

**Choices, Identities, Paths:  
Understanding College Students' Academic Decisions**

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**Abstract**

Curricular exploration is a fateful and internationally peculiar component of undergraduate academic life in the United States, yet the mechanisms through which college students consider and select courses have received only modest social-scientific attention. Guiding insights from organizational theory, decision research, and social psychology can inform further inquiry.

Drawing on preliminary empirical research involving a web-based course exploration and planning tool in use at a private U.S. research university, we develop a conceptual framework for studying college students' academic choices as an important instance of decision making under conditions of uncertainty.

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## **Introduction**

The US higher education system is unique in the world in the extent to which it allows, indeed obliges, undergraduates to explore a variety of courses before committing to a field of study. In contrast with virtually all other national postsecondary systems, in which students enter schools and programs with relatively structured curriculums, most US undergraduates are encouraged to explore a variety of academic options through an iterative course search and selection process. This exploration is fateful. It can stall timely progress toward graduation (Bailey, Jaggars, and Jenkins 2015), create path dependencies that neither students nor faculty fully understand (Chambliss and Takacs 2014), and reinforce inequality when academic pathways parallel other dimensions of demographic difference among students (Armstrong and Hamilton 2013).

Prior research makes clear that students tend to select courses based on partial, poorly integrated information, and are typically restricted by logistical, informational, and normative constraints that have little directly to do with academics (Nathan 2005; Rosenbaum, Deil-Amen, and Person 2006). Yet the organizational mechanics and social psychology of academic search and selection have received only modest social-scientific attention (Babad, Darley, and Kaplowitz 1999). The goals of this paper are to motivate further inquiry into this phenomenon and develop a conceptual framework for pursuing it. Our guiding premise is that the process whereby students and courses are brought together are constitutional features of the US academic system (Abbott 2001), with consequences for individual academic trajectories and college outcomes as well as the evolution of colleges and universities themselves.

## **Motivation and Prior Work**

A central feature of the US academic system is the central role of academic exploration in the undergraduate student experience. With few exceptions, US colleges and universities place few explicit restrictions on how students select courses. This system of elective choice has strong partisans and detractors alike. Liberal-arts ideals embody a faith in the value of broad intellectual exposure to explore and integrate multiple realms of knowledge (e.g., Delbanco 2014). Higher education leaders have long pitched broad education as preparing graduates for a world characterized by complexity, diversity, and change (AAC&U 2002).

Yet many have critiqued the elective model, pointing out its costs and risks to students who navigate a complex academic landscape with little guidance (Goldrick-Rab 2006; Rosenbaum et al. 2006; Bailey et al 2015). Such risks are especially substantial at modestly resourced community colleges, where students may have minimal incoming knowledge of the sequential relationships between particular paths of study and occupational destinations. Even at selective four-year colleges with ample advising and high completion rates, students may fail to consider whole fields of study on the basis of received stereotypes or a single bad experience in an introductory-level course (Chambliss and Takacs 2014).

Despite its risks the elective system is very deeply embedded in the structure of the US academy. Originally initiated at Harvard in 1894 to provide intellectual flexibility to both students and faculty, the system quickly diffused throughout the US academic world (Robinson 2011). It endures in no small part because it gives a high degree of autonomy to faculty, who often enjoy final authority over the content of courses and fields of study as well as academic scheduling (Abbott 1999; Stevens, Miller-Idriss, and Shami 2018). An elective curriculum also

has great utility for academic managers. Colleges and universities are famously anarchic organizations, with a long roster of objective functions and distributed decision making (Weick 1976; Kerr 2001). An elective academic program frees administrators from the steep political challenges inherent in getting faculty to agree and triage on curricular priorities (Abbott 2001). At institutions where curricular and scheduling decisions remain dispersed across a large number of academic divisions, the basic structure of elective curricular organization is highly durable.

Understanding how this elective system plays out in practice -- from course selection to major declaration and beyond -- is social-scientifically important for several reasons. First, there is clear evidence that patterns of employment and income are related to undergraduate major (Gerber and Cheung 2008), so any concern with economic returns to college must seriously consider the preceding exploration process. Second, course selection and major choice are not independent of students' gender and racial identities (Goyette and Mullen 2006). The under-representation of women and ethno-racial minorities in STEM fields is a prominent illustration of this phenomenon (England and Li 2006; Ross et al. 2012). Students sort themselves into courses of study across the entire domain of official knowledge partly on the basis of perceived fit between race, gender, and subject matter (Charles and Bradley 2009; Beasley and Fischer, 2012). Third, a steady secular rise in major declarations in "practical arts" fields such as accounting and computer science, and a concomitant decline "liberal arts" fields such as art history and physics demonstrates dynamism in the entire undergraduate academic enterprise (Brint 2005). To the extent that a key organizational utility of the elective system is its ability to accommodate fluidity and change in academic demand, understanding how that

demand is produced and manifested offers insight into the mechanics of change in the national academic order.

Despite the centrality of the elective process to the organization of US undergraduate education, there is a surprising scarcity of systematic empirical inquiry into how students navigate and select the often wide range of courses on offer at a given institution. Much of the existing research is limited to exploring the impact of course evaluations on future demand for courses, yielding mixed results (e.g., Borgida and Nisbett 1977; Wilhelm 2004; Brown and Kosovich 2015). A more recent line of research uses data-mining techniques to predict course enrollment for institutional planning purposes (e.g., Kardan et al. 2013; Ognjanovic, Gasevic, and Dawson 2015).

Perhaps the most developed treatment of the course selection process was conducted by Babad and colleagues. In the first paper in this research program, Babad et al. (1999) identified several sources and types of information that students may consider when selecting courses. Using a utility-maximization framework and course evaluation data as a proxy for direct information about course enrollment, their analysis revealed a developmental trend in which students shift the emphasis from instructor humor and expressive style early in their careers to learning value variables later on.

In another study, Babad (2001) used retrospective testimonials of students to distinguish between sequential decisions regarding 'First' (important) and 'Last' (unimportant) courses selected in a given term. He found that academic considerations played a more central role in the selection of First Courses, while personal considerations (comfort and ease) played a more central role in selection of Last Courses. Most recently, Babad and Tayeb (2003) deployed an

experimental design involving the selection of hypothetical courses, with findings largely in line with their previous work. While useful, these inquiries are based on modest empirical foundations and rely on substantial inferences about the nature of student decision making.

More robust empirical investigations of academic selection have eluded social scientists for several reasons, many having to do with data limitations. First, in comparison with associational inquiries between declared majors and student demographic characteristics, the observation of sequential accumulation of coursework over time is computationally challenging. This is especially true at research universities with very large numbers of potential courses, course sequences, and programs of study. Second, institutional concerns about student privacy and data security often preclude researchers' access to the transcript data that portray course sequences. Third, the observation of sequences in transcripts does not by itself provide insight into the processes whereby students arrive at the enrollment decisions reflected in their transcripts.

Another limitation of the existing literature is its focus on rational choice as a theoretical anchor. When theory is invoked at all, students are generally portrayed as attempting to maximize utility when selecting courses. This is despite the broad agreement among decision researchers that human choices tend to be made substantially on the basis on partial information, cognitive shortcuts, affect, and peer influence (Bruch and Feinberg 2017). In the following section we advance a more comprehensive and more sociological framework for course selection in US higher education. We additionally point to promising new tools for observing and analyzing the intermediate stages by which students arrive at decision outcomes.

## **Conceptualizing Undergraduate Academic Decisions**

To develop our framework we draw explicitly on analytic tools from social organization theory, decision science, and social psychology. We also leverage preliminary findings from an ongoing research project on course selection at a selective private research university. Qualitative data so far include nine individual interviews and four focus groups with a small sample of undergraduates. Students were asked a variety of questions about their course selection process and their individual and collective advice to others trying to navigate the course selection process.

The second source of data is Carta, a web-based course exploration platform developed as a research instrument at an admissions-selective university in the western United States. The platform visualizes data from registrar records and student course evaluations and is currently used by 85% of the undergraduate population at the university. By documenting the intermediate stages by which students arrive at decision outcomes -- whether or not they end up enrolling in particular classes they consider -- the platform provides heretofore unavailable insight about processes of academic decision-making. Both the qualitative and quantitative strands of our empirical work are ongoing.

Our conceptual framework has five tenets: (1) The provision of potential courses, sequences, and majors is anarchic; (2) sources of information about courses, sequences, and majors are varied and not mutually exclusive; (3) choices of courses, sequences, and majors elude optimization; (4) early choices create path dependencies; (5) student identities are implicated throughout the processes of course search, selection, and sequencing.

1. *The provision of available courses, sequences, and majors is anarchic.*

US colleges and universities are the paradigmatic “loosely coupled systems” -- organizations with broadly distributed decision making and multiple inputs, utility functions, and outputs (Weick 1976). Others have described them as “organized anarchies” in which a wide range of parties pursue multifarious purposes in tandem, with the relations among the purposes negotiated on an *ad hoc* basis (Cohen, March, and Olsen 1972). The provision of academic options available to students at our case university betrays the truth of these classic insights of organization theory.

At the university we studied, each academic department and program has nearly full discretion over the content, sequencing, and scheduling of courses. Different departments schedule, and then re-schedule, course offerings more or less at their discretion. Course requirements for majors change routinely. In practice this means that students may not know with certainty which courses will be offered by which instructors, at which times, during which academic terms. The predictability of major requirements and course offerings varies widely by department and program, and they are always subject to change. Under such conditions, students’ academic planning must be perennially contingent.

At the school we studied as at many others, supply of courses is only partly related to student demand. While the elective system enables the gradual evolution of curriculum in tandem with changes in student preferences (Abbott 2001), many factors other than student demand shape supply. Courses and entire programs with very low enrollments may be sustained indefinitely due to orthogonal institutional commitments. Reputational pressures from the larger academic world may encourage the maintenance of high-status programs with low demand (e.g.,



physics) and discourage programs with a status penalty (e.g., nursing) (Abbott 2002; Frank and Gabler 2006). Supply may also be limited by basic constraints on resources such as budget caps and the paucity of instructors in particular fields. Other constraints on supply may be ideological: a commitment to seminar-style classes, for example, or to excluding more advanced students from introductory survey courses (Chambliss and Takacs 2014). Finally, preservation of faculty autonomy places outside limits on institutional control of supply, as for example when departments are given final authority over course enrollment caps, or when individual faculty members are empowered to select their own students or create bespoke requirements for particular courses.

Taken together, the wide array of factors shaping the undergraduate curriculum and its provision mean that students face an often bewildering and highly dynamic array of courses as they navigate their undergraduate careers.

2. *Sources of information about courses, sequences, and majors are varied and not mutually exclusive.*

Research at the university we are studying affirms copious prior research that students rely on multiple streams of information when selecting courses and prioritize information received from peers (Nathan 2005; Armstrong & Hamilton 2013; Chambliss and Takacs 2014). In a survey we conducted within the Carta platform in the Fall of 2017, we asked, “Which sources of information do you most rely on when selecting courses? Select all that apply.” Response options presented in the following order: faculty, peers, parents/family members, the university’s web-based course catalogue, Carta, an official campus resource, department advisors, pre-major

advisors (who are volunteers), the university's staff of professional advisors, and departmental websites detailing degree requirements. Results are reported in Table 1.

[Table 1 about here]

Note that peers are the most frequently cited source of course information, exceeding even the official catalogue information and far surpassing the number of mentions of the university's faculty and professional advisors. We also asked "Are there any other sources of information you rely on when selecting courses?" with a text response. The responses to this question were mostly "no," but there was a long tail of answers that included, "upperclassmen," "personal preference," "old syllabi," "office hours," "previous course offering websites," "department and club emails," "professor biographies," and "mostly what fits into my schedule."

Our qualitative work provides further evidence that different sources of information are non-exclusive, and that students combine sources of information in a variety of ways. Consider how Melissa, a junior, accounts for one of her course decisions:

I took this class last quarter ... it was also for a [distribution requirement]...and it was on the religious study of yoga...I was just looking for classes that fulfilled that and then one of my roommates...told me that she found a class because she was also trying to fulfill the same [requirement]. She told me ...'You should look it up, the reviews look like it's a pretty chill class and that the professor's kind of cool and that there's not that much work for a general education class' ... Then I just went on and looked at the reviews and was

like, ‘Okay, this looks pretty reasonable,’ and she'd also said that she was pretty sure she was going to take it, so I was like, ‘Okay, well, if you're going to take it, then I might as well take it with you.’

Melissa’s account begins with a need to fulfill a distribution requirement. She first reports obtaining information about a potential course from a friend. Then she seeks out logistical information and descriptions of the course. Lastly, she connects to prior course reviews on Carta and finds them “pretty reasonable.” The deal is cinched by the knowledge that her friend is planning to be enrolled in the same course.

Instances in which students reported combining multiple information streams were so common that we have begun to theorize an *academic information ecology* comprising all of the information available to students for making decisions. We can recognize at least four types of information in the ecology: (a) official information from the university describing courses, instructors, schedules, and major requirements; (b) information from peers, family members, and other known alters; (c) information from the campus and broader cultures -- often in the form of stereotype and lore -- about different kinds of courses and the people who take them; (d) information from students’ own prior experiences. At present, we are agnostic about how these different sources information might be assembled and prioritized, whether by students generally or by particular kinds of students or in particular decision contexts.

### 3. *Choices of courses, sequences, and majors elude optimization.*

While academic choices are important both individually and cumulatively, it is very difficult for students to specify optimal choices over all available ones. This is true for many fateful decisions -- mate selection and residential choice, for examples -- in which there is abundance of options and insufficient information, time, or calculative capacity to adjudicate among all of them (Bruch and Feinberg 2017).

Additionally, a central legitimating idea of the elective academic system is that there is no one a priori “right” way for students to navigate their academic careers and they are encouraged to “explore” a range of potential academic avenues before committing to a particular sequence. Basic insights from decision theory suggest that in lieu of instrumentally rational optimization, under such circumstances selectors will rely on cognitive shortcuts and simplifying heuristics to make decision-making manageable.

For example, people can only choose among options of which they are aware. If whole portions of available curriculum are not even known or consulted, they are essentially excluded from what decision theorists call the “awareness set” and are ineligible for selection. To reduce the remaining known options to simplify consideration further, people will rely on “descriptive norms” -- available information about what *other* people or “people like me” tend to choose (Cialdini and Goldstein 2004). Through such processes selectors tend to reduce potential choices to a “consideration set” dramatically smaller than all that are technically available (Howard and Sheth 1969). Such insights require any student of academic choices to be agnostic about the relationship between theoretically optimal and empirically realizable choices and choice sequences.

Another factor complicating optimization are the many dimensions of each course, among them course content, instructor, time commitment, and grade distribution. At many schools, students have only partial information about these dimensions for only a small set of courses. But even when such data are more readily available, carefully weighing these different dimensions against each other may prove challenging. Instead, students typically focus on one dimension at the expense of others. As sophomore Jordan noted:

So whenever I'm choosing, I just spend a ton of time on Carta. Looking at ... I'm most interested in the reviews, like the little verbal reviews at the end, and the teacher rating. Those are the main things that matter to me...I don't really look at [grades on Carta]. I mean, I haven't done this yet ... I could imagine a hypothetical, where it's a toss-up between two courses and I pick the one that's supposed to be an easier A. Or a quarter where I have some really hard classes and I'm just looking for an easy A course. That hasn't happened to me yet and so it really hasn't played a large part in my thinking.

While Jordan emphasized qualitative reviews in his selection process, Bryan, a junior, described an altogether different approach in his interview:

"Then we compare like a time/grade analysis. Most people will take more time. If 30% of the class gets A+, like people are very, like it says 10 hours a week, 10 to 15 hours a week, I don't care I will take it because it's an A+ and it's four units. It is every engineer's most happy thing, right? That kind of thing. So people do that. I think Carta really does

give you a good perspective because if you see the grade distribution and it is like centered around a B-, you just throw it out. No questions, doesn't matter what the class says, you literally just throw it out because in a voluntary class there are other options that are just as equal that will give you a grade distribution that is an entire GPA point better on average. There is just no reason to risk in the name of an interesting class unless this is exactly what you want to do.

Bryan's "time/grade analysis" suggests a more complex heuristic involving both time commitment and grade distributions, but a closer reading suggests that he too pays almost exclusive attention to one dimension, grades.

Quantitative data describing use of the Carta platform further indicate that most users consult multiple sources of information available about courses. For example, on average 86% of students click the "Show More" button on a course page to obtain access to additional qualitative reviews; 89% and 92% of students similarly request more information about course time commitment and grade distributions, respectively.

Known and inferred characteristics of courses are only some of exigencies students consider when choosing courses. Ample ethnographic research shows that many other factors shape academic decisions. The schedules of athletics practices, social commitments, part-time jobs, sleep preferences, and even the physical proximity of designated classrooms to dorms or other commitments directly impinge on course selections (Nathan 2005; Armstrong and Hamilton 2013; Chambliss and Takacs 2014).

Thus while students may try to optimize course selection and may even believe that they are doing so, the process is better described by the notion of satisficing, in which each selection is a manageable settlement in light of known options and circumstances (Simon 1956).

4. *Early choices create path dependencies.*

Researchers of K12 educational settings have well documented how academic trajectories can be substantially shaped in the early stages of course sequences (e.g., Schneider, Swanson, and Riegle-Crumb 1997; Mcfarland 2005). This phenomenon is central to concerns about tracking -- the categorical tiering of curricular opportunities within a single school or program (Oakes 2005). In contrast with most K12 settings, however, in colleges with elective curriculums, path dependencies are often initiated by student choices rather than administrative ones.

In a carefully designed longitudinal study of cohorts of students moving through a selective liberal arts college, Chambliss and Takacs (2014) found that students' experiences in early introductory courses could have substantial effects on the evolution of subsequent academic trajectories. A single positive course experience could lead students to concentrate subsequent studies within a single department or even a single instructor. Likewise a single negative experience might dissuade students from taking any other subsequent course in an entire domain of the curriculum.

Our qualitative work revealed examples of this phenomenon. Consider this from Jordan, a sophomore:

I was going to take [name of computer science course] because I was like that's what everyone does. But, I talked to ... I was at a lunch for humanities students and someone said just do what you want this quarter. It's your first quarter, pursue what you are most interested in. And so I ended in a Roman history intro sem and now that intro sem professor's my advisor. So that was good advice that paid off.

Planning to heed campus lore and take a computer science because “that’s what everyone does,” a chance lunchtime exchange precipitated a course selection, and then a faculty advisor, that Jordan might never otherwise have imagined.

Among the six students in one of our focus groups, five agreed that enrolling in an introductory seminar was a good decision because it exposed them to new perspectives, professors, and pathways without the commitment of a heavy course:

One of the most important things is to go out of your comfort zone in choosing classes freshman year, like a couple of you mentioned. But being able to say, ‘This sounds interesting, or maybe it doesn't sound interesting, but I'm going to try it anyway and see how it can make me into a different kind of student, or just give me a different kind of perspective on what I think I'm interested in.’ I think that's important to recognize that you don't always have to be taking classes for goals for graduation, but just to take them to understand or to enhance what you're going to learn in the future, too [Melissa, a Junior].

Another said:



I came in intending to be an English major and, Freshman fall, I was like, "I'm going to [take a computer science] class and a drawing class and an engineering class." Now I'm a [CS] major. Never would've happened and I'm so glad I didn't just dive into just doing the core. That's one of the things my Freshman year, I just super do not regret [Octavia, a Sophomore].

Whether the path dependencies created by early course experiences are assets or problems of the elective system is a normative question and beyond our purview here. But there is little question that early academic experiences shape subsequent choices and choice sequences.

5. *Student identities are implicated throughout the processes of academic search, selection, and sequencing.*

While prior research makes clear that declared major is non-trivially associated with fundamental aspects of student identity such as gender and race, understanding of the implication of student identities in the iterative accumulation of coursework is more nascent. Promising work in this vein builds on the literatures on stereotype vulnerability and threat (Steele and Aronson 1995; Aronson and Inzlicht 2004) to explore students' differential sensitivity to grades. For example, using student data from a single research university, Ost (2010) found that women were more responsive to grades than their male peers in physical science courses where women were in the minority. Furthermore, a study by Goldin (2015) found that women who earned B+'s in introductory economics courses were much less likely to major in economics compared to men who had earned the same grades. These findings comport well with sociological research

specifying how gendered beliefs about ability and fitness for occupational roles differentially impact how men and women evaluate their own performance and make academic decisions (Correll 2004; Cech et al. 2011).

Our preliminary qualitative work additionally suggests that students' conceptions of themselves are implicated in iterative elective decisions. Take for example this account of Bryan, a junior, who described his use of a feature on Carta that aggregates prior students' reported investment of time during prior offerings of the class. Here he describes his assessment of an upper-level physics class:

OK, but those are physics majors and graduate students as well. So the 50th percentile says if you do the math like eight to nine hours. Then I know that I'm not in the 50th percentile, so I can say okay it is probably going to take me ten to fifteen [hours] if not more.... So I can make a good value assessment and say you okay I'm going to put twelve hours to this class. I can do my math and make sure that my math doesn't add up to more than 55 hours or something.

Bryan, an engineering major, takes the information provided by Carta describing the self-reports of prior students. But he doesn't stop there. He additionally infers that most of the people whose reports are aggregated by Carta for this course are "physics majors and graduate students," parties to which he compares himself. Whereas those students will spend "like eight or nine hours" on course requirements, "it's probably going to take me ten to fifteen if not more", given that he is an engineering major and not a physics major or a graduate student.

We read the above as a subtle but telling instance of a more general social-psychological phenomenon in which students gauge the appropriateness of particular academic options *for themselves* as particular kinds of persons and compare their potential performance in a given context to how other kinds of students might perform. Depending on the salience of their identities in these choices, we might expect that the elective curriculum creates conditions for an iterative identity project, in which students' conceptions of themselves as learners are integrated and consolidated with their identities as raced, classed, and gendered persons (Ridgeway and Correll 2004).

### **Future Research**

Advocates of liberal arts education on the US model have long extolled the benefits of the elective curriculum for the breadth of inquiry it enables and the self-discovery it affords. Yet specifying precisely how students navigate such a curriculum has long eluded systematic inquiry. Administrative limits on data access, coupled with the sheer computational challenge of observing variation in large numbers of academic trajectories, has made it difficult to imagine a research program in which any theory of academic decisions might be assessed and improved.

Times have changed, offering new tools but also new incentives for pursuing such work. Computational advances dramatically enhance the ability to analyze large corpora of data describing academic offerings, student academic selection, and the reciprocal evolution of both. Ongoing discussions about the relative value and cost of different forms of undergraduate education newly oblige the advocates of any curricular program -- liberal arts or otherwise -- to defend their cases with real data. Finally, accumulating social-psychological research now

compellingly demonstrates that gender, racial, and class identities are implicated in how students negotiate their academic lives, such that any educators concerned with diversity and equity in higher education must also attend to the mechanics of curricular decision-making. We have developed the framework presented above in effort to encourage further inquiry in this domain. Below we specify components of a tractable research program for building a robust social science of undergraduate academic decisions.

Any research in this domain must be informed by the extraordinary organizational variety of US higher education. Selective four-year residential programs comprise a very small and indeed shrinking minority of those pursuing undergraduate degrees (Deil-Amen 2015). The schools serving even this small proportion of students exhibit very wide variation in admissions selectivity, demographic diversity, and institutional resources (Clotfelter 2017). Any serious student of undergraduate academic choice must be judicious about sampling and representativeness of cases at the organization level. Such care will be rewarded in revealing cross-school and cross-sector comparative studies. Similarly, cross-national comparative inquiries would appropriately begin with assessing variation in the institutional architectures in which academic trajectories unfold. The ontology of academic choice now broadly presumed in the United States may be fundamentally different, or indeed unapplicable elsewhere. Specifying and explaining such variation is a compelling sociological project all its own.

## *Supply*

Even while the US curricular system may be said to be elective, with an overall administrative architecture that tends to the anarchic provision of academic choices, we should expect wide variation in both of these characteristics across organizations and organization types. Indeed this variation is a function of the anarchic character of the entire sector, which has exceptionally diverse resource streams and only very minimal national regulation or coordination: a perfect mess, as one seasoned observer has recently called it (Labaree 2017).

In light of this, studies of academic supply might appropriately take single schools and strategically chosen comparisons as case studies. The task would be to determine the organization, administration, and politics of curriculum offerings and change. To wit: how is curriculum produced within particular organizations? How is formal authority over academic offerings distributed intramurally, and what is the relationship between formal and informal mechanisms of curricular change? Do intramural units vary in how academic offerings, sequences, maximum and minimum enrollments are set? How is academic productivity measured and incentivized, e.g., are faculty members rewarded or punished on the basis of numbers of enrollments or majors?

Such studies would ideally be augmented by longitudinal quantitative data describing changes in academic offerings over time. Guidelines articulating formal graduation and program requirements, as well as rosters of offered courses, would be essential data elements. One way in which schools or intramural units within them might be compared with one another is in their relative rates of curricular change. Are some schools or intramural units substantially more fluid than others, and what explains that variation if so?

Investigations of the dynamics of academic supply would appropriately incorporate measures of demand such as secular changes in course and program enrollments. However, analysts must remain agnostic about the relationships between demand and supply and not presume that the latter leads the former. A preponderance of empirical evidence indicates that intramural academic markets are rarely rational in that sense.

### *Information*

We have offered the metaphor of ecosystem to theorize the whole of information that informs academic decision making because even our very preliminary research makes clear that students draw from many information sources and combine them in a wide variety of ways. Further scholarship might further develop the typology of information sources that we specified above: official institutional information; information from peers, family members, and other named alters; information “in the air” on a particular campus and in the larger culture; and information “in my head” about the kind person or learner am and what I am “good at” or is “right” for me.

Beyond the development of information typologies, empirical inquiries could take at least three forms: qualitative field studies, surveys, and controlled experiments. Qualitative field studies and survey research would extend the preliminary work reported above by asking students to explain how they source and combine information. Controlled experiments might systematically manipulate the amount, combination, and presentation of information to students under experimental conditions, perhaps using narrative scenarios to assess how variation in (for example) information source -- parents, best friends, professional advisors or anonymous peers -- is related to how information is consumed and deployed.

### *Choices, Identities, Paths*

The other three components of our research framework call for an integrated analytic approach. The guiding premise of this research program is that course choices, course sequences, and academic identities are conceptually distinct but empirically inseparable. All three coevolve in ways that neither students nor researchers may fully recognize.

Consider, as a hypothetical example, a young woman who enters college with no specified intended major. This student has a part-time job that will require her to leave campus several days per week by 3 PM. To accommodate her work commitment, our student may decide not to consider any courses that meet after 2.30 PM each day. Net of this time constraint, she chooses first-term courses that she suspects she will “like” and that she suspects she is “good” at on the basis of her high school experience. Like many US young women she presumes that she is not “good” at math (Boaler 2016), so she avoids courses not only in the math department but in fields that she surmises might require strong math skills: perhaps economics, physics, and statistics. Thus before the first term of classes has even begun, our hypothetical student has categorically excluded vast swaths of the curriculum. It will be impossible to have her life changed by any of the courses that were rendered ineligible for consideration.

Those few courses our student *does* elect to take in her first term will create conditions for subsequent path dependencies. On the basis of first-term experiences she finds negative (and positive), courses in different parts of the curriculum will be less (and more) at hazard for selection. Academic requirements will additionally impinge on second-term selections if our student learns that any of her prior courses meet prerequisites for other ones. Transaction costs

for some academic options will thus have been lowered, others raised, depending on how our student “spent” her first term.

Once specified conceptually, this incremental and reciprocal evolution of choices, paths, and identities is amenable to systematic empirical investigation. We envision both computational and research strategies as follows:

*Computational inquiries:* Web-based information platforms such as Carta enable the unobtrusive observation of how students derive course consideration sets and move from sets to choices. Carta documents how students browse through courses, select some for further consideration, and then subsequently enroll in a further subset of options -- all the while capturing the “highly granular, intermediate data on consideration sets” so important to empirically grounded decision research (Bruch and Feinberg 2017:219). When linked with information describing student demographic characteristics -- gender and race, for example -- it becomes possible to observe whether and when course choices and exclusions are related to other aspects of student identities. Do students who are women tend to create different consideration sets than students who are men? Does the process of moving from set to choice vary by gender (or race) as well? Are elements describing aspects of a course -- grade distributions, time spent on courses, peer reviews -- accessed variably by different groups? Do course sequences vary with student demographics?

*Qualitative inquiries:* Computational analyses of large corpora of search and selection data can provide aerial views of these processes and enable discernment of patterned variation in how academic pathways unfold. Such studies will be greatly enhanced with qualitative inquiry that generate understanding of the cognitive, affective, and network dimensions of academic



choice. Specifically, we will want to know how students experience academic decision making: for which students is it central, secondary, tertiary, or even peripheral to their priorities in college? How do students make sense of their academic choices, and how are these choices related to other aspects of students' lives: romantic relationships and athletic, employment, and religious commitments? To the extent that academics are only one part of the complex socialization processes of undergraduate education (Stevens, Armstrong, and Arum 2008), it is essential that academic choice is understood in its phenomenological context. Ideally such studies would take longitudinal designs to enable understanding of how academic choices, student identities, and relationships among students coevolve.

When data describing choices, identities, and paths are linked with descriptors of academic supply -- schedules, instructors, prerequisites and graduation requirements, for example -- it becomes possible to identify curricular features that are attractive or dissuasive for particular kinds of students. To take but one example, programs seeking to enhance their enrollments of members of specific ethno-racial groups might be able to identify particularly fateful points in the search process: at the construction of consideration sets, at the moment of choice, or after course matriculation. In this way a systematic social science of academic choice can be put in the service of remediating curricular inequality, bias, and discrimination.

## Works Cited

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**Table 1: Student Self-Reports of Sources of Information about Academic Coursework at Case University, Fall 2017; N = 958**

<b>Rank</b>	<b>Information source</b>	<b>Number of responses mentioning this source</b>	<b>Percentage of responders<sup>2</sup></b>
1	Peers	750	78%
2	Official catalogue search tool	720	75%
3	Carta	618	65%
4	Official sites detailing degree requirements	430	45%
5	Faculty	301	31%
6	Department advisors	161	17%
7	University professional advisors	151	16%
8	Parents/Family members	147	15%
9	Pre-major advisors	141	15%
10	An official university resource	49	5%

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<sup>2</sup> Percentages do not sum to 100 because choices are non-exclusive.