Bending the Curve

How colleges and universities can rethink the course
schedule to graduate more students, faster

September, 2018

AD ASTRA
INFORMATION SYSTEMS

Ad Astra 6900 W 80th Street
Overland Park, KS 66204
www.aais.com

Ad Astra Information Systems. 2018. Bending the Curve: How Colleges and Universities Can Rethink the Course Schedule to Graduate More Students, Faster. Overland Park, KS: Ad Astra Information Systems.

Statement of Data Quality

Ad Astra collects data from two- and four-year institutions across the United States and internationally. For these analyses, United States institutional data was utilized. These data are reviewed through internal Ad Astra verification processes, and, wherever Ad Astra believes a possible error may have occurred, an attempt to remedy is made by staff or institutional representatives are contacted with a request to review those areas. Nearly all institutions comply with our requests for additional review. If resubmitted data meet our internal standard they are approved and appears as part of results in this report.

While Ad Astra makes every effort to provide the most accurate data, the Higher Education Scheduling Index, and these analyses may include inaccuracies, and errors or omissions. Users assume the sole risk of make use of these data; under no circumstances will Ad Astra Information Systems be liable to any user for damages arising from use of these data. Should there be an error in this report, please contact John Barnshaw, Associate Vice President, Research and Statistics, Ad Astra.

About the Higher Education Scheduling Index

The Higher Education Scheduling Index (HESI™) is the premier database for course scheduling that tracks 50 variables related to course scheduling patterns and institutional activity of higher education. It includes metrics from a cross section of 4-year public, 4-year private, and 2-year public higher education institutions to generate benchmarks that can inform institutional scheduling practices and course offerings. It is leveraged by hundreds of institutions to improve on-time graduation rates, and better utilize existing space and other institutional resources.

About this Report

This report utilizes data derived from the HESI database in 2017 when 210 colleges and universities were included. These data can be segmented by Carnegie Classification and are comprised of about 57 percent four-year institutions and about 43 percent two-year institutions. Since the HESI is a purposive sample with a primary purpose of benchmarking, it is important to note that the sample is not representative of all higher education, so caution should be exercised to avoid generalization.

About the Author

John Barnshaw is the Associate Vice President for Research and Statistics at Ad Astra Information Systems, where he directs the Higher Education Scheduling Index, a benchmarking study for course scheduling efficiency and analytics, with more than 200 institutions participating. In his role as Associate Vice President, he is responsible for creating research and statistical solutions that help graduate more students faster while promoting financial stability for institutions of higher education.

Prior to joining Ad Astra, John served as Director of Research and Public Policy at the American Association of University Professors, where he directed the Faculty Compensation Survey, the largest survey of faculty salary and benefits in higher education. Dr. Barnshaw also directed the National Study of Instructional Costs and Productivity (Delaware Cost Study), a longitudinal benchmarking that explores faculty teaching, separately budgeted research and public service expenditures at the discipline level for four-year institutions.

Barnshaw earned his degrees from the University of Delaware (Ph.D.) and the University of North Carolina at Charlotte (MA, BA).

TABLE OF CONTENTS

EXECUTIVE SUMMARY

From the perspective of a provost, dean, or faculty member, rethinking the course schedule poses a daunting challenge. The schedule is, after all, the foundation upon which all students' educational experiences rest. Any solution aimed to improve how the schedule operated would impact the day-to-day activities of faculty, students, and administrators. It would have to center on the core of our higher education institutions: instructional activity.

However, the schedule, as indicated through enrollment ratio – as in census enrollment compared to seats offered -- should be cause for concern on most campuses. More than two-thirds of courses in a typical schedule are not balanced, or 70 to 95 percent full. Nearly one-quarter of course sections (23 percent) are "overloaded," exceeding the 95 percent enrollment ratio threshold. At the same time, about 45 percent of all sections are "underutilized," meaning that the enrollment ratio is less than 70 percent. For example, a course may have 65 students to 100 seats. For associate degree-granting institutions, approximately 50 percent of all courses are underutilized.

Since enrollment ratios are positively associated with student retention, scheduling imbalance presents a significant opportunity to improve student success. Institutions that improve their enrollment ratio have improved retention by about one-half percent. This makes sense, given a balanced schedule means students can access the courses they need, at the times they need them. The schedule is no longer a barrier to their pathway to graduation.

Conversely, an inefficient schedule hurts graduation rates. The greater amount of scheduling inefficiency, the lower the graduation rate for institutions. This, too, inherently makes sense. If limited instructional resources are allocated to courses in lower demand, the capacity to support needed seats in the courses students need to graduate will suffer, time-to-completion will increase, and students will be more susceptible to drop-out along the way.

Efficient schedules positively affect the institution, beyond retention: using the schedule more effectively can be a counterintuitive approach to increasing institutional resources. More students taking more credit hours allows for increased tuition revenue.

Scheduling shifts can have a big impact. At Stephen F. Austin State University, administrators hired 15 new full-time faculty to teach additional sections of bottlenecked courses, enabling 1,770 more students registrations and generating more than $700,000 in net revenue of each semester.

Another institution learned that the single best predictor of cumulative GPA for students is the total number of student credit hours earned per semester. This further motivated them to increase course access to drive grade performance, retention, and on-time completion.

Figure 1 compares the HESI sample to a population frame of all Title-IV eligible, degree-granting institutions that have first-time, full-time undergraduates. This frame is drawn from the National Center for Education Statistics Integrated Postsecondary Education Data System (NCES IPEDS)

database, which is the official source for federally reported data in the United States. In the most recent year of study, there were approximately 4,000 institutions of higher education that reported data to the federal government. As Figure 1 indicates, approximately 40 percent were Associates, one-third (33 percent) were Baccalaureate, one-fifth (18 percent) were Master's and just under 10 percent (8 percent) were Doctoral institutions. When comparing this population to the HESI sample, we see that there is greater peer coverage in the HESI for Doctoral and Master's institutions and nearly equal peer coverage for Associate's institutions. Activities are underway to improve sample coverage in subsequent years for Baccalaureate institutions.

Figure 1 - Higher Education Scheduling Index (HESI) and Integrate Postsecondary Education Data System (IPEDS)

Institutional Participation by Carnegie Classification, 2017
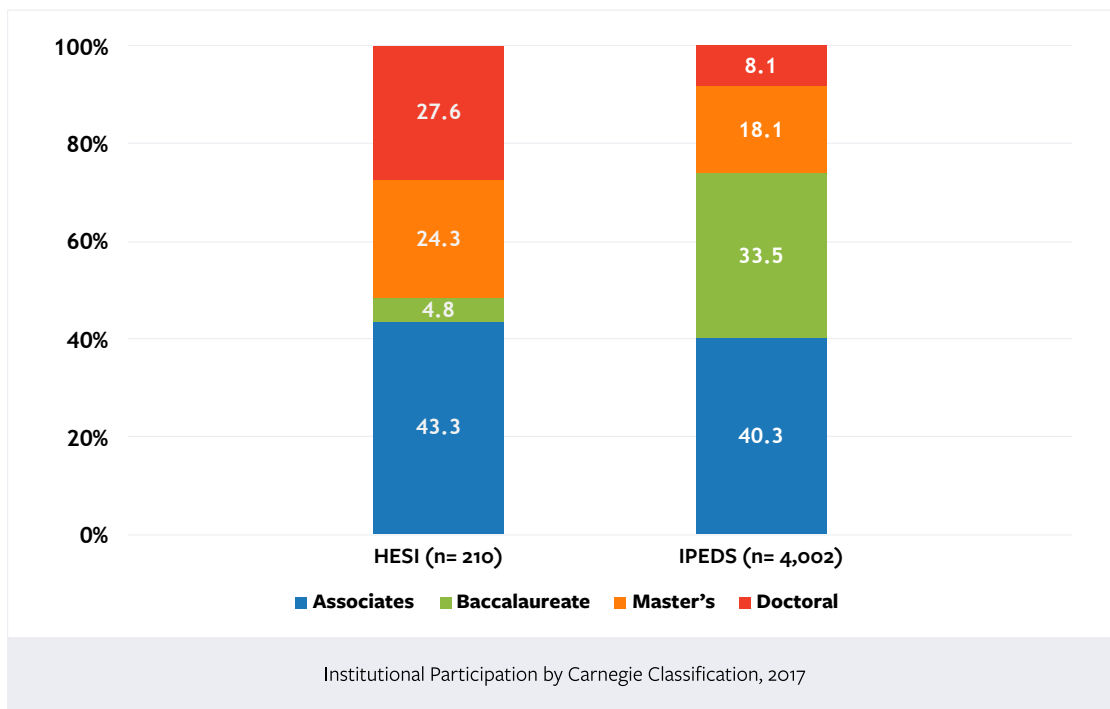
FRAMING THE ISSUE

Institutional leaders often imagine that the magnitude of schedule changes required to impact student outcomes would trigger political discord on campus or require an overhaul of a complex, multi-stakeholder process. The course schedule might, for example, be approved by the registrar, but must balance student demand, faculty interest and availability, chair input, dean approvals, and facility and enrollment manager guidance. All too often, the course schedule remains the same so as not to offend or upset various stakeholders.

Incremental Shifts, Profound Opportunities

These data, in many ways, reveal potential within the complexity. The HESI suggests tremendous opportunity for improvement exists in higher education course scheduling, even when changes are targeted and incremental. As Figure 2 below illustrates, less than one-third (32 percent) of courses at a typical institution are "balanced" with student need, meaning that the census enrollment is between 70 to 95 percent of the seats offered.

At first glance, it might seem that the goal of an enrollment manager would be to fill all course sections to capacity each semester (e.g., 100 students, 100 seats). In controlled settings, this might be ideal. However, in reality, students add and drop classes throughout the registration cycle and those who are most at-risk may have the lowest priority of frequently limited remaining seats. To account for these changes and ensure ample flexibility to enroll students while respecting facility and pedagogical caps, prior research has found that an average enrollment ratio of approximately 85 percent is recommended, within an ideal range between 70 to 95 percent (Ad Astra 2016).

Overloaded and Underutilized

Nearly one-quarter of courses (23 percent) are "overloaded," exceeding the 95 percent enrollment ratio threshold. When courses are "overloaded" this can put additional burdens on the faculty to significantly increase class size, which may negatively affect student-faculty interactions and student retention (Keil and Partell 2002). From a course scheduling perspective, having overloaded courses may indicate there is a substantial shortage of available course sections. If a course has 100 students enrolled and there are 100 seats, there may be 110, 150, or in some cases more than 200 students desiring those 100 seats.

Without adequate course section availability, students may deviate from their required course of study, or may delay their required course of study, which can be an expensive penalty at a time when average net price tuition is at a record high. With nearly one-quarter of courses "overloaded," this represents a genuine opportunity for institutions of higher education to offer more instruction to students, and in the process, generate additional tuition revenue while meeting genuine student need.

Conversely, about 45 percent of all courses are "underutilized," meaning that the enrollment ratio

is less than 70 percent. For the nearly 40 percent of HESI institutions that are two-year colleges, the "underutilized" course ratio exceeds 50 percent, meaning that the majority of all two-year institutions' courses have less than 70 percent enrollment. One reason is the tendency to add new courses, and continue offering them, irrespective of current demand. When courses proliferate, even as enrollments decline, it is not uncommon for institutions to run elective course sections with as few as four students. By more effectively managing student demand from the start, through curriculum mapping, many of these challenges can be avoided.

Underutilization represents a genuine opportunity to better align finite resources at a time when institutions are increasingly being asked to do so. At many institutions, underutilized courses occur in multiple section offerings (e.g., an Introduction to Psychology course with multiple section offerings). In this instance, if there are 10 sections with an average enrollment of 12 students, perhaps six sections of 20 students would better align those finite resources and faculty members could be better utilized teaching a course where there is pent-up demand. Perhaps they could teach an additional section of a foundational course, such as Abnormal Psychology, or a capstone course, such as Psychology Research Methods, which students need to graduate and may be in the faculty members' area of expertise. In other instances, single section courses may be underutilized as there may be low demand for the offerings.

Often, these courses could be offered at a more optimal time for students to generate demand, or they could be rotated to better meet demand. By optimizing course offerings, institutions can increase the number of student credit hours generated without adding additional resources.

Figure 2 – HESI Utilization by Course Enrollment

Due to rounding and data abnormalities, data may not equal 100%
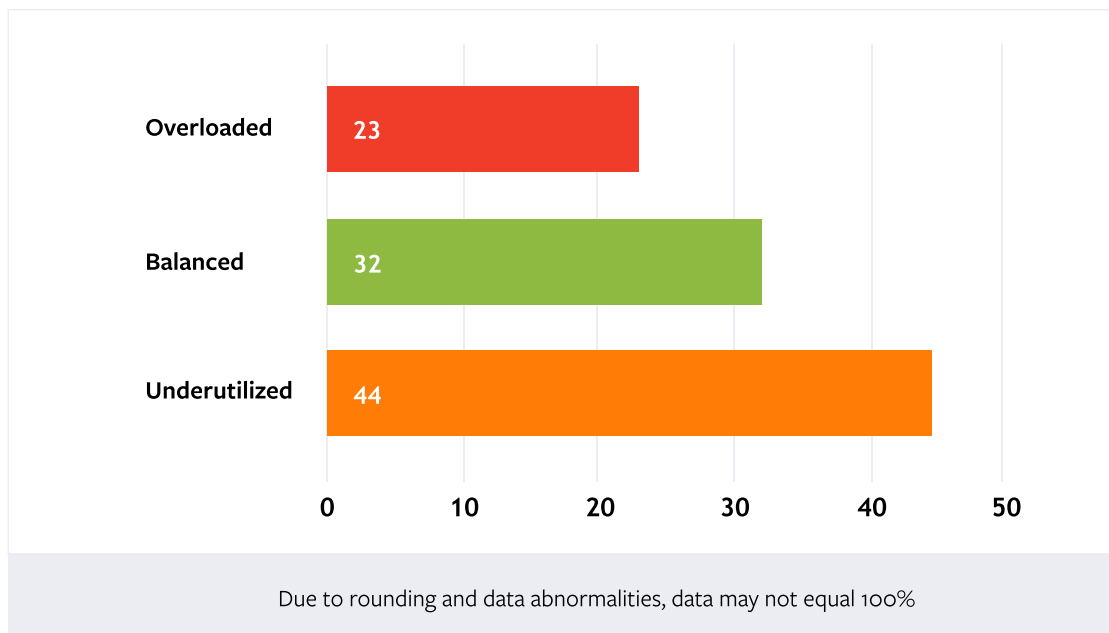
RETENTION AND COURSE SCHEDULING

Thus far, we have seen how more efficiently aligning course offerings to student needs may indirectly influence retention through more optimal student-faculty ratios or improve graduation rates by addressing pent-up demand. What is less understood is the relationship between the course enrollment ratio and student retention, the first step in graduating more students. If first-time, full-time students are not retained from their first fall semester to their second, it is highly unlikely that they will graduate from that institution.

Figure 3 - HESI Enrollment Ratio, Prime Ratio, and Retention Rates by Institution - 2013-2014

Figure 3 presents HESI data that appears to support the claim that effectively managing the enrollment ratio is positively associated with student retention. Among the five highest retention rates, three have a course enrollment ratio within 1 percent of the recommended 85 percent.

An additional HESI metric is the prime ratio, which is the percentage of hours scheduled during 'primetime hours' -- the peak hours where student demand is highest indicated by the green bars. Generally, institutions that effectively manage their prime ratio -- a range between 45 to 67 percent -- have ample accessibility where demand is highest. If the prime ratio exceeds 67 percent, that means that more than two-thirds of course offerings are offered during high demand times, which might mean that there are accessibility issues for students outside of the primetime offerings. For example, if prime hours are between 9:00 AM – 3:00 PM, because the institution serves a largely "traditional student" population of students aged 18 to 24, then it might be difficult for "non-traditional students," those aged 25 and older, to attend courses, as they may be in the labor force between the hours of 9:00 AM – 5:00 PM. If the prime ratio exceeds 75 percent, then "non-traditional students" might not have access to the courses they need, and those course offerings might be underutilized due to low student demand.

Conversely, if the prime ratio is too low -- below 45 percent -- then it may mean that the institution is missing an opportunity to offer more course sections during peak student demand hours. If students are not able to attend during peak hours, it may increase their likelihood to skip or to delay taking required courses, or drive them to take elective courses that may not be part of a degree requirement. Under each of these conditions, enrollment managers, registrars, deans, chairs, faculty, and provosts can do more to improve course scheduling accessibility. Taken together with the enrollment ratio, we see a strong relationship emerge between institutions that effectively manage their course schedule in terms of enrollment and primetime utilization and their retention rate.

Providing "best case" institutions is one source of evidence that can demonstrate the relationship between course scheduling and student outcomes such as retention. A more secure standard of evidence is to control for certain factors that may influence student outcomes such as retention. For example, one could argue that the relationship between enrollment ratio and student retention, though strong, is spurious because a third, yet unidentified, variable might explain the relationship. For example, one could argue that irrespective of the course schedule, institutions with high retention rates are that way because they are highly selective and can attract a student with a better track record than those at other institutions.

To test this hypothesis, it might first be useful to see how large an effect we might hope to see based upon improving student outcomes. Figure 4 presents five-year change in the student retention rate from the National Student Clearinghouse, the primary consortium for understanding student retention. Over the most recent five years for which data are available from IPEDS, the HESI and the National Student Clearinghouse, the percent change in student retention range from a low of 0.00 to a high of 1.70 percent change year-over-year. This is important to remember because, in higher education, a half percent improvement is substantial according to the most reliable data source for continuous improvement in retention.

Figure 4 - National Student Clearinghouse, Percent Change in Retention Rates, 2009 - 2014
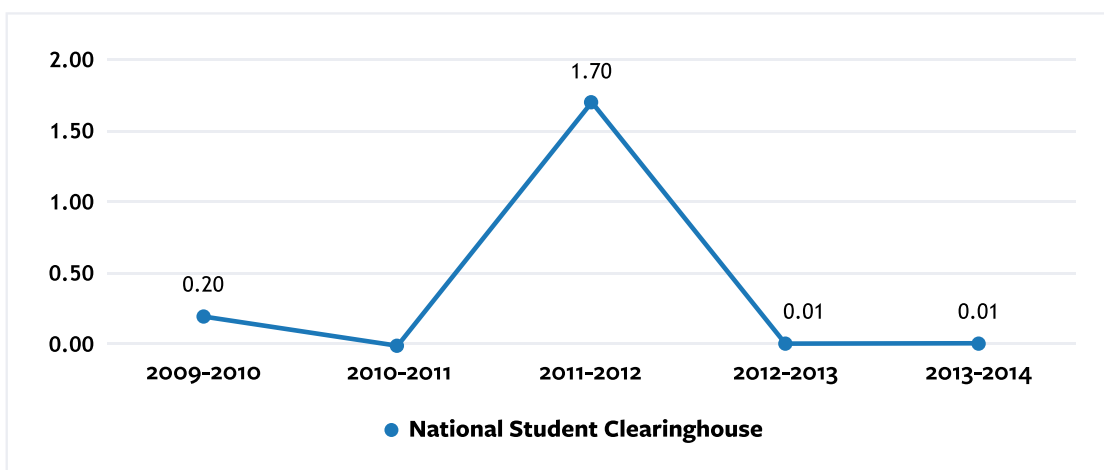
Utilizing the HESI dataset and IPEDS, which offers institutional-level retention rates, we can test to see what effect – if any -- prior achievement as measured by the SAT-Math battery (the most predictive section of the SAT) has on student retention. Consistent with prior research (Sackett and Kuncel 2018; Shaw 2018), the Math section of the SAT is predictive of student first-year student retention. Specifically, among HESI institutions a one standard deviation in selectivity (represented by students' SAT-Math scores) improves the institutional retention rate by 0.936 percent, or about one percentage point.

Figure 5 – Standardized Increase in Retention Rates by SAT Math Scores

Selectivity
+.936% SAT Math
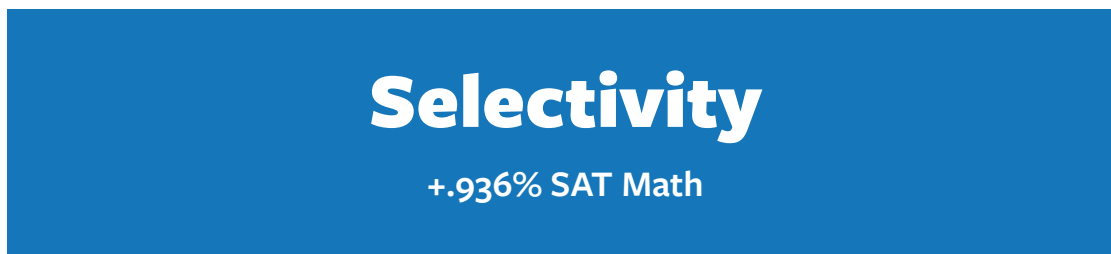
However, even when controlling for prior achievement, institutions that improve their enrollment ratio can improve their retention rate by about one-half percent (+0.533 percent). This statistically significant effect means that, while it may be difficult for many institutions to be more selective in student recruitment, better course scheduling is a strategy all institutions can use to improve retention.

Additionally, controlling for prior achievement, institutions that also more effectively manage their prime ratio can see a change. In this instance, institutions that continually increase their prime ratio see a slight decline in their retention rate (-0.162 percent). This is consistent with what we would expect to find as institutions that seek to pack more offerings into primetime might meet with a diminishing return as they are potentially giving up accessibility in non-primetime offerings which might be needed for "non-traditional students" or appear in times that low-demand.

Figure 6 – Standardized Increase in Retention Rates by Course Enrollment Ratio

Course Enrollment
+.533% Enrollment Ratio
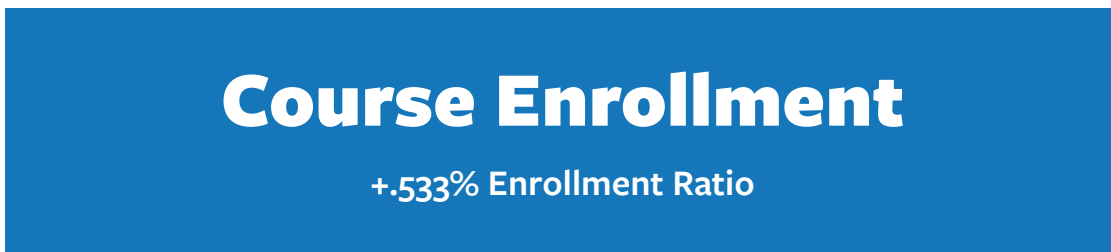
Ordinary Least Squares regression predicting fall-to-fall retention rate for institutions of higher education. Standardized coefficients included "Average SAT Math Score for 25th Percentile (+0.936), "Course Enrollment Ratio (+0.533)," "Course Times (-.162)" all significant at $p < .005$.

GRADUATION RATES AND COURSE SCHEDULING

So far, we have seen that effectively managing the enrollment ratio and offerings in primetime can affect retention, even when controlling for the prior achievement of students. To be sure, retaining more students is advantageous for graduating students and can save an institution a great deal on marketing costs by not having to recruit additional students, but it does not necessarily mean the course schedule can improve graduation rates.

Although some caution should be made in interpreting graduation rates under the period of study due to the small sample size, there are still statistically significant effects worth noting. Institutions that have a higher proportion of students with higher SAT-Math scores are more likely to graduate at a higher rate (0.460 coefficient change), and institutions that more effectively manage their primetime offerings can see an improvement (0.440 coefficient change).

> Institutions of higher education can use the course schedule to positively influence student outcomes including the institutional graduation rate.

Waste and Graduation Rates

By most measures that capture scheduling inefficiencies, a clear trend emerges: **the greater the amount of scheduling inefficiency, the lower the graduation rate for institutions** studied. This is also true when looking at scheduling on a meeting pattern grid.

Figure 7 – Course Scheduling and Course Overlap
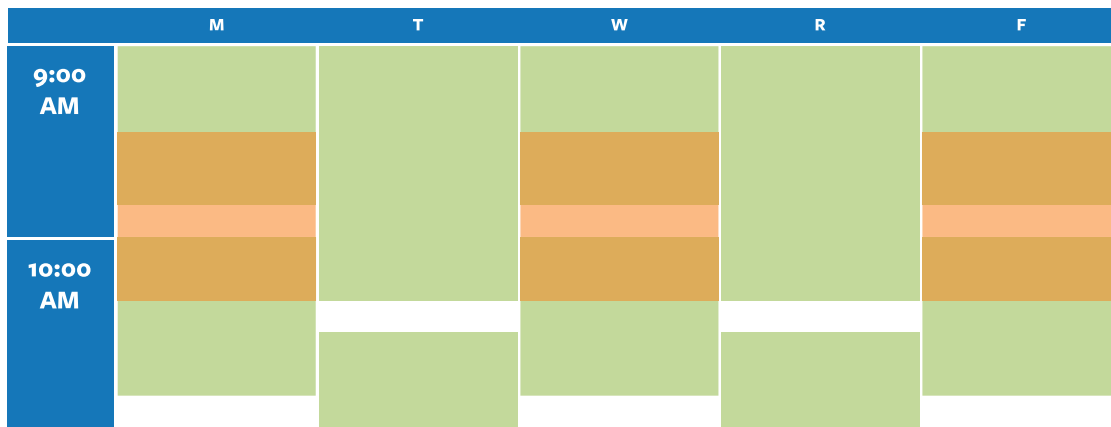

Figure 7 highlights an example of common primetime meeting patterns: In this example, an institution may have an optimal course schedule that allows for two courses on Monday, Wednesday, and Friday between 9:00 AM. to 10:50 AM., - one at 9:00 AM to 9:50 AM.; and the other at 10:00 AM to 10:50 AM., (noted in the chart by the green area). The orange area represents a course that takes
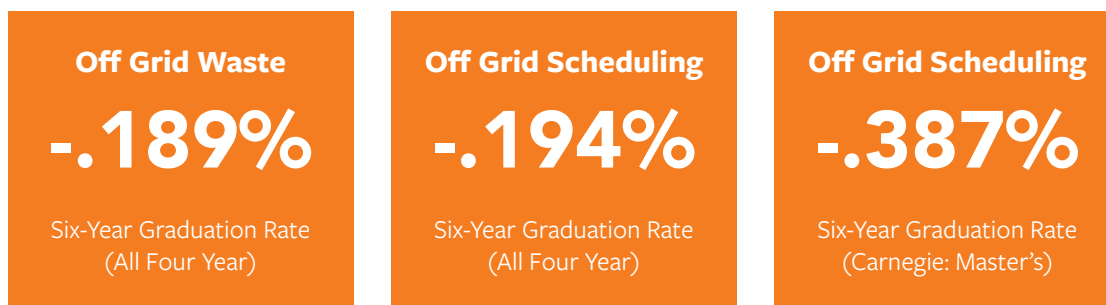
place Monday, Wednesday, and Friday from 9:30 AM to 10:20 AM. The orange meeting pattern is inefficient and is referred to as "off-grid," meaning that between 9:00 AM to 10:50 AM., only one course can meet as opposed to two if sections were more efficiently scheduled. The HESI keeps track of two key metrics related to off-grid meeting patterns: off-grid scheduling (a measure of the number of hours that fall into the orange pattern rather than green), and off-grid waste (the total number of hours that are unusable because of off-grid scheduling).

In each of these metrics the pattern is clear -- as inefficiencies increase, graduation rates, as measured by the six-year graduation rate for four-year institutions, decreases. This relationship seems to make sense: if students are unable to register for courses they need to graduate, their time-to-completion will increase and may exceed the six-year (150 percent graduation rate) threshold. Thus, by working with faculty, chairs, deans, and focusing on reducing off-grid scheduling and waste through efficient scheduling, institutions of higher education can use the course schedule to positively influence student outcomes including the institutional graduation rate.

Figure 8 – Course Scheduling Inefficiencies Influence on Six-Year Graduation Rates

Off Grid Waste	**Off Grid Scheduling**	**Off Grid Scheduling**
-.189%	**-.194%**	**-.387%**
Six-Year Graduation Rate (All Four Year)	Six-Year Graduation Rate (All Four Year)	Six-Year Graduation Rate (Carnegie: Master's)

PRACTICAL APPROACHES TO STRATEGIC COURSE SCHEDULING

If the course schedule can be utilized as an effective tool for retaining and graduating more students, then why aren't more institutions using the course schedule to improve retention, time-to-completion, or graduation rates? It is possible that many are unaware of the potential for improvement. It is also possible that perceptions faculty, chairs, deans, enrollment managers, and provosts have about the course schedule stand in the way of this opportunity? Many of these perceptions, or myths may partly explain why the course schedule is not more widely adopted as a tool for graduating more students faster.

In the following section, we explore some of the most common myths for why the course schedule is not seen as an important solution for retention and graduation initiatives. Specifically, we discuss how institutions are practically addressing the complexity, politics, and finances surrounding the course schedule.

IN PRACTICE: SIMPLIFYING COURSE CODES

Institutions of higher education frequently report a resistance to making changes to the course schedule because it is a complex problem, and without fully understanding this complexity, they may do more harm than good. Grouping courses is a divide-and-conquer solution. By narrowly focusing on managing courses within programs and aligning the courses into meaningful categories, it may be possible to reduce some complexity and, in the process, affect change. As Figure 9 indicates, at most institutions and most programs of study, there are six main course groups:

- Developmental courses, which exist to provide remedial help for students underprepared for college courses
- Service courses, which fulfill degree requirements that are not directly part of the program of study
- Cornerstone courses, which are the first required courses in a program of study
- Foundational courses, which build upon cornerstone courses, and are often required before completing more advanced courses
- Elective courses, which provide optional breadth requirements within a program of study
- Capstone courses, which are the final required courses in a program of study

Figure 9 - Simplifying Programs of Study Using Course Codes

Recently, Ad Astra partnered with a two-year institution to better understand the course scheduling complexity of their nursing program. By dividing the program offerings into six basic course codes, Ad Astra found that students were significantly more likely to earn higher grades in service courses (+1.075) than capstone courses. As students matriculated through the program, cornerstone courses saw higher grades than capstone (+.691) and elective courses also had higher grades (+.863). These outcomes provide valuable insights for where interventions might be most successful in retaining students and where students are most likely to succeed. As useful as course codes can be for reducing complexity, it is equally, if not more important, for all programs of study to have a well-defined pathway to ensure students have access to completion. The below figure provides greater insight across the pathway with course codes to simplify the course-taking process to improve outcomes.

As Figure 10 illustrates, aligning the pathway (courses taken in a recommended sequence moving left to right under course sequence and course title) and course codes (colored under course number) can provide valuable insights into where students are most likely to struggle or succeed in a program of study. For example, the first cornerstone course, Nursing Practice I, recommended in Semester 2, has a cumulative student GPA of 1.96, meaning that nearly half of the students are not retained in this course. By focusing on this cornerstone course administrators and faculty can

work together to improve the chances of success that are similar to capstone courses such as Pharmacology II. For example, by not offering Nursing Practice I with other courses that have high D/F/Withdrawal rates in the first semester they could improve the likelihood that a student will matriculate through the nursing program, which in turn, may impact the class sizes of subsequent foundational, elective, and capstone courses. By focusing on statistically meaningful groups such as course codes, and aligning these codes to scheduling and curriculum pathways, nearly any institution can improve outcomes.

Figure 10 - Nursing Program Course Pathway and Course Codes

Course Sequence	(Pre-Program) Semester 1					Semester 2			Semester 3					Semester 4				Semester 5			
Course Codes	Cornerstone	Cornerstone	Cornerstone	Cornerstone	Cornerstone	Foundational	Foundational	Foundational	Foundational	Foundational	Foundational	Cornerstone	Cornerstone	Foundational	Capstone	Capstone	Foundational	Capstone	Capstone	Capstone	Service
Course Title	Human Anatomy and Physiology 1	General Psychology	College Algebra	Introduction to Computers	Nursing Assistant Skills 1	Nursing Practice 1	Human Anatomy and Physiology 2	Developmental Psychology	Medical Surgical Nursing 1	Behavioral Health Nursing	Pharmacology 1	Writing 1	Introduction to Interpersonal Communication	Medical Surgical Nursing 2	Maternal Newborn Nursing	Medical Microbiology	Writing 2	Medical Surgical Nursing 3	Pediatric Nursing	Pharmacology 2	History / Art / English / Humanities / Music / Religion / Gender Studies
Course GPA for Cohort	2.87	3.35	2.03	3.00	3.21	1.98	2.78	3.29	1.68	2.39	3.83	2.39	3.37	1.92	2.22	2.77	3.03	2.25	3.00	4.00	3.35

IN PRACTICE: COURSE SCHEDULING AND REVENUE

When stakeholders or institutions are reluctant to focus on improving the course schedule, they commonly cite "initiative fatigue," "lack of budget," or "focus on other student-centered initiatives."

Instead of narrowly looking at the cost of a scheduling initiative, it makes sense to assess that cost relative to the significant financial benefits of a student-aligned course schedule. To that end, a growing number of institutions are saving millions of dollars and generating millions of dollars in additional tuition revenue by re-thinking the schedule. For example, through optimizing its schedule, Stark State College was able to save $2 million in instructional costs and increase their tuition yield by $1.3 million in one year.

Recently, Stephen F. Austin State University was facing a $2.7 million shortfall and was

reluctant to spend any additional resources. Their schedule analysis found that numerous courses that were overloaded, needing additional sections to reduce pent up demand. Emboldened by this information, Stephen F. Austin took the risk, and hired 15 new full-time faculty to teach additional offerings of these courses. The 58 additional sections enabled 1,770 more student enrollments leading to new revenue exceeding $1,575,000. The net revenue (margin after accounting for these additional faculty lines) of $700,000 each semester was instrumental in reducing the budget shortfall.

Frequently, institutions choose to prioritize other student success initiatives over course scheduling. As demonstrated earlier, course scheduling can have a significant impact on improving outcomes. In another example, Ad Astra partnered with a two-year institution to conduct a customized research solution in the hope of providing insight to how to improve cumulative Grade Point Average (GPA). In this study, a public two-year institution gained greater insights into their students. While about 60 percent of students were traditional, aged 18 to 24, Ad Astra insights revealed about 40 percent of students were adult learner students, aged 25 and older. The differences in student needs between adult learners and young, more traditional students is significant, particularly as it relates to activities outside the classroom. While only 16 percent of traditional students reported spending 30 hours a week or more taking care of children or dependents, over half (54 percent) of the adult learner students reported taking care of children each week. These adult learner students were nearly twice as likely to be out of the labor force, as well.

This deeper dive into data revealed that the single best predictor of cumulative GPA for students is the total number of student credit hours earned. Consistent with prior research on momentum, at the two-year institution, the more hours a student has taken, the higher their cumulative GPA (Belfield et al. 2016).

If graduating faster means completing more productive credit hours each semester, scheduling is important because if enables students to get the courses they need. Alignment of the schedule with student availability can also reduce the likelihood that a student will miss class due to other obligations. Imagine our same adult learner student having to take a course later in the day. If the student was required to be on campus during primetime when they have a host of other responsibilities, such as dependent care or a full-time job, this might incentivize skipping class. Research at the two-year institution found that the more students report skipping class, the more negatively their cumulative GPA was affected. By partnering with Ad Astra over the past 10 years, this two year institution improved average student credits per semester by 48 percent and realized a 46 percent increase in Associates degrees awarded.

IMPLICATIONS AND CONSIDERATIONS

The course schedule is not simply a tool to for better informing and organizing course offerings. The course schedule is a powerful tool in improving student retention, time-to-completion, and graduation. By eliminating scheduling inefficiencies, institutions can save money, improve retention, reduce time-to-graduation, and increase completions.

Yet less than one-third of courses on a typical campus are currently balanced with student need.

Remember that waste matters. Adhering to a primetime meeting pattern grid can improve course access and have a significant impact on graduation rates. You will find that opportunities abound. Adding more full-time faculty and tailoring schedules to meet student needs can improve student credit hour production. You would be surprised what other problems can be solved when you focus on the course schedule.

Keys to Remember

- Effective scheduling can improve retention.
- Waste matters when it comes to graduation.
- Break down the schedule into manageable parts and foster change.

Although there may be challenges, institutional leaders that work together to improve the course schedule can and do see improvement. Don't let complexity be a reason for inaction; break down the schedule and make targeted changes. The cost of a scheduling initiative is small when compared to opportunities for savings and tuition revenue – and it's even smaller when compared to the greater opportunities for student success.

References

Ad Astra. 2016. "The Higher Education Scheduling Index: July 2016 Report." Retrieved June 15, 2018 (https://www.aais.com/wp-content/uploads/2015/08/The-2016-Higher-Education-Scheduling-Index-FINAL.pdf).

Belfield, Clive, Davis, Jenkins, and Hana Lahr. 2016. "Momentum: The Academic and Economic Value of a 15-Credit First-Semester Course Load for College Students in Tennessee." Community College Research Center. Retrieved June 15, 2018 (https://ccrc.tc.columbia.edu/media/k2/attachments/momentum-summary.pdf).

Grawe, Nathan. **2018.** Demographics and the Demand for Higher Education. Baltimore, MD: Johns Hopkins University Press. Keil, Jack and Peter Partell. 2002. "The Effect of Class Size on Student Performance and Retention at Binghamton University." Office of Budget and Institutional Research. Binghamton University. Retrieved June 15, 2018 (https://pdfs.semanticscholar.org/453b/014bc6b779e3a928dab28bc6958594e7a3b8.pdf).

Sackett, and Kuncel. **2018.** "Eight Myths about Standardized Testing." Pp. 13 – 39 in Measuring Success: Testing, Grades, and the Future of College Admissions, edited by J. Buckley, L. Letukas, and B. Wildavsky. Baltimore, MD: Johns Hopkins University Press.

Shaw, Emily. 2018. "The Core Case for Testing: The State of Our Research Knowledge." Pp. 40 – 64 in Measuring Success: Testing, Grades, and the Future of College Admissions, edited by J. Buckley, L. Letukas, and B. Wildavsky. Baltimore, MD: Johns Hopkins University Press.