Certificate Programs
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OVERVIEW

Students enrolled in Yale College have the ability to choose from more than eighty majors -- all with a liberal arts focus. By offering a wide array of subjects to study, students have the freedom to pursue various academic interests. While students can graduate with a single major or a double major, they are unable to graduate with a minor.

Recently, Yale College has started a certificate program in Language Studies and Statistics and Data Science. These certificates are quasi minors, and offer students an opportunity to customize their Yale academic experience. Additionally, Yale has several Multidisciplinary Academic Programs (MAPS) in a number of fields, including education studies, energy studies, global health studies, and human rights studies. However, these programs are application-based, limiting the number of students that are able to participate in them. Enhancing the academic opportunities of students through the expansion of the certificate program would allow students to experience a greater freedom in their learning.
Currently, Yale College offers a handful of academic certificate programs for students in a limited number of fields. As previously stated, there are several fields in which students can obtain a distinction that is similar to a minor—primarily through the newly established certificate program (languages and statistics and data science) as well as through the Multidisciplinary Academic Programs. These programs require students to take at least four intermediate to advanced classes, depending on the program. Since its implementation, there already seems to be many students interested in pursuing these subjects more in depth.

Many of Yale’s peer institutions offer some form of academic minor, whether they are minors, certificates, or secondary fields. These peer institutions allow their students greater flexibility in their learning, as well as the possibility to develop a deeper understanding in another subject, whether related, unrelated, or interdisciplinary.

- **Stanford University** allows students to minor in seventy-six different subjects, including minors from established major departments, as well as in fields without an established major program. Each department or program has jurisdiction in setting up the requirements of the minor, as long as each minor requires at least six courses.
- **Princeton University** allows students to obtain a certificate in over 55 fields, which is similar to a minor. These fields are included in departments, but may also be in interdisciplinary fields. In order to meet the requirements for the certificate, students must complete the required courses, in addition to a senior thesis or another form of significant independent work.
- **Harvard College** offers students the opportunity to pursue a secondary field. These options are limited to established fields and departments that students can major in. Each department establishes its own guidelines that must be met.
RESEARCH FINDINGS

Overview

Based on our research through campus-wide undergraduate surveys and specific focus groups, we have found that students overwhelmingly support the addition and expansion of the certificate program at Yale. Furthermore, we found that students’ intentions are to use the certificate as an avenue to expand their education to fields outside of their major, or as a means of satisfying pressures from home to study in an area relating to a specific industry (e.g. medicine or finance). Our findings do not indicate that students will become overburdened by the offering of more certificates; instead they will find it liberating to their intellectual experience at Yale.

YCC Survey Data

Through surveys that YCC has sent out to the undergraduate population, we were able to assess student opinion about certificates. First, we found that students largely are in favor of having increased certificate program options. In the 2019 YCC fall survey, about half of all respondents indicated that they would pursue certificates if there were more options. More notably, only roughly five percent said that they would not pursue a certificate as almost forty percent indicated “maybe” or “depends on the subject.” By offering a large variety of certificates, students who indicated these two fields could be likely to pursue certificates.

Q76 - If Yale offered more certificate programs, would you plan on pursuing a certificate?

A certificate recognizes additional coursework pursued in certain fields of study without having to fully major in that field. Examples include Spanish, Data Science, and French
In the survey sent out to students in the fall of 2018, students were asked about minors which bear a large resemblance to certificates, and we found that students also overwhelming supported the creation of minors, regardless of their intended field of study. Figure 2 effectively illustrates that students are passionate about this topic.

More specifically, when looking at the certificates Yale students want we find that computer science and economics are the most popular, with 140 and 139 survey respondents supporting each. After that, going through the certificates over 50 survey respondents wish to have a certificate for, Ethnicity, Race and Migration is a major unique to Yale that 59 survey respondents want a certificate for. Art, Music, and English, three creativity focused departments that 57, 56, ad 56 survey respondents wish to have as a certificate. Lastly, 50 survey respondents want a psychology major.
Our survey data also indicates that students’ primary motivation lies in diversifying their interests. In essence, they believe that breadth in their Yale education could be further achieved through the expansion of the certificate program. Our 2019 survey (Q82 below) found that over half of the respondents would be more likely to take classes in a wider array of fields if minors were offered, and our 2018 survey (Q22 below) demonstrates that students would use a certificate program to learn deeply about areas other than their intended major. Figure 3 portrays the respondents reasoning while also providing some insight into other motivations that lead students to want more certificates at Yale.

Q82 - Do you believe that having a more comprehensive certificate program would encourage you to take classes in a more diverse array of topics according to your interests?

![Bar chart showing the results of Q82 survey](image)

Q22 - I would want a minor because: (Select all that apply) - Selected Choice

![Bar chart showing the results of Q22 survey](image)
Perhaps most importantly, when 2019 survey respondents were presented with sixty three options for which department they wished had certificate programs, sixty two of the sixty three departments had students indicate an interest in pursuing a certificate in that program. Moreover, many respondents in 2018 indicated that they would appreciate being given the opportunity to pursue a certificate in an interdisciplinary field.

Figure 4 (YCC Focus Group Findings:)

Last year, YCC conducted an intensive focus group with students to determine the main reasons why students feel that certificates would benefit their intellectual experience at Yale and not cause them to feel pressure to pursue additional coursework.

First, students believe that certificates would relieve the pressure of having to complete a double major if a student is genuinely interested in two non-related fields. In order to dive into their multiple interests, many students feel compelled to complete a double major. A single major requires anywhere from twelve to over twenty credits, which constitutes a large portion of a student’s academic experience in Yale College. When a student completes a double major, they lose the ability to take amazing elective classes, as this space in their schedule is devoted to the second major. Most faculty concerns dealing with minors and certificates involve the notion that they could potentially detract from the liberal arts experience, as there would be a decrease in the number of electives that students take. However, by offering certificates, we believe that less students would double major, and instead would complete a major and a certificate. Double majors are intensive in terms of the number of classes needed to fulfill the requirements for each major, so there often isn’t enough room for students to explore academic interests beyond either of their two majors. If students fulfilled a major and a certificate in their two interests, they would be able to get credit for proficiency in both subjects while also being able to take other electives, as certificates require less classes to obtain.
Second, students expressed that certificates could also help them cope with expectations from home regarding their academic decisions. Although a student may be interested in Art History, the student may end up majoring in Economics or Molecular, Cellular, and Developmental Biology because their parents push them to enter the finance industry or the medical field, respectively. Our focus group revealed that these sentiments are common within the student population in Yale College and could be better navigated if more certificates are offered. Instead of giving up their own academic interests, students can choose to obtain certificates in areas that they are interested in—even if they decide to pursue the interests and expectations put forth by their parents. Another possibility could be that students pursue majors in their own academic interests and pursue certificates in the areas that they feel is expected of them to complete. Additionally, some students may feel pressured by their parents’ expectations to pursue a double major. By offering certificates, Yale College would allow students the ability to complete a major and a certificate, increasing the number of elective courses that these students would be able to take while balancing their feelings of personal obligation.

Lastly, students suggested that an increase in certificates may increase academic demands in departments that have seen a declining number of students. Certain subjects have faced a diminishing number of students declaring a major in them, as there has been a rise in the number of students majoring in more technical fields. By introducing more certificates, some departments, especially smaller ones, may experience increased numbers of interested students.
RECOMMENDATIONS

We see from the Fall Survey data very clearly that the certificate programs must be expanded to better serve the student body. Having more certificate programs encourages a broader educational range for Yale students, allowing Yale to produce better leaders for the world.

When looking at what certificate programs Yale should create, the fall survey gives reliable numbers for what students want. The certificate programs that over 50 fall survey respondents want are Computer Science (10.17% 140); Economics (10.10% 139); Ethnicity, Race, and Migration (4.29% 59); Art (4.14% 57); English (4.07% 56); Music (4.07% 56); and Psychology (3.63% 50).

There are a few ways Yale college can implement certificates. One key feature, similar to how Stanford University and Princeton University have minors, is to dictate college-wide regulations that all departments must follow when deciding the structure of their department’s minor. For example, all minors at Stanford University must consist of at least six courses. This does not include a senior requirement, or capstone experience. Meanwhile, at Princeton University, certificate programs require five courses, along with a senior requirement. To create the Yale certificate structure, we believe that Yale College can adapt the model of the Data Science certificate to certificates in Economics, Computer Science, or any other subject. Examples of potential certificate structures in Economics, Computer Science, and Ethnicity, Race, and Migration, along with explanations of how these structures were formed, can be found below.

One additional concern brought up during meetings with the administration is that departments may be too underfunded to take in the additional students that would come with expanding certificate programs. We believe that students will decide to certificate in certain programs instead of double majoring, as a certificates lead to some proficiency in a subject without the workload, and by choosing a certificate over a double major, students can use more classes to explore different subjects. With less students majoring and more students choosing to do a certificate, we would expect the total number of students in each department to increase overall, however, each student would be less invested in the department, so overall, there would be no resource strain.
Framework for Creating Certificate Programs

To frame and create new certificates, it is useful to look at one that Yale College already offers, Data Science. By exploring the requirements and restrictions for the Statistics and Data Science certificate, we can create a model for thinking about how to best establish new certificate programs.

Requirements

- Four of the credits required for the data science certificate come from three of the core disciplines within Data Science:
  - Probability and Statistical Theory
  - Statistical Methodology and Data Analysis
  - Computation and Machine Learning.
- The final credit comes from a Data Science in a Discipline Area course, that shows students how data science can be used in a field outside of S&DS.

Based upon the Data Science certificate requirements, other Yale certificate should require the following.

- The certificate should be at least five credits
- Some portion of the certificate should include classes from each of the core disciplines within the department, so students gain a well rounded understanding of the subject
- At least one of the classes should be interdisciplinary or applications based, linking the subject to another field of study

Restrictions:

- No course may be used to fulfill more than one requirement of the certificate.
- Students are required to earn at least a B- in each course counted toward the certificate.
- No course may be applied to satisfy the requirements of both a major and the certificate. If a course in the certificate is required by a student's major, then the student should substitute a different course in the certificate.

We believe these restrictions are fair, justified, and general enough to apply to any certificate program that is established in the future.
We can adapt the requirements and general methodology used to create the Data Science certificate to Economics; Computer Science; and Ethnicity, Race, and Migration certificates. We have also based our structures for the following certificate programs on Stanford’s minors programs. These are only suggestions put forth by the Yale College Council; further consultation with the DUS of these subjects would help with the creation of these certificates.
Hypothetical Certificate Programs

Economics

Stanford’s minor in Economics requires 35 units, or 7 Yale credits. Four core economics classes, along with two application based economics classes, and one elective. To adapt this to the same model as the data science certificate, with 5 credits, we would first look at the requirements of the Economics major. There are three core economics classes, Intermediate Micro, Intermediate Macro, and Data Analysis and Econometrics. Along with the core classes, other major requirements include three introductory courses, four electives, and two advanced courses labeled 400 to 491, one of which is a senior requirement. Because the Data Science certificate did not have a senior requirement while the S&DS major did, we would recommend Yale's economics certificate also not having a senior requirement, removing the advanced courses labeled 400 to 491 from the course. We would also recommend making the introductory classes prerequisites to the economics certificate. Those three classes are prerequisites to take the core economics classes anyways (note that they can be bypassed through AP credits), so it would be best to make them prerequisites rather than including them in the certificate. Both the Stanford minor and the Data Science certificate include a class applying the discipline of data science or economics to another field, so we would recommend including that in the certificate, and both the Stanford minor and the Yale economics major include an elective course, so we would also recommend including that in the certificate. Our recommendation for an Economics certificate is below:

- **Prerequisites:** 2 introductory economics courses in both micro- and macro-economics (ECON 108, 110, or 115 along with ECON 111 or 116), and one math course (MATH 112, 115, 118, or 120)
- **Three Core economics courses:** Intermediate Microeconomics (ECON 121 or 125), Intermediate Macroeconomics (ECON 122 or 126), Data Analysis and Econometrics (ECON 117, 123, 131, 132, or 136)
- **One application based economics course** (e.g. ECON 483, The Political Economy of Migration)
- **One elective economics course**
Computer Science

The Stanford Computer Science minor includes two introductory computer science courses, three core computer science courses, and two computer science electives. The computer science major at Yale has five core courses: CPSC 201; CPSC 202 or MATH 244; CPSC 223; CPSC 323; and CPSC 365 or 366, four intermediate or advanced computer science courses (six for the B.S.), and a senior requirement. Similar to the economics certificate, we recommend not having a senior requirement. Given the range of the core computer science classes, we would recommend keeping the four core computer science classes, and requiring two additional courses, making the certificate worth six credits and less intensive than the actual major. Similar to the Data Science and example Economics certificate, we would also recommend one application based computer science class, and one computer science elective. Our recommendation for the Computer Science certificate is below:

- Four Core Computer Science Courses: CPSC 201; CPSC 202 or MATH 244; CPSC 223; and CPSC 365 or 366
- One application based computer science course (e.g. CPSC 575, Computational Vision and Biological Perception)
- One elective computer science course
Ethnicity, Race, and Migration

Because no other school of similar caliber to Yale offers a minor similar to Ethnicity, Race, and Migration, we will use the format for creating the data science, economics, and computer science certificates to create the ER&M certificate. The requirements for the ER&M major include twelve ER&M courses, two of which must be introduction to ethnicity, race, and migration, and comparative ethnic studies (ER&M 200 and 300). Students must take six courses in a specific area of concentration, one of which must be a methods course, and two electives with ER&M content. To adapt this to the certificate, we recommend keeping both of the required ER&M courses (ER&M 200 and 300), having students take two courses in one area of concentration (one of which must be a methods course) and one elective that spans across ER&M and one other field of study. The ER&M major also includes a senior requirement, but as we did not include a senior requirement in any of the other certificates, we would not recommend that for ER&M either. Our recommendation for the Ethnicity, Race, and Migration certificate is below:

- Two Core Classes: ER&M 200 and ER&M 300
- Specific Concentration Electives: one course in a specific area of concentration and one course in the same area, fulfilling a methods requirement
- One Interdisciplinary Class: a course in the ER&M department that spans across multiple disciplines (e.g. ER&M 394, Climate and Society from Past to Present)
LOOKING FORWARD

After examining our survey and focus group data, we believe that it is imperative that Yale College establishes a more robust certificate program. Such a program would benefit students by allowing them to pursue their diverse interests (and receive recognition) without becoming overburdened with the requirements of a second major. Furthermore, having more certificates alleviates pressures that students feel from home or from urges to double major. This would ensure that students would have an opportunity to obtain an education with full depth and breadth as stated in Yale’s Undergraduate Curriculum. Through our framework based on peer institutions and existing certificate programs at Yale, we have created some example certificates in widely popular areas as indicated by students. We hope that these recommendations not only uncover the need for certificates, but provide an easy path to creating them. If you have any questions or comments, please do not hesitate to email us at saket.malhotra@yale.edu, ronak.gandhi@yale.edu, and sarah.pitafi@yale.edu.