Title of Study: Finding the Keys to Success in Business X-201
Principal Investigator Name and Department: Kari Johnson, Kelley School of Business
Year/Semester Awarded: Spring 2015
Number of undergraduate students who were subjects of your study: 8913 unique student data records were provided from the various sources. (Not all were used in analysis due to gaps in the data.)
Number of graduate students who were subjects of your study: None.

Executive Summary:
As part of the Learning Analytics Fellowship, I set out to better understand the students who took the course, Business X–201: Technology and Business Analytics, and find what contributes to their success in the course and in the job market. Early findings indicate that the source of pre-requisite course credit may have an impact on course performance, and better academic performance may indicate higher salaries.

Additionally, I’ve learned about the process of learning analytics as it pertains to institutional data. In short, I’ve found that data takes a great deal of time and effort to make useful, regardless of the quality, and focused questions with a narrow scope will lead to more productive analysis.

In this report I share some of my preliminary findings, as well as a reflection of my process in an effort to share my experience with others who find themselves on a similar path.
Background:

X201 has been a required course for all majors at the Kelley School of Business since the 1990’s. Titled “Technology”, it has served as an introduction to current technologies that are most relevant to business students. Through the years, the course has evolved to provide students with experiences that will prepare them to succeed in the current business environment.

In its most recent iteration, the course provides an introduction to Business Analytics, focusing on analytical techniques and strategies to manage and gain insight from large quantities of data. X201 is closely linked with the pre-requisite business technology course, K201: The Computer in Business. Students master spreadsheet formulas and functions in K201 and build upon those skills in X201 as they learn to manage larger datasets, structure their own spreadsheet models, and use analytical techniques to solve complex business problems. X201, and the prerequisite K201, have been often mentioned by alumni and recruiters as providing some of the most relevant job skills.

In my early stages of analysis, I set out to evaluate the link between K201 and X201 performance, and to investigate the value in terms of salary after graduation.¹

Initial Findings:

These come from the very early stages of analysis, here are some initial findings of interest.²

According to the data, it appears that students who transfer prerequisite credit from another institution do not perform as well, on average, as their peers who took K201 on the IU-Bloomington campus. Additionally, students who took X201 as a transfer student in their first semester at IUB earned a lower average X201 grade (C+) than their peers who have at least one semester at IU before taking X201.

¹ The parameters for this study required that no current student data was to be used, and that all findings must be reported in summary – no identifiable information may be reported. For the purposes of this study, data was collected from Student Information Systems at the university level, and from Undergraduate Career Services at the Kelley School of Business. The data includes students who completed X201 between the Fall of 2010 and the Fall of 2014. Variables include demographic information, prerequisite course performance, grade information and majors, as well as salary and job titles.

² This portion of the study includes students who were enrolled in X201 between Fall 2010 and Fall 2014 who also received credit for K201 or an equivalent course. Honors versions of K201 and X201 have been excluded for the purpose of this analysis. Letter grades have been converted to a numeric scale for this calculation (13 = A+).
• **Effects Of Prerequisite Course On X201 Performance:**

![Figure 1: Average Grades by Source of K201](image)

Based on a simple comparison of average grades by category, the data show that students who take the pre-requisite course (K201) at IUB perform better, on average, in X201. Students who transfer credit for K201 from outside our campus see an average X201 grade almost two points lower.

• **Effects of taking X201 in first semester on campus:**

Preliminary analysis shows that students who take X201 their first semester at IU as a transfer student show lower average grades in X201.

![Figure 2: Average X201 Grade by Status at Time of Course](image)

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3 The K201 prerequisite credit is required before a student can enroll in X201. The credit can be earned through the Kelley School of Business on the Bloomington campus, or may be transferred from a select set of pre-approved academic institutions.

4 It should be stated that the sample size for transfer students is considerably smaller (74 transferred vs 5482 in-residence). However, the variation in the averages for these populations is notable.
Given the findings depicted in Figure 1, this is not surprising, as students who take X201 in their first semester at IU will most certainly have transferred the credit.

• **Effects Of Academic Performance On Salary:**

Overall, the average starting salary for all records included in the study\(^5\) was approximately $54,000 per year. As shown in Figure 3, when average salary is calculated in categories of academic performance, “A” students earn about $2,000 more per year on average. This appears to be true for both K201 and X201 course grades, as well as the overall GPA at the time of graduation.

Additionally, since X201 is an introduction to business analytics, I was curious to see if students are taking on analyst roles after graduation and if that has any impact on salary. I found that about 30% of job titles in this data set included ‘analyst’. When examining the data by job title as shown in Figure 4, it appears that the trend in academic performance continues but that analyst roles are compensated slightly more in all categories that non-analyst roles.

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\(^5\) For the Salary analysis, the data set includes students who were enrolled in X201 between Fall 2010 and Fall 2014, who have credit for the pre-requisite course K201 or an equivalent, and who have also reported a job title and starting salary for full-time employment after graduation. Those who have not yet graduated, or who have not reported their job status, or took the honors version of K201 or X201, or who took K201 more than one time have been excluded from this part of the report.
Figure 3: Average Salary by Academic Performance
Figure 4: Average Salary by Academic Performance, Job Title
Reflection of the Process

• Use of student learning analytical data and methodological approaches
  Data for this study came from various sources including university registration data, as well as in-house databases within Kelley. Some data, such as salary and job title, were self-reported. Much work was done to merge data from university systems with Kelley data. The majority of time on this project was spent recoding and reconstructing the data to prepare it for analysis. Categorizing variables and understanding the meaning of many institutional codes.

• Appropriateness of the learning analytical data in answering research question(s)
  The data I received were appropriate for the needs of my research, however, the structure of the data will always dictate the way it can be used.

  While the data were of high quality, some of the greatest challenges of this project came from attempting to merge data from multiple sources to get a complete view of the student experience. While all the necessary characteristics that I requested were present, I often found it difficult to get the data where it needed to be for proper analysis.

  However challenging the process, I must express my gratitude to those who have provided the data and answered my countless questions as I attempted to put the pieces of this puzzle together.

• Challenges encountered in using student learning analytical data
  In X201, our students are taught that analytics requires three key factors to be successful. You must have the right data, the right technology, and the right people. I have found that lesson particularly relevant in the process of this study. To that list of factors, I will add Time.

  Data:
  I was fortunate to have great support from the Learning Analytics Fellows, the research office, and from colleagues at Kelley which provided me with access to quality data that applied to my research questions. However, it is important to note that none of this data was collected for the purpose of this type of analysis. Though the data are of high quality, many records are missing values which create challenges in the amount of useable data. Records with empty cells had to be removed, reducing the sample size.

  As the university moves forward in the area of learning analytics, I think a key take away from the Learning Analytics Fellowship is the idea of designing data collection for the purpose of analysis. While institutional sources of data are valuable, the analytics process will be much smoother when the collection is designed with the analysis in mind.

  Technology:
  Through the learning analytics fellowship and my teaching role, I have access to various software packages that allow me to conduct analysis. Though I still have much to learn in
some of these packages, this study proved to be a valuable training ground and an opportunity to explore new tools. Ultimately, I found comfort in the familiar and spent most of my time in Microsoft Excel, but I gained a lot of experience in Tableau and regression packages as well.

People:
I am very appreciative for the support of the learning analytics fellows who have been a sounding board throughout the process. I have benefitted greatly from being part of this group. However, I believe that my process and my outcomes would have been greatly improved if I had worked with a team on this project. The ability to discuss and validate models and techniques with colleagues who know and understand this course would have been a great advantage.

Time:
Unfortunately, it is more difficult than I anticipated to find time for this type of analysis. It seems there is always something else that must be done today. Perhaps being part of a team would have helped me to prioritize my time better, but throughout this project, finding time has been a primary challenge.

I mention this because I believe this is a challenge many organizations face when adopting analytics practices and data-driven decision making. When the organization is already running in real-time, and making decisions about daily operations, it’s difficult to take a step back to see if there are ways we can improve the process. Especially when answers from analytics aren’t readily apparent, it’s easier to do what we’ve always done. I know there is great value to be mined from data, but it takes time and that is a precious resource as well.

• Modifications or adjustments made to the study that differed from original proposal
  Early on in this project, I had to let go of some of my research questions because the data weren’t available. For example, I was unable to obtain data from Oncourse to evaluate how students use our course materials. Ultimately, this was for the best, because I believe the scope of my research was much too broad.

  A key take away for future projects is that it is important to focus the questions to manage the scope of the analysis. Every answer seems to lead to more questions, I expect a series of smaller more focused questions to yield more meaningful and useful results. Additionally, I would focus on variables that can be controlled or at least influenced. Some of the findings here are meaningful but few are actionable.
Connections to the Field and Disseminating the Findings

My initial findings through this preliminary analysis have brought up some interesting insights, but unfortunately not much that I would consider ‘actionable’. I plan to do further analysis and investigation using these leads, as I am able to further process the data and develop more sophisticated models.

I would love the opportunity to continue this research as time permits. I am grateful to the learning analytics fellows and its supporters for providing access to such rich data sources and for being willing to answer my numerous questions about and requests for data as my research has progressed.

Next Steps:

Overall, I have enjoyed being part of this process and especially have benefitted from the learning from and sharing with faculty fellows in this program. I feel I have much to learn and more work to do. I have invested a great deal of time in the data models that are necessary for further analysis. As time permits, I plan to delve further into this data to try to identify actionable insights.

Additionally, despite my lack of actionable insights at this stage, I do feel a great deal of learning was gained through this fellowship. Learning what is available within the institutional data that has already been collected, and how we as researchers can learn and connect to that data will be useful to many future investigations. As we learn about the limitations of existing data, the university can explore other methods of data collection and extraction to aid in the process of analysis.

I firmly believe that there is great deal of valuable information and important patterns to be discovered within our institution, and I appreciate the university’s interest in and funding of this research. I am glad to have been a small part of the process of unlocking that potential.