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## ARTICLE

## Teaching Religion with Data

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### ABSTRACT

The humanities in general and religious studies in particular are currently seeking new ways to address the learning needs of today's students. This article discusses one approach whereby humanities students are taught the analysis of data using a variety of web-based technology. Using the class we taught as our primary example, we discuss the challenges and successes we had bringing data analytics to humanities/religious studies majors. In the end we show how humanities students can gain a new understanding of how to answer religious studies questions while gaining skills valued in the contemporary marketplace.

### KEYWORDS

data analytics, religious studies, technology, software, robot-proofing

## Introduction

Religious studies is in a crisis. From the abandonment of organized religion by the most recent generations ([Cooper et al. 2016](#)) resulting in declining majors (Reed 2016) to the targeting of the university in general in the culture wars (Giroux 2019), religious studies fights for its survival as part of the humanities in today's university. At the same time, technology has advanced—its power surpassing many previous limitations and finding its way into new areas. This results in both opportunity and peril; it leads to new ways of asking questions about our world, but also threatens students and faculty who are not comfortable with the advances.

In this environment, some are starting to rethink the religious studies curriculum. This article will look at one particular experiment at a public university in the South. The course, [Religion in the Digital Age](#) (RDA), was designed to address some of the concerns that religious studies and other humanities programs face. The class employed digital technologies to introduce religious studies students to data analytics in hopes of both increasing the technical skillset of religious studies graduates while also providing new ways for them to ask and explore religious studies questions.

## The Background of Religion in the Digital Age

The Millennial Generation (and Gen Z) are rejecting organized religion and are generally suspicious of the applicability of religion in general (Reed 2016; [Barna Group 2018](#)). Traditional religious studies programs and seminaries are seeing declining enrollment and consequent mergers and elimination of programs and schools ([Kronk 2017](#); [Walton 2017](#); [MacDonald 2016](#); [Jiménez 2017](#); [Ross 2017](#); [Schackner 2014](#)). At the same time, students are demanding that college majors provide a clear pathway to employment (Twenge and Donnelly 2016) and, apart from ministerial or academic jobs, this road is not apparent for religious studies majors.

In addition, there are larger challenges facing universities. The humanities, in particular, are under attack from conservative elements in our culture who feel that the reading of Joyce or Plato or examining the Battle at Waterloo is time wasted. Others feel that skills developed within a humanities liberal arts curriculum, beyond a waste of time, are akin to indoctrination as part of a covert liberal agenda ([Jaschik 2017](#)). The rise of a ubiquitous internet has led to the cultural diminution of expertise (Nichols 2018). With academic credentials no longer the criterion for authority, now a host of self-appointed experts speak through social media outlets. All this has led to a re-envisioning of the university system as vocational, teaching students “marketable skills” and decrying anything not directly connected to that goal.

Into this maelstrom the private sector has interjected its thoughts about education and its future. Calum Chace, whose book *The Economic Singularity* predicts the end of most jobs through automation and artificial intelligence, suggests students today should “study computers,” but then backtracks to say “give yourself as broad an education as you can” (2016, 278–9). Bill Gates said if he was entering college today he would study Artificial Intelligence and, if not that, then STEM ([Elkins 2016](#)).

While it is clear that the study of technology is important, it’s just as clear that this is not a complete answer to concerns about widespread underemployment in the future. Calum Chace (2016) and Martin Ford (2016) have both made strong arguments that with an increase in robotics and artificial intelligence many of the careers that were once staples of the economy (including jobs in technology) may be subject to automation. Beyond the elimination of manufacturing jobs, which we have seen over the last several decades, they predict that white collar workers, from legal assistants to doctors, may soon also be replaced by automation. The conversation about the possibility of a post-work world in which the majority of people can no longer find full-time employment has begun. What kind of education will be required in such an environment?

Some are starting to question the siloed approach of the university which pits STEM and the Humanities in opposition. Tech entrepreneur and publisher Tim O’Reilly in his book *WTF? What’s the Future and Why it’s Up to Us* suggests that the subject of study is not of the greatest importance; rather, it is the method of analysis that is key:

I studied Greek and Latin in college. Everything I learned about computers, I learned on the Job. The *knowledge* I learned in college was useless to me. The habits of mind that I formed were what mattered, the foundational skills of study and particularly the ability to recognize patterns. . . . It’s not just knowledge that we have to teach, it is the ability to learn. (2017, 345–6)

What O’Reilly suggests is that analysis, what we often refer to as critical thinking, is essential for the college student regardless of their subject of study. Thus, for O’Reilly himself (a proud classics graduate), the value of the skills typically emphasized in humanities programs should not be underestimated.

Too often, we have not asked if all critical thinking is the same. The elision of difference between humanities programs has led some universities to contemplate eliminating individual programs and majors and replacing them with consolidated majors ([Flaherty 2017](#)). But such a move shows the weakness of O’Reilly’s argument. If the upshot of humanities is critical thinking, then why does a university need multiple majors to accomplish that? Could a single humanities program (say English or history) not produce the same effect?

As advocates for humanities programs, we need a more refined argument than that we are teaching critical thinking in English, and history, and religion, and classics. Instead, we must demonstrate that religious studies offers something apart. We will leave other disciplines to make their own arguments about their benefits, but we suggest that in religious

studies we are teaching more than just critical thinking. While we certainly are teaching critical thinking, we are also teaching other skills such as empathetic reasoning, textual analysis, social systems study, psychological interpretation, political implications, and so forth. Likewise, religious studies examines the various dimensions (social, psychological, political, economic, etc.) of beliefs and practices, rituals and texts.

Yet as important as what religious studies does, we find ourselves in need of expansion as well. The new coin of the realm is data and a survey of religious studies curricula shows that this is not an area that religious studies programs have adopted. There are some pioneers: the University of Alabama has created a Digital Humanities in Religious Studies course, the University of Virginia has started a Digital Humanities Certificate Program, and Iliff School of Theology has started an Experimental Humanities lab. These programs, courses, and centers, however, represent the exception rather than the rule.

Nevertheless, the power of data and its analysis continues to grow and religious studies curricula dare not ignore it. An hour watching television includes multiple commercials by businesses who want to “harness data” to optimize profits. In politics, the post-fact environment has led to an increasing reliance on quantitative data as a way of eschewing the subjectivity of mere assertion. Graduates of our program who have gone into ministry report that church boards, often populated by business people, often ask for data to support the distribution of church resources.<sup>1</sup>

Some, though not many, scholars of religion are doing this sort of work. The Society for the Scientific Study of Religion, Religion Research Association, and the Sociology of Religion and Religion and Social Sciences units (of the American Academy of Religion) all provide opportunities for scholars to present their use of data. Yet, we do not see significant integration of this work into religious studies curricula at the undergraduate level. Religious studies programs tend towards text and cultural analysis rather than building quantitative literacy in relation to religion. The failure to take quantitative literacy seriously puts students in religious studies departments at a disadvantage when they graduate and enter the workforce. There is no doubt that in the employment world it is important to be able to work with spreadsheets and numbers, to speak the *Lingua Franca* of the digital world.<sup>2</sup>

This is not a new problem. The social sciences tried to bring an understanding of data to the general college student (Sweet and Strand 2006)—often termed “Quantitative Literacy” (QL). Yet even in sociology courses, surprisingly, there is a lack of data analysis focus. A 2006 study of sociology course syllabi showed only 11.9 percent had goals related to data analysis and even fewer dealt with technological literacy (1.5 percent) (Grauerholz and Gibson 2006). Pedagogical work on developing QL in introductory sociology courses focuses on using group work to pursue a particular research question and engage in hands-on analysis of data (Caulfield and Caroline 2006).

To this end, resources for teaching QL have appeared on the internet. The “Integrating Data Analysis” project worked with faculty in departments (largely social scientific) to create course modules to teach and enhance QL in the mid-2000s (Howery and Rodriguez 2006). More recently, the Association of Religion Data Archives (ARDA) has created a series of both self-directed and classroom-based modules to teach QL as well as how to use the data resources that the ARDA provides.<sup>3</sup>

Increasingly, QL entails not just knowing how to use datasets appropriately, but also the recognition of the limitations of such datasets (Nowakowski, Sumerau, and Mathers 2016). Although recognizing one’s own position and the biases that may come along with that is addressed, social scientists still teach QL through the active use and analysis of data

1 This is not to say that there are not legitimate critiques of the use of this data, particularly as a way of understanding religion (Silver 2015; Wuthnow 2015; Ramey and Miller 2013). Wuthnow (2015), in particular, has lodged complaints about the use of “polls” to understand religion (though see the criticism of Blankholm [2017] and Wald [2016]). But this importantly makes our point: it is only with careful exposure to the appropriate use of data, as well as the raising of questions about those limitations (as we did in our class), that an educated quantitative literacy can be formed. On the other hand, as Wald (2016) points out, to say that religion is so complicated and individual as to be essentially uncapturable by data is another retreat to the *sui generis* argument.

2 This is not restricted to the business world. As noted above, we have increasingly heard reports of church boards demanding data and, certainly, in the nonprofit sector, the use of careful data tracking has become an important part of transparency and accountability.

3 The ARDA is the largest repository of religion-related data sets in English on the internet. For our class, we made use of several datasets from the ARDA and instructed the students doing quantitative research that the ARDA should always be the first place they looked for datasets applicable to their question (<http://thearda.com>). For teachers, the ARDA provides a repository of syllabi related to the sociology of religion as well as lesson plans, assignments, and quizzes.

even if that data may be flawed. The creation of hands-on experiments and analysis is understood to lead to a deep and important understanding of social issues such as inequality (Arabandi, Sweet, and Swords 2014) or local demographic trends (Burdette and McLoughlin 2010).

More recently, the notion of QL has been positioned within a wider and more robust debate that includes new and expanded ideas of “literacy” as well. In his 2018 book, *Robot-Proof: Higher Education in the Age of Artificial Intelligence*, Robert Aoun suggests a new model he calls “humanics,” arguing:

We need a new model of learning that enables learners to understand the highly technological world around them and that simultaneously allows them to transcend it by nurturing the mental and intellectual qualities that are unique to humans—namely, their capacity for creativity and mental flexibility. (Aoun 2017, 53)

For Aoun, this does not mean the humanities lose out against STEM. Instead, he seeks to integrate the humanities and STEM through several “literacies.”

His first literacy is what he calls “technological literacy” (Aoun 2017, 55). He defines this as a “Knowledge of mathematics, coding, and basic engineering principles” (2017, 55). Clearly, this is within the STEM arena. However, Aoun spends most of his time, not praising the advances of STEM, but talking about the need for all of today’s students to have experience with coding.

The second literacy that Aoun advocates for is “data literacy” (Aoun 2017, 57). Here he notes that data is increasing in size and importance in our world. Larger data sets are providing the opportunity to understand things in novel ways. Additionally, these options will only grow. The much-vaunted “Internet of Things” may provide the kind of micro-level understandings of individual’s behaviors multiplied billions of times over that will give us unparalleled insights into human values and practices. But, as Aoun notes, the keys to understanding all this data is “interpretation and context” and this is a realm where religious studies excels.

Aoun’s third literacy, what he names “human literacy,” is particularly suited to the humanities (2017, 58). He argues, “Human literacy equips us for the social milieu, giving us the power to communicate, engage with others, and tap into our human capacity for grace and beauty” (Aoun 2017, 59). The religious language is clear here, and Aoun goes on to talk about other things which are the strengths of religious studies: the ability to “challenge presuppositions,” “respectful inclusion,” understanding how to “communicate and motivate” people, and the all-important question of “why?” beyond the “how” and “what” that the other literacies give us (2017, 60). This literacy is certainly in the religious studies wheelhouse.

Aoun proposes four “cognitive capacities” on top of these three literacies. Here he includes “critical thinking,” “systems thinking,” “entrepreneurship,” and “cultural agility” (2017, 62). With the exception of entrepreneurship, religious studies programs have prided themselves on the cultivation of all of these. The understanding of a religion, its systemic organization, the way it creates its participants and enforces its norms and structures, are part and parcel of what religious studies attends to. The process of creating that analysis is, of course, critical thinking; once a student understands that process in one religion, the transfer of the process to other religions happens quite seamlessly. This results in the kind of cultural agility that Aoun describes as “empathy, discretion, and a very human nuance” (2017, 70).

This model of Humanics emphasizes what religious studies programs are already creating—students who have most of the competencies and some of the literacies that Aoun recommends. Aoun does not make these recommendations arbitrarily. As the title of his book indicates, he sees a time in which robots and artificial intelligence will replace many jobs, white collar as well as blue collar. At some level, Aoun, a techno-optimist, sees that as positive. Many jobs that are mind-numbing drudgery, whether in the factory or in the office, will be offloaded to machines. But if that is the case, then what sort of education will facilitate people into jobs that will replace these old jobs? That is what Humanics hopes to accomplish.

Religious studies already does much of what is encompassed by Humanics, but religious studies programs have, by and large, avoided teaching data and technological literacy. For religious studies to be a full player in Humanics this must change.

## *Religion in the Digital Age*

In fall of 2016, a THATCamp<sup>4</sup> discussion about teaching data analytics to religious studies students led to two conclusions: First, there was wide agreement that a course like this should be taught. Second, at least amongst the participants of the discussion, no one had made this a part of their program's curriculum.<sup>5</sup> As a result, the authors of this paper resolved to think carefully about constructing such a class.

The THATCamp discussion produced a list of technologies that the participants thought students should be taught. Spreadsheet programs like Microsoft Excel topped the list, but numerous other tools for data management and analysis were included. We determined that we would narrow this down through focus groups to determine whether certain programs posed too great a learning curve and what sorts of technical problems we might expect. We conducted the focus groups in the summer of 2017<sup>6</sup> and through them decided web-based software was preferable to downloaded software, even if that occasionally meant the software was less powerful. Recognizing we needed access to a computer lab, we secured one on campus for the fall.

The pedagogical goal of the course was to give students experience analyzing quantitative data related to religion. We asked each student to create an electronic portfolio that would demonstrate their ability to analyze data and do research using that data. The portfolio contained mini-projects of single-issue applications and a final paper that integrated traditional humanities research techniques with supporting and supplemental quantitative data analysis.

We structured the class in two parts. We used the first part of the class focused on the research process. The students were taught to define a good research question, consider the data needed to answer the question, and conduct a literature review. We integrated technical and research skills, drawing on library faculty to show us different resources, both print and data. Students were encouraged to discuss their individual projects in these sessions and think together about ways information could be found. The class discussed different kinds of research questions: descriptive, explanatory, hypothesis, and theory (Thomas 2017, 10–16). Their final projects were individual ones, but the class worked together to master the technologies, find appropriate literature and data, and present mini-projects to the class. The professor and the TA were both available to meet with students and work through problems that came up.

With this in place, the second second part of the class focused on learning software products related to data analysis. Different programs were selected in accordance to the different types of data the students were using. Google n-grams helped us understand cultural movements while the [GSS Data Explorer](#) gave insight into a particularly large scale survey (the General Social Survey), et cetera. In each case, it was not about learning the technology for its own sake, but using it to further their research goals. We conducted in-class demonstrations for each technology and students followed along. In general, Reed would give a demonstration to the class while Doyle would observe and take notes regarding student participation and comprehension. Doyle would also help individual students who fell behind or had technical problems. The presence of a technical assistant was essential for the smooth running of the class and we would highly recommend others attempting this do the same.

## *Software Instruction*

As noted before we made sure that the software we used was web-based. This made the technical administration easier, and it eliminated cost considerations because the web-based products were free for academic use. The class used several different products: [Aportfolio](#) (an electronic portfolio system used by our university), [Google Sheets](#), [Google N-Grams](#), [Google Trends](#), [GSS Data Explorer](#), and [IBM Watson Analytics](#).

4 THATCamp (<http://thatcamp.org>) is a pre-conference meeting held annually the day before the annual meeting of the American Academy of Religion. THAT stands for "The Humanities and Technology." That Camp is described as an "unconference" and focuses on participation and spontaneity. At AAR, this is generally where religion scholars who have an interest in technological applications to religion meet and discuss experiments, products, and class usage of technology.

5 Obviously, it is possible that the self-selected group was out of touch with the entirety of the field. Certainly, religion scholars trained in the sociology of religion and psychology of religion are teaching methods classes that do include quantitative literacy. However, the consensus was that there was not an established model that included data and technological literacy in most religious studies programs.

6 This project was funded by a Wabash Center grant.

## *Aportfolio*

One of the challenges of this class was to enable students to display their learning. The electronic portfolio product standard at our university, Aportfolio, seemed to be ideal. It allows posting of text and graphics and students could personalize their portfolio. We assumed that since the product was part of required freshman-sophomore writing classes, our students would already be familiar with it. This assumption was incorrect. Students were not all experienced with Aportfolio. A few students had worked with it in previous classes, but about half the class had not. We brought in a university trainer to demonstrate the software, but while students with backgrounds in web design took easily to Aportfolio, most of the class never gained a complete understanding of the product. In the end, we deemed the system too complicated for most students to use with the limited training they were given.

Lack of an easy-to-use online portfolio program remains a challenge for the class. We need a system to showcase student projects; [Google Sites](#) has been suggested as an alternative, though we continue to explore options.

## *Google Sheets*

Part of doing data analytics is understanding how data works. Most datasets are best understood as a combination of rows and columns like in a spreadsheet. Thus we decided to include a spreadsheet program as a foundational component to the class. We chose Google Sheets over Microsoft Excel for three reasons: our university has adopted Google for its productivity suite of programs; Google Sheets is web-based, meaning it will run on any platform including Chromebooks, which are increasingly popular alternatives for students due to their low cost; Google Sheets is a free product, and does not require a license.

In class, we offered tutorials on Google Sheets. Students learned basic spreadsheet manipulation, how to use things like hiding columns and filtering columns to answer questions, and then moved on to basic functions such as sum, count, subtotal, and counta. Ultimately we taught them how to graph results displaying an analysis of the data. For the most part, students were able to keep up with the introductory material.

Using the Public Religion Research Institutes Values Survey from 2015,<sup>7</sup> we discussed how we interrogate quantitative data. What conclusions can we draw, and what conclusions should we not draw about the data?

While this was an interesting entree into dealing with data, it did not go flawlessly. Some students struggled to make a copy of the “view only” document that we sent to them and others struggled with basic usage like hiding and unhiding columns. These particular challenges were not surprising given that over half the class had not worked with Google Sheets before. While demonstrations occasionally had to be paused so that students could catch up, the presence of the TA ensured that individual difficulties did not delay the entire class. Overall, the demonstration-style lectures accommodated the full range of student abilities.

After covering the basics, the class began working with the QUERY function in Google Sheets. While not as powerful as SQL itself (Structured Query Language -- the preeminent language for the manipulation of data), students could learn and understand the way that components of SQL work (like select, from, where, and aggregation functions). The QUERY function allowed students to write SQL-like statements to extract data from the larger sheet and engage in a basic level of coding. The advantage of this, as opposed to introducing more conventional programming languages like Python, Java, or Go, was that it was immediately applicable to the data that the students were analyzing.

By the end of the unit, students demonstrated a marked improvement in their ability to use Google Sheets. But, it became clear that students needed what we called “micro-tutorials,” videos that reminded them how to do discrete actions. Using the Wabash grant, we were able to create the videos and make them available for the class ([Reed 2021](#)).

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<sup>7</sup> This data is available from the PRRI and can be downloaded in SPSS format (.sav) from their website (<https://www.prrri.org/data-vault/>). For the purposes of the class, we resaved the data in .xls format for use in Google Sheets.

Student presentations offered an occasion to help students see the relationships among research question, dataset selected, and method of analysis. We helped students craft more exact phrasing of their research question and data interpretation. We highlighted this cycle again and again through the course of the class.

## ***Big Data***

Big data is a term used often in the media. The ability to make use of big data, the ways to access it, and the insights it offers are of growing importance both in the academy and in the workplace. To introduce us to the usefulness of big data, as well as its limitations, students read excerpts from *Everybody Lies: Big Data, New Data, and What the Internet Can Tell Us About Who We Really Are* (2017) by Seth Stephens-Davidowitz as well as two of his articles (Stephens-Davidowitz 2014; [Stephens-Davidowitz and Varian 2014](#)).

To explore big data, we used two big data sites: Google Ngrams and Google Trends. Google Ngrams provides web-based access to the Google Books Scanning project through which Google has scanned in books published from 1500 to 2008 from a wide variety of libraries. Google currently has over five million books in this database. Google Ngrams allows the user to enter words or phrases and see their use in published books over time. The results of these searches can often show the invention of terms and their popularity in written culture. Google Trends shows anonymized Google searches since 2004 indicating the popularity of particular searches. Google Trends allows one to look at the data both in terms of sheer numbers and where particular searches were generated.

Using Google Ngrams we used as an example the term “Personal Savior” tracing its use since the 1500s. Given that most of our students were raised in the Evangelical South, they were surprised to see that a term that for them seemed eternal, which they assume came from the Bible, was really non-existent until the late 1800s. They were surprised to find that its use did not show significant growth until the rise of fundamentalism in the early 1900s. The term virtually disappeared during the 1950s with the dominance of mainline denominations but it recurred with more frequency during the late 1970s and ‘80s with the popularity of the Evangelical movement. Showing that a term could have such a recent history was enlightening to students and showed the power of Ngrams.

Using Google Trends, we were able to chart moments when certain ideas burst onto the public scene. For instance, a search for “Women Priests” showed a great deal of traffic around the time when Pope Francis seemed to rule out the possibility. Likewise, we were also able to track the rise and fall of particular ideas. For example “Megachurch” had a great deal of interest between 2004-2006 with a steady decline thereafter. We did the same for “Christian Science” but with a focus on the regional searches. This showed the decline of the Christian Science denomination in the U.S. alongside its ongoing relative strength in developing nations.

The class caught on to the basics of both Google Ngrams and Google Trends quickly. There was little need to slow down to allow students to catch up, and the only time that students voiced any confusion was in the application of some of the more complex Ngrams features. Students enthusiastically presented their first Ngrams assignment findings on the second day of class and required minimal feedback to prepare for the final project. The groups effectively identified their research question, used Ngrams and Trends to produce relevant graphs, and presented appropriate analyses of their findings.

However, the groups struggled to provide meaningful interpretations of their findings. They had mastered the software, but it was not always clear they had thought through the “so what?” question. This provided the opportunity to prod students to make sure they did not allow the visual nature of the results to overwhelm the point. Visualizations need to be a way of telling a story, but they are not the whole story.

## ***GSS Data Explorer***

The General Social Survey (GSS) is the most important dataset for the social sciences. A bi-annual poll of over two thousand people, GSS has been administered since 1972. Conducted by the National Opinion Research Council at the University of

Chicago, the GSS is the gold-standard for opinion research. Now including more than five thousand variables, the GSS is the go-to database for most social scientists looking to assess cultural and political trends. Religion is no exception. Many articles related to religion—from the rise of the “Nones” (the religiously unaffiliated) to the effect of religion on health and well-being—contain GSS data in their reports. The importance of the GSS cannot be overstated.

The GSS Data Explorer provides a web-based portal to the GSS data. Using the GSS Data Explorer, a researcher can select various variables and then engage in a variety of analyses: correlations, regressions, and multi-level tabulations. The GSS Data Explorer does not have any visualization tools itself,<sup>8</sup> producing for the most part either tables or the results of statistical tests. However, a user can extract data from the GSS and download that data in a variety of formats, including .xls format for import into Google Sheets.

The GSS Data Explorer has a usable interface. Using the “shopping cart” metaphor, the user selects the variables of interest. Then they go to the analysis section of the site and select between correlation, cross-tabulation, multi-level tabulations, and regression. The user drags and drops the variables from the cart for the different rows and columns, filters various variables (select a specific year, specific denominations, etc., depending on the variables chosen), and then runs the analysis.

The GSS Data Explorer gave us the opportunity to teach some basic statistical concepts that are essential for working with data. Many religious studies majors are math phobic; they often have fled math-oriented majors to become religious studies majors. But our level of statistics can be understood at an intuitive level with proper instruction (Wheelan 2013), and students who can understand the language of basic statistics are better equipped for the world after graduation.

Correlation was the first concept we covered, emphasizing the distinction between correlation and causation. We discussed at length the significance of the results of a chi-squared test as part of its cross-tabulations analysis and how p-value functions influence confidence in the results of a correlation. We reviewed different kinds of data: numerical, ordinal, and categorical. Depending on the kind of data we are working with, different tests and products are possible or excluded. Once we got past some problems logging on, students learned the GSS with relative ease and seemed comfortable using it. Surveys conducted at the end of the class indicated that students, while previously unfamiliar with the GSS, were generally confident in their ability to use it after presenting their projects. Most students also indicated they believed they would use the GSS again in future academic or professional endeavors.

### ***IBM Watson Analytics***

IBM’s Watson remains one of the best-known natural language processing computer system products in the analytics industry to date. Watson made a name for itself when it beat two human champions at Jeopardy! (Markoff 2011). Later, Watson was able to hold its own in a debate on space exploration (Krishna 2015). Between those feats (which had more flash than practical application), IBM produced Watson Analytics. This product is intriguing because it offers a natural language interface to conduct data analysis. The user uploads their own data, and then they can ask questions like “What is the number of Muslims by state?,” “What drives the response ‘Islam has different values?’,” or “What percent of Evangelicals are high school graduates?” This was by far the most sophisticated and powerful program we used in class. (IBM offers a free subscription to students and teachers to use Watson.)

We used the PRRI Values Survey from 2015 again in this segment. Once uploaded, we were able to create “discoveries.” A discovery allows the user to ask questions of the data. Watson will then produce a visualization as a response. One can inspect the data, change the parameters of the question, or copy and modify it. Eventually, one can export the visualization for use in presentations. When showing students how to use this, we also showed students how they could bring data from the GSS to Watson.

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<sup>8</sup> The GSS data explorer has no visualization tools for analyses that the user creates. However, there are some pre-programmed analyses that do have visualizations located in the “Key Trends” section of the website.



The power of Watson is its natural language interface. However, this interface is dependent on the titles of each column. Thus to make maximum use of Watson, the data must be cleaned beforehand: descriptive titles need to be cleared of punctuation and symbols. We created a clean dataset for use in the class demonstration and offered instruction on how to clean the titles. Additionally, because it uses a natural language interface, awkwardly titled columns lead to awkwardly phrased questions. For instance, in one example the PRRI title for a column was “Islam numeric.” Asking Watson “Islam numeric by state” does not exactly flow, but will produce a color-coded map of the United States with Muslim populations. Oftentimes, we (and the students) had to play around with the wording in order to get Watson to produce the results we wanted. This led to some initial frustration with the interface as it did not quite live up to its reputation of being as easy to use as simply asking a question as you would conversationally.

After several days of working with Watson, students became accustomed to the requirements of forming questions and became more appreciative of its power. The ability to ask questions and get visualizations as answers allowed students to focus less on the technology and more on the central question: “What am I really asking?” Student presentations showed that they knew how to use the software and in some cases went beyond the expectations of a mini-project to create a full presentation. We were able to discuss where there were gaps in students’ knowledge, where their questions needed better formation, and how they might make improvements to their presentations.

There are some flaws with Watson. Beyond the problem of data cleaning (which is a challenge for all data analytics programs) Watson fails to deal with percentages. Given that most of the data we use in religious studies is categorical, counts are less helpful. The answer that four hundred people think God is personal versus seven hundred and fifty people who think God is impersonal is often not sufficient to answer the question, particularly if the question is a subset (e.g. nones or mainline Christians). The more helpful approach would be to calculate percentages, but Watson does not do this automatically and doing it manually can lead to errors. Still, Watson provided an important addition to the class.

## Conclusion

The pedagogical goals of the class were to have students engage in the research process by creating a research question, reviewing the literature, and writing a research paper that included numeric data. In future iterations of the class, the portfolio issue will need to be resolved in order for this goal to be achieved.

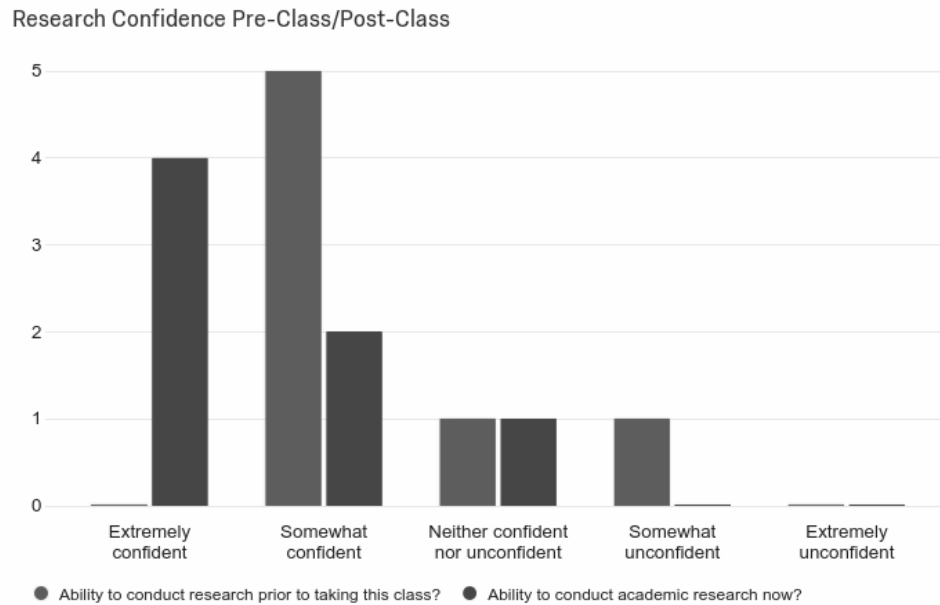
Reflecting on our goals, introducing multiple software packages might have had the downside of not enabling the students to master any. In future forms of the class, it might make most sense to concentrate on just three technologies: a spreadsheet (which provides a good entry into understanding the form of data), Structured Query Language (SQL) to facilitate the filtering and comparison of the data, and finally a visualization program to create charts. Minimizing the number of technologies would perhaps allow students to spend less time learning the programs and more time with the data.

A post-class survey showed several interesting results (see Figure 1). The survey asked students to reflect on their confidence in several areas before and after the class. Asked how confident they were in their ability to conduct research before the class, students generally said they were “somewhat confident,” but no student said they were “extremely confident.” However, after the class, the majority said they were “extremely confident” in their ability to conduct research. Likewise, before the class students said they were “somewhat” or “extremely” lacking in confidence in using quantitative analysis tools, but after the class, the majority were either “somewhat confident” or “extremely confident.” No student chose one of the “lack of confidence” options. Thus, in terms of research skills in general and data literacy in particular, students in the class clearly saw marked growth in themselves. In our post-class survey, most students thought they were “very likely” or “somewhat likely” to use the technologies we had introduced in the future.<sup>9</sup>

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<sup>9</sup> The one exception to this is the General Social Survey Data Explorer. An equal number of students said they were “not likely” to use it again as said they were “very likely.”

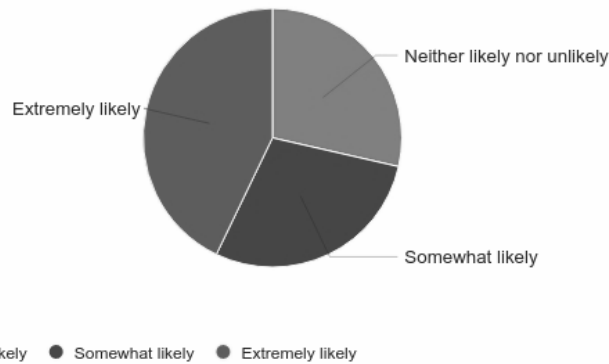
**Figure 1**



But, perhaps more important, when asked whether they were likely to use research and quantitative analysis tools in their future careers, the majority said they expected to, with the largest group (43 percent) saying they were “extremely likely” (no respondent selected either of the “unlikely” options; see Figure 2). Students saw the future value of the work they had done in the class.

**Figure 2**

How likely are you to apply research and quantitative analysis tools in your future academic or professional pursuits?



While students indicated they were likely to follow a variety of paths from business to graduate school to public service, no one in the class said they were likely to go to seminary. It is clear that we were not appealing to pre-ministerial students; they did not see the value in our class (see Figure 3).

**Figure 3**

Field	Choice Count
Grad school (Religious Studies, Humanities, Social sciences)	5
Non-Profit/Government Work	3
Other	2
Public Service Programs	2
Business	2
Grad School (other- eg. medical school, law school, MBA)	0
Seminary	0

This is a problem because ministerially-minded individuals have great need for these skills. As churches continue to experience membership decline, resource allocation is going to be increasingly dependent on quantitative analysis. Programs that show gains for the church are going to be more likely to receive funding. Churches often draw from the business community for their Elder and Deacon Boards who oversee church activities and these people who see the value of data in their everyday work will expect the same from their church. The ministers and church workers of the future will need a command of data literacy to make their arguments. The days when churches made decisions based on spiritual “leading” and/or prayer may be behind us.

In our class, we understood data literacy not as an end in itself, but as a means by which we might answer religious studies questions in new ways. We recognize that the numbers themselves are a means to understanding phenomena, to answering questions. It is easy to get wrapped up in the excitement of a powerful software application or a dazzling visualization which seems to shed so much new light on the question. And yet, as we did in our class, we worked to redirect students back to the essential fundamentals: What is your question? How does your data enhance your explanation? And most importantly, what does it mean?

While younger generations may be decreasingly interested in the structures of organized religion, that does not mean, as many have pointed out, that there is no religious impulse (Kosmin and Keysar 2013; Masci 2016). Part of our task in religious studies programs is to show how our work remains relevant. Integrating data and technology into our reflection on religion is an important part of building the religious studies major for the future.

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