The Link Between Disruptive Innovation and A Data Measurement System to Customize Student Success Pathways

Dr. Marie Michelle Rosemond

Rosie's Library

Braselton, GA.; USA

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Abstract

Integrating incoming high school students into college is complex. To unpack retention and identify student success, the college has analyzed retention data, data sources, and utilized various analytical methods, to understand how to optimize support services and facilitate student success within the high school-to-college transition during the first year. Two theories, Disruptive Innovation and College Readiness expand both insights and phenomena to move student success from broad concepts to actionable decisions. The findings within the theories led to the design of a practice for student success management. A comprehensive measurement system informs how data drives strategies for managing cross-functional collaborations, campus transformation leading to a multiplicity of student success cultures and value by informing knowledge for student success resource management.

Introduction

Purpose

Data often lives everywhere. An organized data system is critical in identifying innovative practices to disrupt ineffective student services. However, the use of analytics, insights, and attributes can be used as drivers to influence campus conversations, goals, and the allocation of resources for effective student success support service. To meet the challenges of the 21st century, higher education must change from a system primarily based on performance (Reuben et al., 2022, p. 276).

Student Success is achievable when quality structured and unstructured data supports decisions for advantageous student success management. Historically, student success concepts are general broad base concepts. To advance student success from ambiguous general concepts, this paper endeavors to present a student success pedagogy that translates data into meaningful transactions across the university environment to increase student success cultures among staff and faculty.

Measurement Systems

Variously termed performance metrics, key performance indicators (KPI), scorecards, and dashboards have become increasingly popular as measurement systems (Reuben et al., 2021, p. 278). Structured and unstructured data are in abundance today, and data sources are available to some degree at most colleges and universities, as found in countless higher education or news reports, and the National Center for Education Statistics. Those are a small fraction of a plethora of higher education data sources. Most common across a variety of data sources are needed for higher retention rates and graduation rates or an overall call to action for better levels of student success. Complete College America (Laserfiche, 2019) reported that only 38% percent of students at four-year flagship institutions complete a bachelor's degree on time. On average, it takes students six years to finish, and academic institutions often cite their graduation rate using a six-year figure. Although data sources are prolific, Michael Zastrocky, the executive director of The Leadership Board for CIOs, a higher-education organization said, "We are data rich and information poor" (Laserfiche, 2019, para. 6). Consequently, the ineffective use of the data impacts student success.

In this paper, student success pedagogy combines knowledge from data related to college readiness, academic success, social integration, and persistence. Together with data collected

from the Office of Institutional Research and Analytics, this model provides a blueprint for efficiently scanning the differences between the high school and university or college environment, a plan to disrupt draconian attrition, retention, and completion rates through innovation, and a move from theories and concepts into a practice yielding student success cultures throughout the university or college.

The overall theme from data sources highlights challenges around retention, completion, and student success. Several other higher education themes emerged upon closer examination of higher education data from The Integrated Postsecondary Education Data System (IPEDS) and The National Student Clearinghouse (NSC). As captured by Kirp (2019), "The fact that 40% of college freshmen never make it to commencement is higher education's dirty little secret and a dereliction of duty that has gotten too little public attention" (p. 4). The lesson from this narrative is a call for higher education leaders, staff, and faculty to restore the confidence in public education and all stakeholders involved.

Students are stakeholders in the pursuit of higher education. The non-completers (62%) or those taking longer to finish, represent a pipeline of rich data for actionable insights related to retention of students. In this paper, student success is linked to academic and social integration, which expands the role of students as stakeholders beyond high school and admissions benchmarks. Social integration, a key for retaining new students, is found in incorporating newcomers in the college environment.

Literature Review

A thorough literature review provided evidence for the need to understand college

readiness trends for current high school students, issues with implications for higher education, leadership, and opportunities to expand the high school-to-college transition. First-generation college students, students from low socioeconomic status, and students from under-represented groups were examined in the literature, which also linked parent education level to predict college retention and graduation.

In addition, the literature review indicated a need for greater understanding of the misalignment between high school benchmarks and college admissions benchmarks. Diagnosis of this misalignment could adjust organizational focus and create opportunities for student success. The research showed an increase in the number of institutions that have recognized that higher education is a service industry and therefore need to place greater emphasis on meeting the expectations and needs of their customers, i.e., students (DeShields, Jr et al., 2005). Understanding the links between high school and admissions benchmarks and retention data in an era of declining enrollments, universities may be able to customize innovative pathways for greater efficacy of the transition from high school to college.

Theoretical Framework, Methods, Results, Significance, and Limitations

College Readiness. Making a data-driven decision implies that student success leaders use data to set goals, identify problems, seek and evaluate options, and choose a course of action (Wang, Y. (2019). Essential to student success outcomes, practitioners need to build skills of data use and college readiness (MacIver, M., 2019). Collaborations between Student Success practitioners and Data Scientists are key to optimize student success outcomes. Data scientists can easily quantify and analyze the college readiness framework. The four tenets of college readiness are the basis of how to organize the data within content knowledge and basic skills,

core academic skills, and college knowledge. Attributes within each of three other tenets include benchmarking data for high school GPA, academic disciplines, admissions criteria, and financial aid data.

The fourth tenet includes non-cognitive skills and norms of performance, which are based on students' self-awareness, self-monitoring, self-control of study skills, work habits, time management, and help-seeking behavior and social problem-solving. However, student success practitioners can benefit from deep quantitative analysis from the three categories (content knowledge and basic skills, core academic skills, and college knowledge) to inform effective student success services and outcomes for the non-cognitive skills and norms of performance category.

The college readiness indicators and student performance gaps of prospective high school applicants piqued the interest of campus leaders in both academic and student affairs at College. A careful analysis of 10 years of cohort data from Institutional Research and Analytics retention trends, and patterns, revealed opportunities for innovation by campus leaders and staff, students, and the community. One analytic framework juxtaposed admissions data, financial aid, and census data. This robust view of previous cohorts informed curricular design for multiple, customized head-starts to fundamentally implement student success best practices uniquely suited for the student profile. A second data set positioned high school benchmarks, first year retention data, and completion patterns to determine whether the patterns unveiled what was missing from the students' profile for impactful and effective customization.

David Conley's (2007) work on college readiness identified four main areas of skill development that are critical in shaping college readiness: (a) content knowledge and basic skills, (b) core academic skills, (c) non-cognitive skills and norms of performance, and (d) college

knowledge. Colleges use students' high school coursework, performance on achievement exams, relative class rank, and grade point average (GPA) to identify whether applicants have been exposed to content that prepares them for introductory college courses and college readiness (Roderick, Nagaoka, & Cocoa, 2009). Although each type of indicator correlated with levels of college readiness, university stakeholders noted that this is where college access for students with lower levels of readiness require innovation to manage retention holistically. Different indicators suggest very different strategies for attacking the college readiness problem for prospective students (Roderick et al., 2009)

Disruptive Innovation. The link between disruptive innovation and student success serves as a guiding framework for the use of metrics by student success administrators. Colleges have disrupted their admissions processes and standards. Enrollment has increased tremendously over the past 20 years, "almost exclusively" due to a surge in low-income and minority students, according to a 2019 Pew Research Center study.

Customized higher education pathways are part of the disruptive innovation theoretical framework pioneered by Christensen & Eyring (2011).

Disruptive innovation challenges educators to create student-centric customized learning, to move from monolithic structures that inhibit students' performance, and capitalize on non-consumers. Modifying organizational lenses to view advantages and disadvantages allow universities to identify non-consumers, people who can benefit from innovation. Historically, and the present, college access has improved enrollment to many types of universities; however, in today's economic and enrollment cliff climate, disruptive innovation strengthens the goals of access and retention by providing a framework for universities to explore their organizational DNA, identify institutional unique assets, normalize that imitation is suicide, and recognize that

for some Generation Z students to achieve their dreams, multiple pathways are critical for closing the gap on college readiness and retention (Christensen & Eyring, 2011).

Field (2018) cited George L. Mahaffy, Vice President for Academic Leadership and Change at the American Association of State Colleges and Universities, who said the following: The combination of "pressures—financial and political—has forced colleges to pay closer attention to student success, policymakers, and the public who no longer tolerate high failure rates, and institutions faced with dwindling state support have discovered it's substantially cheaper to keep the students you have than to go find new ones," (p. 2).

Most important, an examination of high school indicators for college readiness with disruptive innovation offers a framework for customized higher education pathways (Christensen & Eyring, 2011). Fields (2018) cited Suzanne Walsh, Deputy Director for Postsecondary Success at the Bill & Melinda Gates Foundation. "Institutions may have once relied on a single program to promote first-year success—a seminar, or an orientation—they're now stitching together multiple solutions," (p. 1).

The high school to college pipeline and college completion rates are crucial in an era of the enrollment cliff. The enrollment cliff is a negative phenomenon and or factors affecting the pool of students ready for college. Several sources have precisely confirmed the impact of the enrollment cliff. The Looming Higher Ed Enrollment Cliff Report written by Missy Klein in the Fall of 2019 reported on the following four trends defining the enrollment cliff.

1. "U.S. Birthrate Drops 4th Year in a Row, Possibly Echoing the Great Recession."
2. "U.S. Births Fell to a 32-Year Low in 2018; CDC Says Birthrate Is in Record Slump."
3. "The U.S. Birthrate Is Still Falling."
4. "College Students Predicted to Fall by More Than 15 Percent After the Year 2025." (p. 1)

The connection between the enrollment cliff and retention is an intersection for colleges

and universities to further define and examine with a critical eye. The competition for students is high. The resources in the certain college sectors are dwindling. Therefore, designing data systems within higher education to increase productivity in terms of retention and resources for budgets is a win-win for everyone involved. See figure 1.

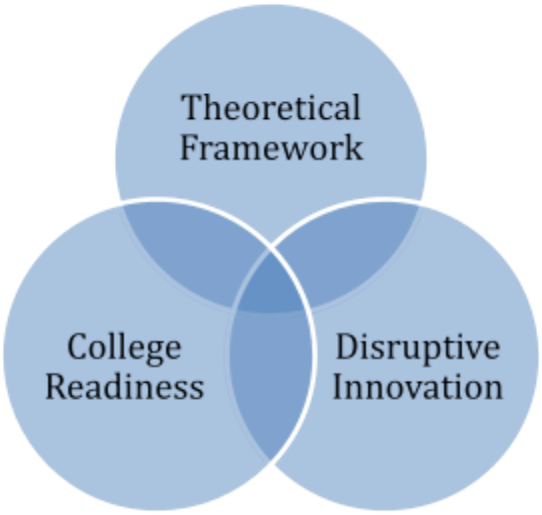

Figure 1. Theoretical Framework College Readiness and Disruptive Innovation

The disruptive new form of competition will require traditional universities to change fundamentally (Christensen & Eyring, 2011).

Organization of Data. The data in this study were organized in multiple ways. However, to report findings the following data were critical to capture how students were moving in through and out of the college. High school GPA begins to inform critical progress through the first-year experience. High school GPA informs the institution about which students for whom they should set goals and invest resources to provide great levels of support as part of the innovation. High school GPA also begins to inform the institution about which students are not ready for college even with maximum levels of support.

The next data set begins to reveal retention patterns from cohort 2015 through 2021. Retention has ranged from a low for the college of 55% to the recent high of 69%. To achieve the 69% required critical examination of patterns through good data collection and ongoing conversations with faculty, deans, leadership, and staff.

The final data set examines equity gaps. Addressing equity gaps is a high impact practice most colleges and universities in the public state sector report as a best practice. The data begin to clarify the various rates of admissions by race, then proceed to slice the data further by understanding completion rates by race. These patterns could be of greater priority for institutions with designations of Minority Serving Institution as well as Hispanic Serving Institution. How can a measurement system which includes analytics and artificial intelligence inform access institutions to innovate?

1. How do analytics and data sources contribute to the design of student success pathways?
2. How do analytics and data sources inform cognitive, social, and institutional factors?

Six data sources by year are shown in Table 1.

Table 1.

Six Data Sources by Date

Data Sources	**2015-22**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Cohort Data								
High School GPA Data								
Retention by Race Data								
Retention Data								
Graduation Cohort Data								

Data Sharing Tour and Conversions			

(College Office of Institutional Research and Analytics)

Methods

The data shown in Table 1 were from a mid-size college in the South. IRB approval was granted. The college's data infrastructure was non-existent. As part of the design for the data system, the data were collected, extracted, transformed from Banner**,** a secure software system that supports a range of functions and data held by students and various departments, then securely loaded with password protection into the Z-drive. When the data were organized in a consumable format, several PowerBI Dashboards were created. Access to PowerBi required a protected password.

The college in the Metro Atlanta, GA area is one of the newest colleges in the third century. Opening in 2006 with an access mission, the college has grown from 118 students in its first class to more than 12,000 students. The college offers 19 undergraduate programs of study with more than 60 areas of concentration; it is ranked the most ethnically diverse Southern regional college. Data files are harvested each fall by Census Day to control for a variety of shifts in student transactional data. After Census, the data verified by the Office of Institutional Research and Analytics becomes the official data for the cohort. The data in this study is captured for cohorts 2011 through 2021. Ten years of rich data provides analysis and trends for how students are retained throughout the first year; each cohort varies. Data for first-time full-time first-year students ranges from 977-1552 students. The data also analyze the number of students retained in each beginning cohort. The range for retention for the cohorts are 618-991 students.

The data fields also include high school grade point averages. This added field informs the role high school grade point averages to college grade point averages. Other fields for analysis include race to explore equity gaps. The data is also used to design dashboards to capture important milestones established by the College such as: Courseload: students who are registered for 30 credit hours or less, students who receive Pell or scholarships, gender, and major. Dashboards offer a robust measurement system. This study does not unpack trends for majors. Rather, the deep analysis offers a glimpse into first-year experience.

Description of the Participants. This study examined college students in the first-year experience. The students' ages ranged between 18 and 29. Each data file contained high school GPA, race, gender, and programs of study. The data were uncoded to protect students' identity and to ensure maximum confidentiality. One of the benefits of this study was the use of data and zero harm to participants. Rather, the volumes of data allow for tracking of student patterns at the college.

Modes of Inquiry. Measurement systems offer several benefits (Reuben et al., 2021, p. 280) to disrupt retention and completion patterns. Structured and unstructured data are key to changes in decision-making. Data is then valuable to understand the needs of the organization and its stakeholders. The analytical framework is an analysis of the college's institutional research data that corroborated national trends and findings for students with high school GPA of 3.0 or better. However, as Christensen and Eyring (2011) highlighted, prestige is elusive, and institutions are not able to limit their enrollments to the academically most gifted full-time students. This study captured benchmark data prior to investing in the new Division of Student Engagement and Success (SES). The Student Engagement and Success division began to understand retention and completion patterns in January 2020. Once the benchmark data was

organized and analyzed it created a sharp line of demarcation measure retention in 2020 and 2021. Figure 2 illustrates the link between high school GPA and retention rates at the College.

Retention Rate (1-yr) by HS_GPA Range	5-year Average Rates 2015-2019	2020	2021
1.99 or less	61.8%	62.5%	50.0%
2.00 to <2.25	53.5%	57.3%	46.2%
2.25 to <2.50	58.1%	49.8%	46.1%
2.50 to <3.00	66.9%	60.1%	52.0%
3.00 to <3.50	73.8%	69.1%	66.1%
3.50 or above	77.3%	73.5%	70.9%
Total	**67.1%**	**63.0%**	**58.8%**

Figure 2. High School grade point averages and longitudinal college retention rates. (College Office of Institutional Research and Analytics)

Institutions acknowledge that the pattern of student engagement in higher education is changing, and they should be prepared to positively respond (Yorke & Thomas, 2003). A part of the analysis includes the exploration of data between high school admissions and college retention data by cohorts. Figure 3 is a longitudinal view of retention rates when students aim to persist in the first year and return for their sophomore year.

One Year Retention of First-time, Full-time New Students

Fall Term Entering Cohorts	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Count of Cohort	1,266	1,235	977	1,251	1,169	1,181	1,233	1,317	1,552	1,291	1,434
Sum of Retained in 1 Yr	692	697	618	764	741	726	741	828	945	723	991
% Retained in 1 Yr (FT only)	55%	56%	63%	61%	63%	61%	60%	63%	61%	56%	69%

Figure 3. First-time full-time new students one year retention rates. (College Office of Institutional Research and Analytics)

Data alone are just a jumble of numbers, but pose the right questions and you can glean valuable insights from dissecting masses of information (Kirp, 2019, p. 33). A suite of tools is used to answer questions as part of the analysis to identify and disaggregate the many pathways students take as they enter and move through the institution. Data elements are defined in Power BI. The attributes include demographics, enrollment, status, financial aid, housing, and academics. The key influencers and top segments are examined to clarify which students are leaving the institution. The volumes of historical data inform predictive analytics to close gaps and identify areas for support.

Disruption to retention and completion is achievable with a comprehensive efficient data ecosystem. A data ecosystem has been defined as “a complex socio-technical network that enables collaboration between autonomous actors in order to explore data" (Oliveira, Lima, & Loscio, 2019, p. 1). The volume of data offers data scientists’ possible ways to organize data. Dashboard data capture attributes and key influencers that begin to tell a data-driven story. Decision-makers are better informed to optimize resources to increase retention. All data sources illustrate an opportunity for disruption within the student lifecycle.

The role of data-informed decision making is designing effective success pathways for

students. Figure 4 provides insights for completion rates by race. This data driven approach informs which actionable cognitive, social, and institutional factors are capable of closing equity gaps as part of student success.

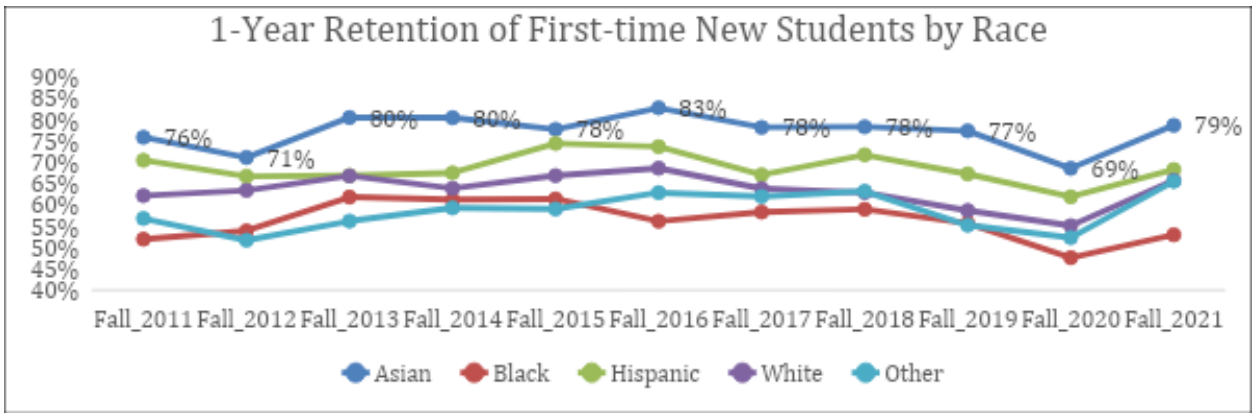

Figure 4. Retention rates for first-time full-time first years by race. College Office of Institutional Research and Analytics.

Results - Non-consumers: High School-to-College Transition

Disruptive Innovations supports finding new ways that are hidden in plain sight. Doing so is a practice around optimizing resources in place. The high school grade point average and retention illuminates the likelihood to finish as well as challenges access institutions to identify a medley of academic enrichment and social integration to optimize student readiness. The attributes from predictive analytics clarify what key influencers lead students to persist and stop-out. Attributes inform interventions to balance challenge and support (Anderson, Goodman, & Schlossberg, 2011).

One curriculum to mitigate challenges for social integration and college readiness is Swail's geometric model of student persistence and achievement. Conley's college readiness model includes content knowledge and basic skills, core academic skills, college knowledge, non-cognitive skills, and norms of performance. As students matriculate through high school in

four years, they overcome many milestones in their homes, communities, and from high school academic experience. Students' progression from grades 9 through 12 created experiences that allowed students to demonstrate a set of core competencies for a high school diploma and high school standards that are in alignment with college expectations (Roderick et al., 2009).

By graduation, high school graduates typically have mastered their high school curricula. Their grades from high school courses and overall final grade point average (GPA) summarizes the high school academic performance. Under scrutiny, these data begin the link between high school and postsecondary performance (Roderick et al., 2009). Furthermore, the results highlight students' achievement patterns and, when juxtaposed within peer groups through rankings, more information is acquired about college readiness skills. Table 2 aligns college readiness skills by content knowledge and basic skills, core academic skills, non-cognitive skills and norms of performance, and college knowledge.

Table 2.

Factors in College Readiness (Conley, 2007).

College Readiness			
Content knowledge and basic skills	Core academic skills	Non-cognitive skills and norms of performance	College knowledge

Foundational to the understanding of academic disciplines and are often specific to a given subject area	Writing and analytical thinking that are not subject-specific, but rather allow students to engage in work in a range of disciplines	Behaviors that reflect greater student self-awareness, self-monitoring, and self-control study skills, work habits, time management, help-seeking behavior, and social problem-solving skills	Includes information and skills that allow students to successfully navigate the complex admissions and financial aid processes, as well as develop an understanding of college norms and culture

High school students who graduate with higher test scores, better grades, and more rigorous coursework are more likely to enroll in and graduate from four-year colleges (Roderick et al., 2009). However, high school students with gaps in their preparation but have college aspirations create an opportunity for universities to innovate, address, and strengthen the goals of access, by creating different student success pathways.

"Students can be derailed from graduating for many different reasons, including a lack of academic preparation or money" (Douglas-Gabriel, 2016, p. 1). Student success models that forecast challenges and empower staff and faculty to nurture first-year students by connecting students to financial and mental resources or academic support benefits. Innovation for non-consumers requires sustainability for all stakeholders to offset draconian retention rates. Universities or colleges then garner a return on their investment and students as stakeholders obtain a return on their education and investment. The concepts from college readiness,

academic and social integration, and Swail's geometric model of student persistence are shown in Figure 5

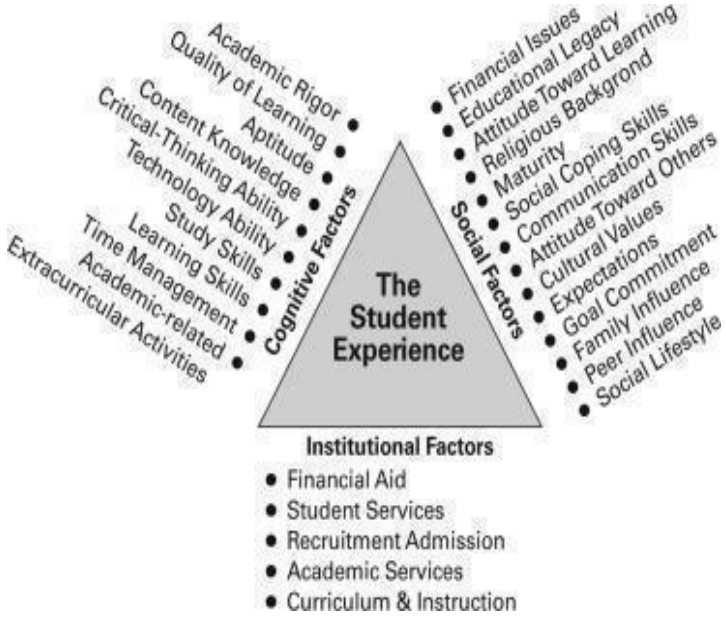

Figure 5. Swail's Geometric Model of Student Persistence

The statistics and the triangulation of text about college readiness, social integration, and Swail's geometric model of student persistence clarifies missing epistemology. The term triangulation describes how the use of multiple approaches to a research question can enable the researcher to zero in on the answers or information sought (Oppermann, 2000; Singleton, Straits, & Straits, 1993). The new knowledge and inter-relatedness of each concept, disrupts false narratives and identifies implications for the design of innovative, effective retention pathways for students. The knowledge acquired operationalizes onboarding, strategic planning, retention goals, resources, and support services to customize the academic socialization curricula for students with a 2.0 to 2.9 high School GPA. This GPA range is critical to access institutions' mission, the vitality of enrollment targets, budgets, and resource allocation.

First-year students have low high school college readiness indicators and high hopes for a

college degree. Although college readiness benchmarks are low for some students, many in this group who enroll in college place a high premium on education, believing it to be the one commodity that could empower them (Freeman, 2005). The disadvantages and advantages in this population offer university leaders and staff the opportunity to implement an effective head-start specifically for students with this profile. Together, the conceptual framework revealed a need for institutional involvement beyond recruitment. Access institutions to the greatest degree address institutional factors for a relevant student success pedagogy to innovate pathways for students. How are faculty and staff involved to increase student success cultures throughout the college environment?

Diagnosing and understanding the student is a critical component, because without this kind of knowledge the access institution cannot innovate (De Lourdes, Brites, Magalhães & Sä, 2011). Field (2018) quoted Joyce Holl, the Executive Director of NODA, the Association for Orientation, Transition & Retention in Higher Education, who said that student success culture must "…create programs that are specific to the students who are coming to their campus" (p. 1)

In this study, retention increased for cohort 2021 by 13%. Students retained in this cohort returned as sophomores due to many disruptions to previous institutional practices. Academic and social integration accounts for a greater understanding of the high school and university or environment. The differences between the two environments helps refine the retention equation for greater levels of student success in the transition from high school to college. When academic and social integration is factored in the retention equation, the equation allows for derivation, because the first-year student experience is not monolithic. Opportunities for student success in the high school-to-college transition are increased when students are exposed to relevant structure and activities that account for differences across the various student demographics for

all first-year student populations.

The transition is contingent on reimagining socialization messages or techniques essential to socially integrate numerous first year students from a variety of demographics. Retention measures increase because academic and social integration fine tunes initiatives for first generation students in any college, first time/transfers to the college, advanced placement high school students, adult learner first year students, online first year students, and at risk/conditional admit students, and others for whom the post-secondary experience is new.

Some argue that metrics fail to illuminate exactly which initiatives among many are achieving results (McDougal, and White, 2019). Priority initiatives included restructured institutional resources, identified emergency resources, organized communication plans through various platforms, reimagined academic advising centers, and facilitated cross functional collaborations between staff and faculty. As student success efforts aim to find the best fit between metrics and initiatives, technologies and software are essential to track metrics yielding greater levels of student success cultures across the college environment.

Integrating Initiatives. A student-centered college success model aims to integrate Swail's geometric model of student persistence and achievement that places students at the center and focuses on cognitive, social, and institutional factors (Swail, Redd, and Perna (2003) and offers institutions a proactive way to support student persistence and achievement (De Lourdes et. al., 2011). The cognitive factors refer to students' intelligence, knowledge, and academic ability; social factors include parental and peer support, development or existence of career goals, educational legacy, and the ability to cope in social situations; and institutional factors concern the ability of the institution to provide appropriate support to students during their university experience (Swail et al., 2003). The students enjoy peer support and rapport with

coaches; once trust is earned, students integrate insights from success coaches to navigate the college experience. Most importantly, students seek timely help with the adjustments to the academic environment.

Significance of the Study

Measurement can be used to benefit all the functions and services of higher education institutions (Reuben et al.,2022, p. 281). Data-informed and data-driven practices are key to shift access institution factors to disrupt and innovate. In this study students with a high school 2.5 GPA or lower yielded lower retention rates at the College. As a result of the data integration, the data presented is capable of being disaggregated by institution specific student-data points including whether students participated in special programs (learning communities, peer support, etc.), their first-generation student status, tutoring attendance, campus activity participation, and other characteristics (Demographics, Pell eligibility, Veteran Status, living on-campus, and more). The gaps in retention are sliced by high school GPA to illuminate how these figures impact retention at the college. Equity gap data expands understanding about completion patterns as a Minority and Hispanic Serving Institute.

A commitment on the part of the whole institution, whose objective must be to maximize students' satisfaction and ultimately their success, is essential (De Lourdes et al., 2011). Customized student success pathways consist of a retention paradigm and the use of data to inform decisions and priorities around institutional resources, climate, and customer service to normalize relevant support for students. Developmental milestones are monitored throughout critical periods from onboarding, to the first week, the first month, the first semester, and through the second semester to mitigate historical attrition rates. The data system in this study captured ways to increase retention and create a return on investment. An initial investment of $4.4

million dollars was invested to launch the new Division of Student Success. The retention increases of 13% in 2021, represented more than a $15 million dollar gain for the college.

Universities with open enrollment access are in the position to innovate by assessing their capabilities and identifying the keys to implementing unique learning models (Christensen & Eyring, 2011). The intense competition in today's educational market (Elliot & Healy, 2001) leads universities to adopt a market orientation strategy to differentiate their offers from those of their competitors; therefore, they need to be more aware of and understand their target markets (i.e., students), assess the target market needs, adapt their offerings to meet those needs, and enhance customer satisfaction (Keegan & Davidson, 2004).

Retention has historically hovered at 60.4% * at the college that served as a model for this study. The various interventions increased retention by 13%, * the highest for the entering 2021 cohort. The implementation of structures and activities informed by academic, and social integration, college readiness, and disruptive innovation created campus-wide student success cultures. Increases were found for students in learning communities, students who completed the first-year seminar in learning support communities, first generation students, African American, Latinos, and female students. To operationalize student success structurally and systemically, retention is the conduit within the high school and college transition. This intersection holds insights for further discovery to offer a counter narrative, experiences, and solutions to appalling retention and completion rates in higher education.

Limitations

Although the data encourage discussion, clarification of aspirations, goals, and what constitutes evidence of successful or unsuccessful outcomes (Reuben et al., 2021, p. 280), this measurement system is one example. In a future study, the data will go beyond predictive

analytics and expand binary comparisons within the first-year full-time retention data to understand to what degree interventions are likely to increase retention. The assessment of the quality of the work within higher education has always been important in concept and practice (Reuben et al., 2022, p. 281). However, the intersection between data science and higher education is relatively new. There is a need to increase practitioners who understand this intersection and offer training and development. *Data provided by Office Institutional Research and Analytics (2022).

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