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Is technology scary? Student perceptions of analytics content in graduate core courses

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Abstract

This case study focused on student perceptions of analytics content in graduate core courses. Fifty-four students provided their perspectives about technical course content, their general interest in analytics and how they perceive analytics roles in industry. The study's findings indicate opportunities to help students reduce potential anxiety with technical content in analytics programs, to understand the breadth of career opportunities in the analytics field and to emphasize both business and technology in analytics courses.

Keywords: analytics, curricula, pedagogy, business, technology, programming, analysis

Introduction

Graduate students often approach business analytics content with trepidation. Then, after exposure to technical content many confirm they dislike it. Devising strategies to demystify analytics content for non-technical students, convey the full breadth of available career opportunities and position technical content as a means to succeed in non-technical roles should enhance student success and increase analytics program enrollment.

Literature Review

Havelka (2003) affirmed by recognizing differences in students' confidence with using computers, educators can take relevant action to provide effective support and instruction. He also found students in majors like economics and information systems are more confident than management and general business students while those who take more courses using computers tend to be more comfortable than those who take less courses. This confidence is known as self-efficacy, which Compeau and Higgins (1995) defined as "the belief that one has the capability to perform a particular behavior." Perceptions of self-efficacy tend to have a positive or negative impact on attitudes toward using technology.

Self-efficacy also influences students' confidence and persistence when coping with challenges. Students pursing different business majors have differing levels of self-efficacy with computers (Havelka, 2003). Years of use, courses taken, and the variety of software packages and programming languages learned impact confidence. Self-efficacy may only improve with several years of experience so non-technical majors require more time to acclimate and gain comfort with technology. Students need to achieve a "threshold level," or critical mass, of training and experience before their self-efficacy increases (Havelka, 2003).

Bandura (1989), through his study of Social Cognitive Theory, affirmed with personal effort people can effect change in themselves and their situations. He also concluded when people exhibit strong self-efficacy

they tend to set higher achievement goals and became more steadfast. Canfield (2005) defined visualization as the act of picturing compelling results and affirmed the process of visualization drives people to achieve personal goals. Bandura's conclusions reinforced this. Those with a high sense of self-efficacy can visualize success while many who cannot fail.

Marcoulides (1988) used The Computer Anxiety Scale (CAS) to evaluate students' anxiety and self-efficacy while using technology. The CAS posits students' anxiety with using computers predicts their achievement. Some students may respond to computing with enthusiasm while others may not and their perceptions of computers either trigger unpleasant or rewarding experiences. Some computer anxiety remains even after the acquisition of technical expertise and this impacts students' effectiveness and their ability to leverage positive experiences with technology. Instructors should be cognizant of the role anxiety plays in learning how to use technology and provide an environment that diminishes that anxiety. This case study was designed to address these research questions:

- How do business master's students perceive the technical content in analytics programs and what is the impact that perception has on their interest in analytics?

- How do business master's students perceive analytics roles?

Methodology

Creswell (2007) describes case studies as exploration within a single case, or bounded system. This case study focused on the lived experience of graduate students taking core business courses in management and information systems at the University of Bridgeport in Bridgeport, CT, USA. Approved by the university's Institutional Review Board, this study explored students' perceptions of analytics and technology. A Survey Monkey survey instrument was administered that asked these qualitative, open-ended questions:

- Please select your program (a list of master's programs was provided).

- Do you have previous work experience (yes/no)?

- Have you taken any courses using software to analyze data (any course is appropriate if the software and analysis comprised a large portion of it),
    - If yes, how would you feel about doing such analysis in your career?
    - If no, how does using software to analyze data in a course make you feel? Why?

- "Coding" is the act of following syntax to program a computer to perform tasks. How do you feel about coding? Why?

- Please describe what you feel the typical analytics role looks like.

- Which of these two words is most associated with analytics to you, business or technology? Why?

54 participants responded, hailing from these programs in descending order by number of students. The principal investigator (PI) and author employed a convenience sample of students in the four analytics and management courses he teaches.

Table 1: Counts of Student Participants by Program

Program	Number of Students
MS, Analytics	15
MBA, Management	9
MBA, Analytics	5
MS, Finance	5
MS, Technology Management	5
MBA, Accounting	4
MBA, Marketing	4
Other	3
MBA, Finance	2
MBA, Human Resources Management	2
Total	54

While most participants were from the business school, several students hailed from a technology management program delivered by the School of Engineering and the "other" category consisted of three students from unique programs combined into this category to ensure anonymity. In addition, the business school offers two analytics programs, an MS in analytics, described above as "MS, Analytics" and an MBA concentration in analytics, described above as "MBA, Analytics." Though this study's participant sample is large for a qualitative study (Creswell, 2007), its purpose was not to achieve generalizability, instead this was an exploratory study to inform faculty and researchers about graduate student perceptions of technical and analytics course content in business programs.

Findings

Though most students expressed enthusiasm about engaging in data analysis as with this student's affirmation, *"I look forward to it! I enjoy looking into data and being able to tell a story with it,"* several students expressed trepidation, as with this student's response, "*[I'm] a bit nervous as I'm not sure if I have the brain power for it, but excited, motivated and willing to learn."* Many expressed deeper concern when confronted with the prospect of coding computer programs. These quotes summarize this well:

"It looks hard and complicated."

"I am not too keen on coding because I don't have a coding background."

"Not so good, not much of a computer or a coding savvy person."

"Coding seems like a complicated skill that I will most likely have little use for in my desired career field."

"I am not excited about coding, I have no present knowledge of coding."

"Scared to death of it. Not sure I have the capacity to understand it. Always willing to try though."

"Intimidated."

"I don't feel very confident about coding, because I feel it is a very complex and specific task."

"Skeptical about it, related to spending the whole day in front of the computer."

"It really scares me, and whenever…someone starts talking about coding, [it] is basically like they are speaking [in another language]."

"I do feel little nervous about coding. Because my background is not from the field."

"Coding is like rocket science to me. Tedious."

These sentiments are intriguing because understanding coding is a core analytics competency. Participants' perceptions about the analytics field were also interesting. Student perceptions about analytics careers ranged from, *"I don't know,"* to this comprehensive affirmation,

"Descriptive analytics examines what happened in the past: Monthly revenue, quarterly sales, yearly website traffic, and so on. These types of findings allow an organization to spot trends. Diagnostic analytics considers why something happened by comparing descriptive data sets to identify dependencies and patterns. This helps an organization determine the cause of a positive or negative outcome. Predictive analytics seeks to determine likely outcomes by detecting tendencies in descriptive and diagnostic analyses. This allows an organization to take proactive action—like reaching out to a customer who is unlikely to renew a contract, for example. Prescriptive analytics attempts to identify what business action to take. While this type of analysis brings significant value in the ability to address potential problems or stay ahead of industry trends, it often requires the use of complex algorithms and advanced technology such as machine learning."

Between these extremes, students perceived analytics roles as quantitative and solitary:

"Finding meaning in numbers, charts, graphs, etc."

"Someone sitting in a desk, with a bunch of raw data, responsible to organize and supply structured spreadsheets on demand according to requests from data managers. One of the jobs could consist on delivering findings about trends or deviations to normal."

"Technical, no human interaction."

"I think about the person that has the patience in crunching numbers and putting the meanings in each of the numbers. Which is great, but not fitting everyone's personalities."

Clearly, most students perceived analytics as a technical endeavor. Only one student mentioned managerial content, *"Before taking the courses, I thought that analytics role is all about coding. Soon to realize that the analytics role is more towards management."*

Thirty students associated the word technology with analytics while twenty-four students associated the word business with the field. These comments typify feedback from participants who associated the word technology with analytics,

"You need technical skills to do analytics but you don't necessarily need business to do analytics."

"Analytics sounds like it is more associated with technology."

"Analytics is all about technology."

"…analytics seems like it is directly related to technology and using programs to format data/punch numbers, etc."

These comments typify feedback from participants who associated the word business with analytics,

"You have to understand the business side of things in order to understand what the data you are analyzing is saying."

"I think analyzing the data and giving the prediction of where your business needs to go is more related to Analytics than technology."

"I feel like 80% of the analytics focus more on business and only the tools that we are using such as SAS, R and Tableau can be considered as technology. Ultimately, the main focus is using these tools in making money in business."

"Nowadays, business world is in need of metrics."

"I feel like analytics has more to do with data analysis of products, monetary factors and things like that. It looks like it is more connected to the aspects of business."

Previous experience with data analysis did not impact this study's findings.

Discussion

Between the time this study's data was captured and the findings recorded in 2020 and the publication of this paper in 2022, the dataset was destroyed so several questions remain unanswered. For instance, 25 of the 54 students surveyed, or 46% of the respondents, hailed from technically oriented programs in analytics and technology management. It would be interesting to see whether these were the students who perceived analytics as more technical than business oriented. Likewise, the remaining 29 students hailed from business and liberal arts programs. Were they the participants who perceived analytics as more business oriented than technical? Unfortunately, we no longer have the ability to further explore the data to find out.

Maturation effects aside, several high-level themes did surface from the feedback. First, students from a cross section of programs held positive perceptions of analytics but they became hesitant when confronted with the reality that they might need to code. Likewise, a subset of participants described analytics as a solitary endeavor devoid of human contact. This does not paint an enticing picture for prospective students and presents an interesting avenue for further research. It is also helpful to know for faculty and administrators tasked with enticing potential candidates for their analytics programs.

Some study participants also did not realize effective analytics requires both technical and business acumen. Instead, their perception of available opportunities tended to be narrow. This indicates an opportunity to both reinvigorate business and technical content in analytics curricula and promote the wide breadth of analytics opportunities available in the marketplace.

Finally, students' trepidation when contemplating technical content is cause for concern. While encountering varied levels of student preparedness in the classroom is common, this feedback points to a need to orient and inform students in advance so they arrive better prepared to succeed.

Conclusion

This study's participant feedback suggests several actions analytics instructors and curriculum developers can take to better prepare students to work through potential anxiety and move toward self-efficacy with technology. It also highlights opportunities to ensure analytics curricula emphasize both business and technical skills while also affirming the variety of available analytics careers.

Recommendations for Future Research

A new study should be initiated to further address the research questions posed here. Over time, a grounded theory study should also be conducted to develop a theoretical model for quantitative testing.

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