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Natural Language Processing of Supervising Manager and College Intern Explanations of Work Ethic and Professionalism

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INTRODUCTION

Less than a decade ago, the National Association of Colleges and Employers rolled out their eight career competencies, identified as: leadership, communication, critical thinking, teamwork, professionalism/ethics, technical savviness, equity and inclusion, and career and self-development (NACE, 2016). An outpouring of time, money, and teaching resources continues by the higher education field, government, and the private employment sectors in hopes of increasing college student career readiness (Angel, 1995). However, after almost ten years of seeing the phrase "career competencies" transcend national conversations, (Human Resources-UNL, 2017, p. 1), supervising managers and college students still rate proficiency levels for competencies very differently. As Koncz and Gray point out, "in terms of graduates' level of proficiency in the competencies, employers and college students expressed very different opinions" (2022, p. 1). Pointedly, there continues to be a concerning gap in how recent college graduates and supervising managers learn, perceive, and describe career readiness. Detecting and identifying such a language gap through direct examination of language used by graduates and supervising managers may require unrealistically large labelling efforts by researchers. Natural language processing (NLP) methods can help bridge this gap by algorithmically finding topics that may constitute such "articulation gaps."

Of the eight previously listed competencies, a research effort by the National Association of Colleges and Employers (NACE) found leadership, communication, and professionalism/work ethic are among the top three performance gaps for recent college graduates (Koncz and Gray, 2022). In other words, recent college graduates rate themselves higher in the competencies of leadership, communication, and professionalism/work ethic than supervising managers rate the graduates. Although less prevalent, this troublesome trend continues through the other competencies. Further exploring the rating discrepancy for any one competency could shed light on the rating discrepancies seen in the other competencies. Using machine learning, narrative analysis, and artificial intelligence (AI) technologies can help to determine if any of those gaps are caused by ambiguities in competency definitions or generation-related language differences. Kovalcik (2019) refers to this as an articulation gap, as opposed to a performance gap.

To find articulation gaps requires examining potentially very large text corpuses to find potentially subtle differences between the way that supervising managers and students conceptualize these competencies. Leveraging AI in the form of natural language processing technologies can help address the difficulty of analyzing large amounts of data text, thus making the narrative analysis process more scalable and feasible as a research tool. This study demonstrates how natural language processing, as well as a lineup of other AI and statistical techniques, can be applied to extend researchers' analysis of large, text-heavy datasets.

FIGURE 1

Student-supervising manager group of interest

TOPIC #	TOPIC RELEVANT TERMS	TOPIC THEME	GAP (Student or Supervising Manager Favored, P-value)
1	Social, brand, rule, internship, work, policy	Rules and Policies	Student, 4.27e-6
2	Improve, ask, asked, worker, project, time, design	Questions and Improvements	Supervising Manager, 1.43e-10
3	Make sure, made sure, feedback, act, opportunity, communication	Opportunities and Consequences	Student, 1.01e-4
4	Ethic, integrity, situation, hard, challenge, skill, choose	Integrity and Ethics	Student, 3.28e-27
5	Information, confidentiality, right, sensitive, deadline, handle, data	Information and Confidentiality	Student, 4.76e-2
6	Environment, professional, come across, office, duty, accountable	Workplace Culture	Student, 2.47e-22
7	Complete, given, assignment, task, plan, complete task, hour	Completing Tasks on Time	Student, 1.50e-16
8	Animal, community, move, side, discussion	No Identifiable Theme	Student, 4.56e-14
9	Done, finish, completing, task, timely, committed, ability, great	Ability to Finish Tasks	Student, 2.21e-21
10	Honest, money, moral, professional, reliable, true	Honesty and Morality	Student, 5.18e-15

Note: Example topics from LDA model comparing student-supervising manager group of interest.

More pointedly, this study explores how those technical tools might be leveraged to further unpack the student-supervising managers nuances of the competency articulation gap. To effect this exploration, we address the research question: do students' and supervising managers' responses to our survey questions differ with respect to which topics those responses emphasize? We demonstrate how NLP topic analysis can be combined with a statistical analysis of its results in order to answer this question in the affirmative.

DATA

The data for this project was obtained through Clemson University's Center for Career and Professional Development (CCPD). The CCPD houses an internship class comprising on-campus internships, off-campus internships, and international internships. Any intern who completes an internship through a CCPD internship class must complete a survey regarding the evaluation of their individual career competencies as part of the final coursework. Out of the 3,792 responses used in the study, 3,593 are student responses, and 199 are supervising manager responses.

RESULTS

After constructing and running the LDA model with ten topics chosen with our methodology described above, our model produced the topics seen in Table 1 for the Student-Supervising Manager groups' responses to the ethics-focused question. The "Topic Relevant Terms" column is a curated list of terms selected from the top relevant terms produced by the model to create a more meaningful topic theme. It is important to note that LDA is a stochastic process, and the ten topics described below did not always appear in every run of the model (see Figure 1). However, many of the topics, such as: Topic 1: "Rules and Policies," Topic 3: "Opportunities and Consequences," Topic 4: "Integrity and Ethics," Topic 5: "Information and Confidentiality," and Topic 10: "Honesty and Morality" were consistent in their formation across many runs of the model.

DISCUSSION

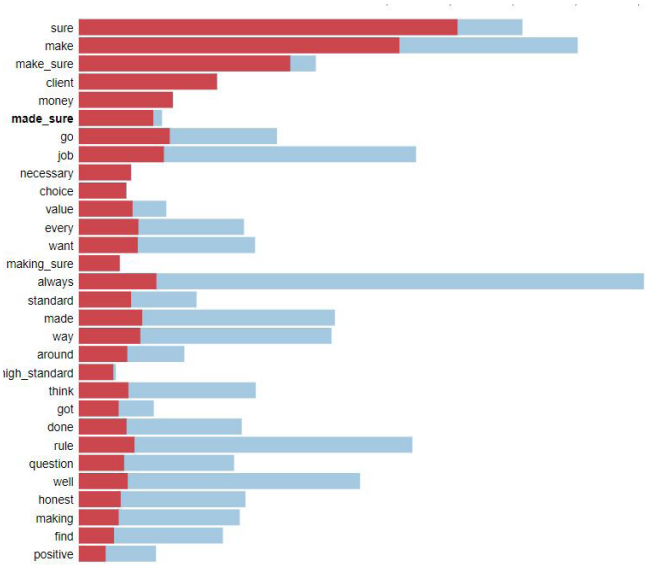
The miscommunication of how each group defines and explains the professional and work ethic competency becomes apparent in this study, and as Peck (2017) stated, "…very few [students] indicate that they are not gaining these skills in college" (p. 63). Instead, the results found in this work support Jackson's (2010) statement that supervising managers and students are "comparing and rating skills based on their own interpretation of the assigned skills" (p. 52). Students and supervising managers aren't just scoring professionalism and work ethic differently, their thought processes and descriptions for the competency is also incongruent. In short, these two groups have unique and contrasting constructs and paradigms for professionalism and work ethic.

Specifically, as students discuss the application and enforcement of rules and policies in the workplace, supervising managers are more likely to discuss students' abilities to analyze and solve problems. Students want to ensure that the rules are always or consistently being adhered to and enforced (see Figure 2). We also see in this study that talking about communication issues, being punctual and on time with projects, and owning up to mistakes are more aligned with supervising managers' thinking about professionalism and work ethic.

Viewed through a different lens, students are likely thinking about professionalism and work ethic as the competency relates to applying basic standards and adhering to written expectations. Their concerns are localized to the time of the incident versus the concept of an overall culture within the organization. Students want to ensure that procedures are being followed and that there is consistency in meeting those standards.

FIGURE 2

Made-sure word frequency



Note: Word frequency histogram displaying the topic Made-sure.

However, after supervising managers have onboarded and oriented a new team member, the supervising managers appear to be more concerned with more universal problems and workforce productivity. We see a trend of supervising managers defining the competency of professionalism and work ethic by using words and phrases often associated with the other seven competencies. They value professionalism and work ethic as the competency that relates to communicating effectively across team members and completing assignments independently and quickly. Having the foresight and self-awareness to analyze and fix problems is part of their definition of being highly proficient in the competency of professionalism and work ethic.

CONCLUSION

In the era of "Big Data," researchers have access to increasingly large amounts of data. For researchers undertaking labor-intensive, time-consuming qualitative analysis, such large datasets are both a blessing and a curse, in that such analysis is difficult to scale. Researchers frequently cannot carefully read the volume of documents available to them

for analysis. In such circumstances, there is a role in developing tools that can allow a researcher to gain insights from data that is too large for direct manual investigation. This paper presents a method that adapts NLP tools to perform this role, deriving insights from arbitrarily large sets of textual data, specifically tailored to identify and verify articulation gaps present in a text corpus for two or more groups of interest. We describe a text data processing pipeline that uses topic analysis to produce, for each text document in the corpus, scores describing the document's association with various topics, and then performs a statistical analysis to detect articulation gaps corresponding to any of the topics. Our method scales to arbitrarily large text corpuses with multiple groups. We demonstrate that this tool can be used to identify articulation gaps between student interns and their supervising managers regarding core workplace competencies. As previously stated, students and supervising managers aren't just scoring competencies differently. They are thinking, conceptualizing, and articulating the competencies in very unique ways, as well. These differences create the opportunity to adjust pedagogies and explore new teaching strategies.

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