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Interdisciplinary college curriculum and its labor market implications

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This article sheds light on how to capture knowledge integration dynamics in college course content, improves and enriches the definition and measurement of interdisciplinarity, and expands the scope of research on the benefits of interdisciplinarity to postcollege outcomes. We distinguish between what higher education institutions claim regarding interdisciplinarity and what they appear to actually do. We focus on the core academic element of student experience—the courses they take, develop a text-based semantic measure of interdisciplinarity in college curriculum, and test its relationship to average earnings of graduates from different types of schools of higher education. We observe that greater exposure to interdisciplinarity—especially for science majors—is associated with increased earnings after college graduation.

interdisciplinarity | curriculum in higher education | knowledge structure | textual analysis | income returns

Significance

The knowledge structure of higher education curriculum, especially its interdisciplinarity, is not well understood at the very basic level of knowledge itself. From insights arising from the sociology of knowledge on interdisciplinarity, we develop a measure of the concept based directly on the content of college courses. We deploy this measure at the course level to identify the degree of interdisciplinarity for simulated course-taking trajectories of college students from different types of schools. We find that schools claim to be more interdisciplinary than they are; that, across schools, only practice matters for postgraduation earnings returns.

It is generally recognized that college graduates have more marketable skills than high school graduates. In accounting for this, higher education institutions frequently point to the greater critical thinking and higher order reasoning, among other skills, that college education provides (1–4). In particular, they point to the interdisciplinary quality of their curricula, claiming students benefit directly from this interdisciplinarity (5). Academic researchers often echo this claim, suggesting that the benefits of interdisciplinarity stretch beyond college, enriching students' lives by their becoming life-long learners and by influencing their understanding of others (6). Because course interdisciplinarity and these kinds of outcomes are difficult to measure, evidence for such life effects arising from exposure to interdisciplinarity has been equivocal. In this article, we develop a different strategy for measuring what constitutes an interdisciplinary education by directly observing interdisciplinarity from curricula themselves, and we examine the association between this measure of interdisciplinarity and a relatively clear-cut life outcome measure, postgraduation earnings.

There are good reasons to expect interdisciplinarity may affect postgraduation earnings. Previous work has suggested interdisciplinarity enhances students' cognitive capacity for developing innovative ideas, facilitating knowledge production/diffusion, and constructing targeted solutions to real-world social problems (7). Likewise, scholars have argued that interdisciplinarity enhances interpersonal and communication skills useful for bringing together people with divergent values and interests (8, 9). These potential benefits to interdisciplinarity may in turn enable graduates to become knowledge and communication brokers, leading to greater earnings returns in the labor market.

To measure interdisciplinarity, we utilize the distinct disciplinary vocabularies that can be captured from course catalog descriptions and from course syllabi of 20 traditional fields of study in which most undergraduates in the US major. We use these different data to distinguish schools' interdisciplinary claims (course catalogs) and practices (syllabi) and to consider the relationship between interdisciplinarity and students' economic returns, using discipline/school-level earnings data. We find, in general, that schools claim to be more interdisciplinary than they are and that actual exposure is associated with benefits to the students. In particular, our measure of course-level interdisciplinarity, when aggregated at the discipline/school level, is positively associated with graduates' average incomes 1 y after college graduation.

Measuring Interdisciplinarity

Extant measures of exposure to interdisciplinarity in postsecondary education rely on school-level characteristics, specifically, the presence or absence of organizational elements of colleges and universities thought to facilitate interdisciplinary program effectiveness

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(10). Often found in liberal arts institutions, these are characteristics like increased faculty team-teaching (11), more frequent course cross-listing with other programs of study and majors, and more frequent faculty interaction across departmental or disciplinary lines (12). These features, and others, such as the number or scale of interdisciplinary research and teaching centers, grant programs within colleges incentivizing faculty to develop courses across disciplines, and so forth, capture important characteristics of the institutional landscape, but they are at some remove from student course experience.

Recognizing the importance of capturing this experience, emerging research programs-College and Beyond II (13), initiatives at Stanford University (14), and elsewhere (15)-have started to link student course-taking trajectories with course materials and content. Our work complements these efforts by examining interdisciplinarity with course materials and connecting such interdisciplinarity with students' postgraduation earnings. Specifically, we demonstrate that interdisciplinarity is positively associated with a key and generally valued outcome of earnings in the year immediately after graduation.

Measuring the dynamics of knowledge cross-fertilization achieved by interdisciplinarity is not simple. In sociology of knowledge studies, scholars have used coauthorship and citation networks (16–18) to capture knowledge structures within and across disciplines. In the current study, we bridge insights from this work to develop a measure of interdisciplinarity based directly on course content, content which contains the basic element of interdisciplinarity–knowledge itself. Conceptually, our argument rests on the simple intuition that cross-fertilization of ideas can be achieved when the concepts, methods, or content of one discipline becomes incorporated into the thinking and work in a second, different discipline. Text data make it possible to observe this cross-fertilization by quantifying the similarity/dissimilarity of one discipline's language to that of all other disciplines. It follows, then, that we can define interdisciplinarity as the degree of semantic resemblance of course materials in any focal discipline to course materials in all other disciplines, paying attention to the kindred distance between disciplines themselves. To observe interdisciplinarity, we extend a text-based measure of the concept (19) and use our measure to analyze a rich collection of course descriptions from universities and liberal arts colleges in the United States.

To do so, we first capture all the material in course descriptions to provide a vocabulary of each discipline. For example, "genomics" and "sequencing" and "reproduction" are part of the vocabulary of biology. "Reproduction," "life-course," and "deviance" are part of the vocabulary—and the knowledge base that vocabulary expresses—of sociology. We then measure how distant sociology is from biology or from all other departments by a) combining all text documents into a single "discipline document" that represents the discipline's full range of discourse and reflects how its courses are commonly described; b) transforming these discipline documents into a tf-idf matrix, where each row is a document (i.e., discipline), each column is a unique word, and cell values show the number of times each word appears in the corresponding document, inversely weighted by the word's frequency across all documents (20); and c) calculating the pairwise cosine similarity for all row vectors in this matrix to generate a discipline–discipline similarity matrix. Fig. 1 uses course catalog data to show the resulting similarity matrix for the chosen disciplines. To illustrate, disciplines normally considered kindred, such as sociology and anthropology (0.39) and English literature and classics (0.28), have higher cosine similarity scores

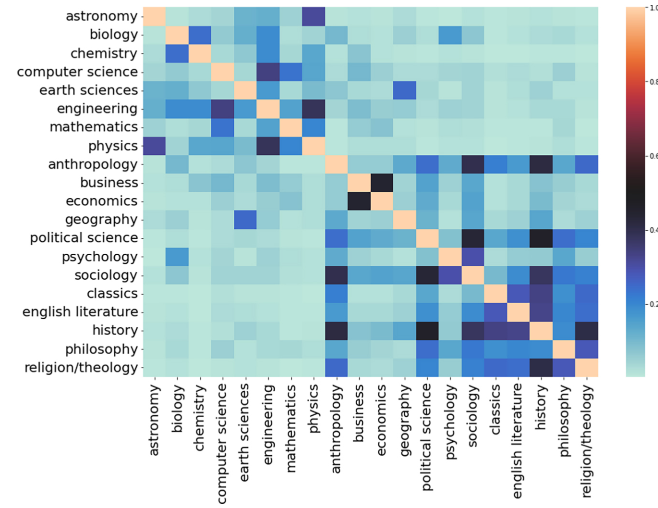

Fig. 1. Pairwise discipline cosine similarities in course catalog data. The rows and columns are the chosen disciplines in the analysis, ordered by divisions: science, social science or humanities, and arts.

than disciplines considered more distant, such as English and Physics (0.01).

The extent to which the content of a specific course resides in the center, on the periphery, or between disciplines provides a powerful measure of that course's interdisciplinarity. We assess this relationship for all courses in 20 disciplines at all institutions for which we have data. We do this by creating a second tf-idf matrix at the level of the individual course, where columns are specific words and each row vector is an individual course. By calculating the cosine similarity between each individual course vector and the vectors for all selected disciplines, we generate a C × D matrix of similarity scores, where C is all courses and D all the disciplines in the data, and each cell represents the similarity between course i and discipline j. If a course is highly typical of its own discipline, its cosine similarity is highest for its own disciplinary corpus and much lower for all others; if a course is interdisciplinary, it resembles, by definition, multiple disciplines rather than only its own, i.e., its cosine similarity scores are moderately to greatly higher for a few disciplines rather than for just one. Table 1 shows an example of this course-to-discipline cosine similarity comparison. The content description of Course A (at the bottom of the table) shows it is typical of anthropology (similarity to anthropology corpus = 0.39) but bears little resemblance to other disciplines, save for classics (similarity = 0.11). On the other hand, Course B's description shows that it has affinities with anthropology, economics, political science, and sociology and, so, is an interdisciplinary course. Hence, its similarity scores are highest for these disciplines and lower for all others.

Of course, it is one thing for sociology to be "interdisciplinary" with respect to, say, anthropology but quite another with respect to chemistry. The concepts, methods, and content of sociology and anthropology are more akin than they are for sociology and chemistry. Our interdisciplinarity measure takes this into account by allocating higher interdisciplinarity scores to courses that bridge more dissimilar disciplines. To do so, we weigh distances between a course and a disciplinary corpora by how similar or different the particular disciplines are from one another, since this distance between disciplines is not uniform. Thus, in the end, our measure consists of the sum of course-to-discipline cosine similarity for comparisons to all 20 discipline corpora, weighted

Table 1. Similarities to disciplinary corpora of two sample courses

	Course A	Course B
Anthropology	0.39	0.13
Astronomy	0.00	0.00
Biology	0.00	0.00
Business	0.00	0.07
Chemistry	0.00	0.00
Classics	0.11	0.00
Computer science	0.01	0.00
Earth science	0.01	0.00
Economics	0.00	0.16
Engineering	0.00	0.00
English literature	0.02	0.02
Geography	0.02	0.04
History	0.03	0.08
Math	0.00	0.00
Philosophy	0.03	0.01
Physics	0.00	0.00
Political science	0.00	0.14
Psychology	0.04	0.01
Religion/theology	0.02	0.01
Sociology	0.05	0.22

Although both courses are from an anthropology course catalog listing in the same school, they differ in their level of interdisciplinarity.

Course A: "Introductory-level discussion-based investigation of a selected issue in contemporary sociocultural anthropology, linguistics, physical anthropology, or archaeology. Recommendations: Freshman only."

Course B: "Draws on ethnographic, popular culture (e.g., films, art, and music), demographic, and public policy texts to explore theories of Latino/a diversity, family structures, trends in transnational migration, and macro- and micro-economic factors influencing community resource bases and social and cultural networks. Surveys how Latinos/as interface with US institutions such as labor organizations, religious institutions, political parties, the educational system, immigration, health, welfare, the military, correctional institutions, community organizations, sports and cultural organizations."

by the similarity of the focal course's most similar discipline to all other disciplines. Formally:

$$\text{course } i\text{'s interdisciplinarity} = 1 - \frac{\cos_{iD_1} + (\cos_{iD_2} * \cos_{D_2D_1}) + (\cos_{iD_3} * \cos_{D_3D_1}) ... + (\cos_{iD_{20}} * \cos_{D_{20}D_1})}{\Sigma_{j\in(1,20)} \cos_{(i,D_j)}}, \quad [1]$$

where i is a course, and $\cos(i, D_j)$ is the cosine similarity between course i and discipline j. $\cos_{D_2D_1}$ is the cosine similarity between course i's second most similar discipline to that of the most similar discipline, and so on in descending order of the value of similarity scores in the numerator. A higher value in this index signifies a more interdisciplinary course, and vice versa. For every school, we calculate the mean interdisciplinary score across all courses and standardize this variable to a mean of zero and a standard deviation of one.

Using this measure, we examine the relationship of interdisciplinarity to earnings after college. As suggested earlier, interdisciplinarity may affect earnings by developing students' cognitive capacity through enhanced critical thinking (8), higher-order reasoning (21), and problem-solving (3)–skills that benefit students' ability to innovate in their work after graduation (7, 21). In particular, critical thinking is thought to enable knowledge diffusion across fields, which some have taken to be critical for tackling difficult sociotechnological issues (22, 23). Interdisciplinarity is also thought to improve interpersonal and communication skills by enhancing the ability to appreciate and identify the different social contexts that generate differences in opinions and/or divergent values of diverse group members (8, 9, 24). If interdisciplinarity enriches individuals' capacities to become knowledge and communication brokers, those exposed to a more interdisciplinary curriculum in college may appear more likely to become innovative thinkers, problem-solvers, and leaders compared to their peers and, thus, more valuable in the labor market.

Materials and Methods

Course Materials. We build the interdisciplinarity index from two different kinds of course content: course descriptions from online course catalogs (CC) and from the syllabi of the Open Syllabus Project (OSP). Differences between these lie in how much they resemble designed or enacted curriculum (10, 25). Because the catalog entry for any given course is more distant from what actually gets taught than the syllabus directly associated with that course (26, 27), the latter more resemble the "enacted" curriculum than do the former. Thus, in the continuum of claims and practices that schools, departments, and professors make for their courses, syllabi are closer to the practice side than are course catalog entries. Thus, we can define and analyze an institution's claimed interdisciplinary curriculum (CC) relative to its practiced interdisciplinary curriculum (OSP).

CC Data. To analyze claims-making, we draw a sample of 80 4-y colleges and universities in the United States. These are primarily residential schools offering 4-y degrees where interdisciplinarity is particularly valued and data are more easily available (28). These include liberal arts colleges and universities, stratified by prestige, geographic location, and enrollment size (see *SI Appendix*, Table S1 for details). For each school, we gather information on all courses listed in its 2018 catalog, including course codes and titles, departments, and descriptions. This yields 345,569 courses across all 80 schools. Because our analysis focuses on undergraduate students, we exclude graduate- and remedial-level courses. In many schools, the same course can be cross-listed in multiple programs, generating duplicate records. We deduplicate these by keeping only one record for each course, and we remove all courses without a catalog description. This leaves 153,004 courses. Among these, we select 20 fields common in American higher education curricula: anthropology, astronomy, biology, business, chemistry, classics, computer science, earth science, economics, engineering, English literature, geography, history, math, philosophy, physics, political science, psychology, religion and theology, and sociology. This results in the 69,099 course descriptions we use to analyze CC interdisciplinarity.

OSP Data. The OSP (https://opensyllabus.github.io/osp-dataset-docs/index.html) provides information about course syllabi from 8,648 colleges and universities in 152 countries. Because its source data are unstructured, OSP (29) uses machine learning models to extract structured metadata for each course. One element of this metadata is the narrative description of course content, an expanded parallel of the text found in the CC course descriptions. To analyze these data, we select the same 80 schools and the same 20 fields present in the CC data and focus on the course description section of each syllabi. In the OSP data, this section consists of text containing, typically, one or two paragraphs describing course content. The analytic sample from OSP has 110,421 syllabus documents. To ensure the same coverage of schools and disciplines in both OSP and CC, we use multiple years of OSP data.

Catalogs and syllabi differ in their origins and purposes. In general, catalogs are aimed at parents and prospective students as well as at current undergraduates and are revised infrequently. Course syllabi are aimed at current students interested in the potential of the course and may have new content each semester. As a result, and relatively speaking, catalogs more articulate what schools claim for their curriculum and syllabi more articulate the enactment of that curriculum.

Method.

Simulated course-taking trajectories. Both OSP and CC data reflect the curriculum a school offers, but they do not reflect the specific course-taking history every individual student experiences. A student's exposure to interdisciplinarity is contingent on the specific courses he or she takes. A small set of schools are starting to produce this individual-level data, but their range is too limited to support inference even to the 4-y primarily residential schools which are the focus of our work (13). To address this, we simulate 1,000 student course careers–representing 4 y worth of undergraduate coursework culminating in a bachelors degree–for each existing school/major combination. To have our simulated student course careers closely resemble actual student course careers, we collect information on each major at each school, as well as on each school's general requirements that apply to all or most undergraduate students regardless of major. We then use this information to customize the simulation parameters for each student based on major and school.

Student course careers are composed of three types of courses: those satisfying general education requirements, those satisfying major requirements, and those independent of either set of requirements ("free electives"). In *SI Appendix, Simulation Methods Description*, we detail how we simulate each of these at the individual student level. To summarize here, for each school, we manually collect data on the general requirements for bachelor degrees; for the requirements for each major, we deploy a semiautomated approach that combined the search features of GPT-4 (30) and Bing with human supervision and training to gather the requirements for each major at each particular school; and for free electives, we analyze three ways that characterize possible student elective preferences. Students can choose electives

- randomly (i.e., each field has an equal chance of being assigned to an elective course),
- in fields similar to their major discipline, or
- in fields dissimilar to their major discipline.

We determine the similarity and dissimilarity of courses in the second and third scenarios by using the matrix of discipline-to-discipline cosine similarities to weight the random assignment of electives to fields, as shown in Fig. 1. By considering all three sets of elective preferences, we capture the potential for extreme intellectual diversity in students' preferences.

Having generated a population of simulated student coursework trajectories, we calculate each trajectory's exposure to interdisciplinarity by matching each course in a student's progression to the interdisciplinarity scores generated from our textual data for the corresponding courses. Student-level interdisciplinarity is the mean value of these scores, and interdisciplinarity at the discipline/school level equals the mean of all student-level scores within each discipline for each school.

Recent work on a small sample of schools promises to shed light on the social (influence of friends and roommates, the practical (course meeting time and location relative to each students' schedule for required within major and distribution requirements), and the intellectual (topic of course) motivations that shape elective choice, conditional on major. But, as yet, we have little understanding of the dynamics of that choice. As it turns out, these dynamics do not shape our results.

Earnings outcomes. Our paper considers the relationship of interdisciplinarity to a simple, postcollege, nonlearning-based outcome–income earnings 1 y after graduation. We use this measure for three reasons. First, a person's first job is likely to be contingent on college experience. Employers often recruit new hires based on GPA and college ranking; over time, subsequent positions are likely based more on work experience than on education. Second, an individual's first job is an important predictor of her career to come (31), making the early career stage especially worth studying. Third, although projected income at later years after college graduation is available [i.e., 10, 15, and 20 y after college entry (32)], these data points are projected and not directly observed from student experience, making them less valid and, so, less useful for our analysis.

To correspond with our discipline/school level interdisciplinarity score, we acquired the College Scorecard dataset containing the most recent discipline/school-level earnings of students 1 y after graduation. We carry out our analysis at the discipline/school level because baseline levels of interdisciplinarity differ from one field to another (which may cancel each other out at the school level) and because the job market rewards certain fields (e.g., engineering) more than others (e.g., English literature). We use the most recent field-of-study level data (2020) that contains earnings from the College Scorecard. We further incorporate field-by-institution gender composition from IPEDS (33). *SI Appendix*, Table S2 includes summary statistics of logged earnings by division based on the College Scorecard (34).

Control variables. Previous research has established a number of school-related factors associated with postgraduate earnings. These include college quality (*US News & World Report* rankings) (35), student selectivity and SES composition, enrollment size and student-faculty ratios, and field of study distribution. Our factor analysis of these variables reveals three dimensions underlying the prestige of an institution: size, ranking status, and student financial disadvantage. We use all three dimensions and the interdisciplinarity index as the key independent variables in our multilevel models predicting discipline-institution-level cumulative logged earnings 1 y after college graduation. In *SI Appendix*, Tables S3 and S4 and Fig. S1, we include details of the factor analysis.

We utilize a multilevel model to predict postgraduation earnings, formally specified as:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + \gamma_{ij}, \quad [2]$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_j + \mu_{0j}, \quad [3]$$

where i represents the discipline, j represents the institution, γ_{00} represents the grand mean intercept, X_{ij} represents the discipline/school-level variables, W_j represents the institution-level variables that affect the institution-specific intercept, and μ_{0j} represents institutional random error.

Results

Claimed Levels of Interdisciplinarity by Institution Type. We use course catalog data to describe the claimed level of interdisciplinarity across the previously described four types of schools. Regarding kind of school, liberal arts colleges claim higher mean levels of interdisciplinarity than do universities: 0.93 for elite liberal arts colleges relative to 0.34 for elite universities, and −0.18 for nonelite liberal arts colleges relative to −0.47 for nonelite universities. Regarding status of schools, as these values show, elite colleges and universities claim more interdisciplinarity than nonelite schools. These patterns are consistent with lay understandings of the promotional materials schools circulate: Elite liberal arts colleges strive to communicate that their students receive an interdisciplinary education, and our measure shows, concomitantly, that elite institutions are doing a relatively good job of claiming they offer an interdisciplinary education. However, our analysis of the OSP does not indicate this: The same statistics show no pattern along either the elite/nonelite or the college/university axes. This demonstrates that the level of interdisciplinary practice does not match what institutions claim, begging the question whether some schools and their disciplines are nevertheless practicing a form of knowledge-based interdisciplinarity associated with student postgraduation earnings even if they do not claim to offer highly interdisciplinary courses.

Practiced Levels of Interdisciplinarity on Earnings by Disciplinary Divisions in Each Institution Type. We run multilevel models on discipline/school-level income earnings 1 y after graduating college or university. We run this model separately on the three divisions—the sciences, social sciences, and humanities—and on three different simulations of students' elective courses—those random to, more similar to, or more dissimilar to their major. For ease of presentation, we only present here coefficient results and figures for the random choice scenario; in the SIs, we include tables and figures for the other two scenarios, as well as tables for the random scenario. In *SI Appendix*, Tables S5–S7, Model 1s include only discipline-level (level 1) variables, including field of study dummies, gender composition at discipline/school level, and discipline/school interdisciplinarity; Model 2s add to Model 1s school-level (level 2) variables, including a dummy variable for whether or not the school is a liberal arts college, factors for prestige, size, and student composition, and percentage of STEM degrees conferred. The last set of models, Model 3s, include the interaction between liberal arts college and interdisciplinarity.

SI Appendix, Table S5 includes results for the sciences. OSP Model 1 in this table shows that chemistry, computer science, engineering and math have significantly higher earnings than the reference field, biology, while earnings returns in astronomy, earth sciences and physics do not differ from biology statistically. The percentage of female students in the discipline is negatively related to the postgraduation earnings and is consistent in all following models (as well as in social science and humanities). Model 2 in *SI Appendix*, Table S5 shows that liberal arts colleges suffer from an earnings penalty, while more prestigious institutions have significantly higher earnings returns. Model 3 in *SI Appendix*, Table S5 shows that discipline/school-level interdisciplinarity has a significant, positive relationship to earnings (coef = 0.04; $P < 0.05$). This indicates that a one-unit increase in interdisciplinarity is associated with a 4% increase in first-year postgraduation earnings. We observe virtually the same relationship for simulations with more similar elective courses and with more dissimilar elective courses (coef = 0.04 and 0.04 respectively, both significant at $P < 0.01$). Patterns for these same models using CC data are similar, except the coefficient for the interdisciplinarity index is not statistically significant and the value of its coefficient in the models is very small. Fig. 2 plots the relationship of interdisciplinarity to logged earnings for science in the random scenario, with other variables set at their mean levels.

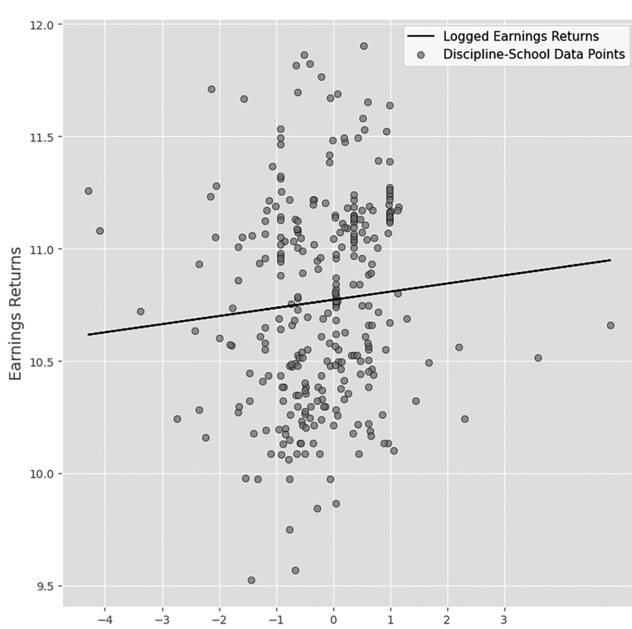

Fig. 2. Predicted logged earnings by standardized interdisciplinarity level in science subjects, with random simulation of elective courses. Every data point represents a discipline in a school. The *x* axis represents the standardized discipline/school-level interdisciplinarity index, which has a mean of 0 and SD of 1. The *y* axis represents the logged earnings of the corresponding discipline/school in the year after students' college graduation. The full regression model can be found in *SI Appendix*, Table S5.

SI Appendix, Table S6 shows results for the social sciences. For business, economics, geography, and political science, earnings are higher than the reference field, sociology, while they are lower for psychology and anthropology. Compared to the sciences models, institutional factors are more strongly related to the earnings of social science majors. In addition, size and liberal arts college are significantly and negatively related to earnings, while prestige and student composition are positively related. In contrast to our findings for science majors, the interdisciplinarity index and its interaction with liberal arts college are not significantly related to earnings, regardless of the type of simulation for elective courses. CC models show the same pattern as these OSP models. Fig. 3 plots the relationship of interdisciplinarity to logged earnings for social science, with other variables set at their mean levels.

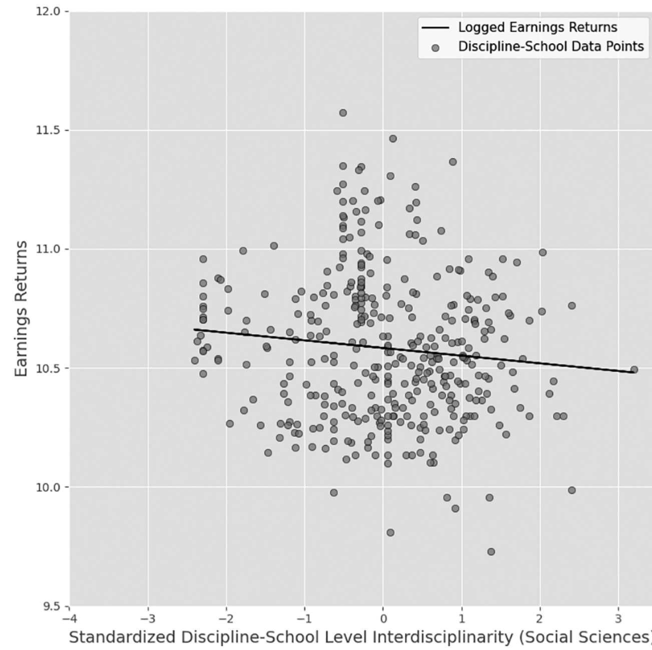

Fig. 3. Predicted logged earnings by standardized interdisciplinarity level in social science subjects, with random simulation of elective courses. Every data point represents a discipline in a school. The *x* axis represents the standardized discipline/school-level interdisciplinarity index, which has a mean of 0 and SD of 1. The *y* axis represents the logged earnings of the corresponding discipline school in the year after students' college graduation. The full regression model can be found in *SI Appendix*, Table S6. The coefficient for interdisciplinarity in the social science models is not significant.

SI Appendix, Table S7 reports results for the humanities. Compared with earnings in the reference field English literature, religion/theology has significantly lower income levels, and history and philosophy show no difference. Liberal arts colleges continue to show an earnings penalty, prestige has earnings benefits, larger institutional size is negatively related to earnings, and student composition is not statistically significant. Similar to the social sciences, discipline/school interdisciplinarity and the interaction effect between interdisciplinarity and liberal arts colleges are not statistically significant for humanities and arts, regardless of the type of simulation for elective courses. Fig. 4 plots the relationship of interdisciplinarity to logged earnings for humanities and arts, with other variables set at their mean levels.

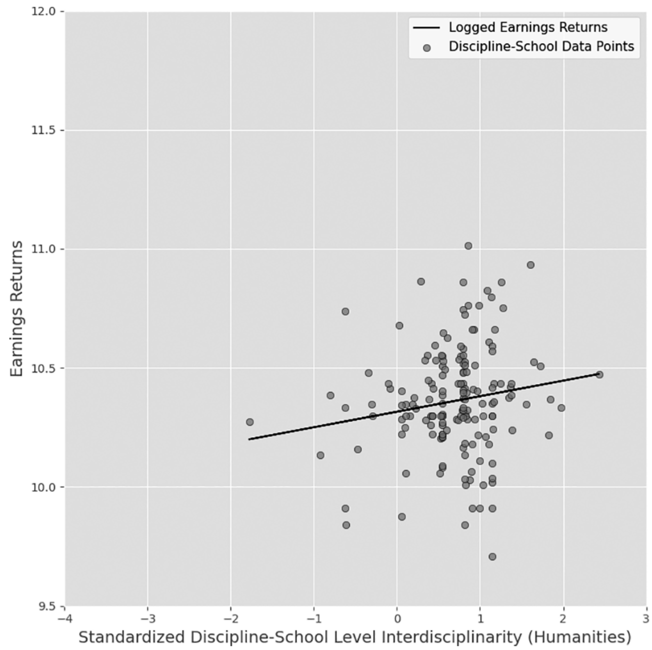

Fig. 4. Predicted logged earnings by standardized interdisciplinarity level in humanities and arts subjects, with random simulation of elective courses. Every data point represents a discipline in a school. The *x* axis represents the standardized discipline/school-level interdisciplinarity index, which has a mean of 0 and SD of 1. The *y* axis represents the logged earnings of the corresponding discipline school in the year after students' college graduation. The full regression model can be found in *SI Appendix*, Table S7. The coefficient for interdisciplinarity in the humanities and arts models is not significant.

Taking all three analyses together indicates that science majors with greater interdisciplinary exposure than other science majors are more strongly associated with labor market benefits than are social science and humanities majors. This pattern does not vary across our three ways of choosing elective courses (as *SI Appendix*, Tables S5–S7 show), suggesting the relationship of interdisciplinarity exposure to earnings is mostly associated with majors courses and, to some extent, with school distribution courses. To check this, we carried out the earnings analysis without the elective courses to find no substantial differences from what we show in *SI Appendix*, Tables S5–S7.

These results support our argument that interdisciplinary exposure is associated with tangible, material benefits, in addition to learning gains. Job candidates with a science education and with interdisciplinary exposure during their undergraduate years may stand out among their science peers in the labor market. Conversely, the absence of a clear interdisciplinary payoff in the social sciences and humanities may reflect a ceiling effect, i.e., social science and humanities majors with greater interdisciplinary exposure than their peers are not as distinct in the job market as are interdisciplinary science majors.

Comparing across OSP and CC models suggests different relationships, in general, for claims and practices and, importantly, that only practice is associated with earnings returns. This supports our expectation that syllabi better capture curriculum interdisciplinarity, as they are closer to what tangibly happens in the classroom than are claims made in course catalogs. Practice matters for the economic returns to college graduates. Simply claiming interdisciplinary exposure for students is not associated with subsequent earnings. Institutions with fewer resources to enact curricular interdisciplinarity in the classroom may mimic other institutions' interdisciplinary claims, but such mimicry does not enhance the economic value of the degrees they offer.

Conclusion

Conceptually and methodologically, this article shows a way to capture the dynamics of interdisciplinary knowledge integration in college course content, improves and enriches the definition and measurement of interdisciplinarity, and expands to postcollege outcomes the scope of research on the benefits of interdisciplinarity. By developing a text-based semantic measure of interdisciplinarity in college curriculum, we show interdisciplinarity may benefit the earnings of college graduates. Additionally, by focusing on the knowledge structure in college curriculum, our findings speak to growing literature on knowledge growth and innovation, higher education pedagogy and administration, and educational stratification. We see interdisciplinarity as not only a cognitive task or a knowledge growth mechanism but also as a specific skill. Acquiring such a skill may be as important for students' postcollege experience as it is for schools of higher education.

Furthermore, we distinguish between the interdisciplinary claims and practices of schools to find that, across schools, only practice matters for postgraduation earnings but that interdisciplinary curricula are more likely found in liberal arts colleges, regardless of elite status. These asymmetries between interdisciplinary claims and practices speak to the important question of when social class prestige amplifies the benefits of a liberal arts education and when it does not. This finding supports the claim that a liberal arts curriculum, as such, offers students a uniquely diverse and cross-fertilizing knowledge structure. It may be that exposure to such a structure fosters students' cognitive complexity and critical thinking.

Thus, our answer to the question of whether higher education institutions practice what they preach is not a resounding "yes." Schools claim to be more interdisciplinary than they are. That said, actual exposure to interdisciplinarity may provide college graduates with both superior cognitive and noncognitive capacities useful in making a living. This exposure matters more for science majors, where educational content indicates less interdisciplinarity overall. Insofar as our semantic approach to measuring interdisciplinarity and our demonstrating that exposure to interdisciplinary course content shift today's conversation about the costs and benefits of a liberal arts education in the United States, our findings can help reconceptualize the value of such an education.

Limitations. As our study focuses on 20 long-established disciplines for which many institutions offer programs, and as these disciplines are also those where students tend to pursue further graduate study at higher rates than more applied disciplines, inference with respect to outcomes for students majoring in newly emerged and explicitly interdisciplinary fields of study (e.g., American Studies) is limited. Likewise, our findings do not speak to earnings outcomes for students majoring in disciplines with a terminal bachelor's degree having immediate economic returns, such as pharmacy and nursing. Importantly, our sample of schools covers only one portion of the US secondary education field. Not covered are community colleges, technical schools, or schools whose curriculum is vocational. We observe positive returns for interdisciplinarity in a relatively constrained sample of schools under a model that assumes random course selection. Further research with more refined samples and with actual individual-level data may produce different findings and allow for explicating relevant causal relationships, which our model, due to the possible impact of unobserved variables, cannot.

Data, Materials, and Software Availability. Replication code data have been deposited in https://osf.io/5a9wk/ (https://doi.org/10.17605/OSF.IO/5A9WK) (36).

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