CASES FROM THE FIELD

The Data Science Playbook

By Michael Chavez and Brian Mullen

This article describes the step-by-step process of how data science, marketing and communications, and higher education improved access and success for students. Over the last three years, strategic planning efforts helped develop a data-informed culture on campus. The work described within the playbook required time, energy, and a lot of communication and collaboration. While it is not a stand-alone method for success, it is a process that is working for Lone Star College–Montgomery.

The playbook features basic and more complicated examples of the work that was conducted. It is intended to start small and to work up to more sophisticated campaigns. College campuses may not need all of the tools mentioned within this playbook. They are included because they were the tools available to Lone Star College. Additional tools have been requested, and some are not currently being utilized.

Three years ago, Lone Star College–Montgomery realized that its usual strategies for recruitment, retention, and completion were not adequate to meet its goals for improvement. College leadership encouraged exploration of the use of data science as a tool for accelerating improvement. The result was the formation of a data team that began leveraging internal expertise in analytics; developed its members' skills relative to predictive analytics tools and techniques; and eventually coalesced into a cross-disciplinary, cross-functional group that addressed specific issues with increasing agility. The first two years saw the development of hundreds of interventions and culminated in the establishment of the Digital Marketing Intelligence Center (DMIC).

One of the best assets for the data team is having the support of the college leadership and the entire marketing team. The marketing team was immediately involved, launching and maintaining up to 60 campaigns running simultaneously to boost student enrollment and success. It soon built a center dedicated to showcasing and analyzing the campaigns.

The DMIC, housed in the Office of Public Relations and Marketing Communications at Lone Star College-Montgomery, is a creative suite that enables fac-

ulty, staff, and students to monitor millions of online conversations about organizations, brands, products, and services in addition to the college's social media channels and digital marketing campaigns. Like a small network operations center, the DMIC has six large display screens showcasing current data and conversations across the Web. A graphic display summarizing social media content conveys sentiment, share of voice, trend information, geolocation data, and more. In addition to marketing support, the center offers educational and research opportunities to faculty and students.

Mavalytics

Although there are a variety of new technologies in higher education, data analytics are making one of the largest impacts (Jing 2002). Lone Star College–Montgomery coined the term "mavalytics" ("maverick"— a nonconformist, an individual, a rebel, a radical, and Lone Star College–Montgomery's mascot—plus "analytics"): the infusion of data science in higher education. Even inspired by analytics, only a maverick challenges the status quo. The innovation is the use of data science to improve student success. A lack of resources and funding also inspired increased use of data science. Campus leaders sought to utilize data science (which was available and free) as a cost-effective means by which to increase student success.

Enrollment management alone is collaborative and analytical, involving functions that cross divisional lines—*e.g.*, advising, admissions, program development, marketing, recruiting, financial aid, orientation, and retention (Stewart 2004). The factors mentioned above are the reason for the development of the mavalytic playbook, a comprehensive process for deploying a data-science campaign given all the entities involved. The idea to call it a "playbook" derived from a sports analogy: Just as a coach draws up plays using Xs and Os, the same can be done for data science. The team in the latter case is people working together to use data to improve student success. It includes a data coach who motivates and draws up campaigns in which every team member plays a vital role. Most important, the plays are recorded in the playbook for others to replicate.

What is a data team?

As with a sports team, a data team requires time and an investment in the players. Team members must enjoy gathering, mining, reviewing, and analyzing data. Data teams spend time identifying trends and anomalies. Members must be risk takers and see failed initiatives as learning opportunities.

A presenter at a national conference talked about "failing forward." The chances one does not take are failed opportunities. Data team members need to be willing to challenge or disrupt current processes and policies and to use data to improve the current state of being. Coaches need to identify members with the aforementioned characteristics and to be selective in recruiting team members.

Team members across the college are carefully selected and invited to serve. The six-member cross-functional team includes an academic dean, a faculty member, a director, the student services dean, an analyst, and the vice president of student success. The data warriors work together to gather and interpret data. Then they create action-oriented initiatives (*i.e.* nudges, campaigns utilizing social media and text messages) to improve student success. Swing and Ross (2016) indicate that when a broader range of decision makers is involved, more support is gleaned, and more student-focused paradigms emerge.

After assembling a team, the coach calls to order a team meeting and lays out the ground rules: (1) data will be presented at each meeting, (2) meetings will not last more than one hour, (3) each member will contribute, (4) titles do not hold weight at a data meeting as each member is equal, (5) we complete a campaign in three or four meetings, and (6) the coach will measure and distribute the results to the data team.

What is a data coach?

A data coach is passionate about analyzing data and understands the value of data to the institution. This person seeks out data warriors, organizes a team, and cultivates an atmosphere conducive to analytics. Like a coach, the person advocates for others to have access to data, assesses the data needs of the institution, and

disseminates results. The data coach also serves as a resource and is accessible to coach others regarding their data needs.

At Lone Star College–Montgomery, the data coach assigns responsibilities to other members in accordance with their strengths. The key is to make sure that others return to the next meeting with results to present to the data team. Members may be assigned to:

- Connect with another department for additional information.
- Distribute a survey and analyze the results.
- Invite others to attend the next meeting.
- Conduct additional research.
- Retrieve additional data from PowerBI or Civitas.

My experience removing a team member was with my first data team. I recruited a member who was excited about implementing campaigns and whose strength was connecting with students. But with regard to reviewing and analyzing data, his demeanor was distant, and he did not contribute during team meetings. As a coach, I called him in and asked if something was wrong. His quick response caught me off guard: "I'm a doer, and this data stuff is not my cup of tea!" He explained that reviewing data seemed "too administrative." Before I could finish asking if he wanted off the team, he smiled and said, "Yes, and thank you."

I learned a valuable lesson from that conversation: If I had tried to keep him on the team, it would have disrupted the momentum we had struggled to gain. Although removing a team member seemed like a tough situation, doing so ended up helping the team. The team was struggling to keep one member interested in the work, and this shifted our focus away from the primary goal: to stay agile and focused and to complete the sprint. What I realized was that tough decisions need to be made, and it is okay when others are not passionate about data.

The first data team stayed together for eighteen months and completed nearly 100 campaigns. (We averaged about 5.5 campaigns each.) The team laid the foundation for increasing the number of campaigns throughout the college. Team members gained enough insight and skills to lead their own data team. This allowed Lone Star College–Montgomery to ultimately develop five data teams strategically assigned with the following goals:

- enrollment;
- veteran students' success;
- financial aid;
- graduation rates; and
- first-time-in-college students.

What is a campaign?

A campaign is a comprehensive action-oriented plan to improve enrollment and student success. The college's efforts include e-mailing, texting, social media, geofencing, and push notifications in order to nudge students to increase or improve specific key performance indicators. In some cases, a campaign has a limited duration: it will run for two to six weeks before it is terminated. The following are examples of campaigns that were developed and implemented:

- "*What's Your Excuse?*": Three days before the first day of the spring semester, staff targeted 1,000 students with high GPAs who lived within a fifteen-mile radius, were financial aid–approved, and enrolled in the fall but not the spring semester. An ad was created with a current student pointing and asking, "What's your excuse?" (*See* Figure 1, on page 38.) The ad hyperlinked to registration. With an ad budget of $238, the campaign targeted the 1,000 students on social media. Within the first three days of the campaign, 226 students registered (22.6 percent yield rate), providing a $904,000 financial boost. The total conversion cost per student for this campaign was $1.05.
- "*Finish Strong*": Staff targeted 306 students who were struggling in math with personal online and mobile inbox notifications, mobile application push notifications, online portal ads, and a targeted Facebook ad. Twenty-one of the students visited tutoring within the first three days of the campaign, for a total ad spend of 60 cents. Additional students responded in subsequent days. The campaign's financial impact was $140,000. (*See* Figure 2, on page 39.)

FIGURE 1 ➤ "What's Your Excuse?" Campaign Sample

Data Center

The Data Center is housed in the student services building. It comprises four large digital display monitors, a large, long, bar-style table, and bar-style chairs. The computer running the monitors has various analytic tools that anyone on campus may use. Data teams meet at the Data Center to view, analyze, and make decisions regarding the data and results. Software tools are also available in the Data Center so members can analyze and segment data for campaigns. For example, multiple queries are pulled from the Lone Star College student information system.

Although each query is different and has unique variables, they all need to be merged using students' identification numbers. A CSV file is pulled from a predictive analytic tool like Illume in Civitas. The data team members then decide if they want to add the predictive score to persist or distance from campus. This data mining and cleaning is processed by Veera, a Rapid Insight tool. Rubenking (2001) describes data mining as a process of "extracting useful information and relationships from immense quantities of data." Data team members who use the Data Center have access to all the tools provided by Lone Star College and some specific to Lone Star College–Montgomery. Additional tools used in the Data Center are described later in this playbook. (*See* Figure 3, on page 40.)

Marketing and Communication

The Marketing and Communication Office plays a critical role in cross-disciplinary collaboration, merging predictive analytics and marketing to boost student engagement, success, recruitment, and retention. Marketing and communication has a Digital Marketing Intelligence Center (DMIC) to monitor each campaign (*see* Figure 4, on page 41). Various campaigns are targeted to students on the basis of demographics, grade point average (GPA), radius from campus, and likelihood to persist.

For campaigns, the data teams and the marketing staff first identify target populations and segment them for maximum return on investment. This is done by identifying all possible variables needed to analyze and segment the data. Then, timelines are set for how and when students should be nudged. These mindful, short, and personal nudges are delivered via the mobile application push notification system, the college online

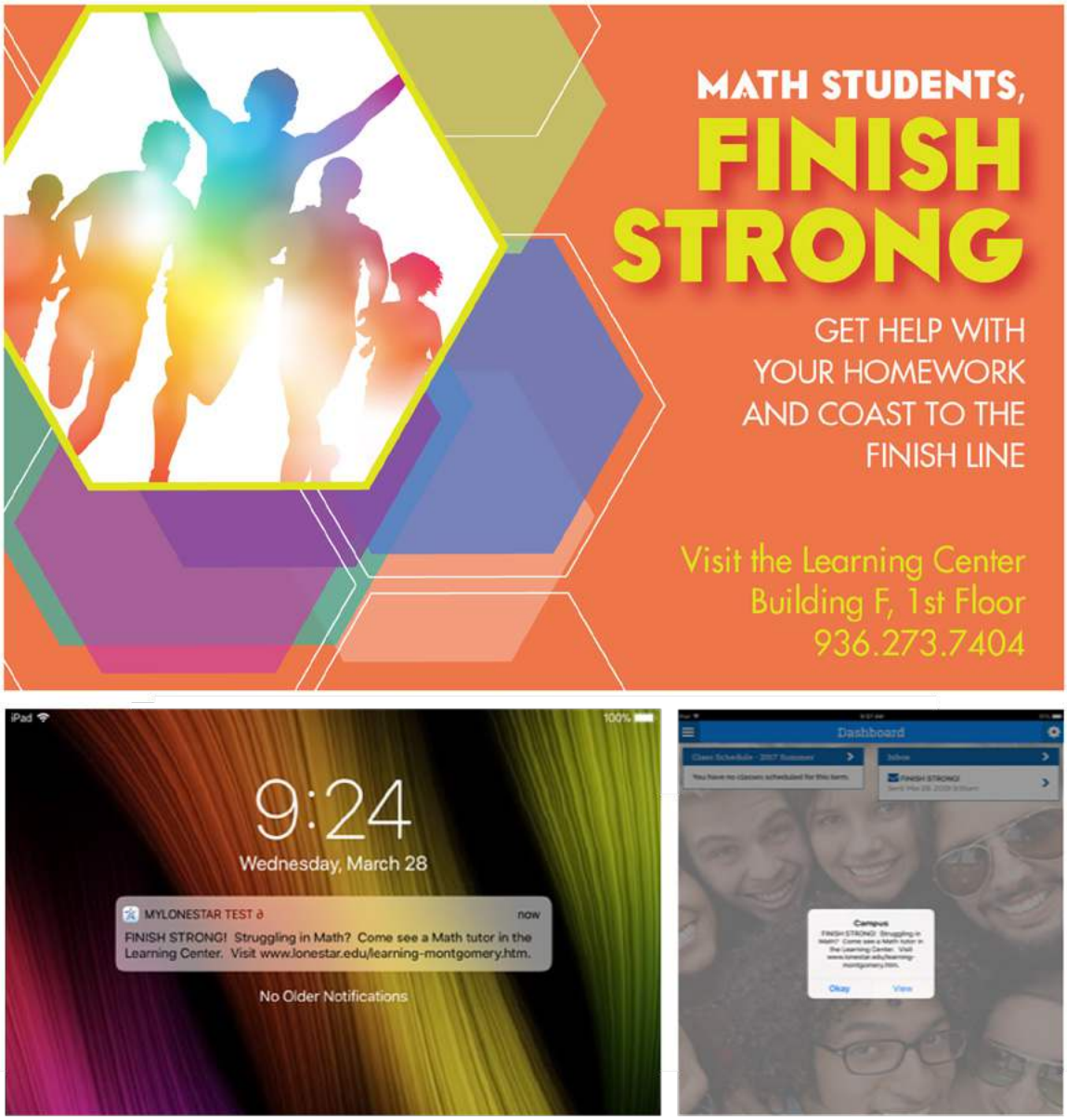

FIGURE 2 ➤ "Finish Strong" Campaign Samples

portal, social media channels (Facebook/Instagram, Twitter, and LinkedIn), Google AdWords/Display, and texts, e-mail, and phone calls. Staff also have access to college-specific data so they can target at-risk students and develop personalized predictions that are timely, accurate, and actionable.

Cross-functional teams continually monitor opportunities to improve services, intervene when students have challenges, and prompt specific actions such as going to tutoring, applying for financial aid, and registering. Following are some examples of the hundreds of successful campaigns launched as a result of the collaboration of cross-disciplinary staff within the DMIC.

Data Science Tools

- *Lone Star College—Analytic and Institutional Reporting (AIR):* Created by AIR, the landing page lists hundreds of queries and reports that Lone Star College employ-

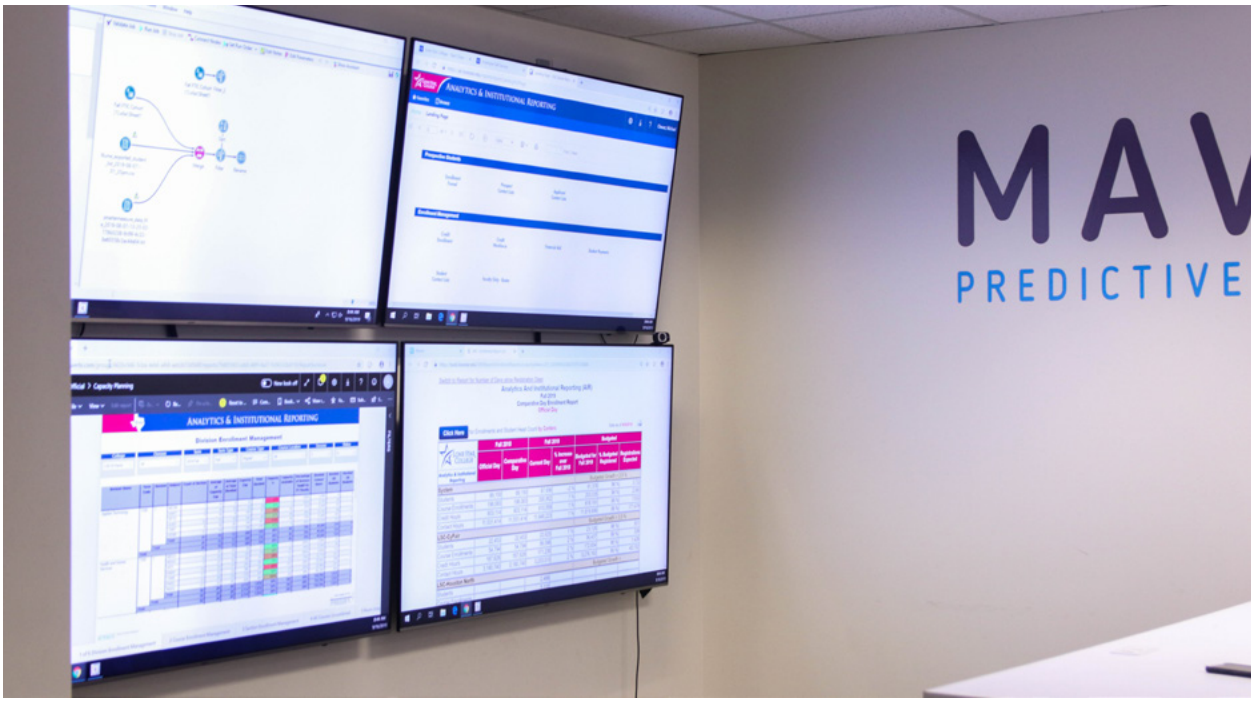

FIGURE 3 ➤ The Data Center

ees may access. The queries and reports vary from new admits to financial aid to graduation. This is the first step in the democratization of data, which are available to a select group of users who request access.

- *Veera (Rapid Insight):* Veera is a predictive analytics software that enables users to gather and mine historical data from a variety of sources and recognize variables. It creates predictive powerful and transparent models that help the data team achieve success and long-term goals. The software makes predictive modeling projects faster and easier, and it does not require users to be experts in coding.
- *Power BI:* This business analytic solution enables data visualization and the sharing of insights across the organization or the embedding of them in an app and/or website. It also enables connection to hundreds of data sources and "brings data to life" via live dashboards and reports.
- *Microsoft Excel:* Developed by Microsoft, this spreadsheet tool features calculation, graphing, and pivot tables.
- *WEKA:* This open-source, machine-learning software in Java is a collection of algorithms for data-mining tasks. It contains tools for data preparation, classification, regression, clustering, association rules mining, and visualization.
- *Illume (Civitas Learning):* Illume uses the institution's data to develop personalized predictions that are timely, accurate, and actionable. It enables the targeting of at-risk students, development of coordinated student success initiatives, and deployment of targeted e-mail interventions.
- *Lone Star College Query Viewer:* This tool is located inside the Lone Star College portal. Hundreds of queries are available. Once accessed, they may be downloaded in a variety of options, including CSV. These queries contain numerous data sets, such as admissions, graduation, EDUC 1300, etc.

Agile Theory

Royce (1970) wrote about agile theory: An approach to managing a project or campaign, this method allows

FIGURE 4 ➤ The Digital Marketing Intelligence Center

data teams to respond to the unpredictability of constructing software. In higher education, it allows data teams to respond to the volatility of accessing variables, data, or philosophical differences. It uses incremental, iterative work sequences commonly known as *sprints*. (A sprint is a period of time allocated for each campaign.)

Agile theory is used to ensure that value is optimized in the process and completion of a campaign. Iteration planning and feedback is a process the data team can utilize to continuously align an iteration that reflects institutional goals. It quickly and easily adjusts to changing requirements throughout the process of measuring and evaluating the status and development of each campaign.

Nudges: What They Are and How To Write Them

According to Thaler and Sunstein (2008), a nudge is:

> *any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentive. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at the eye level counts as a nudge. Banning junk food does not* (6).

Sending an e-mail to students who show they are a high priority is an example of a higher education nudge. According to a predictive analytic tool (Illume), these students would be at risk of not persisting. Following is an example of a personalized e-mail nudge sent by an advisor on the basis of data that were analyzed and segmented:

> **Subject:** "*We are proud of you!*"
> **Body:** "*The semester is halfway over, and I want you to succeed. Please stop by or e-mail me if I can be of any assistance to you. Below is a list of on-campus resources.*"

A similar nudge campaign focused on encouraging students who had completed 45 credit hours to return to college after they had been out at least three years.

The response rate has been positive thus far. At this time, the campaign will be analyzed until the official day of record (twelve days after the first day of class). Each campaign is measured after the official day of record.

Following is an example of an e-mail nudge sent by a counselor:

Subject: "*We miss you on campus!*"
Body: "*Can I help you with registering or planning for any of your courses?*"

Here is one student's response:

> *My circumstances have changed, and for now I'm pursing a trade so I may be able to attend school again in a few months. I do appreciate this e-mail, because it has encouraged me to not give up sight of where I would like to be in a few years. I do plan on registering some time again. One thing LSC-Montgomery has shown me is to keep going. Thank you for reaching out. If I have any questions I will be in touch.*

The more we segment the data and learn about our students, the easier it becomes to develop a nudge specifically for them. This is an example of reaching the right students at the right time with the right message.

Collaborative

When implementing action-oriented initiatives, the data team sought to collaborate with various departments. For example, an association rule-mining analysis was conducted on the courses in which students enrolled over a three-year period. Association rule-mining analyzes variables that were clustered together. The results indicated that students who enrolled in English courses also enrolled in history courses during the same semester, and students who enrolled in biology courses also enrolled in the student success course. The data team scheduled a meeting with the academic deans to reveal the results. One important outcome of the meeting was that deans worked together to improve course scheduling and alignment. Subsequently, the number of students enrolling in fifteen credit hours increased 30 percent. This relates to Swing and Ross's (2016) statement that data "is needed to assure that the informed decisions routinely occur across an organization with the speed and flexibility required for real-world management of modern postsecondary education" (10).

Transparency Results

One of the most revealing actions for the data team is how transparency of the data and results transformed the culture at the college. The data team analyzed data for students who were predicted not to persist and who were enrolled in student success courses. The team shared the results with the advising team. An initiative was launched, and students were nudged by advisors via e-mail and text messaging. Students responded promptly.

At the end of the semester, the data team scheduled a meeting with advisors to reveal the results. They were ecstatic; most important, the data confirmed that the advisors had made an impact on student success. By the end of the meeting, the advisors generated their own ideas for using predictive analytics to inform their next campaign.

Data Camp

The culture at Lone Star College–Montgomery has become data and action oriented. To expand the use of predictive analytic initiatives to other Lone Star Colleges, the first data camp event was organized in 2016. This conference-type event teaches participants how to utilize data, predictive analytics, student nudges, social media, and tools (Civitas, PowerBI). The event was for all Lone Star College employees and was so successful that it continues as an annual event hosted by the college and attended by higher education administrators from across the nation.

Data Science Model

- *Descriptive Analytics:* The first step in the data science model is to summarize raw data using basic arithmetic such as mean, median, mode, and percentages. Descriptive analytics are used for reporting purposes, such as comparing enrollment or graduation numbers from one year to the next. The question often asked at this stage is "What happened?"
- *Diagnostic Analytics:* The second step is diagnostic analytics. This is when the drill-down, data discovery,

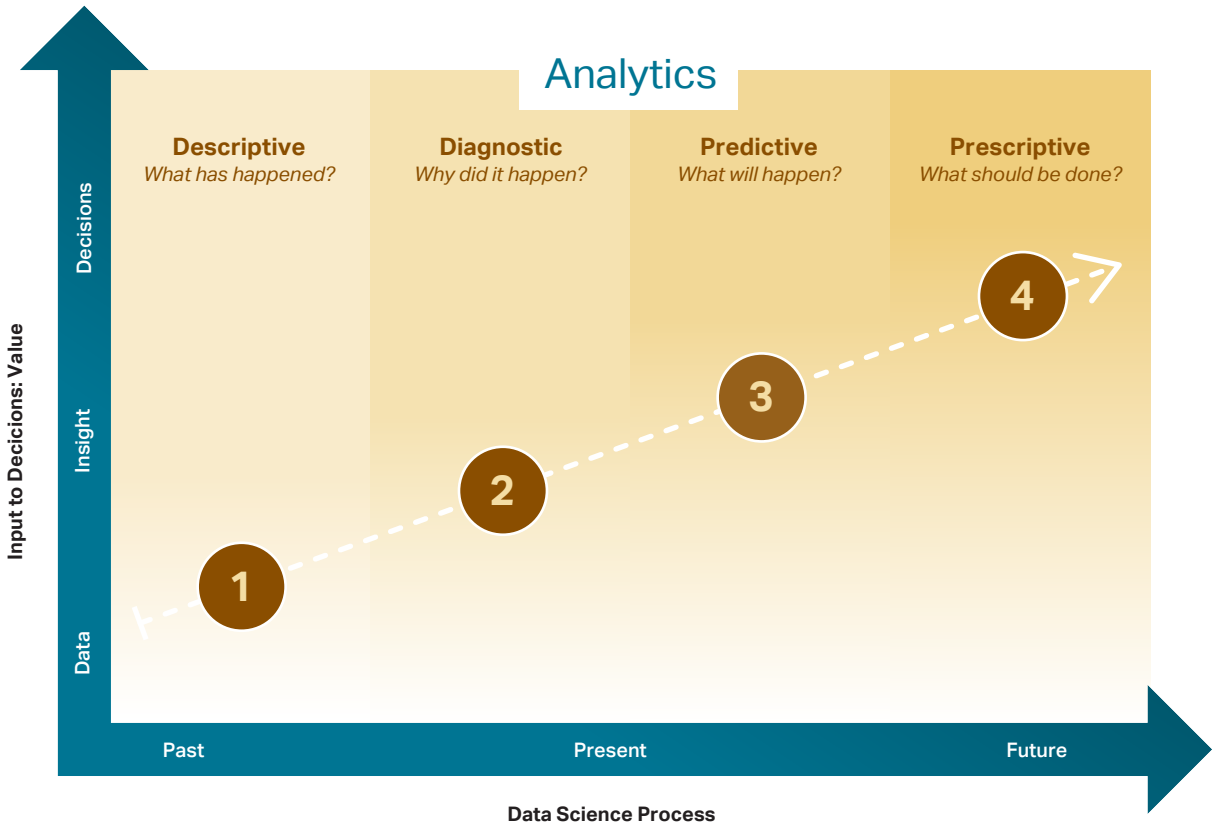

FIGURE 5 ➤ The Data Science Process

data mining, and correlations insights occur. "Why did it happen?" is asked.

- *Predictive Analytics:* At this stage, historical datasets are collected and merged with one another to identify patterns and insights. Statistical models and algorithms are used to forecast. It is important to know that these analytic models are probabilities. It is probable that the predictability is not 100 percent. Civitas Illume is used to predict students' persistence rates. The Illume data combined with zip code analysis have proven to be a strong predictor of success and persistence.
- *Prescriptive Analytics:* Prescriptive analytics is where the action takes place. These analytics provide advice about actions that should take place. A combination of techniques and tools is used, such as machine learning, business rules, and algorithms. The most common tool is chatbots, which help answer students' questions 24 hours a day.

Insight Into a Data Team Meeting

- *Idea/Vision:* A systematic explanation of a data team meeting structure is as follows: The data coach identifies problems. Often, these problems are articulated at meetings or by individuals. The coach teases out some or most of the data sources. For this example, students in EDUC 1300 (a student success course) were the focus of the campaign. All first-time-in-college (FTIC) students are required to take EDUC 1300. One of the course assignments is to register for the upcoming semester. However, when spring registration opened, more than 60 percent of the students in EDUC 1300 did not register. Data from Civitas Illume were pulled to identify persistence scores. Then two

queries with students' course information as well as basic demographic and all contact information were accessed from the AIR Reporting web page, Query Viewer, and a request from the analyst. Once these datasets were accessed, they were merged into a single dataset, and descriptive analytics were run. The vision was to identify patterns and insights for students who had not enrolled and to implement an intervention to get them enrolled.

- *Data Team Meeting:* After initial analysis of the data, schedule a meeting. The meeting should not last longer than one hour. The data coach should keep staff focused on the issue and data at hand. Prior to the data being disseminated or viewed, the vision/goal needs to be specified. In this case, students needed to register for spring semester courses. The team may request that additional data and/or other individuals be brought to the next meeting for consultation and buy-in. The coach assigns tasks to team members. The second meeting should take place two to three days after the initial meeting; team members should be prepared to present the results of their tasks at that time.
- *Gather Data, and Bring Key Personnel:* If additional staff were invited to attend, they need to be available for the meeting. If additional data were requested, the analysis must be completed prior to the second meeting. Additional and more sophisticated analyses are conducted and presented at the second meeting. They can be iterative, but not to the point where nothing is being accomplished.
- *Commit:* Commitment happens at the second or third meeting, after gleaning additional data, inviting other individuals, or by a special task—for example, meeting with the dean to advise that an intervention/campaign is going to be implemented in a particular division. This is also to gain the support of the individual(s).
- *Develop a Nudge:* During the second or third meeting, the data team and others discuss interventions. In the current example, students were segmented into their persistent levels in Illume.
- *Implement:* First, one of the data team members sends a text message to each student prior to counselor and advisors' communicating with them. A spreadsheet with the students' contact information should be disseminated to the counselors by their supervisor. Counselors are assigned students predicted to be least likely to persist and should be given two weeks to contact them via e-mail and phone. Students who were predicted to be moderately or highly likely to persist were assigned to academic advisors.
- *Analyze/Measure:* This part of the process is vital. For the campaigns that are conducted, measuring the students' yield rates and the financial impacts creates momentum. People doing the work want to know if their efforts are making a difference. After every campaign the results should be sent to every person who worked on it. Much of this analysis is descriptive, though sometimes a chi-square analysis is conducted and shared with the group. To avoid confusion, keep this as simple as possible.
- *Document:* Documenting each step of every campaign is cumbersome. Yet if campaigns are not documented, valuable work is missed and forgotten. Document what campaigns were conducted and who was assigned what task. Assigning or recruiting a team member to document each step for each campaign will help prevent repetition, and others at different campuses will be able to duplicate the campaign.

Act Now!

ACT List: Lone Star College–Montgomery purchased a list from ACT. Only students who had taken the ACT and were in the Lone Star College–Montgomery service area were requested. After the list was obtained, it was compared against a list of students who had applied and enrolled.

In Veera (a Rapid Insight tool), the two files were merged by first name, last name, and date of birth. Records were then classified "1" if the student had applied and "0" if they had not applied. (This helped filter students who live in the service area and who had taken the ACT but had not applied to Lone Star College–Montgomery.) One predictor of success is the

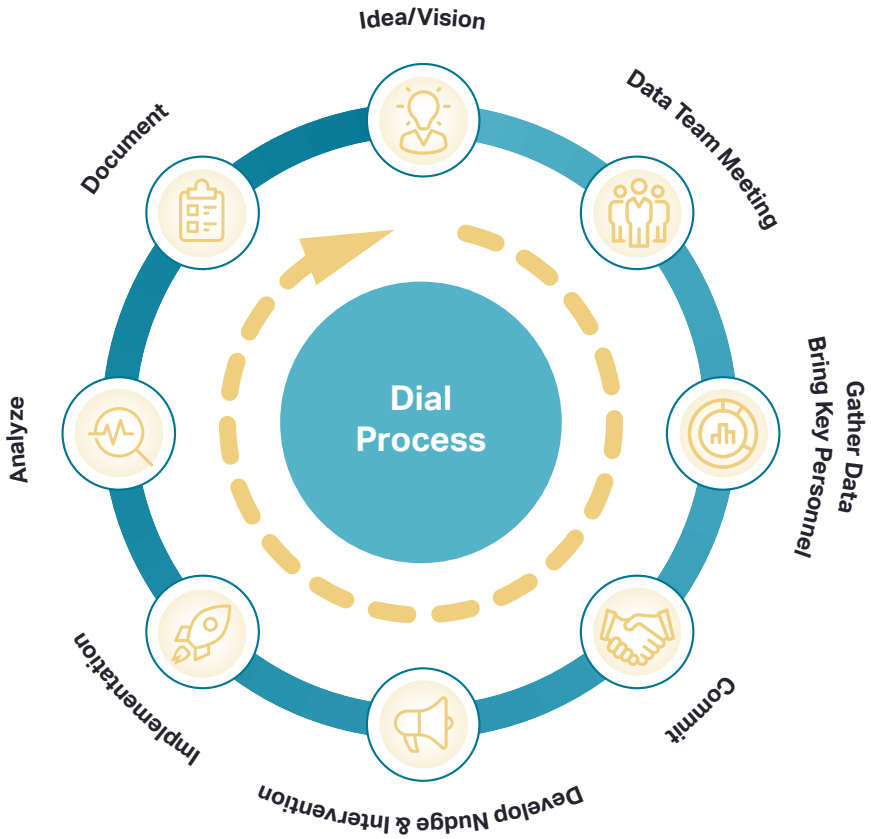

FIGURE 6 ➤ Sample Campaign

distance students live from campus; the threshold is a ten-mile radius. Students who live more than ten miles from campus are less successful. After the data-mining process was completed, the list numbered 962 student records, including e-mail and physical addresses as well as phone numbers.

The data team invited admissions and one academic dean to the meeting, where it was decided that each prospect would be e-mailed and sent a text message. The list was segmented by major for each academic division. Academic deans were sent the segmented lists and were encouraged to contact their students. Some deans contacted the students themselves via e-mail while others asked department chairs to contact the students. The students were also sent a postcard nudging them to enroll. The campaign was named "Act Now!"

Yield for "Act Now!' numbered 189 students—20 percent of the 962 students. (This was calculated after census day.)

Strategic Enrollment Management: Data Science Playbook

Because the data science process is iterative and ever changing, the goal at this point is to memorialize the hundreds of campaigns for others to replicate. This is the purpose of "Strategic Enrollment Management: Data Science Playbook." The timing of a campaign's launch is vital to increasing enrollment. For example, the ACT campaign cannot be launched when registration is not open. Given the goal of recruiting students who have completed the ACT and who have not yet applied to Lone Star College–Montgomery, each campaign is

TABLE 1 ➤ Lone Star College's Data Science Playbook (Sample)[1]

Category	Owner	Data Mining	Activity	Modality	Semester	Month
ACT_NotApplied						
Recruitment	L. Cash	Segmented students on the ACT list who did not complete an LSC application	▸ Nudged students ▸ Separated list by majors ▸ Sent list to respective academic deans for…	▸ Text ▸ Email ▸ Post Cards ▸ Soical Media	Summer	June
	Tools	Veera, AIR				
	Queries	LSC_CS_AD_Appl_NotEnrolled				
	Air Dashboard	All Prospects				
	Civitas	—				
	Other	—				
Sping18_VeryHighMod_FinAidCompleted_3Terms_15Miles						
Retention	M. Samford	Merged files to access student contact info, persistence rates, and those that live less than 15…	▸ Nudged students to enroll in subsequent semester	▸ Text ▸ Email ▸ Soical Media	Spring	February
	Tools	Veera				
	Queries	LSC-M Contact List of Students Spring18.xlsx\Contact List				
	Air Dashboard	—				
	Civitas	Illume_ExportedStudentList_2018_0226_07-31PM.csv				
	Other	—				
Netflix_Campaign						
Retention	M. Chavez	Completed K-Means and association rule mining analyses	▸ Nudged students to enroll in one of the 8 most-taken courses	▸ Text ▸ Email ▸ Portal ▸ LSC App	Spring	October
	Tools	Veera, WEKA				
	Queries	Request from AIR for 3 years data from all online students				
	Air Dashboard	—				
	Civitas	—				
	Other	—				
GradReadyStudents_45PlusCredits						
Completion	J. Lebron	Removed duplicate IDs	▸ Sent list to the TRAC Center for a nudge campaign ▸ TRAC Center nudged students and…	▸ Text ▸ Email	Spring	August
	Tools	Veera				
	Queries	GradReady_LackingPhEd.xlsx\Sheet 2				
	Air Dashboard	—				
	Civitas	—				
	Other	—				

[1] Layout adapted from original spreadsheet for presentation purposes; job names indicated in darkly-banded rows.

strategically outlined and scheduled according to the academic cycle. Because the campaigns have not been documented, they have been easily forgotten, and we've moved on to the next campaign. Yet the previous work made an impact. Following are samples of four campaigns that were informed by the Lone Star College–Montgomery Strategic Enrollment Management: Data Science Playbook. A step-by-step process was developed so others could replicate this work. The playbook includes the details of the queries used, where the queries were attained, the tools used, data-mining process, activities, modality in how nudges were carried out, and who is accountable for launching the campaign.

Conclusion

The overall impact of merging data science and marketing via cross-functional teams over the last three years at Lone Star College-Montgomery includes:

- 15 percent enrollment increase;
- Increased class density;
- 18 percent increase in FAFSA submissions;
- 30 percent increase in students enrolling in 15 credits or more; and
- 48 percent increase in financial aid awards (n=869) compared to FY17.

The culture at Lone Star College shifted to a data- and action-oriented one.

In an effort to expand use of data science initiatives across the Lone Star College System, the first Data Camp was organized. The camp is a conference-type event that teaches participants how to utilize data, predictive analytics, student nudges, digital marketing, and use tools (*e.g.*, Civitas, PowerBI, Rapid Insight). The event was initially planned for Lone Star College employees, but its success soon brought community college leaders from across the country. Data Camp (LoneStar.edu/DataCamp) is held every fall at Lone Star College–Montgomery.

Today, data teams have extended across the entire Lone Star College System; more than 20 are now active. Six colleges have built their own data centers, similar to the Digital Marketing Intelligence Center at Lone Star College–Montgomery.

Enrollment and student success data related to data team accomplishments speaks for itself. Collaboration and strategy with accessible data will lead to positive results for your college's culture, enrollment efforts, and student success.

References

Jing, L. 2002. Data mining and knowledge management in higher education—Potential applications. 42nd Annual Forum for the Association for Institutional Research, June 2–5, Toronto, Canada.

Rubenking, N. 2001. Hidden messages. *PC Magazine*. May 22.

Stewart, G. 2004. Defining the enrollment manager: Visionary, facilitator and collaborator. *Journal of College Admissions*. 183(Spring): 21–25.

Swing, L. R., and W. L. Ross. 2016. A new vision for institutional research. *Change*. 48(2): 6–13. Available at: <doi.org/10.1080/00091383.2016.1163132>.

Thaler, R., and C. Sunstein. 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New Haven, CT: Yale University Press.

Royce, W. R. 1970. Managing the development of large software systems. In proceeding of IEEE WESCON, Number 8, Los Angeles, CA. Available at: <www-scf.usc.edu/~csci201/lectures/Lecture11/royce1970.pdf>.

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Brian Mullen

Brian Mullen is Executive Director of Marketing at Lone Star College. He has more than ten years of experience in public relations and marketing communications, and a passion for maximizing an organization's image and reputation. He has already done so for such prestigious organizations as the Smithsonian Institution, Clemson University, Georgia State University, and now Lone Star College. He was awarded the Public Relations Society of America's Silver Anvil Award for Excellence and seven additional awards from PRSA and the Council for the Advancement and Support of Education for outstanding strategic marketing communication programs and projects, excellent and innovative use of social media with a high impact, online innovation and experimentation, and outstanding media relations programs. He earned his bachelor's degree in communication studies from Barry University in Miami, Florida, and his M.B.A. from Clemson University in South Carolina.