning potential. It is widely

accepted that there is a scarcity of people in the workforce able to analyze and use data in general decision making. Van Knippenberg et. Al. (2015) suggest that people must increasingly devote attention to analyzing and coping with large amounts of openly available data.

3. DISCUSSION

What is the Master of Liberal Arts?

It is of course expected that liberal arts graduates are “innovative and independent thinkers with strong communications and reasoning skills” (UR, 2003).

The Pilot

When deciding to offer a Data Analytics MLA concentration, there was no strategic vision integrating the DA coursework with the MLA. Library research indicated that most concentrations consisted of three or four courses. It was thought that a three-course concentration would be most practical, as it would result in more of the 10 course, 30 credit program could be dedicated to analytics courses.

This was tried with several students during the 2022/2023 academic year. It was understood that there would be no indication on transcripts of the concentration since it was not yet approved. Students simply took independent study courses (ISYS 399U) on Introduction to Analytics, Predictive Analytics and Data Visualization. The participants, while glad to get some exposure to analytics, were blasé on the value of the concentration. One student did not even return for the spring semester.

Revising the Program

Discussion following the pilot yielded several modifications to the program. Program developers were uneasy with the way the courses threw students a smattering of DA without a cohesive goal, yet not enough to develop a professional competence. It was decided that there was an insufficient amount of statistics and descriptive analytics. Discussions with the registrar’s office mandated required changes before the concentration could be transcribed.

Looking at the program holistically, there was no cohesiveness in simply requiring several DA courses in the concentration. Something would need to be done to tie the program together and give it focus, integrating the DA aspects with tenets of the MLA. Keeping with the traditional goal of the MLA to require courses from diverse fields such as history, the social sciences, literature, and other disciplines with the goal of

solving a central focus question, it was decided that the DA portion of the program should facilitate such inquiry. With the area of inquiry developed with the assistance of the program coordinator, the DA aspects of the program were changed to give students the competencies required to conduct an analysis using DA to answer their focus question in a capstone project.

It was thought as the pilot was devised that a prerequisite of an undergraduate applied statistics course would provide a sufficiency of descriptive analytics. This was done to economize on the number of courses required for the concentration. However, it was found during the pilot that this was not the case. Students could not perform a descriptive exercise, and the lack of knowledge also affected their performance in the predictive analytics course. Students also needed a background in probability to fully understand analytics concepts. Consequently, it was decided to add a descriptive analytics course to the program.

Course	Name	Topics
ISYS 504U	Introduction to Analytics	Survey course which gives participants an analytics vocabulary and introduces various aspects of analytics
ISYS 506U	Descriptive Analytics	It uses historical data to understand changes and analyze performance metrics
ISYS 508U	Predictive Analytics	Forecasting future outcomes and performance using historical data
ISYS 510U	Data Visualization	Translating information into a visual context

Table 1: Data Analytics Concentration Courses

The result was a four-course concentration consisting of the courses listed in Table 1. Students enrolled in the concentration take ISYS 504U and 506U during the Fall Semester, and ISYS 508U and 510U in the Spring Semester. The program is designed to be completed in a year for full-time students.

The first course students take is USYS 504U, Introduction to Analytics. This course provides a foundational understanding of the uses and value of data analytics in the liberal arts environment and in personal affairs. Important data analysis

and statistical methods that will help enable an organization to realize value from the data available to it are introduced, demonstrated and practiced. Fundamental probability concepts that underpin informed use of the results of the presented data and statistical analysis methods will be introduced and integrated into course materials and activities. Course materials and activities emphasize practical aspects of data and statistical analysis. A course paper discusses uses of analytics in the liberal arts discipline, and how analytics may be used in a capstone project.

The second course, ISYS 506U, Descriptive Analytics, is taken concurrently with ISYS 504U during the Fall Semester. This course introduces students to statistical ideas and concepts with an emphasis on the methods and tools used most frequently in a liberal arts environment. The course takes a practical approach to collecting, organizing, summarizing, displaying, and analyzing data. Specifically, the course helps students understand basic concepts to interpret statistics reported by others in reports, journals, and in the media, develops logical, critical, and quantitative thinking skills, helps students appreciate statistics and its practicality in everyday life, and to analyze problems, identify pertinent information, use data, and select an appropriate method for solving problems.

After the winter break, students take ISYS 508U during the Spring Semester. Predictive Analytics explores concepts in data management, processing, statistical computing, and dynamic visualization. The purpose of predictive modeling is to be able to predict the behavior of new data. Participants are introduced to managing and analyzing data for purposes of extracting useful information and providing actionable forecasting. Activities include importing and exporting, cleaning and fusing, modeling, analyzing and synthesizing complex datasets using data analytics techniques. Linear regression is used to build models for predicting responses. The course goal is to give students the tools to complete an MLA program project using Predictive Analytics.

Concurrently with ISYS 508U, students take ISYS 510U during the Spring Semester. This course introduces Data Visualization, with emphasis upon applied projects and issues. The goal of the course is developing the ability to turn data into descriptive graphics, communicate those graphics, and understand common pitfalls in the practice of data visualization in support of a data visualization project. Students will use data visualization tools and will be introduced to data visualization evaluation. The goal is to give

students the ability to use Data Visualization to complete an MLA program project with Data Analytics.

The four courses are focused on introducing the students to DA, giving them the vocabulary to have a cogent discussion on DA, as well as to provide them with the tools and competencies to complete a capstone project using analytics. This revised course list adds focus and coherency to the concentration and integrates it with the degree program.

Finally, it was realized that without transcribing the concentration, it would not exist in the minds of students. They want hard evidence of their achievement to add to their resumes documenting their data competence. It was thought that it would be easy to add a concentration to student transcripts since the university's School of Business and School of Arts and Sciences have long had transcribed concentrations. The MLA degree is offered by the School of Professional and Continuing Studies, which is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). According to the university registrar, accreditation requirements are for a concentration to be transcribed, all students in that program are required to have a concentration. Therefore, concentrations in interdisciplinary studies and leadership were devised, and all future MLA students will be required to declare a concentration. This is not difficult for students, as the traditional student not interested in DA would simply declare the interdisciplinary studies major.

These changes collectively add focus to the DA concentration and give it more structure moving forward. The new concentrations are not as of this writing mentioned on the program website – the first students find out about them is when they meet with their advisors. Despite that, 8 students declared the DA concentration for the 2024/2025 academic year. In a small program such as this, that is a significant number.

Future Efforts

Future efforts include a move away from the current capstone course which all students take, and towards more directed research projects working closely with a professor. Although the MLA is not a Ph.D. funnel program, working closely with a faculty member on their capstone project is anticipated to add tremendous value to the student experience. It is hoped that more opportunities to work with a faculty member on other projects and courses will emerge.

There is also anticipated that additional concentrations may be developed. Having DA, Leadership and Interdisciplinary Studies concentrations is a great start, but it is easy to envision other concentrations in a diverse program such as the MLA

4. SUMMARY

This paper has discussed the need for and development of a successful MLA program with DA concentration.

- The need for including a DA competence in a liberal arts master's program exists.
- This project started with a smattering of DA courses added to an MLA program and evolved into a focus on supporting an analysis for the capstone project.
- The number of courses was increased from three to four to include a Descriptive Analytics course.
- Other concentrations were developed in order to transcript the concentration.
- Future work includes having students work closely with faculty in directed research instead of the current mass capstone course.
- The program has proven wildly popular, with the first cohort starting during the Spring 2024 semester simply through word-of-mouth.
- The program has continued to be popular, and evolutionary changes are made to keep it popular and relevant.

5. CONCLUSIONS

The MLA with DA concentration developed from thoughts about adding some DA competencies to the MLA because of student interest. Through an evolving process, the smattering of DA courses became focused on supporting an analysis of a liberal arts focus question using DA methods.

The program has been proven to be popular and successful. The concentration started during the spring of 2024, and there are three times the number of students registered for the concentration for the 2024/2025 Academic Year. Surprisingly, the number of students registered for the Spring 2024 concentration courses was two to three times higher than declared concentration students – these students were taking the courses as electives.

The popularity of the program as well as the literature suggest that it is essential to include data literacy and DA competencies in the liberal

arts. Bachelor's degree students in the liberal arts have also been asking for DA courses, and a minor available to all bachelor's degree students regardless of major has also been developed, to be implemented in the coming year. A degree requirement for all students to take a DA course has been discussed, but not all faculty are sold on this, and there is currently insufficient momentum.

At this point, it is sufficiently gratifying that the MLA concentration is popular, successful, evolving and relevant.

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