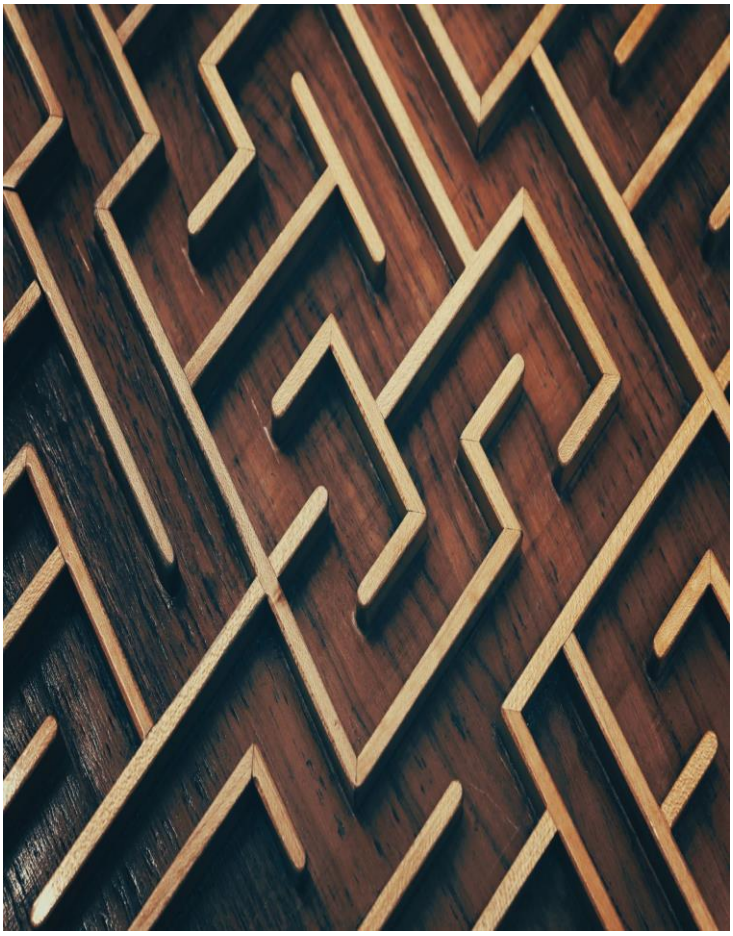

LEARNING ANALYTICS

Full Analysis Report

ABSTRACT

We use data to provide us with information and details to improve the experience for learners, instructors, and the organization. After receiving the data, we consider the 'story' that is given to us. Finally, we must think about what our 'next steps' will be as we develop strategic steps based on the 'story'. Our "Learning Analytics: Full Analysis Report" is designed to assist as you develop these strategic steps for the future of your organization.

Quality Analytics Associates & Bintel, Inc.

Learner Analytics
Full Analysis Report

QAA
Bintel Inc

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Background

Quality Analytics Associates (QAA) and Bintel combined skills to create a Learner Analytics Solution. To prove value, the team developed a proof of concept from a small sample of performance reviews about fictitious professors who taught an Introduction to Chemistry Course at "University Y". This is the report created based on that scenario with the inclusion of recommendations for next steps based on the analytics. For all of the data presented, all names, numbers and text are fictitious.

Introduction

For this dashboard, we analyzed the Introduction to Chemistry professor performance at University Y for the Fall 2018, Spring 2019, Fall 2019, and Spring 2020 semesters. Two professors, Kim Han and John Barker, were assessed by the assignment of numbers (Professor 1 and Professor 2 respectively) to protect their identities for privacy purposes. Sources used for analysis included course evaluation feedback surveys, student assessment performance (i.e., final grades), and open-source data from ratemyprofessors.com. In this report, other data sources were not used, however, project for consisting within an educational or organization setting would utilize other public and private sources describing the professors, instructors or trainers as well as the organization.

Figure 1: Data Collected from Chemistry Courses

Planning & Collaboration

To create this report effectively, the QAA team would need to collaborate with multiple members of the University Y leadership and faculty. These would include the dean of the college of sciences, the chemistry department head, and the two professors (the university team) that were to be assessed to determine what insights they were looking to gain from this experience. Their focus was to discover what exactly resulted in the scores that were given and how the professors could improve their scores. They also wanted proof through the Learner Analytics Solution that improved learner experience would resulting in higher scores and higher student satisfaction.

The team determined that for this time period the most important data source would be the course evaluation surveys. However, to supplement this data, our team added student performance and data from ratemyprofessors.com to demonstrate the system's capability of ingesting different types of data for this phase of the project. Data collection began and the university provided QAA with a data file containing the anonymized results of the course evaluation surveys and student performance at the end of each semester. Bintel extracted data from ratemyprofessors.com including the scoring and free text responses to the survey.

Figure 2: Collaboration to Determine Desired End Goals & Insights

Artificial Intelligence (AI) was used to detect specific topics in the free text responses of the course evaluation surveys and from ratemyprofessors.com. The team chose these topics: difficulty, examples, extra credit, homework, instructor, lecture, office hours, study guide, tests, and textbook. AI would

also be used to detect the sentiment of the free text response so that someone could see if the comments regarding a topic were generally positive, negative, or neutral.

An interactive dashboard was created for this project to allow stakeholders to view high level themes and allow them to drill down into exactly what the students were saying when desired.

Learners & Professors Served

In our example dashboard, we gathered data for two University Y professors who taught Introduction to Chemistry course over four semesters. These professors were required to ensure the learners met the same objectives by following the basic syllabus and used the same textbook. However, the professor's method of instruction, approach for meeting objectives and engaging the learners is their choice.

Learners Descriptions

As with typical Introduction to Chemistry courses, the learners of University Y's Introduction to Chemistry were freshman or sophomores with a few upper-level learners. The majority of upper-level students attended Professor 1's classes. In addition, the learners were divided fairly evenly between the genders with some choosing not to identify.

Professors Descriptions

We gathered data from two professors. Professor 1 (Kim Han) was tenured with 12 years of experience teaching at the postsecondary level. She had been teaching Introduction to Chemistry at the University of Y for eight years. Professor 1 has a PhD in Chemistry from State C University.

In contrast, Professor 2 (John Barker) was a novice instructor who began teaching at University Y after graduating with his EdD in Chemistry. As a graduate student, professor 2 served as a graduate assistant to multiple professors and assisted with their Introduction to Chemistry courses. Based on his ratings and performance, Professor 2 may be able to begin the tenure process at the end of the two years.

Findings

At the end of each semester the data sources were processed and displayed in the dashboard for the university team members to use. QAA did an analysis of the results of the semester and provided a report detailing trends and changes that may have reflected in the free text responses.

Professor performance, according to the course evaluation surveys, changed each semester along with the topics that the students wrote about. This correlates with the professors' actions because at the end of each semester they adjusted try to improve learner experience. The semester reports by QAA detailed what students liked and did not like, but also what the professor had changed in the last semester and intended to change in the next semester.

Figure 3: Learners engaging with Instructors

Outcomes

As we analyzed the results of this data, we noted the outcomes benefited not only the professors but the learners. With our dashboard, we were able to compare Professor 1 semester to semester. Or we could compare Professor 1 and Professor 2 during the same semester. The dashboard allowed us to gain a better understanding over the first two years.

Learner Outcomes

Based on the feedback provided to the professors, learners exhibited a higher pass rate for course. The course and instructors became more engaging during and after class which allowed the learners to become more interested and retain more of the content.

As part of the analysis, our team reviewed syntax themes. We analyzed verbal comments for common syntax themes. These were narrowed down to 10 common themes: difficulty, examples, extra credit, homework, instructor, lecture, office hours, study guide, tests, and textbook. As we reviewed the resulting analysis, we noted that the number of references to these themes changed over time. This was for different reasons. For example, we noted that the theme examples decreased likely resulting in overall satisfaction from learners. The number may be reviewed in the Appendix: Table 3.

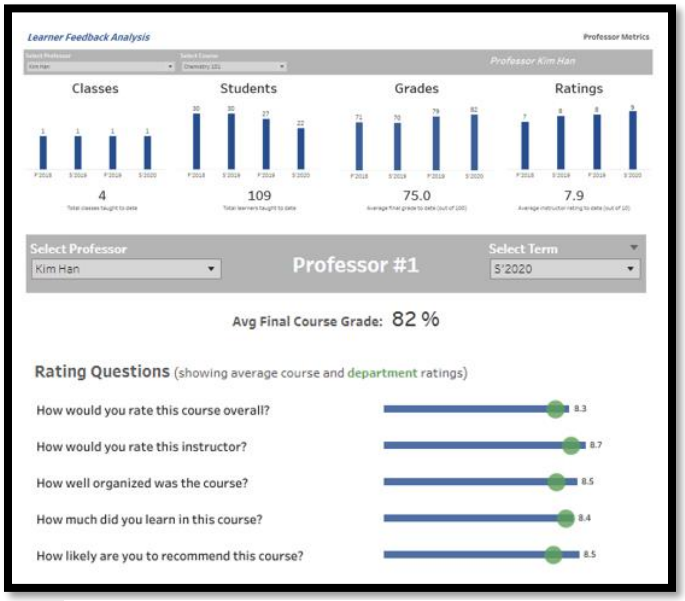

Figure 4: Learner Responses for Professor 2

Professor Outcomes

Professor 1 and Professor 2 both took note of the areas in which students were giving them low scores. As these professors noted these issues, they each took steps to improve these areas of their performance. For example, Professor 1 and Professor 2 both enrolled in training sessions in their identified lower areas. As a novice, Professor 2 also sought a mentor with more experience.

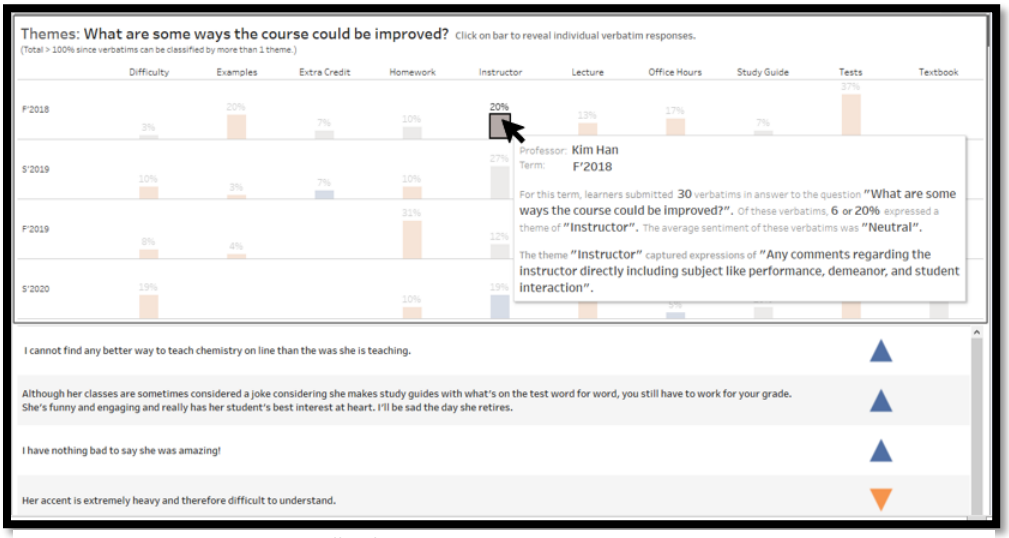

Figure 5: Learner Responses Feedback

OpenSource Outcomes

We also collected data about the professors from ratemyprofessors.com. How did this data assist with the analysis overall?

This data was analyzed and compared with the end of course surveys. The responses and scoring allowed for a more holistic, true scoring of each instructor by the learners. In addition, the learners tended to be more verbose in their

responses online which allowed for more syntax analysis of the course. Figure 6 provides a visual opensource data collected.

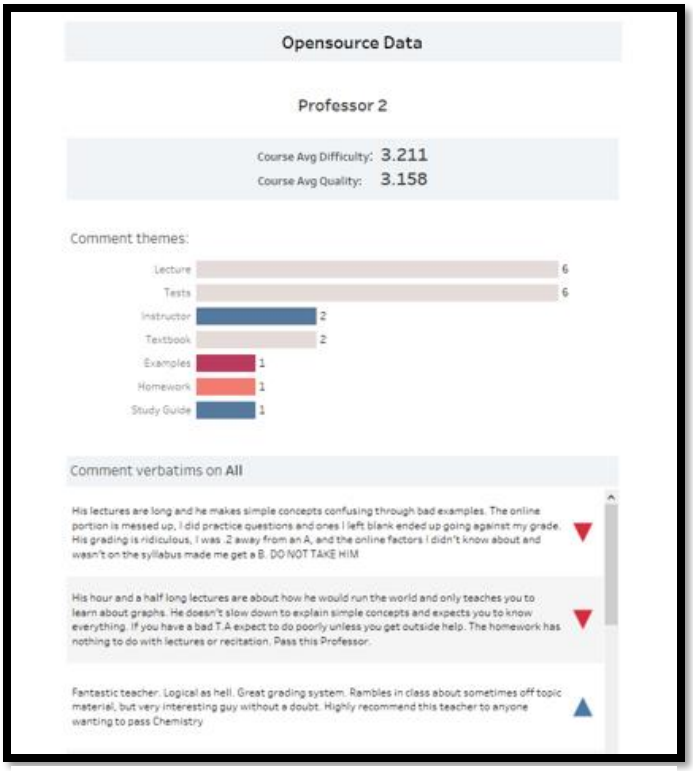

Figure 6: OpenSource Data Collected

Next Steps

Based on the data and the findings in this fictional scenario, we were able to prove that the Learning Analytics system is able to analyze multiple types of data (i.e., verbal and non-verbal) over time to determine connections. With the data gained, University Y will be able to compare the consistent learner issues over time. In our scenario, Dr. Han's top issue in the fall of 2018 dropped to the fourth identified issue by learners in the spring of 2020. However, the last issue identified by learners in the fall of 2018 moved up to the number one issue by the spring of 2020. It should be noted though that all of the areas in the spring of 2020 have fewer comments than those in the fall of 2018. Table 3 of the Appendix shows this trend. After reviewing Table 3, the syntax feedback can be reviewed within the free text responses by visiting the dashboard.

Now, consider what can the university, or any organization, do with this information?

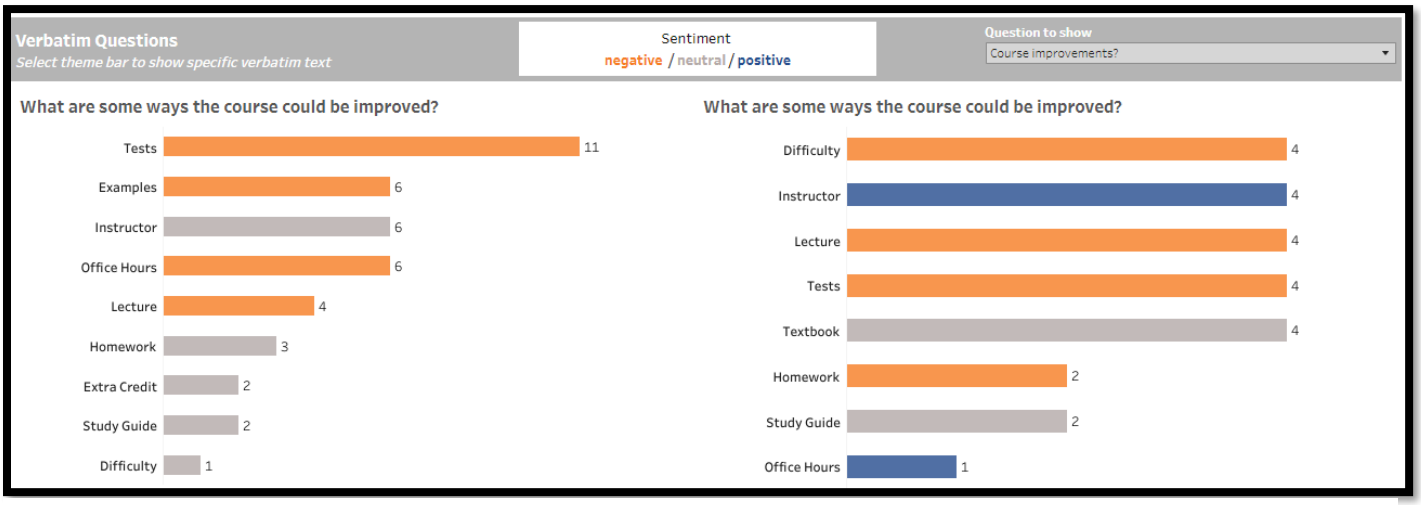

Figure 7: Instructor Improvement Comparison Fall 2018 & Spring 2020

If multiple professors with the sciences department demonstrate this same issue, the dean of the college of sciences may take this issue as a strategic goal for the next year to five years. This would allow for the overall improvement of the faculty and staff behavior while leading to the improved learner experience and performance. In the end, this would ultimately lead to learner or customer satisfaction which leads to more customers.

If we consider this from a learner perspective, University Y would be able to determine what learners may be lacking in certain subjects. For example, if there is a lack of materials in the science lab to accommodate people with disabilities. A

learner may not seek help from the professor or someone from the university, but they may write about in an open, anonymous forum like ratemyprofessors.com or the end of semester survey. This will allow the data to be captured for analysis to determine if a larger issue exists, such as lack of materials.

Finally, consider the current online environment. Learners at universities and within organizations are having issues that may or may not be resolved by the professors, instructors or trainers. They may feel frustrated by technical issues or a lack of directions for using the technology. These issues will become apparent quickly in the surveys and more so in the open-source data. After these issues are identified, universities and organizations will be able to take strategic steps to alleviate and remove these barriers. Thereby, increasing learner satisfaction and decreasing learner frustration which should improve the word-of-mouth advertising.

Further Information

To explore our data comparison, visit the following link.

References

Our sample dashboard was created for University Y and Professor 1 (Kim Han) and Professor 2 (John Barker) by gathering and editing data from the following site(s).

- www.ratemyprofessors.com

Appendix: Table

Table 1: University Y – Longitudinal Data for Introduction to Chemistry

University Y - Longitudinal Data for Introduction to Chemistry					
Professor 1					
	Gender	**Semester**	**Total # of Learners**	**Total # Passed**	**Percentage Passed**
	Female	Fall 18	30	19	63%
		Sp 19	29	21	72%
		Fall 19	26	25	96%
		Sp 20	21	13	62%
Professor 2					
	Gender	**Semester**	**Total # of Learners**	**Total # Passed**	**Percentage Passed**
	Male	Fall 18	29	11	38%
		Sp 19	30	28	93%
		Fall 19	31	29	94%
		Sp 20	30	30	100%

Table 2: University Y – Longitudinal Data for Introduction to Chemistry Learners

University Y - Longitudinal Data for Introduction to Chemistry Learners								
Professor 1								
	Semester	**Total # of Learners**	**% Females**	**% Males**	**% 1st Year**	**% 2nd Year**	**% 3rd Year**	**% 4th Year or >**
	Fall 18	30	40%	50%	37%	27%	23%	10%
	Sp 19	29	41%	52%	45%	28%	21%	14%
	Fall 19	26	54%	46%	42%	27%	23%	12%
	Sp 20	21	38%	57%	38%	38%	14%	0%
Professor 2								
	Semester	**Total # of Learners**	**% Females**	**% Males**	**% 1st Year**	**% 2nd Year**	**% 3rd Year**	**% 4th Year or >**
	Fall 18	29	34%	62%	38%	38%	24%	7%
	Sp 19	30	40%	50%	47%	37%	13%	10%
	Fall 19	31	35%	61%	48%	32%	16%	6%
	Sp 20	30	43%	50%	40%	40%	20%	3%

Table 3: University Y – Syntax Data from Learner Responses

University Y - Syntax Data from Learner Responses

Professor 1

	Semester	Difficulty	Examples	Extra Credit	Homework	Instructor	Lecture	Office Hours	Study Guide	Tests	Textbook
	Fall 18	6	11	2	3	12	10	11	7	15	7
	Sp 19	5	7	2	5	14	9	6	5	9	1
	Fall 19	7	5	0	9	16	6	5	6	16	8
	Sp 20	5	5	0	4	15	6	7	2	9	5

Professor 2

	Semester	Difficulty	Examples	Extra Credit	Homework	Instructor	Lecture	Office Hours	Study Guide	Tests	Textbook
	Fall 18	11	1	0	5	17	12	4	2	8	3
	Sp 19	2	9	1	5	19	9	7	5	8	3
	Fall 19	10	4	0	0	29	5	1	2	10	3
	Sp 20	6	0	2	6	29	7	7	2	3	6

Explanations of the Syntax Themes

** Difficulty - Students describing general difficulty of the course or its components*

** Examples - Example problems done in class or in office hours*

** Extra Credit - References to offers of extra credit or extra credit assignment content*

** Homework - Homework content, type, duration, and difficulty*

** Instructor - Any comments regarding the instructor directly including subject like performance, demeanor, and student interaction*

** Lecture - Lecture content, duration, and professor use of time*

** Office Hours - Students decribing their experiences in the professors office hours or other meetings/assistance they receive outside of class*

** Study Guide - Exam preparatory materials including study guides and hints or clues as to exam content*

** Tests - Exam content, type, duration, and difficulty*

** Textbook - Textbook value and cost, frequency of use for course*