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UNIVERSITY OF CALIFORNIA, MERCED

Are You Going to be a Teacher? Racialized and Gendered Patterns
in Earning a Teaching Credential Among College Graduates

A Thesis submitted in partial satisfaction of the requirements
for the degree of Master of Arts

in

Sociology

by

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2019

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University of California, Merced
2019

Table of Contents

Abstract.....	vii
Introduction.....	8
Literature Review.....	9
Teacher Preparation Programs to Address Teacher Shortage: CalTeach.....	9
Who Gets a Teaching Credential?	9
College Achievement and Experience	11
Intersectionality	12
Hypotheses.....	13
Methods.....	14
Data.....	14
Intersectionality as a Methodological Approach.....	14
Dependent Variable	15
Independent and Control Variables.....	15
Procedure.....	16
Findings.....	17
Discussion and Conclusion.....	21
References.....	27

List of Tables and Figures

<i>Table 1.</i> Means and Standard Deviations for Variables Used in Analysis by Racial and Gendered Groups.....	23
<i>Table 2.</i> CTERIN 2011-2013 Odds Ratios and Standard Errors on Binary Logit Analysis of Receiving a Teaching Credential.....	24
<i>Figure 1.</i> Predicated Probabilities of Obtaining a Teaching Credential for Model 1.....	25
<i>Figure 2.</i> Predicated Probabilities of Obtaining a Teaching Credential for Model 3.....	25
<i>Figure 3.</i> Predicated Probabilities of Obtaining a Teaching Credential for Model 4.....	26

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Abstract

California is facing a heightening teacher shortage that is being felt the most by underserved schools, which have high percentages of students of color, from low socioeconomic status, and/or English Language Learners. Along with a teacher shortage, there is a great racial mismatch between public school students and teachers in California. While prior research has identified how high school academic achievement is important for entering the teaching occupation there is limited research that considers how college academic achievement and overall college experience may mediate or moderate the racial and gendered patterns of obtaining a teaching credential. The research questions for this project are: 1) Are there significant differences by race and gender in the probability of earning a teaching credential? And 2) Are these differences mediated or moderated by college achievement and experiences? This project aims to examine the racialized and gendered patterns of earning a teaching credential among three CalTeach graduating cohorts (2011-13) on three University of California Campuses (n=982). I find that Latinas, Latinos, white men, Asian women, Asian men, and Black women and men are less likely to obtain a teaching credential than white women. I have found that high school achievement (GPA and college entrance exam scores) is not significantly associated with earning a credential, but students' college GPA at graduation and major are important, especially for Latinas. This suggests that academic outcomes in college are important for who goes into teaching, and especially among Latinas.

Introduction

California leads the nation in the largest public K-12 student-to-teacher ratios among all states, ranking 50th. With more than one third of teachers preparing to retire from the profession, the state is tackling a worsening teacher shortage and a greater reliance on unprepared teachers (Darling-Hammond, Furger, Shields, and Stucher 2016). The majority of California schools—including 71% of rural and 83% of urban/suburban school districts—are experiencing teacher shortages, and it is particularly pronounced among math and science teachers (Sutcher, Thomas, and Darling-Hammond 2018:1; Darling-Hammond et al. 2016). Along with these shortages, California's teacher population poorly reflects their K-12 public school student population. There is a great racial mis-match between teachers and students. In the 2016-2017 school-year, 52% of students were Latinx compared to only 20% of teachers (California Department of Education 2017).

According to the California Commission on Teacher Credentialing 2015-16 Annual Report Card, 29.7% of students enrolled in traditional teacher preparation programs were Latinx and 71% were female. While teacher preparation programs are a way to reduce the teacher shortage, they are also trying to diversify the teacher occupation. In addition, previous research has focused on how teacher's personal history and educational backgrounds are likely to shape their longitudinal trajectories in teaching (Freedman and Appleman 2009; Holt-Reynolds 1992). It has also focused on how academic achievement may be important for entering the teaching occupation and college student's experiences in teacher preparation programs, especially the field experience during teacher training (Aichenstein et al 2010; Boyd, Lankford, Loeb, and Wyckoff, 2005; Boyd, Grossman, Lankford, Loeb and Wyckoff 2009; Cochran-Smith and Zeichner 2005; Ingersoll and Smith 2004; Renzulli, Parrott, and Beattie 2011; Ronfeldt 2012; Ronfeldt, Kwok, and Reininger 2016); however, the previous research focused on the connection between academic achievement and teaching is contradictory. Qualitative research has found that college students who are high academic achievers would not consider teaching as an occupation. Berry (1986) found higher academic achieving college students were less likely to become teachers as they often told by their own teachers and counselors not to enter the teaching occupation. However, quantitative research has found that college students who showed an interest in teaching tend to have high academic achievement, measured by high school and college GPA, but lower SAT scores (Zumwalt and Craig 2008). Therefore, the connection between college academic achievement and college experiences in regard to earning a teaching credential is unclear, as well how it applies to teacher preparation programs like CalTeach.

This study examines how academic achievement and experiences in college may relate to racialized and gendered patterns in earning a teaching credential among college graduates who expressed an interest in teaching. My research questions are: 1) Are there significant differences by race and gender in the probability of earning a teaching credential? And 2) Are these differences mediated or moderated by college achievement and experiences?

Literature Review

Teacher Preparation Programs to Address Teacher Shortage: CalTeach

California has invested almost \$200 million over the last five years towards addressing the teacher shortage (Lambert 2018) by incentivizing increasing participation in teacher preparation programs and offering more options to earn teaching credentials. In 2005, the University of California (UC) system implemented CalTeach, a teacher preparation program offered on all nine undergraduate-serving UC campuses that encourages college students who are science, technology, engineering and mathematics (STEM) majors to work toward obtaining a teaching credential, while also receiving their bachelor's degree. CalTeach is aimed at addressing the teacher shortage, specifically the STEM teacher shortage in K-12 public schools, but also offers students from all majors a chance to complete coursework and field experiences that count toward a teaching credential. Their mission is to “recruits and prepare mathematics and science majors for future teaching careers by providing special coursework and field experiences in K–12 schools while they complete their undergraduate degrees” (University of California CalTeach 2017). While not expressly aimed at increasing the diversity of the teaching profession, CalTeach promotional materials highlight diversity by gender, race, and class of the program participants as one of the program's key impacts. CalTeach STEM graduates tend to be more diverse across gender, race, and socioeconomic factors compared to all UC STEM majors, with 21% of CalTeach graduates being students of color compared to 18% of all UC Stem graduates (University of California CalTeach 2017). While the program highlights the diversity of participants, it is an open question whether the program's diverse participants are actually becoming teachers as well as whether there are racialized and gendered outcomes among participants that relate to their college academic experiences. However, CalTeach is one of the many solutions California has implemented to increase the teacher population across the state.

Who Gets a Teaching Credential?

Out of the \$200 million that California has invested to reduce the teacher shortage, \$45 million has been allocated to increase teaching credentialing (Lambert 2018), which is a necessary point in the educational pathway for teachers. Teaching is still an occupation that is dominated by whites, females, and monolingual English speakers (Zumwalt and Craig 2008). In 2016, 82% of the US teacher population was white (2016 US Department of Education), which may be due to there being racialized and gendered college experiences on the way to earning a teaching credential. According to the 2016 US Department of Education report, racial diversity, decreases at each educational trajectory (i.e., postsecondary education, teacher preparation programs, and retention). Students of color are underrepresented in teacher preparation programs, with many feeling uncomfortable and out of place and are less likely to complete the program than white peers, with many of them pursuing college degrees in business, engineering, and social sciences (Ocasio 2014).

The teacher shortages across the nation and the underrepresentation of students of color in teaching preparation program has led four-year universities to initiate teacher preparation programs whose missions are to increase diversity in the teaching occupation; however, this solution has led to a miniscule increase in teachers of color across the years. In the 2011-12 school year, there was a 5% increase in teachers of color in the United States compared to the 1987-88 school year (2016 US Department of Education). In more recent years, the percentage of white teachers in California has decreased. According to the California Department of Education, in the 2016-2017 school year, the percentage of white teachers in K-12 public schools was 63.35%, a 13.85% decrease since 1997-98. Since 1998, there has been a 10.2% increase in teachers of color in K-12 public school in California, with the highest increase in Latinx teachers (Freedberg 2018). Zumwalt and Craig (2008) highlight that working- and lower-class students view teaching as a middle-class occupation and often participate in it as a way to be upwardly mobile. Although there has been a slight increase in teachers of color, there is still an underrepresentation of teachers of color relative to the population of public-school students of color, specifically the Latinx public-school students in California.

While teaching is still a white female dominated occupation, Latinas are the largest subgroup entering the field (Flores 2017). According to Flores (2017), “teaching is the top occupation among Latina professionals, with three times as many going into teaching than the next most concentrated occupation, nursing” (Flores 2017:10). Furthermore, Irizarry and Donaldson (2012) found the primary motivation for Latinx teachers to enter the field was the negative experiences they experienced in K-12 schools, along with having a strong sense of commitment to give back to their communities. They also found preservice Latinx teachers saw their future work in the field as “inherently political and potentially transformative, due to the deleterious racialized experiences they faced in k-12 schools” (Irizarry and Donaldson 2012:169).

Obtaining a teaching credential is contingent on passing the California Basic Educational Skills Test (CBEST), the California Subject Examinations for Teachers (CSET), and the Reading Instruction Competence Assessment (RICA). As racial diversity decreases at each educational trajectory (i.e., postsecondary education, teacher preparation programs, and retention), these standardized exams may contribute to it. According to the California Commission on Teaching Credentialing’s 2018 Annual Report on Passing Rates of Commission-Approved Examinations from 2012-2013 to 2016-2017, from 2012-17 only 68.7% of students passed all three sections of the exam the first time (California Commission on Teaching Credentialing 2018). In terms of demographics, from 2012-17, 80.9% of white students passed the CBEST the first-time compared to 53.7% of Latinx students (not including Mexican American) and 47.3% of Black students (California Commission on Teaching Credentialing 2018). These exams reduce the percentage of nonwhite students (Epstein 2005).

In addition, previous research demonstrates there are multiple motivators—economic, social, interpersonal, intellectual, and ethical—that influence individuals to enter careers in teaching (Eren and Tezel 2010). Ocasio (2014) found the main reasons

teachers choose to teach is due to intrinsic motivators, i.e. “wanting to work with children, making a difference in the lives of students, enjoying their schooling experience and wanting to continue their experiences with it” (247). Berry (1986) found females were more inclined to enter the teaching occupation as it provided a “work schedule that better fit their future family responsibilities” (272). In addition, Berry (1986) found college students from rural and low socioeconomic backgrounds were more likely to be encouraged by their communities and parents to seek employment closer to home (274). Although there are many motivators influencing college students to enter the teaching occupation, the teacher shortage in California is getting worse and teachers are not entering the field at fast enough rates. Earning a teaching credential is a significant transition in a college students’ lives, as it a step needed to shift into the role of becoming a teacher.

College Achievement and Experience

Previous research has shown teacher’s personal history and educational backgrounds are likely to shape their longitudinal trajectories in teaching (Freedman and Appleman 2009; Holt-Reynolds 1992). As the representation of people of color in the teaching occupation is small and decreases at each educational trajectory, it is evident that individuals can have different racialized and gendered pathways in college. Alwin, Thomas, and Sherman-Wilkins (2018) state that “personal life pathways are ordered differently across racial and ethnic groups” (285).

As previously mentioned above, there are many individual predictors that influence earning a teaching credential and entering the teaching occupation. The current research on college achievement and entering the teaching occupation is in opposition. Quantitative research has found college students who showed an interest in teaching tend to have high academic achievement, measured by high school and college GPA, but lower SAT scores (Zumwalt and Craig 2008). In addition, students with lower academic achievement exit educational pathways at each transition point (Zumwalt and Craig 2008), i.e. high school graduation, postsecondary education, teacher preparation programs, and retention as teachers. Nonetheless, qualitative research has found high academic achieving college students tend to not consider teaching as an occupation. Berry’s (1986) case study on 80 non-education college seniors found it was not the lack of financial reward in teaching as the reason why high academic achieving students did not consider the occupation, it was the “frustrating work conditions, bureaucratic requirements, lack of professional control, few opportunities for intellectual growth, their intolerance for diversity in the workplace, and their perceived view of teaching as boring” (Berry 1986:269). In addition, Berry (1986) found higher academic achieving college students were less likely to become teachers as they were often told by their own teachers and counselors not to enter the teaching occupation. It is evident that college student’s own teachers, along with family members, can influence the decisions students make concerning their career trajectories. Berry (1986) found students from urban and upper-middle class settings were more likely to be encouraged by their parents and teachers to pursue “academic, intellectual and/or professional careers” (275). It is important to

acknowledge how colleges and other institutions are spaces that influence student's career trajectories and often funnel particular students into certain occupations, thus contributing to racialized and gendered pathways in teaching.

In terms of college experience, there is limited research on how overall experiences in college influence whether college students earn a teaching credential. According to Chen (2013), in 2003-2004, 28% of bachelor's degree students choose a STEM major at some point within entering college, however, many leave for non-STEM fields. Furthermore, women and students of color are underrepresented in most STEM fields (Rainey, Dancy, Mickelson, Stearns and Moller 2019). According to the National Center for Education Statistics (NCES), in the 2014-15 school year, 52% of bachelor's degrees awarded were in business fields compared to the 20.6% in education (U.S. Department of Education NCES 2018). Furthermore, at the bachelor's degree level, education has higher attrition rates than STEM, business, and social science majors (Chen 2013), which may be a contributing factor to the teacher shortage. In addition, Berry (1986) found science majors expect their employment to have an "intrinsic order" and were less comfortable with the "uncertainties of life in the public-school classroom" (272). Zumwalt and Craig (2008) found less teachers graduate with education majors. Lastly, previous literature on college experiences has not examined the relationship between college major and obtaining a teaching credential.

Although previous research on academic achievement has been contradictory, there is evidence that high academic achievement is important to entering the teaching occupation. Previous research found Black and Latinx undergraduate students in STEM have greater achievement gaps compared to their Asian and white counterparts (Harper 2010). For students of color, often entering higher education is a challenge. Furthermore, once attending a four-year university, there are many structural barriers that students of color face that increase their likelihood of not completing their degrees relative to white students—such as racism, financial instability, and negative experiences with faculty members (Greene, Mati, and McClenney 2008). In addition, certain students might feel pressure from their families to succeed and major in certain topics. Flores (2017) mentions one of the pathways that pushed Latinas from the Los Angeles area to become teachers was structural factors—the changing opportunity structure of the economy, family, social networks; and the intersections of social structural forces of racial, class, and gender inequalities)—that channeled them into the occupation. Therefore, it is interesting to examine how academic achievement and being a STEM major influences the odds of obtaining a teaching credential for college students who showed an interest in teaching, as well as if teacher preparation programs that are designed to address the STEM teacher shortage, like CalTeach, are contributing to diversifying the teaching profession in terms of race and gender, but also academic achievement. Lastly, participating in CalTeach may have various meanings to students by race and gender. Students of color may feel pressured to participate in such a program as it will allow them to be economically mobile in such a "short" time, while some students may see it more as an "extra experience" to add to their resumes.

Intersectionality

Educational pathways into teaching are not homogenous. They are not only racialized but gendered as well. Alegria and Branch (2015) highlight the importance in understanding that racial factors can “transform how gender operates in the context of each field” in their research on the causes and consequences of inequality in STEM (326). College students come with multiple identities that are not mutually exclusive from each other but intertwined. The intersections of identities create different experiences and pathways, as well as come with different factors and actors that influence their career trajectories, with academic achievement and their majors being some of those pressures.

Intersectionality is defined as “the critical insight that race, class, gender, sexuality, ethnicity, nation, ability, and age operate not as unitary, mutually exclusive entities, but as reciprocally constructing phenomena that in turn shape complex social inequalities” (Collins 2015:2; Collins 2000). For this project, I am not interested in focusing on the significance of one identity but am interested in fused analysis of two identities, race and gender. Previous research on teachers and college students have used an intersectional approach Flores (2017) examines how Latina college graduates were funneled into the teaching occupation by the intersection of racial, class, and gender inequalities. On the other hand, Rainey, Dancy, Mickelson, Stearns, and Moller’s (2019) work uses an intersectional approach to examine the racial and gendered differences in how college seniors’ decisions to major in STEM are influenced by instructional style and how they perceived STEM professors cared about them. They focus on the intersections of race and gender identities: white men, white women, women of color, and men of color. Through this approach, they were able to avoid diminishing the complex nature of individuals’ identities and allow readers to see both a “gender and race analysis” (3).

As teaching is a white female dominated occupation, this research paper will use an intersectional approach. In this study, I examine the axis of two identities—race and gender—and the intersections of them in shaping the earning of a credential by considering the separate influences on white women, white men, Latinas, Latinos, Asian women, Asian men, Black women and men, and Other-race women and men. I am analyzing the fusion of both identities to explicitly interrogate the “diversity” narrative promoted by CalTeach to see how student outcomes in teaching play out not only by race or gender, but at the intersection of the two. This is important because the teaching occupation is both racialized and gendered (as discussed above), and different groups have different patterns of relationships to schools and schooling as well as the teaching profession.

Hypotheses

As previous research has shown that teaching is still a white female dominated field, I predict the following:

Hypothesis 1: White women will have higher odds of obtaining a teaching credential than all other racialized and gendered groups.

Also, previous research suggests that high school achievement, college achievement and experiences are important, I predict the following:

Hypothesis 2: High school achievement, college experience and achievement increase the odds of obtaining a teaching credential across all racial and gendered groups.

In addition, as intersectionality literature states identities are not mutually exclusive and shape social inequalities, I predict the following:

Hypothesis 3: Although college experience matter, different groups may be influenced differently by it.

Methods

Data

To understand how race, gender, college academic achievement, and college experience influence whether college graduates earn a teaching credential, I analyze the post-baccalaureate educational pathways for students who graduated from three University of California (UC) campuses in 2011-13, who expressed an interest in teaching by taking at least one CalTeach Course (n = 982). Institutional data was collected by the University of California Office of the President (UCOP), who merged data from the California Commission on Teaching Credentials (CTC). This data includes individual-level data on pre-college achievement, college academic experiences, and the date and type of teaching credential obtained. Data was linked for three cohorts of UC CalTeach program graduates, a program under the University of California's Science and Math Initiative (UCSMI) dedicated to assist undergraduate students receive a teacher training before graduation from UC Merced, UC Irvine, and UC Berkeley. These three sites were selected as the academic programs are structured similarly, thus minimizing variation in the curriculum aspect of the teacher training program. In addition, the 2011, 2012, and 2013 CalTeach student cohorts were chosen to avoid observing teacher outcomes at the height of the economic recession. Additionally, focusing on the 2011-2013 CalTeach graduates allows for sufficient time to have passed to observe whether students graduated with a teaching credential in the five years after obtaining their bachelor's degree.

Next, UCOP data provides college students' key measures of social background, such as gender, race/ethnicity, and class (i.e., parent's education), which will be used as focal variables. Lastly, data on college student's social background, high school academic achievement, and college academic achievement and experience will be merged using student IDs to CTC data on whether the college student earned a teaching

credential. My sample includes the full population of UC graduates in 2011-13 from the focal campuses who took any CalTeach courses. My unit of analysis is the individual, as I focus on how demographic characteristics and academic achievement are associated with earning a teaching credential.

Intersectionality as a Methodological Approach

As I am interested in examining the axis of two identities—race and gender—in shaping the earning of a credential, I will use an intersectional methodical approach. McCall (2005) states an intercategorical approach “begins with the observation that there are relationships of inequality among already constituted social groups, as imperfect and ever changing as they are, and take those relationships as the center of analysis” (1784-85). In this study, we examine the axis of two identities—race and gender—and the intersections of them in shaping the earning of a teaching credential by considering the separate influences on white women, white men, Latinas, Latinos, Asian women, and Asian men. Like Rainey and colleagues (2019), this study is not entirely intersectional. Unfortunately, respondents who identified as Black and Other-race did not have sufficient numbers to produce reliable estimates for the intersection of identities. I acknowledge this limitation; however, I believe using this partial intersectional approach provides a better analysis and allow readers to see and understand how pattern outcomes are both racialized and gendered.

Dependent Variable

The dependent variable for this study is whether or not college students who showed an interest in teaching earned a teaching credential within five years of completing their bachelor’s degree. The permits and credentials obtained by respondents during college were recorded with the variable having 18 categories. For this project, I am only interested in the earning of full teaching credentials, rather than those that can be used on an emergency basis or to work as a substitute teacher. Thus, I created a dummy variable (Respondents who obtained a Multiple Subject Teaching credential or a Single Subject Teaching Credential or an Education Specialist Credential or a District Intern Credential or a Career Technical Education Teaching Credential =1; no credential or other type of credential=0).

Independent and Control Variables

The main variables of interest for this article are race and gender, as well as college achievement and experiences. For this project I am interested in the intersection of race and gender, I created dummies for race+gender groups based on the raw data for race and gender. I first created a five categorical race variable using the University of California Office of the President (UCOP) student admissions data, where ethnic origin is a self-reported ethnic identification categorical variable with 15 categories (white, Black, Asian, Latino, and Other). These five racial categories were created into a series of five dummy variables (white= reference). In addition, sex is self-reported by respondents and

is measured by creating a dummy variable (female = 1). As teaching is a white female dominated profession, I created a collection of dummy variables combining race and gender for Latinxs, white, and Asian respondents using the race variable and sex variables (White women= omitted). In this data set, respondents who identified as Black and Other-race did not have sufficient numbers to produce reliable estimates for race+gender groups, therefore they were not separated by gender and instead a dummy variable that indicates race for both men and women in these groups is included in the model¹.

Other main variables of interest are college achievement and college experience. For this project, college achievement is measured by grade point average (GPA) at graduation. GPA at graduation is a continuous variable ranging from .45 to 4. GPA at graduation is based on total units attempted and grade points to date, as of end of term (UCOP). In addition, college experience is measured by majors in which they received their degrees in (110 majors), thus, I created a STEM majors dummy variable (respondents graduated with a STEM major=1). Being a STEM major was defined as majors that are a part of science (natural science), technology, math, and engineering². A limitation of my data was the no information on double majors; however, I conducted sensitivity analysis counting them both as STEM or non-STEM and it did not alter key findings. In addition, to view how STEM major effects the relationship between race and gender and obtaining a teaching credential, I interacted all race/gender groups with STEM to see if the relationship changes in magnitude or direction when the interaction is examined. Only Latina women in STEM and Asian women in STEM were statistically significant and therefore included in the model. Lastly, to view how college GPA at graduation effects the relationship between race and gender and obtaining a teaching credential I tested all race+gender groups and only kept the significant interaction term, Latinas' college GPA at graduation³.

Control variables include a measure of socioeconomic status (first-generation college student status), high school achievement (high school GPA, college entrance exam scores), and campus effects. First-generation college student status is measured by combining mother's and father's highest educational attainment variables. Mother's and father's highest level of educational attainment were categorical variables: 1) no high school, 2) some high school, 3) high school graduate, 4) some college, 5) 2-year college graduate, 6) 4-year college graduate, and 7) post graduate study. As previous research has stated that a first-generation college student is one whose parents did not obtain a bachelor's degree, I created a dummy variable for first-generation (mother's and father's

¹ Black students include African American and Black Ethnic groups. Other-race students include American Indian/Alaskan Native, Other, Polynesian, and decline to state.

² Psychology was categorized as non-STEM.

³ Both sets of interactions (STEM and college GPA at graduation) were interacted with all racial and gendered groups (along with Black and Other respondents), but only Latinas and Asian women had statistically significant results (with STEM). Therefore, only their interactions are being reported.

education is below a four-year college degree = 1). In addition, high school GPA is a continuous variable ranging from 0 to 4.66. High school GPA is computed from self-reported information on the respondent's college application. In calculating this GPA, the number of AP and honors courses is limited to 8, 10th grade honors are limited to four and will not include any IB honors or HL honors for English (UCOP). Also, college entrance exams scores variable is a standardized value based on the ACT or SAT total score (UCOP). It is a continuous variable ranging from 57 to 297. In addition, all models include fixed effects at the campus level in order to control for differences between campuses. A condition of my data is that I don't make comparisons across the campuses, therefore, the coefficients for these measures will not be included in tables. Lastly, this project does not have a CBEST measure, which is a limitation of my data.

Procedure

Data Analysis

As multiple control variables had some missing data (parental education, high school GPA, and SAT score), I used multiple imputation. As my dependent variable is dichotomous, I will be using binomial logistic regressions, which predict the log odds that sample members obtain a teaching credential. My analysis strategy includes six nested models which allow me to compare the models to examine if additional variables explain a significant amount of variance in the data. Nesting models allows me to see how high school achievement and college achievement and experience mediate or moderate the relationship between race and gender and obtaining a teaching credential. Model 1 is the base model and examines race and gender differences, while controlling for high school academic achievement (GPA and college entrance exam scores) and fixed effects at the campus level on obtaining a teaching credential. In Model 2, I focus on examining if college achievement (GPA at college graduation) and college experience (STEM major) mediate or moderate racialized and gendered groups odds of obtaining a teaching credential. In addition, in Model 3 I focus on examining the Latina*STEM interaction and Asian women*STEM interaction odds of obtaining a teaching credential. Furthermore, in Model 4 I examine the Latina*GPA at graduation interaction. Lastly, Model 5 examines both Latina* interactions to test whether they are capturing different things.

Findings

Table 1 provides descriptive statistics for the 2011-2013 sample population for all variables used to examine my hypotheses. 30.1% of white female college students obtained a teaching credential. 19.3% of Latina and 22.9% of Latino college students obtained a teaching credential. Furthermore, 21.2% of Asian women and 14.9% of Asian men obtained a teaching credential. In terms of first-generation status, 26.8% of white female and 42.1% of white male college students were first-generation college student. In addition, 88.2% of Latinas and 81.9% of Latinos were first-generation college students. In terms of academic achievement, for white female students the average high school

GPA was 3.290 compared to the 2.761 average high school GPA for Latinos. Asian female college students had an average high school GPA of 3.405 compared to the 3.135 average high school GPA for Black female and male students. In terms of GPA at college graduation, white females had an average GPA of 3.387 compared to the 3.040 GPA average for Latinas. Lastly, 42.3% of white female college students were majoring in STEM compared to the 23.5% of Latinas. 67.3% of Asian men majored in STEM compared to 56.6% of Latinos.

[TABLE 1 ABOUT HERE]

Table 2 presents the 2011-2013 odds ratios and standard errors of the multivariate binary logit analysis examining factors on receiving a teaching credential. Model 1 is the base model and is limited to examining race and gender differences and controlling for high school academic achievement and fixed effects at the campus level on obtaining a teaching credential. This model demonstrates high school GPA and college entrance exams scores are not statistically significant, holding all else constant. In addition, this model indicates there are sharp difference on who is obtaining a teaching credentials across race and gender, and only Latinos do not have statistically significant odds, holding all else equal. While holding all else constant, Latinas, white men, Asian women and men, and Black women and men have statistically significant lower odds of receiving a teaching credential than white women. Latinas are 51.6% less likely of obtaining a teaching credential compared to white women ($p > .05$), holding all else constant. On the other hand, Asian men have 73% lower odds of obtaining a teaching credential compared to white women, holding all else constant. Also, Asian women have 56.2% times lower odds of obtaining a teaching credential compared to white women, holding all else constant. Black men and women are 72.6% less likely to obtain a teaching credential compared to white women, holding all else constant. In sum, the results confirm that even among a sample of college graduates with some interest in the teaching profession, white women are substantially more likely than other race-gender groups to obtain teaching credentials.

[TABLE 2 ABOUT HERE]

Figure 1 presents the predicted probabilities for race and gender on obtaining a teaching credential, holding the fixed effects at the campus level, socioeconomic status, and high school achievement at their means (Model 1). The figure demonstrates the predicted probability of Latinas obtaining a teaching credential is 19 percent probability compared to the 33 percent probability for white women. White men, Latinas, and Latinos have similar predicated probabilities of obtaining a teaching credential compared to white women. The figure also demonstrates the predicted probability for Asian women obtaining a teaching credential is 17.6 percent probability compared to the 32.8 percent probability for white women. The predicted probability for Asian men obtaining a teaching credential is 11.5 percent probability compared to the 32.8 percent probability for white women. The figure also demonstrates the predicted probability for Black women and men obtaining a teaching credential is 11.8 percent probability compared to

the 32.8 percent probability for white women. Lastly, the predicted probability for Other-race women and men obtaining a teaching credential is 26.3 percent probability compared to the 32.8 percent probability. In sum, the results confirm that even among a sample of college graduates with some interest in the teaching profession, white women have higher predicted probabilities of obtaining a teaching credential than other race and gender groups, holding all else at their means.

[FIGURE 1 ABOUT HERE]

In Model 2, I focus on examining the significance of college academic achievement and college experience in earning a teaching credential for racialized and gendered groups. This model includes the examination of race and gender considering the fixed effects at the campus level, socioeconomic factors (first-generation status) and high school achievement (high school GPA and college entrance exam scores) and adds college achievement (GPA at graduation) and experiences (whether respondents are STEM majors). Holding all else constant, this model indicates college academic achievement is not statistically significant; however, being a STEM major is statistically significant. Students who are STEM majors have positive and statistically significant higher odds of receiving a teaching credential than students who are not STEM majors, holding all else equal. Respondents who are STEM majors are 92.1% more likely of obtaining a teaching credential compared to non-STEM majors, holding all else equal. With the inclusion of college academic achievement and college experience, Latinos odds of earning a teaching credential become statistically significant, while holding all else constant. Latinos are 47.6% less likely to obtain a teaching credential compared to white women, holding all else equal. In addition, Latinas, white men, Asian men, Asian women, and Black women and men continue to have negative and statistically significant lower odds of obtaining a teaching credential than white women, holding all else equal. In sum, the results for this model confirm that even among a sample of college graduates with some interest in the teaching profession, major is important for earning a teaching credential, specifically being a STEM major. Lastly, they also confirm the lack of effects of college GPA at graduation on the odd of obtaining a teaching credential.

The predicted probabilities for Model 2 are for race and gender on obtaining a teaching credential, holding campus fixed effects, socioeconomic status, high school academic achievement, college academic achievement, and college experience at their means. They demonstrate that white women continue to have higher predicted probabilities of earning a teaching credential compared to all other race and gendered groups, while all else at their means. It demonstrates the predicted probability of Latinas obtaining a teaching credential is 19.1 percent probability compared to the 32.8 percent probability for white women.

In Model 3, I examine how college experience mediates or moderated obtaining a teaching credential, specifically for Latinas and Asian women. This model includes the effects of race and gender considering the effects of socioeconomic factors (first-generation status) and high school achievement (high school GPA and SAT scores),

college achievement (GPA at graduation) and experiences (whether respondents are STEM majors), an interaction term for Latinas in STEM and an interaction term for Asian women in STEM. This model indicates Latinas in STEM have positive and statistically significant higher odds of obtaining a teaching credential compared to non-STEM white women. While holding all else constant, Latinas in STEM are 189% more likely of obtaining a teaching credential compared to non-STEM white women. In addition, Asian women in STEM have a negative and statistically significant lower odds of earning a teaching credential compared to non-STEM white women. This model indicates Asian women in STEM are 58.1% less likely of obtaining a teaching credential compared to non-STEM white women, holding all else constant. In addition, this model continues to demonstrate STEM majors continue to have positive and statistically significant higher odds of obtaining a teaching credential compared to students who are non-STEM, while holding all else constant. While holding all else constant, all racial and gendered groups except Other-race women and men continue to have negative and statistically significant lower odds of receiving a teaching credential than white women. In sum, the results for this model confirm that even among a sample of college graduates with some interest in the teaching profession, being a STEM major is important for earning a teaching credential, specifically for Latinas and Asian women. Lastly, it continues to confirm that majors are important on the odd of obtaining a teaching credential.

Figure 2⁴ presents the predicted probabilities for race and gender on obtaining a teaching credential for STEM and non-STEM majors, holding campus fixed effects, socioeconomic status, high school academic achievement, college academic achievement, college experience, at their means. The figure demonstrates white women in STEM majors have higher predicted probabilities of earning a teaching credential than all other racialized and gendered groups (45 percent probability). However, Latinas in STEM have similar predicted probabilities of earning a teaching credential (40.0 percent probability). In addition, Latinas in STEM have higher predicted probabilities of earning a teaching credential compared to non-STEM Latinas (11.9 percent probability). Also, Asian women in STEM and non-STEM majors have similar predicted probabilities of earning a teaching credential (18.7 and 18.6 percent probability respectively).

[FIGURE 2 ABOUT HERE]

In Model 4, I focus on examining the effects of college GPA at graduation, specifically for Latinas. I tested the STEM interaction for all groups, but Latinas was the only significant one. This model includes the effects of race and gender considering the effects of campus, socioeconomic factors (first-generation status) and high school achievement (high school GPA and college entrance exam scores), college achievement (GPA at graduation) and experiences (whether respondents are STEM majors) and the interaction term for Latina*GPA at graduation. While the direct effect of college GPA at

⁴ Figure 2 was created using a model that included all the interaction terms for race+gender groups and STEM.

graduation is not statistically significant, the interaction term for Latinas*GPA at graduation is positive and statistically significant. This means, with every one-point increase in college graduation GPA, Latinas have 4.238 times higher odds of earning a teaching credential compared to a one-point increase in college graduation GPA for white women, while holding all else constant. In addition, in this model all racial and gendered groups except non-Hispanic Others continue to have negative and statistically significant lower odds of receiving a teaching credential than white women, holding all else constant. In terms of college experience, respondents who are STEM majors continue to have positive and statistically significant higher odds of receiving a teaching credential compared to students who are non-STEM majors, holding all else equal. In sum, the results for this model confirm that even among a sample of college graduates with some interest in the teaching profession, there is a lack of effects of college GPA at graduation on the odd of obtaining a teaching credential. However, they also confirm college GPA at graduation is important for Latinas' odds of earning a teaching credential.

Figure 3 presents the predicted probabilities for the Latina*GPA at college graduation, holding the effects of campus, socioeconomic factors (first-generation status) and high school achievement (high school GPA and college entrance exams scores), and college experiences (whether respondents are STEM majors) at their means (Model 4). The figure demonstrates that higher GPA at college graduation matters for Latinas earning a teaching credential. The predicted probabilities for Latinas with a 4.0 GPA are 30.1 percent probability compared to 18.1 percent probability for non-Latinas with a 4.0 GPA at college graduation.

[FIGURE 3 ABOUT HERE]

Although difficult to interpret models with multiple interaction terms, Model 5 is included to establish whether the Latina*interactions remain significant when in the model together. This includes the effects of race and gender considering the effects of socioeconomic factors (first-generation status) and high school achievement (high school GPA and college entrance exam scores), college achievement (GPA at graduation) and experiences (whether respondents are STEM majors) and both interactions, Latina*STEM and Latina*GPA at graduation. In this model, both Latina*interactions remain positive and statistically significant; suggesting these two measures are capturing independent processes. While holding all else constant, all racial and gendered groups except Other-race women and men continue to have negative and statistically significant lower odds of receiving a teaching credential than white women. In terms of college experience, STEM majors continue to have positive and statistically significant higher odds of obtaining a teaching credential compared to non-STEM majors. In sum, the results confirm for Latinas, college GPA at graduation and being a STEM major is important for their odds of earning a teaching credential.

Discussion and Conclusion

California continues to heavily invest in education, specifically to reduce the worsening teacher shortage. Leading universities to create new teacher preparation programs to increase teaching credentialing and to extend the teacher workforce. In addition, previous literature demonstrates teaching continues to be a white-female dominated occupation with Latinas being the largest subgroup entering the profession. This project takes on an intersectional approach to examine how the axis of two identities—race and gender—shape the outcome patterns in obtaining a teaching credential. I found white women have higher odds of obtaining a teaching credential compared to all other racial and gendered groups, even white men. This is not a surprise as my results is consistent with previous literature. There were no observable racial difference in earning a teaching credential until I disaggregated the data by gender. Thus, further justifies the value of using an intersectional approach, which demonstrates educational pathways into teaching are not homogenous. Identities are not mutually exclusive of one another and neither are their inequalities.

In addition, white men and Latinos have similar predicted probabilities of obtaining a teaching credential to Latinas, which is surprising as previous literature demonstrates they are not entering teaching at relatively the same rates as Latinas. In addition, Latinos in STEM and white men in STEM have similar predicted probabilities of earning a teaching credential. Thus, begs to question, are white men and Latinos entering a different occupation? If so, why? This is interesting, especially since CalTeach was designed to specifically address the STEM-teacher shortage. This project demonstrates there are indeed racialized and gendered life course trajectories for college students and not everyone experiences college in the same way.

While previous research found high school academic achievement, measured by GPA and SAT scores were important factors to entering the teaching profession, in this study they were not statistically significant. I found college experience mattered more than high school academic achievement. In terms of college experience, STEM majors have higher odds of obtaining a teaching credential compared to non-STEM majors. In addition, Latinas in STEM are more likely to obtain a teaching credential than non-STEM white women and Asian women in STEM were less likely to obtain a teaching credential than non-STEM white women. While CalTeach is a teacher preparation program offered mainly to STEM majors, non-STEM majors are allowed to apply and participate in the program. While college achievement was not statistically significant as a direct measure, it was an interaction. Which suggests academic outcomes are important to understanding who is going into teaching, especially for Latinas, as well as who is not going into teaching as likely, Asian women in STEM.

While teacher preparation programs are addressing the teacher shortages, are teacher preparation programs like CalTeach diversifying the teacher workforce at the cost of not diversifying STEM occupations instead? Higher achieving and stem-focused Latina college graduates are entering the teaching profession instead of entering the

STEM workforce. At a macro level, this may be due to feeling more represented in teaching than in the STEM workforce, as only 7% Latinx folks are part of the STEM workforce (Graf, Fry and Funk 2018). While having STEM-focused Latinas entering the teacher workforce is great for the diversification and quality of the teaching profession, it may be these individuals are being diverted from participating in more prestigious and higher paid STEM careers.

While representation is important, other factors may also influence why higher achieving and stem-focused Latina college graduates are entering teaching instead of STEM occupations. Flores (2017) found two main pathways pushed Latinas from the Los Angeles area to become teachers: 1) by accident or “fell into it” and 2) structural factors i.e., the changing opportunity structure of the economy, family, social networks; and the intersections of social structural forces of racial, class, and gender inequalities) that channeled them into teaching. In terms of the family structure, Ovink’ (2014) work on gendered familism demonstrates Latinas often receive more pressure from their parents to succeed both educationally and financially than Latinos and are often contributing financially to their families while in college compared to Latinos who feel more pressure to financially contribute to “future” family. In addition, Boyd, Lankford, Loeb, and Wychoff (2005) found most public-school teachers take their first teaching job very close to their hometowns, within 15 miles from their hometown, or where they attended college. Due to these structural factors, Latinas may be entering the teaching occupation because it is closer to their families and hometown, while STEM occupations may not be. Therefore, entering a STEM occupation may make Latinas feel as if they are not fulfilling their “duties or roles” at home and thus, not an option. At the micro level, individuals are having to make life decisions that ultimately set them on different paths in their career trajectories. Not everyone wants to have a STEM career and participating in settings where they may feel represented might encourage to take a different path in their career trajectories.

As teacher preparation programs are a high investment of the state of California to reduce the worsening teacher shortage, a potential policy implication of these results is to examine whether these programs, like CalTeach, are indeed increasing the presence of underrepresented groups in teaching. Latinas in STEM are likely to obtain a teaching credential; however, Asian women in STEM are less likely. What are teacher preparation programs doing to diversify the teaching occupation? These programs tend to have dual missions: 1) reduce the teacher shortage and 2) increase diversity in teaching. Are these programs being intentional about recruitment and of who will be entering the teaching occupation? In addition, another potential policy implication would be to consider the transitional period between earning a bachelors and obtaining a teaching credential. It may be that in this transition period, college students who showed an interest in teaching are existing the teacher pathway or are being left behind.

Lastly, further research on teaching credentialing will be to conduct multinomial regression to examine which type of teaching credentials students are receiving (Single vs. multiple subject vs. no credential). In addition, to examine if STEM students who obtained a teaching credential are becoming STEM teachers. Lastly, future research on

the life course of teachers should focus on how social background and educational institutions can shape educational and career trajectories into teaching, specifically for Latinas

Table 1: Means and Standard Deviations for Variables Used in Analysis by Racial and Gendered Groups

Variables	White		Latinas		Latinos		Asian		Asian		Black		Other- race	
	Women Mean (SD)	Men Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Women Mean (SD)	Men Mean (SD)	Women Mean (SD)	Men Mean (SD)	Women Mean (SD)	Men Mean (SD)	Women Mean (SD)	Men Mean (SD)
Dependent Variable														
Received a Teaching Credential	0.301 (0.460)	0.217 (0.415)	0.193 (0.397)	0.229 (0.423)	0.212 (0.410)	0.149 (0.356)	0.106 (0.317)	0.273 (0.449)						
Socioeconomic Status														
Respondents' who are First- Generation College Student	0.268 (0.445)	0.421 (0.497)	0.882 (0.324)	0.819 (0.387)	0.486 (0.501)	0.465 (0.500)	0.447 (0.503)	0.500 (0.504)						
Respondent's Academic Achievement														
High School GPA	3.290 (1.575)	2.858 (1.764)	3.325 (1.174)	2.761 (1.702)	3.405 (1.308)	3.192 (1.532)	3.135 (1.374)	2.940 (1.763)						
College Entrance Exam Scores	207.817 (43.141)	197.002 (42.662)	152.055 (36.655)	161.976 (39.441)	190.141 (43.776)	198.151 (46.898)	165.434 (44.756)	200.762 (47.876)						
GPA at College Graduation	3.387 (0.395)	3.229 (0.391)	3.040 (0.410)	2.974 (0.438)	3.135 (0.435)	3.149 (0.460)	2.962 (0.341)	3.263 (0.413)						
College Experience														
Respondents' who are STEM Majors	0.423 (0.496)	0.614 (0.490)	0.235 (0.426)	0.566 (0.499)	0.498 (0.501)	0.673 (0.470)	0.383 (0.491)	0.576 (0.498)						
N (982)	123	83	119	83	259	202	47	66						

Table 2: CTERIN 2011-2013 Odds Ratios and Standard Errors on Binary Logit Analysis of Receiving a Teaching Credential

	Model 1	Model 2	Model 3	Model 4	Model 5
Latinas	0.484 (.170)**	0.543 (.193)*	0.366 (.157)**	0.006 (.013)**	0.003 (.006)***
Latinos	0.570 (.207)	0.524 (.194)*	0.538 (.199)*	0.491 (.183)*	0.503 (.187)*
White Men	0.523(.182)*	0.473 (.167)**	0.485 (.171)**	0.462 (.163)**	0.475 (.167)**
Asian Men	0.266 (.079)***	0.233 (.071)***	0.242 (.074)***	0.224 (.069)***	0.232 (.071)***
Asian Women	0.438 (.117)***	0.423 (.116)***	0.429 (.117)***	0.406 (.112)***	0.411 (.113)***
Black Women and Men	0.274 (.146)**	0.275 (.148)**	0.277 (.148)**	0.260 (.140)**	0.261 (.140)**
Other-Race Women and Men	0.732 (.261)	0.670 (.244)	0.685 (.248)	0.652 (.238)	0.668 (.242)
Campus2	3.425 (.692)***	3.046 (.633)***	3.071 (.640)***	2.978(.620)***	3.002 (.627)***
Campus3	0.744 (.200)	0.763 (.206)	0.743 (.201)	0.711 (.194)	0.693 (.189)
First-Generation College Student Status	1.264 (.238)	1.211 (.231)	1.201 (.230)	1.210 (.231)	1.202 (.230)
High School GPA	1.062 (.067)	1.089 (.069)	1.086 (.069)	1.088 (.070)	1.085 (.069)
College Entrance Exam Score	1.002 (.003)	1.001 (.003)	1.001 (.003)	1.001 (.003)	1.001 (.003)
GPA at College Graduation		1.068 (.226)	1.080 (.228)	0.914 (.203)	0.921 (.203)
STEM Majors		1.921 (.351)***	1.694 (.325)***	1.935 (.355)***	1.694 (.326)***
Latinas in STEM			2.890 (1.611)**		3.252 (1.876)**
Latinas GPA at Graduation			.419 (.221)*		4.864 (3.343)**
Asian Women in STEM					
Constant	0.171 (.101)**	0.125 (.108)**	0.135 (.116)**	0.124 (.108)**	0.242 (.216)
Observations	982	982	982	982	982
Log Likelihood	-461.276	-454.672	-452.842	-451.693	-450.110
BIC	1012.116	1012.687	1015.917	1020.508	1017.343

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.0$

Figure 1: Predicated Probabilities of Obtaining a Teaching Credential for Model 1

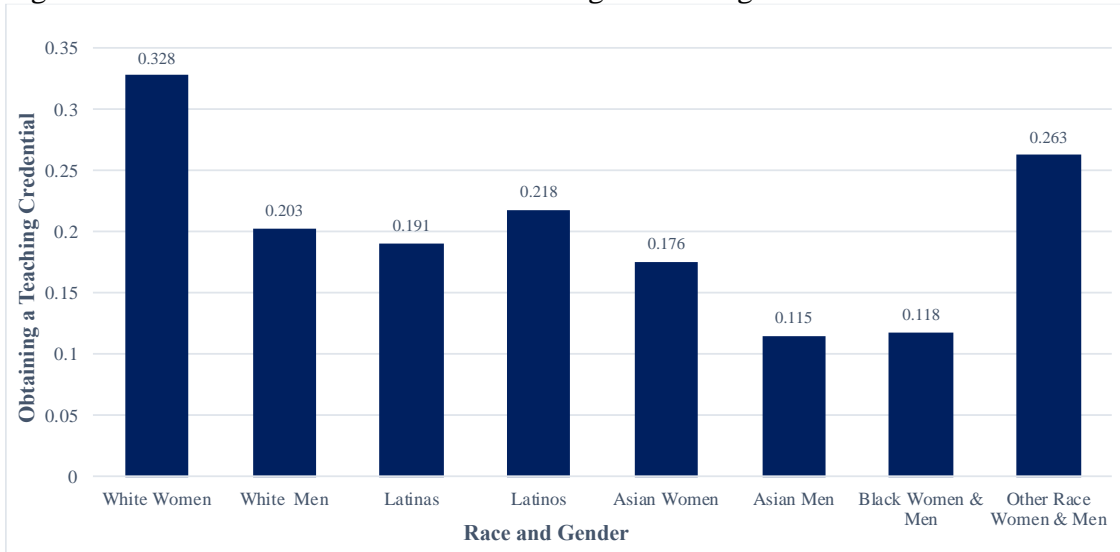


Figure 2: Predicated Probabilities of Obtaining a Teaching Credential for Model 3

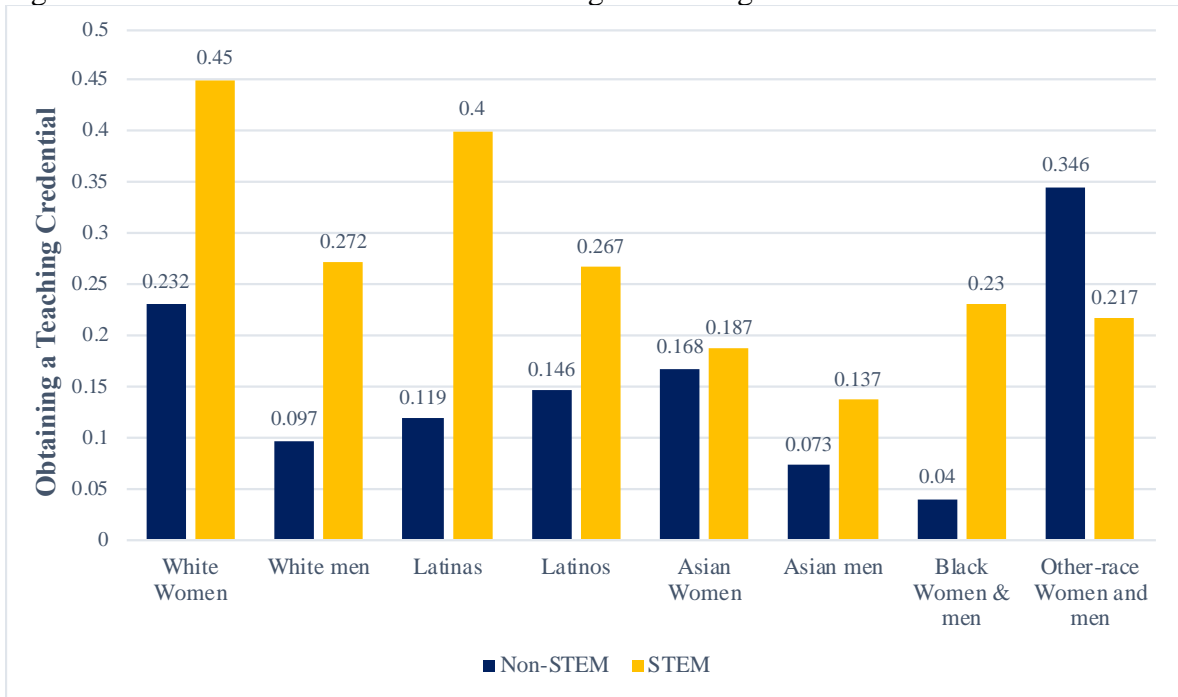
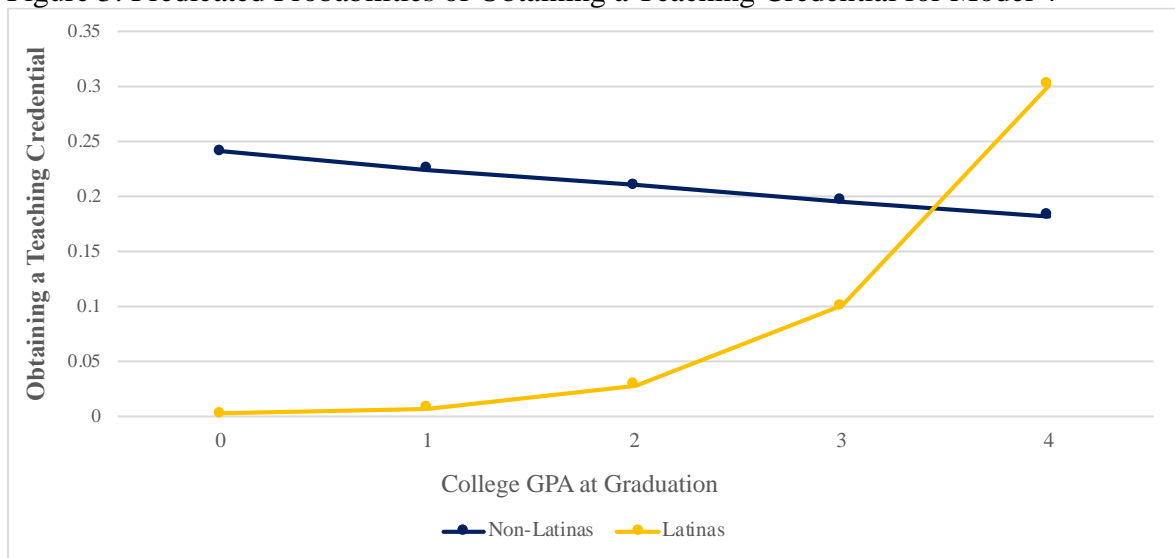


Figure 3: Predicated Probabilities of Obtaining a Teaching Credential for Model 4



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