

Using High School and College Data to Predict Teacher Candidates' Performance on the Praxis at Unibetsedåt Guåhan (University of Guam)

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Using High School and College Data to Predict Teacher Candidates' Performance on the Praxis at Unibetsedåt Guåhan (University of Guam)

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Policymakers and educators on Guåhan (Guam) are concerned about the persistent shortage of qualified K–12 teachers. Staff at the Unibetsedåt Guåhan (University of Guam, UOG) School of Education, the only local university that offers a teacher training and certification program, believe that more students are interested in becoming teachers but that the program's admissions requirements—in particular, the Praxis® Core test, which consists of reading, writing, and math subtests—might be a barrier. Little is known about the predictors for passing the Praxis Core test. This makes it difficult to develop and implement targeted interventions to help students pass the test and prepare for the program.

This study examined which student demographic and academic preparation characteristics predict passing the Praxis Core test and each of its subtests. The study examined two groups of students who attempted at least one subtest within three years of enrolling at UOG: students who graduated from a Guåhan public high school (group 1) and all students, regardless of the high school from which they graduated (group 2). Just over half the students in each group passed the Praxis Core test (passed all three subtests) within three years of enrolling at UOG. The pass rate was lower on the math subtest than on the reading and writing subtests. For group 1, students who earned credit for at least one semester of Advanced Placement or honors math courses in high school had a higher pass rate on the Praxis Core test than students who did not earn any credit for those courses, students who earned a grade of 92 percent or higher in grade 10 English had a higher pass rate on the reading subtest than students who earned a lower grade, and students who earned a grade higher than 103 percent in grade 10 English had a higher pass rate on the writing subtest than students who earned a lower grade. For group 2, students who did not receive a Pell Grant (a proxy for socioeconomic status) had a higher Praxis Core test pass rate than students who did receive a Pell Grant, students who earned a grade of B or higher in first-year college English had a higher Praxis Core test pass rate than students who earned a lower grade, and male students had a higher pass rate on the reading and math subtests than female students.

The study findings have several implications for intervention plans at both the secondary and postsecondary levels. Although students must pass all three Praxis subtests to be admitted to the teacher preparation program at the School of Education, examining student performance on each subtest can help stakeholders understand the content areas in which students might need more support. In the long term preparing more prospective teachers for the Praxis Core test might increase program enrollment, which in turn might increase the on-island hiring pool.

Why this study?

The Guam Department of Education (GDOE), the Unibetsedåt Guåhan (University of Guam, UOG), and education stakeholders are concerned about the persistent shortage of K–12 teachers on Guåhan (Guam).¹ GDOE struggles with recruiting teachers due to a small teacher candidate pool on the island. To address

For additional information, including Unibetsedåt Guåhan (University of Guam) admissions requirements and research on the Praxis Core test, technical methods, and supporting analyses, access the report appendixes at <https://go.usa.gov/x6s2w>.

1. Regional Educational Laboratory Pacific reports use the spelling conventions of Indigenous Pacific languages, including diacritical marks, when those spellings are the official names of institutions, languages, ethnicities, and places. Corresponding English spellings are provided on first reference.

the shortage, GDOE also recruits from off-island, but relocating qualified teachers can be difficult (Fernandez, 2015). Moreover, research suggests that teachers prefer positions at schools geographically close to where they grew up (Boyd et al., 2013). As an alternative, GDOE has started rehiring retired teachers on limited-term contracts, provisionally hiring teachers with temporary teaching certificates, and working with schools to reduce the number of teachers needed by eliminating elective courses, combining classes, and asking teachers to teach a class outside their certification areas.

About 79 percent of teachers on Guåhan come from the island and are educated at UOG (Miller et al., 2016). However, the number of teacher candidates UOG prepares does not meet the jurisdiction's need. For instance, GDOE expected a shortfall of 359 teachers for the 2019/20 school year (Ngirairiki, 2019), and other reports indicate a need for more than 300 educators a year (Gilbert, 2018). Yet UOG is able to produce only a fraction of the needed workforce. For example, by the end of the 2020 academic year, only 38 new teachers qualified for an Initial Educator Certificate. While GDOE can and does recruit teachers from off-island, increasing the number of students who complete the teacher preparation program at the UOG School of Education, the only educator preparation program on Guåhan, would help address teacher shortages and reduce reliance on alternative strategies to locate teachers.

UOG officials believe that students on Guåhan are interested in becoming teachers but that the admissions requirements for the teacher preparation program might be a barrier. Students must pass the Praxis® Core Academic Skills for Educators Tests (Praxis Core test),² which consists of reading, writing, and math subtests. Students can take the individual subtests at different times and can retake any subtest they do not pass.

UOG School of Education faculty report that many students take the Praxis Core test multiple times before passing but that some students do not persist after multiple unsuccessful attempts. According to UOG faculty, in spring 2018, 42 students applied to the School of Education, but only 8 passed the Praxis Core test on their first attempt. Of those who did not pass on their first attempt, six passed on their second.

UOG officials want to identify the characteristics of students who pass (or do not pass) the Praxis Core test in order to provide more support as students prepare for the test. School of Education faculty recently conducted a qualitative study to learn more about how students prepare for the test, what preparation activities students report have helped them pass the test, and what recommendations students have for UOG to better support them (Santos, 2020). Detailed information about that study is in appendix A.

The current study examines how students' demographic characteristics, high school academic preparation characteristics, and college academic preparation characteristics are related to whether they pass the Praxis Core test and each of its subtests. The study findings will provide GDOE and UOG stakeholders with actionable evidence to support students interested in pursuing an education career while they are in high school and during their first years of college, prior to being admitted to the School of Education. Detailed information about admission to the School of Education, descriptions of and research on the Praxis Core test, and UOG's qualitative study findings appear in appendix A.

2. "Praxis Core test" is used throughout this report to refer to all three subject area subtests (reading, writing, and math). References to an individual subtest, such as the Praxis reading subtest, include the subject area. Students can take any of the subtests individually. The concern motivating this study is whether students passed all three subtests; however, information about success on individual subtests might be important for understanding areas for targeted intervention, so the study team examined outcomes on both the Praxis Core test and its subtests.

Research questions

The study analyzed data on two groups of prospective K–12 teacher candidates who enrolled at UOG between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. Group 1 included only students who graduated from a Guåhan public high school, and group 2 included all students, regardless of the high school from which they graduated. The study used descriptive statistics and conditional inference classification tree analysis to address three research questions:

1. What percentage of prospective K–12 teacher candidates in group 1 and group 2 passed the Praxis Core test and each of its three subtests (reading, writing, and math)?
2. What student demographic and high school academic preparation characteristics predict whether a prospective teacher candidate in group 1 passes the Praxis Core test and each of its three subtests?
3. What student demographic and college academic preparation characteristics predict whether a prospective teacher candidate in group 2 passes the Praxis Core test and each of its three subtests?

Key terms used in this study are defined in box 1. The data sources, sample, and methods are described in box 2 and discussed in detail in appendix B.

Box 1. Key terms

Advanced Placement and honors courses. High school courses designed to challenge students beyond the required curriculum. Advanced Placement courses are college-level classes approved by the College Board that students can take in high school (Guam Department of Education, 2015). Students who pass the end-of-year Advanced Placement exam in a course may receive college credits from the postsecondary institution at which they enroll. Honors courses cover high school–level material but are designed for more advanced students. At Guåhan high schools students can earn grades of up to 110 percent in Advanced Placement and honors courses.

College academic preparation characteristics. Course grades for the seven courses required for admission to the Unibetsedåt Guåhan (University of Guam, UOG) School of Education: Basic Mathematical Applications (MA 110), Introductory College Algebra (MA 115), Mathematics for Elementary School Teachers (MA 150), Introductory Statistics (MA 151), first-year English (EN 110), Writing for Research (EN 111), Introduction to Teaching (ED 110), Human Growth and Development (ED 201), and Fundamentals of Communication (CO 210).

High school academic preparation characteristics. Cumulative high school grade point average, attendance rate across high school math courses, attendance rate across high school English courses, total high school math credits, total high school English credits, total high school Advanced Placement and honors math credits, total high school Advanced Placement and honors English credits, grade 9–12 math course grades by semester, and grade 9–12 English course grades by semester.

Pass rate. The percentage of students who pass a test. The percentage of students who passed an individual Praxis subtest is referred to as the *subtest pass rate*, and the percentage of students who passed all three subtests is referred to as the *overall pass rate*.

Praxis Core Academic Skills for Educators (Praxis Core) test. A test developed by ETS consisting of three standardized subtests in reading, writing, and math. The UOG School of Education requires students to pass all three Praxis subtests for admission (Unibetsedåt Guåhan, n.d.). Students can take all three subtests at the same time or take (or retake) individual subtests at different times to meet the requirement. Because students also must complete 54 credit hours before being admitted to the School of Education, many students take the Praxis Core test within three years of enrolling at UOG, generally during their third year (Unibetsedåt Guåhan, 2020). The reading subtest includes 56 multiple-choice questions on such topics as key ideas and details;

craft, structure, and language skills; and integration of knowledge and ideas. The writing subtest includes 40 multiple-choice questions and two essays focusing on argumentative writing and informative/explanatory writing. The math subtest includes 56 multiple-choice questions focusing on numbers and quantities, algebra, geometry, statistics, probability, and data and interpretation (ETS, 2020).

Student demographic characteristics. For research question 2: high school graduation year, high school graduated from, gender, Pell Grant status (a proxy for socioeconomic status), race/ethnicity, and primary language spoken at home. For research question 3: gender, race/ethnicity, and Pell Grant status.

Box 2. Data sources, sample, and methods

Data sources. The Guam Department of Education (GDOE) and Unibetsedåt Guåhan (University of Guam, UOG) provided the data for this study. Data from GDOE included student demographic and high school academic preparation characteristics. Data from UOG included college academic preparation characteristics; student demographic characteristics, including the high school from which a student graduated (whether it was a Guåhan public high school or another high school); high school cumulative grade point average; Praxis subtest scores; date the student attempted each subtest; grades for college courses that are required for admission to the UOG School of Education; and cumulative college grade point average. A complete list of characteristics examined is in appendix B.

Sample. The study used two analytic samples. The first sample (group 1) comprised 128 students who graduated from one of six Guåhan public high schools between spring 2012 and spring 2017; enrolled as first-time, degree-seeking, full-time students at UOG between fall 2012 and fall 2017; and attempted at least one Praxis subtest within three years of enrolling. This sample was used to answer research questions 1 and 2. The second sample (group 2) comprised 216 students who enrolled as first-time, degree-seeking, full-time students at UOG between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. This sample included students regardless of the high school they attended and was used to answer research questions 1 and 3. All the students in group 1 were included in group 2. The only difference between the samples is group 2 includes 88 students who did not graduate from a public high school on Guåhan.

Methodology. The study team generated descriptive statistics (percentages, means, and standard deviations) for the demographic and academic preparation characteristics of students who graduated from a Guåhan public high school (group 1) and of all UOG students, regardless of the high school from which they graduated (group 2). To analyze which factors predict student success on the Praxis Core test and its subtests, a conditional inference classification tree analysis was used. The study team estimated eight different models (four each for research questions 2 and 3). The models predicted passing the Praxis Core test and passing each of the three subtests individually. All models used academic preparation and student demographic characteristics as predictor variables. Conditional inference classification tree analysis selects a subset of the included predictor variables that best classifies students as those who passed and those who did not. The subset of variables was selected based on the results of permutation tests, a type of a statistical test. The results of the conditional inference classification tree analysis are displayed in figures 3–11 in the main text, which present the groups of students and variable cutoffs as determined by the models. Results of conditional inference classification tree analysis, despite its name, are descriptive, not inferential. In other words, one cannot claim the student demographic and academic preparation characteristics analyzed caused the pass rates. Full results of the analysis are in appendix C.

More information on the data sources, sample, and methodology is in appendix B.

Limitations. The results should be interpreted with caution, as they might not apply to all students enrolling at UOG—such as nontraditional or part-time UOG students, who did not meet the inclusion criteria. In addition, the study team could use only the variables available in the administrative data, some of which might have been measured with error or have other quality concerns. For instance, the proxy for socioeconomic status (Pell Grant status) might underestimate the number of economically disadvantaged students. In addition, data on course absences might have been calculated differently from course to course or across high schools.

More information on the study limitations is in appendix B.

Findings

This section describes the findings for prospective K–12 teacher candidates related to the three research questions addressed in the study. Additional results are in appendix C.

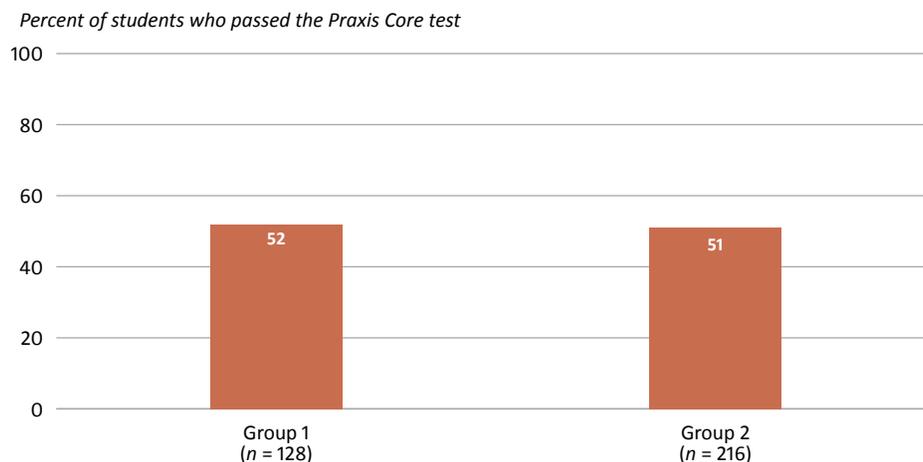
Over half the students in both groups passed the Praxis Core test (passed all three subtests) within three years of enrolling at the Unibetsedåt Guåhan

Among students who graduated from a Guåhan public high school and attempted a Praxis subtest within three years of enrolling at UOG (group 1), 52 percent passed all three subtests (reading, writing, and math), thereby meeting the admissions requirement for the School of Education (figure 1). The overall pass rate was similar among all students, regardless of the high school from which they graduated, who enrolled at UOG and attempted a subtest (group 2; 51 percent).

Students were less likely to pass the Praxis math subtest than the reading or writing subtest

About 79 percent of students who graduated from a Guåhan public school (group 1) passed the Praxis reading subtest, 72 percent passed the writing subtest, and 61 percent passed the math subtest (figure 2); these pass rates were higher than the overall pass rate (52 percent; see figure 1).³ The results were similar among all students, regardless of the high school from which they graduated (group 2).

Figure 1. About 52 percent of graduates from Guåhan public high schools who attempted the Praxis Core test and 51 percent of graduates from all high schools who attempted the Praxis Core test passed it

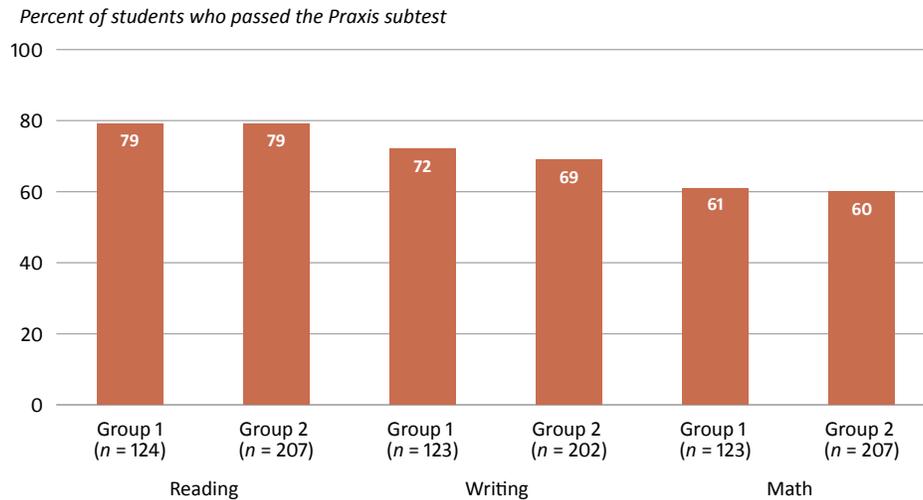


Note: Group 1 refers to students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted at least one Praxis subtest within three years of enrolling. Group 2 refers to all students, regardless of the high school from which they graduated, who enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. Descriptive statistics were used to determine the percentage of students who passed each subtest. See table C1 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

3. The overall pass rate is lower than the pass rate for each subtest because students can take subtests individually. The sample size for the Praxis Core test is larger than the sample sizes for the individual subtests because it includes students who took at least one subtest, while the sample sizes for the individual subtests include only students who attempted the specific subtest.

Figure 2. Students had higher pass rates on the Praxis reading and writing subtests than on the math subtest



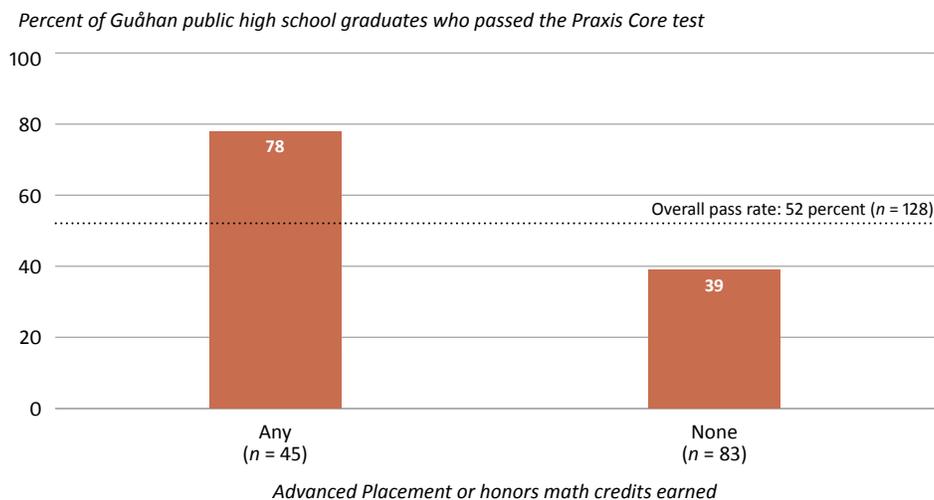
Note: Group 1 refers to students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted at least one Praxis subtest within three years of enrolling. Group 2 refers to all students, regardless of the high school from which they graduated, who enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. Descriptive statistics were used to determine the percentage of students who passed each subtest. See table C1 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

Guåhan public high school graduates who earned any Advanced Placement or honors math credits had a higher pass rate on the Praxis Core test than the overall pass rate for all group 1 students

Guåhan public high school graduates (group 1) who earned any Advanced Placement or honors math credits had an overall pass rate of 78 percent on the Praxis Core test (figure 3), which exceeded the overall pass rate for all

Figure 3. Among Guåhan public high school graduates, those who earned any Advanced Placement or honors math credits passed the Praxis Core test at a higher rate than those who did not earn any Advanced Placement or honors math credits



Note: A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .001$. The sample refers to group 1, which included students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted at least one of the Praxis Core subtests within three years of enrolling. A conditional inference classification tree was used to determine that earning high school Advanced Placement or honors math credits was a predictor variable for passing the Praxis Core test. See figure C1 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

group 1 students (52 percent; see figure 1). Among Guåhan public high school graduates who did not earn any Advanced Placement or honors math credits, 39 percent passed the Praxis Core test.

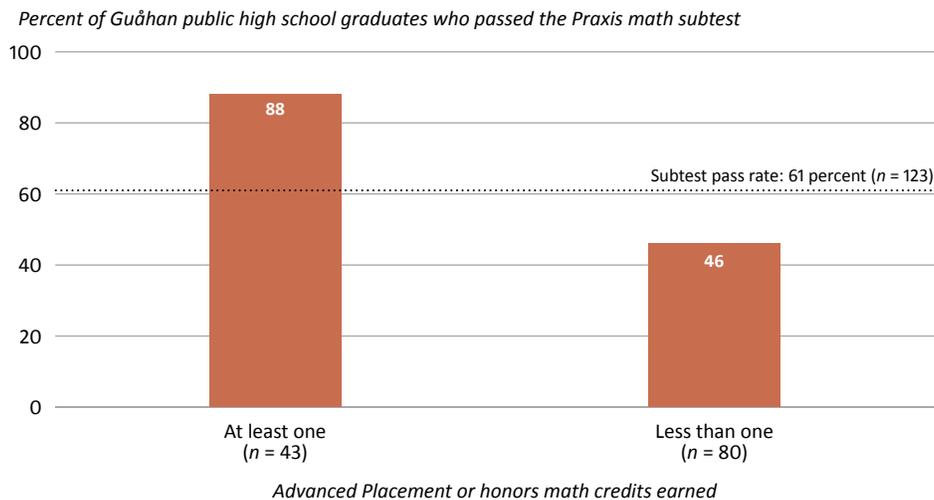
Guåhan public high school graduates who earned at least one Advanced Placement or honors math credit were more likely than graduates who earned less than one Advanced Placement or honors math credit to pass the Praxis math subtest

In most Guåhan public high schools, students earn half a credit for each semester of an Advanced Placement or honors math course that they pass. Among Guåhan public high school graduates (group 1), 88 percent of those who earned at least one Advanced Placement or honors math credit passed the Praxis math subtest compared with 46 percent of those who earned less than one Advanced Placement or honors math credit (figure 4). The pass rate for students who earned at least one Advanced Placement or honors math credit (88 percent) was also higher than the subtest pass rate for all group 1 students (61 percent; see figure 2).

Guåhan public high school graduates who earned a grade of 92 percent or higher in the second semester of grade 10 English were more likely than graduates who earned a lower grade to pass the Praxis reading subtest

Guåhan public high school graduates (group 1) who earned a grade of 92 percent or higher in the second semester of grade 10 English had a pass rate of 87 percent on the Praxis reading subtest (figure 5), which was higher than the subtest pass rate for all group 1 students (79 percent; see figure 2). Students who earned a grade of 91 percent or lower had a pass rate of 54 percent.

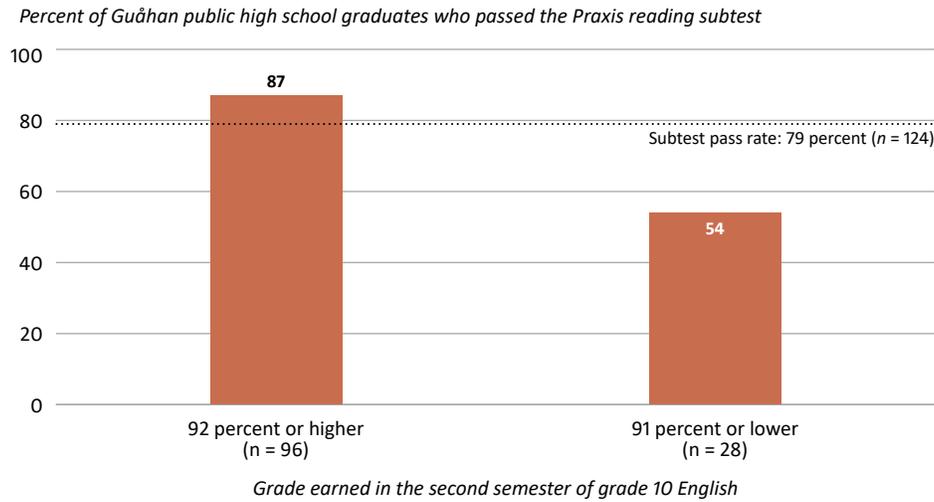
Figure 4. Among Guåhan public high school graduates, those who earned at least one Advanced Placement or honors math credit passed the Praxis math subtest at a higher rate than those who earned less than one Advanced Placement or honors math credit



Note: In most Guåhan public high schools, students earn half a credit for each semester of an Advanced Placement or honors math course that they pass. A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .001$. The sample refers to group 1, which included students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted the Praxis math subtest within three years of enrolling. A conditional inference classification tree was used to determine that earning at least one Advanced Placement or honors math credit was a predictor variable for passing the subtest. See figure C4 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

Figure 5. Among Guåhan public high school graduates, those who earned a grade of 92 percent or higher in the second semester of grade 10 English had a higher pass rate on the Praxis reading subtest than those who earned a grade of 91 percent or lower



Note: In most Guåhan public high schools students earn half a credit for each semester of a high school course that they pass, and course grades are reported by semester. A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .001$. The sample refers to group 1, which included students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted the Praxis reading subtest within three years of enrolling. A conditional inference classification tree was used to determine that the grade earned in the second semester of grade 10 English was a predictor variable for passing the subtest. See figure C2 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

Guåhan public high school graduates who earned a grade of 103 or higher in the second semester of grade 10 English were more likely than graduates who earned a lower grade to pass the Praxis writing subtest

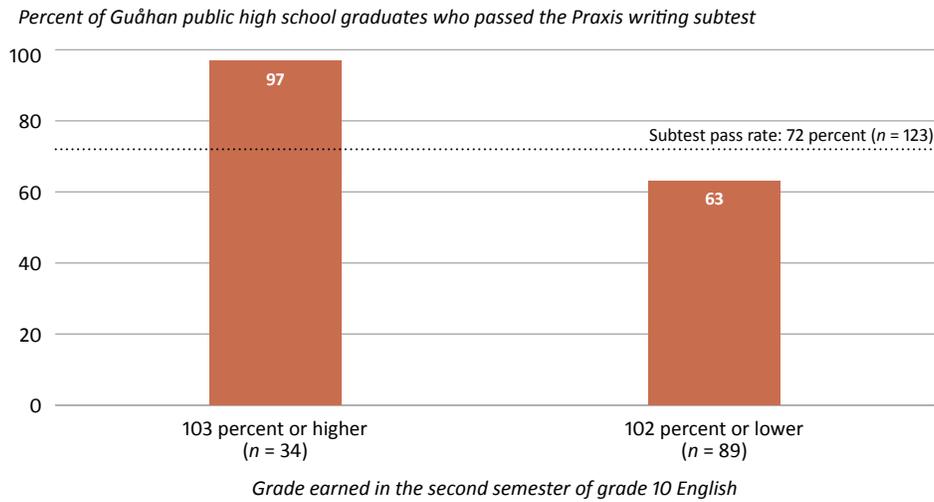
Guåhan public high school graduates (group 1) who earned a grade of 103 percent⁴ or higher in the second semester of grade 10 English had a pass rate of 97 percent on the Praxis writing subtest (figure 6). Students can earn a grade from 0 to 110 percent in honors courses, so the findings show that students who enrolled and performed well in honors grade 10 English were more likely to pass the writing subtest than students who did not perform well in the course. The pass rate for students who earned a grade of 102 percent or lower in the second semester of grade 10 English was 63 percent.

Unibetsedåt Guåhan students who did not receive a Pell Grant had a higher overall pass rate on the Praxis Core test than students who received a Pell Grant

Among all students, regardless of the high school from which they graduated, who enrolled full-time at UOG between fall 2012 and fall 2017 (group 2), those who did not receive a Pell Grant (used as a proxy for socioeconomic status) had an overall pass rate of 59 percent on the Praxis Core test compared with 44 percent for students who received a Pell Grant (figure 7). Students who did not receive a Pell grant also had a higher pass rate than all group 2 students (51 percent; see figure 1).

4. Course grades at Guåhan public high schools range from 0 to 110 for Advanced Placement and honors courses and from 0 to 100 for non-Advanced Placement and nonhonors courses. Courses that have both nonhonors and honors versions were combined in the analysis, but the original grade scales were kept. Appendix B provides more information about the variables used in this study.

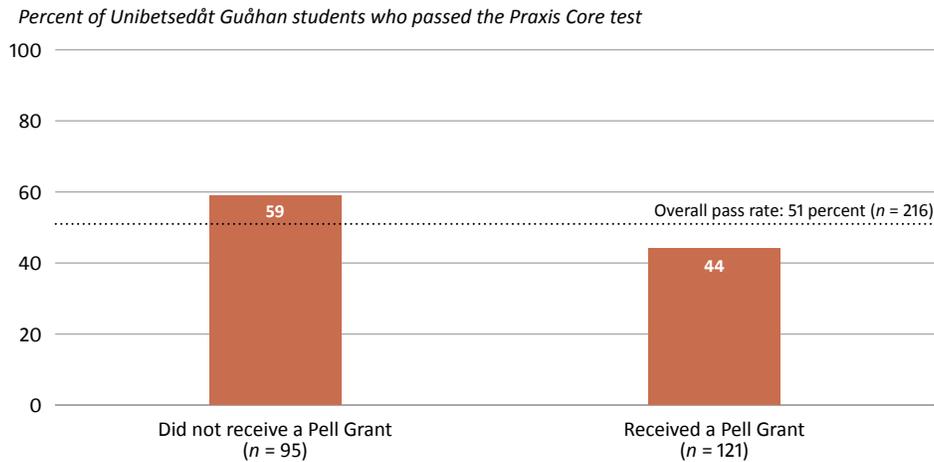
Figure 6. Among Guåhan public high school graduates, those who earned a grade of 103 percent or higher in the second semester of grade 10 English had a higher pass rate on the Praxis writing subtest than those who earned a grade of 102 percent or lower



Note: In most Guåhan public high schools students earn half a credit for each semester of a high school course that they pass, and course grades are reported by semester. Honors courses allow students to earn a grade of up to 110 percent, and nonhonors courses allow students to earn a grade of up to 100 percent. A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .001$. The sample refers to group 1, which included students who graduated from a Guåhan public high school, enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017, and attempted the Praxis writing subtest within three years of enrolling. A conditional inference classification tree was used to determine that the grade earned in the second semester of grade 10 English was a predictor variable for passing the subtest. See figure C3 in appendix C for detailed results.

Source: Authors' analysis of data from the Guam Department of Education and Unibetsedåt Guåhan.

Figure 7. Unibetsedåt Guåhan students who did not receive a Pell Grant had a higher overall pass rate on the Praxis Core test than students who received a Pell Grant



Note: A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .05$. The sample refers to group 2, which included all students, regardless of the high school from which they graduated, who enrolled at Unibetsedåt Guåhan between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. A conditional inference classification tree was used to determine that Pell Grant status (a proxy for socioeconomic status) was a predictor variable for passing the Praxis Core test. See figure C5 in appendix C for detailed results.

Source: Authors' analysis of data from Unibetsedåt Guåhan.

Among Unibetsedât Guåhan students who did not receive a Pell Grant, those who earned a grade of B or higher in first-year college English had a higher overall pass rate on the Praxis Core test than those who earned a grade of C or lower

Among all students, regardless of the high school from which they graduated, who enrolled full-time at UOG between fall 2012 and fall 2017 (group 2) and did not receive a Pell Grant, those who earned a grade of B or higher in first-year college English (EN 110) had an overall pass rate of 69 percent on the Praxis Core test compared with 43 percent for those who earned a grade of C or lower (figure 8).

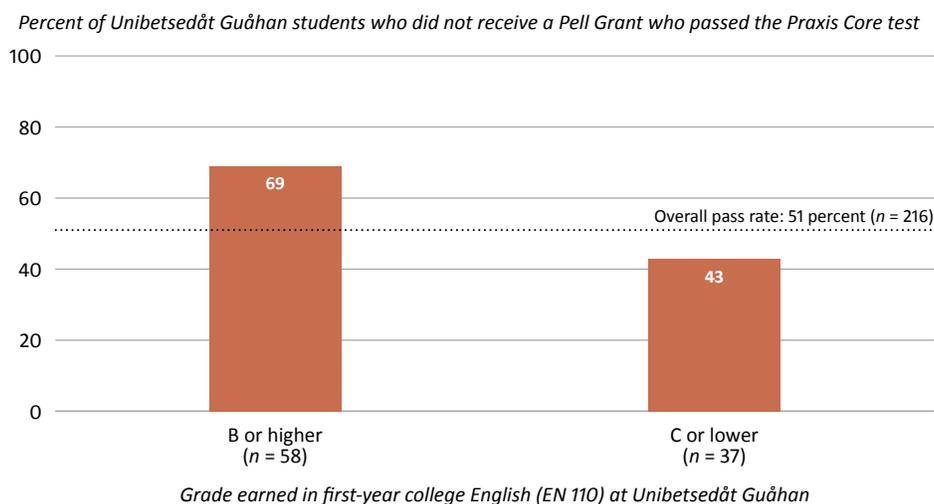
Male students at Unibetsedât Guåhan had a higher pass rate on the Praxis reading subtest than female students; among female students, those who did not receive a Pell Grant outperformed those who did

Among all students, regardless of the high school from which they graduated, who enrolled full-time at UOG between fall 2012 and fall 2017 (group 2), the pass rate on the Praxis reading subtest was 92 percent for male students compared with 75 percent for female students (figure 9). The pass rate on the reading subtest for all group 2 students was 79 percent (see figure 2), which male students exceeded but female students did not. Among female students, the pass rate was 67 percent for those who received a Pell Grant compared with 85 percent for those who did not, both of which exceeded the subtest pass rate for all group 2 students.

Unibetsedât Guåhan students who earned a grade of A in Human Growth and Development had a higher passing rate on the Praxis writing subtest than students who earned a lower grade

Among all students, regardless of the high school from which they graduated, who enrolled full-time at UOG between fall 2012 and fall 2017 (group 2), those who earned a grade of A in Human Growth and Development (ED 201) had a pass rate of 83 percent on the Praxis writing subtest (figure 10), which exceeded the subtest pass rate

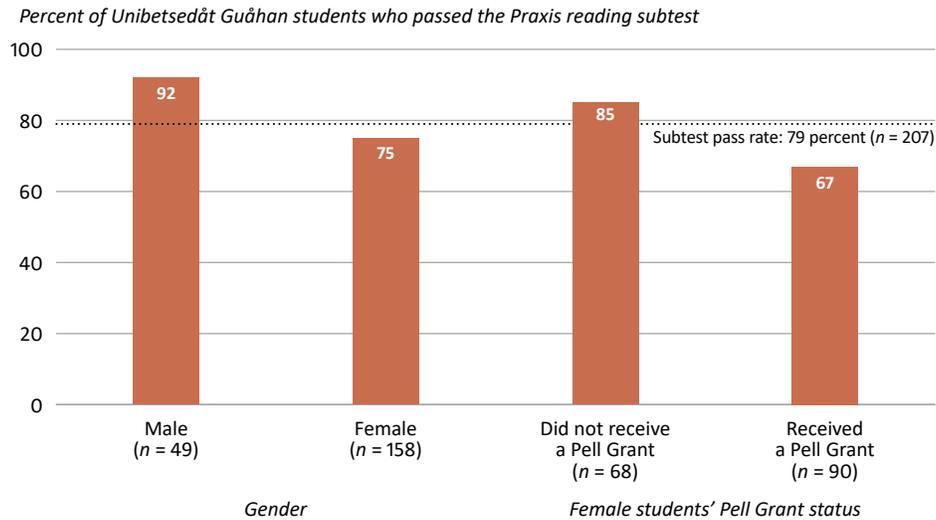
Figure 8. Among Unibetsedât Guåhan students who did not receive a Pell Grant, those who earned a grade of B or higher in first-year college English (EN 110) had a higher overall pass rate on the Praxis Core test than those who earned a grade of C or lower



Note: A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .05$. The sample refers to group 2, which included all students, regardless of the high school from which they graduated, who enrolled at Unibetsedât Guåhan between fall 2012 and fall 2017 and attempted at least one Praxis subtest within three years of enrolling. A conditional inference classification tree was used to determine that Pell Grant status (a proxy for socioeconomic status) and first-year college English grade were predictor variables for passing the Praxis Core test. See figure C5 in appendix C for detailed results.

Source: Authors' analysis of data from Unibetsedât Guåhan.

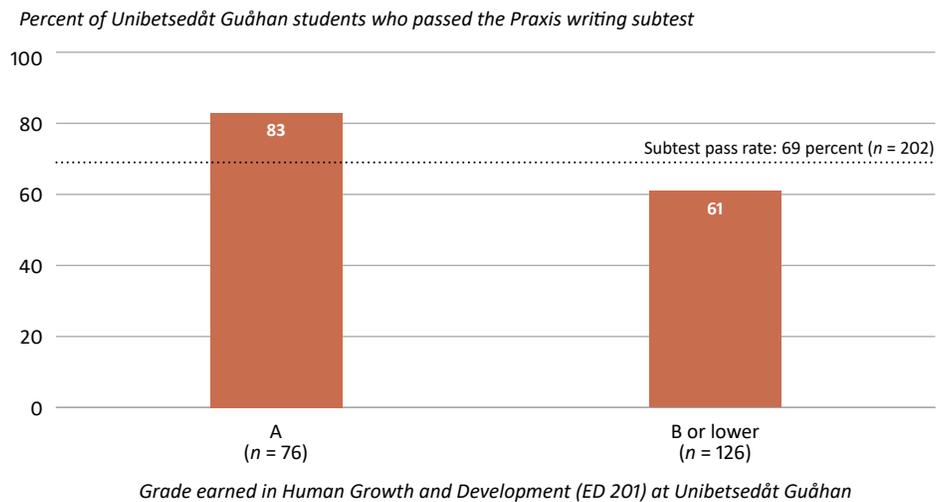
Figure 9. Male students at Unibetsedât Guáhan had a higher pass rate on the Praxis reading subtest than female students, and female students who did not receive a Pell Grant had a higher pass rate than female students who received a Pell Grant



Note: Post-hoc chi-square tests indicated that the pass rates for the identified groups were statistically significantly different at $p < .05$. The sample refers to group 2, which included all students, regardless of the high school from which they graduated, who enrolled at Unibetsedât Guáhan between fall 2012 and fall 2017 and attempted the Praxis reading subtest within three years of enrolling. A conditional inference classification tree was used to determine that gender and Pell Grant status (a proxy for socioeconomic status) were predictor variables for passing the subtest. See figure C6 in appendix C for detailed results.

Source: Authors' analysis of data from Unibetsedât Guáhan.

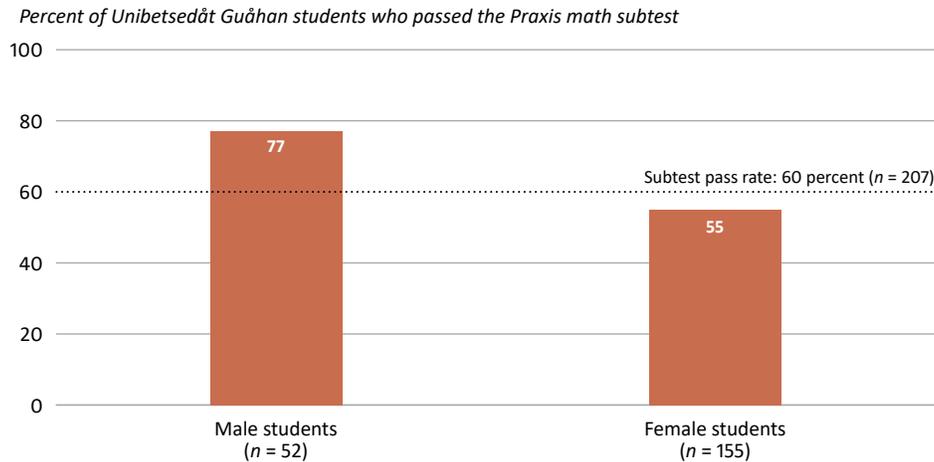
Figure 10. Unibetsedât Guáhan students who earned a grade of A in Human Growth and Development (ED 201) had a higher pass rate on the Praxis writing subtest than students who earned a grade of B or lower



Note: A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .01$. The sample refers to group 2, which included all students, regardless of the high school from which they graduated, who enrolled at Unibetsedât Guáhan between fall 2012 and fall 2017 and attempted the Praxis reading subtest within three years of enrolling. A conditional inference classification tree was used to determine that the grade earned in Human Growth and Development was a predictor variable for passing the subtest. See figure C7 in appendix C for detailed results.

Source: Authors' analysis of data from Unibetsedât Guáhan.

Figure 11. Male students at Unibetsedât Guáhan had a higher pass rate on the Praxis math subtest than female students



Note: A post-hoc chi-square test indicated that the pass rates for the identified groups were statistically significantly different at $p < .01$. The sample refers to group 2, which included all students, regardless of the high school from which they graduated, who enrolled at Unibetsedât Guáhan between fall 2012 and fall 2017 and attempted the Praxis math subtest within three years of enrolling. A conditional inference classification tree was used to determine that gender was a predictor variable for passing the subtest. See figure C8 in appendix C for detailed results.

Source: Authors' analysis of data from Unibetsedât Guáhan.

for all group 2 students (69 percent; see figure 2). Students who earned a grade of B or lower had a pass rate of 61 percent.

Male students at Unibetsedât Guáhan were more likely than female students to pass the Praxis math subtest

Male students, regardless of the high school from which they graduated, who enrolled full time at UOG between fall 2012 and fall 2017 (group 2) had a pass rate of 77 percent on the Praxis math subtest, while female students had a pass rate of 55 percent (figure 11).

Limitations

One limitation of this study is that it is descriptive in nature. The findings do not indicate that student pass rates are caused by certain demographic or academic preparation characteristics. For example, although students who received a Pell Grant had a lower pass rate, receiving a Pell Grant did not cause students to perform poorly.

Another limitation is that the analyses were based on small samples. The findings might have identified relationships among variables that pertain to the specific analytic samples used in the study and might not be applicable to larger or more diverse samples. In a related vein the large extent of missing data on other variables might have contributed to findings that are less robust. Larger and more complete datasets might provide more robust findings that yield a better understanding of the relationship between student demographics and academic characteristics and passing rates on the Praxis Core test.

A final limitation is that conditional inference classification tree models, the analytic method used to answer research questions 2 and 3, can be affected by small changes in the independent variables (for example, student course grades) and are prone to overfitting the data (too closely matching the original dataset), which limits the generalizability of the results. Although the study team's data analysis methods might have mitigated some of these effects (see appendix B), the results might not be generalizable to all students graduating from a public high

school on Guñhan or all students wishing to be admitted into the School of Education. Additionally, the sensitivity of the models to small changes means that the models might be sensitive to how the predictor variables are coded. The results of the study depend on the coding used for each variable, and different coding schemes might lead to different results.

Implications

The study findings have several implications for supporting prospective K–12 teacher candidates at UOG, who take the Praxis Core to meet the admissions requirement for the teacher preparation program. The findings suggest that enrolling in Advanced Placement and honors math courses during high school, high school and UOG course grades, Pell Grant status, and student gender are predictors of passing the Praxis Core test and its subtests. Given these findings, GDOE and UOG might consider the following:

- *Understanding which Praxis subtests students are more likely to struggle to pass and, to the extent that the Praxis Core test measures knowledge that teacher candidates need to know in order to become successful classroom educators, ensuring curricula are designed to build that knowledge.* For example, since students are less likely to pass the math subtest than the reading or writing subtest, math instructors at both the high school and university levels might want to consider putting more emphasis on the topics covered by the math subtest. Educators also could develop formative assessment systems that identify when students are struggling and allow for additional teaching in the areas that students find difficult.
- *Exploring how to offer resources⁵ (test preparation materials) and supports (study groups, mentorship programs, supplemental instruction) that provide students with the knowledge they need for a career in education or other career pathways.* Prior research on increasing the success rates of vulnerable populations on the Praxis Core test suggests a three-pronged approach that includes a structured program, coursework, and supplemental instruction (McAdoo & Harrison, 2018). UOG faculty might want to review that approach to determine whether the School of Education could adapt any of the strategies to the local context. UOG students might benefit from having more information about the Praxis Core test earlier in their college experience so they can better prepare and decide whether teaching is the right path for them (Santos, 2020). Educators at UOG might consider creating an early warning system to identify whether students who enroll in prerequisite education courses (an indication of intent to enroll in the School of Education) are at risk of not passing the Praxis Core test, so that appropriate supports can be provided. Several Praxis Core test preparation resources are available for students, and educators might want to encourage students to review practice materials available through the ETS website (<https://www.ets.org/praxis/prepare>). ETS offers free practice preparation materials, strategies and tips, and advice for creating a study plan.
- *Conducting research on the extent to which the courses identified in this study are beneficial to passing the Praxis Core test (that is, Advanced Placement and honors math and grade 10 English).* A review of courses identified by the analyses as predictors of passing the Praxis subtests could shed light on the extent to which the knowledge and skills obtained in these classes align with the Praxis Core test content or prepare students to succeed in academic tasks, such as passing the tests.
- *Conducting research into why Pell Grant recipients and female students are less successful on Praxis subtests than non–Pell Grant recipients and male students, despite similar academic preparation.* Most UOG students are female and receive Pell Grants. This same population of students is among those who are least successful at passing the Praxis reading subtest. Similarly, female students at UOG are less likely than male students to pass the math subtest. Understanding what factors contribute to these disparities, even when academic preparation is controlled for, could help identify targeted resources and supports that increase the number of UOG students who pass.⁶

5. The School of Education currently offers a Student Success Grant to financially support students with Praxis Core test preparation and registration fees. During the 2019/20 academic year 16 undergraduate and 9 graduate students were awarded the \$150 grant. Grant funding was derived from the annual Giving Tuesday drive, coordinated by UOG Endowment Foundation.

6. This assumes staff will have knowledge of Pell Grant status.

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