



Outcomes for Teachers with Graduate Degrees in North Carolina Public Schools

In this policy brief, we assess the relationships between graduate degrees and teacher value-added, evaluation ratings, and retention in North Carolina public schools (NCPS). In comparison to teachers with undergraduate degrees only we find that: (1) teachers with a graduate degree in their area of teaching are significantly more effective in mathematics; (2) in five comparisons, concentrated in middle and high school grades, teachers are significantly more effective after earning a graduate degree than they were prior to graduate degree completion; (3) graduate degree holders are significantly less effective in six of the ten comparisons examined; (4) graduate degree holders earn significantly higher evaluation ratings; and (5) while graduate degree holders are more likely to exit NCPS, overall, those with a graduate degree in education are more likely to stay. Together the evidence suggests that:

1. Graduate degrees in teachers' area of teaching have positive impacts on student achievement and teacher development.
2. Differences in value-added estimates and evaluation ratings between graduate degree holders and undergraduates are relatively small and conflicting.
3. Outcomes for graduate degree holders do not lend themselves to straightforward policy prescriptions; efforts to both reward effective teachers and incentivize teachers to pursue additional learning will require nuance and a thorough understanding of research evidence.

Introduction

States and school districts frequently seek approaches to enhance teachers' knowledge, skills, and the quality of their instructional practices. While education officials and practitioners have instituted many policies and reforms towards this end, one long-standing approach has been to incentivize teachers to acquire additional credentials that may improve their teaching practices. Most notably, many states and school districts provide permanent salary increases for teachers that earn a graduate degree or become Nationally Board Certified (NBC). In recent years, however, these pay increases for graduate degree holders have faced critical attention as states and school districts experience financial shortfalls and research evidence questions the impacts of graduate degrees on teacher

value-added. A small number of school districts and states, including North Carolina, have now limited or ended pay increases for graduate degrees. More than ever, high-quality research evidence is needed to better understand the impact of graduate degrees on a range of policy relevant teacher outcomes. Therefore, in this policy brief, the Education Policy Initiative at Carolina (EPIC) assesses the relationships between graduate degrees and teacher value-added, evaluation ratings, and persistence in North Carolina public schools (NCPS). By examining multiple teacher outcome measures and the content-area of graduate degrees, this policy brief provides a more complete and nuanced perspective of graduate degree impacts.

Background

Beginning in the 1997-98 school year, North Carolina instituted 12 percent pay increases for NBC teachers; shortly thereafter, in the 2000-01 school year, the state also instituted 10, 15, and 20 percent pay increases for teachers with masters, specialist, or doctoral degrees.¹ These policies had substantial impacts on teacher pay in the state—by 2012-13, approximately 13 and 36 percent of North Carolina’s 96,000 teachers were NBC or held a graduate degree. In the time since these salary reforms, research evidence connecting teacher credentials to teacher value-added estimates has generally shown that NBC teachers are more effective than their non-NBC peers and that, with a few exceptions, graduate degree holders are no more effective than peers with an undergraduate degree only. Given this research and the budgetary impacts of the Great Recession, in 2013, the North Carolina General Assembly eliminated pay increases for graduate degree attainment. Teachers who already had a graduate degree or those who had completed at least one graduate-level course by August 1, 2013, would continue to receive or be eligible to earn salary increases. All other graduate degrees would not result in salary increases.

Due to data availability, the research on graduate degree impacts has generally been limited in two important ways. First, researchers have focused on teacher value-added, rather than a more comprehensive set of teacher outcomes. Second, researchers have estimated overall impacts of graduate degrees, rather than estimating results for specific graduate degree content-areas. This second concern is particularly salient, given the possibility of reinstating graduate degree pay for in-area graduate degrees (e.g. for mathematics teachers earning a graduate degree in mathematics).

To address these limitations, we use data provided by the North Carolina Department of Public Instruction (NCDPI) and the University of North Carolina General

Administration (UNCGA) to examine teacher value-added, evaluation ratings, and persistence and to code graduate degrees in four ways. Specifically, we perform (1) overall analyses, comparing all graduate degree holders to teachers with undergraduate degrees only; (2) timing analyses, comparing those with graduate degrees earned prior to and after their entry into teaching to teachers with undergraduate degrees only; (3) content-area analyses, comparing those with graduate degrees in particular content or grade-level areas (e.g. elementary, science) to teachers with undergraduate degrees only; and (4) in-area analyses, comparing those with a graduate degree in their area of teaching or outside their area of teaching to teachers with undergraduate degrees only.² These content-area and in-area analyses improve on the status quo in graduate degree research, but are still limited since we can only code the content-area of graduate degrees for UNC system institution graduates and for a limited number of North Carolina private university graduates.³ While we do not exclude teachers from the content-area and in-area analyses whose graduate degree content is unknown, we stress that it is unclear whether results would be the same if we could code the content-area for all teachers with graduate degrees.

We run teacher value-added and persistence analyses using data from the 2005-06 through 2012-13 school years and evaluation rating analyses for the 2010-11 through 2012-13 school years. In these analyses we include teachers with all experience levels and control for a rich set of covariates to better isolate the impact of graduate degrees. Given the policy relevance of this research, we also report estimates for NBC teachers. This allows readers to compare the magnitude of results for these key teacher credentials that have traditionally been associated with salary increases.⁴ In the following sections, we provide more detail on our research objectives and methods.

¹ Prior to 2000-01, pay increases for masters, specialist, and doctoral degrees were approximately 6.20, 11.50, and 16.70 percent, respectively.

² We estimate these in-area graduate degree models for teacher value-added only.

³ Data for the UNC system institutions cover the early 1980s to present and include graduate degrees earned in colleges and schools of education and graduate degrees earned in other colleges, schools, and departments. In our teacher sample we can classify approximately 90 percent of graduate degrees earned at UNC system institutions. Data for NC private universities are from 2000-01 to present and cover graduate degrees earned at colleges and schools of education only.

⁴ Our models do not formally test for differences between graduate degree holders and NBC teachers—graduate degree holders are compared with undergraduates and NBC teachers are compared with their non-NBC peers.

Are graduate degree holders more effective than their peers with undergraduate degrees?

Given the outlay of public funds to pay for graduate degree salary increases, states and school districts have an interest in knowing whether graduate degree holders impact a primary schooling outcome—student achievement. Therefore, we estimate 10 value-added models across North Carolina’s End-of-Grade and End-of-Course exams to assess the extent to which students taught by graduate degree holders experience larger achievement gains than their peers taught by teachers with undergraduate degrees only.⁵

The top panel of Table 1 shows that in six comparisons—elementary grades reading, 5th grade science, middle grades reading, high school math, high school science, and high school social studies—teachers with graduate degrees are significantly less effective, on average, than peers with undergraduate degrees only. We note, however, that many of these negative results are small—less than one percent of a standard deviation of student achievement. By comparison, the bottom panel of Table 1 indicates that NBC teachers are significantly more effective than non-NBC peers in all subject-area/grade-level comparisons. Results from the graduate degree timing analyses show that the magnitude of many of the negative graduate degree results is larger for teachers earning graduate degrees prior to, rather than after, entry into teaching. For example, in four comparisons, those earning a graduate degree before entry into teaching are significantly less effective than undergraduate degree holders, while those with a graduate degree post-entry into teaching perform comparably. Lastly, teachers with a graduate degree in their area of teaching are significantly more effective in elementary, middle, and high school mathematics and high school English. These mathematics results are consistent with previous analyses showing that teachers with graduate degrees in mathematics perform better in that subject-area.

Does the process of earning a graduate degree improve teacher effectiveness?

While a key policy concern is whether graduate degree holders are more effective than peers with an undergraduate degree only, an important, related question is whether the process of earning a graduate degree improves teacher performance. Essentially, is a teacher more effective after earning a graduate degree than she was before?⁶

Overall, the top panel of Table 2 shows that after earning a graduate degree teachers are significantly more effective in five comparisons—5th grade science, middle grades math, 8th grade science, high school English, and high school science. Teachers earning a graduate degree in their area of teaching have similar positive results concentrated in middle and high school grades with one negative result in elementary grades math. In contrast, the bottom panel of Table 2 indicates that teachers are no more effective after becoming NBC than they were prior to completing those credentialing requirements.

Do graduate degree holders have higher evaluation ratings than peers with undergraduate degrees?

A significant contribution of this research is its move beyond teacher value-added to examine relationships between graduate degree status and teacher evaluation ratings on the North Carolina Professional Teaching Standards. Compared to value-added, evaluation ratings entail two important advantages: they are available for a large percentage of the teacher workforce and they provide data on specific teaching practices (e.g. classroom management). In North

⁵ For these analyses we estimate two types of models: (1) a multi-level model with students nested within classrooms and schools and (2) a school fixed effects model, comparing the effectiveness of teachers working in the same schools. We present results from the multi-level model and note when results from the school fixed effects model significantly differed.

⁶ We estimate these value-added models with a teacher fixed effect controlling for a rich set of student, classroom, teacher, and school characteristics.

Table 1: Are Graduate Degree Holders More Effective than Peers with an Undergraduate Degree Only?

Teacher Credentials	Elementary School Math	Elementary School Reading	5th Grade Science	Middle School Math	Middle School Reading	8th Grade Science	High School Math	High School English	High School Science	High School Social Studies
Overall Analyses										
Graduate Degree	-0.002	-0.003*	-0.009**	0.002	-0.005**	-0.008	-0.010*	0.003	-0.014**	-0.009*
Timing Analyses										
Pre-Entry	-0.004	-0.008**	-0.011*	-0.006	-0.004*	-0.014*	-0.015*	0.001	-0.020**	-0.009
Post-Entry	-0.001	-0.001	-0.009*	0.006*	-0.006**	-0.005	-0.007	0.004	-0.007	-0.009
Content-Area Analyses										
Elementary	0.010**	0.003	-0.007	0.047**	0.016**	0.051	-0.014	0.002	---	---
Mathematics	-0.002	0.030	0.027	0.023**	-0.033*	0.114*	0.022**	---	0.054	---
English/Reading	0.014*	-0.000	-0.007	0.060**	-0.005*	0.054	---	0.006*	---	-0.074
Science	0.010	-0.008	0.015	0.027*	0.005	0.012	-0.007	---	0.009	-0.025
Social Studies	-0.026	-0.020	---	0.006	-0.011	-0.060*	---	0.016	---	-0.006
Special Education	-0.008	0.012	-0.023	-0.018	-0.028**	-0.001	-0.012	-0.023	0.094	0.061*
Administration	-0.012	-0.003	-0.028*	-0.010	-0.022**	0.008	-0.015	-0.008	-0.008	-0.005
Other	-0.018**	-0.004	-0.014	0.001	-0.006	-0.029	-0.046**	-0.009	0.012	0.016
Unclassifiable	-0.006**	-0.005**	-0.009*	-0.003	-0.005**	-0.013*	-0.019**	0.003	-0.029**	-0.012*
In-Area Analyses										
In-Area	0.010**	0.003	-0.006	0.041**	0.003	0.012	0.022**	0.006*	0.009	-0.006
Out-Area	-0.004	-0.001	-0.016*	0.003	-0.013**	0.003	-0.025**	-0.010*	0.015	-0.006
NBC Teacher Analyses										
NBC Teacher	0.029**	0.007**	0.024**	0.039**	0.014**	0.053**	0.058**	0.016**	0.065**	0.042**

Note: Cells in this table report differences in adjusted-average student achievement between teachers with a graduate degree and those who have undergraduate degrees only (for NBC teachers, results are in comparison to non-NBC peers). Cells with dashed lines have too few teachers to report estimates. *, *, and ** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 2: Does The Process of Earning a Graduate Degree Improve Teacher Effectiveness?

Teacher Credentials	Elementary School Math	Elementary School Reading	5th Grade Science	Middle School Math	Middle School Reading	8th Grade Science	High School Math	High School English	High School Science	High School Social Studies
Overall Analyses										
Graduate Degree	0.002	0.002	0.023⁺	0.010[*]	0.006	0.026⁺	0.003	0.014[*]	0.024^{**}	0.001
Content-Area Analyses										
Elementary	-0.015⁺	-0.009	0.031	-0.037	0.001	-0.057	---	0.014	---	---
Mathematics	-0.006	0.048⁺	0.134^{**}	0.002	-0.035^{**}	-0.244^{**}	-0.000	---	-0.169^{**}	---
English/Reading	0.048^{**}	0.008	-0.002	0.073[*]	0.012⁺	0.220^{**}	---	0.023[*]	---	-0.079
Science	-0.105	-0.068⁺	-0.021	0.002	0.015	0.115^{**}	-0.211^{**}	---	0.031⁺	-0.028
Social Studies	-0.104	0.059	---	0.086⁺	-0.032	0.004	---	---	---	-0.003
Special Education	0.020	0.037	-0.116⁺	0.021	0.013	0.027	-0.011	-0.044	-0.079	-0.207
Administration	0.007	0.021⁺	-0.007	-0.003	-0.006	0.008	0.010	0.010	0.026	0.008
Other	-0.020	0.008	0.065⁺	0.024⁺	0.003	0.082⁺	0.002	0.019	0.019	0.018
Unclassifiable	0.004	0.003	0.017	0.014[*]	0.005	0.012	0.006	-0.005	0.018	-0.003
In-Area Analyses										
In-Area	-0.013⁺	-0.003	0.031	0.018⁺	0.014[*]	0.114^{**}	-0.000	0.023[*]	0.031⁺	-0.003
Out-Area	0.010	0.014[*]	0.022	-0.000	-0.003	0.022	-0.005	0.020	0.021	0.005
NBC Teacher Analyses										
NBC Teacher	-0.002	-0.000	0.002	-0.002	0.004	-0.018	-0.001	-0.006	-0.029^{**}	0.002

Note: Comparing within teachers, cells in this table report differences in adjusted-averaged student achievement before and after teachers earn a graduate degree (for NBC teachers, results compare within teachers before and after earning NBC). Cells with dashed lines have too few teachers to report estimates. ⁺, ^{*}, and ^{**} indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Carolina, principals use classroom observations and other teaching artifacts to rate teachers as either not demonstrated, developing, proficient, advanced, or distinguished on five teaching standards—Leadership, Classroom Environment, Content Knowledge, Facilitating Student Learning, and Reflecting on Practice. We use these ratings to assess whether graduate degree holders have higher levels of instructional practice quality, as judged by school principals, than peers with undergraduate degrees only.⁷

Table 3 shows that across evaluation standards, teachers with graduate degrees earn significantly higher evaluation ratings than their peers with undergraduate degrees only. These significant results hold for models examining graduate

degrees earned pre- and post-entry into teaching and for graduate degrees in specific content areas. Table 3 also shows that for all five teaching standards, NBC teachers earn significantly higher evaluation ratings than their non-NBC peers. To better convey the magnitude of these evaluation rating differences, Figure 1 displays predicted probabilities of earning a rating of developing, proficient, advanced, or distinguished for the Facilitating Student Learning standard. Overall, approximately 59 percent of undergraduates earn evaluation ratings in the top two categories—advanced or distinguished. By comparison, approximately 62 percent of graduate degree holders and 75 percent of NBC teachers earn evaluation ratings in the top two categories.

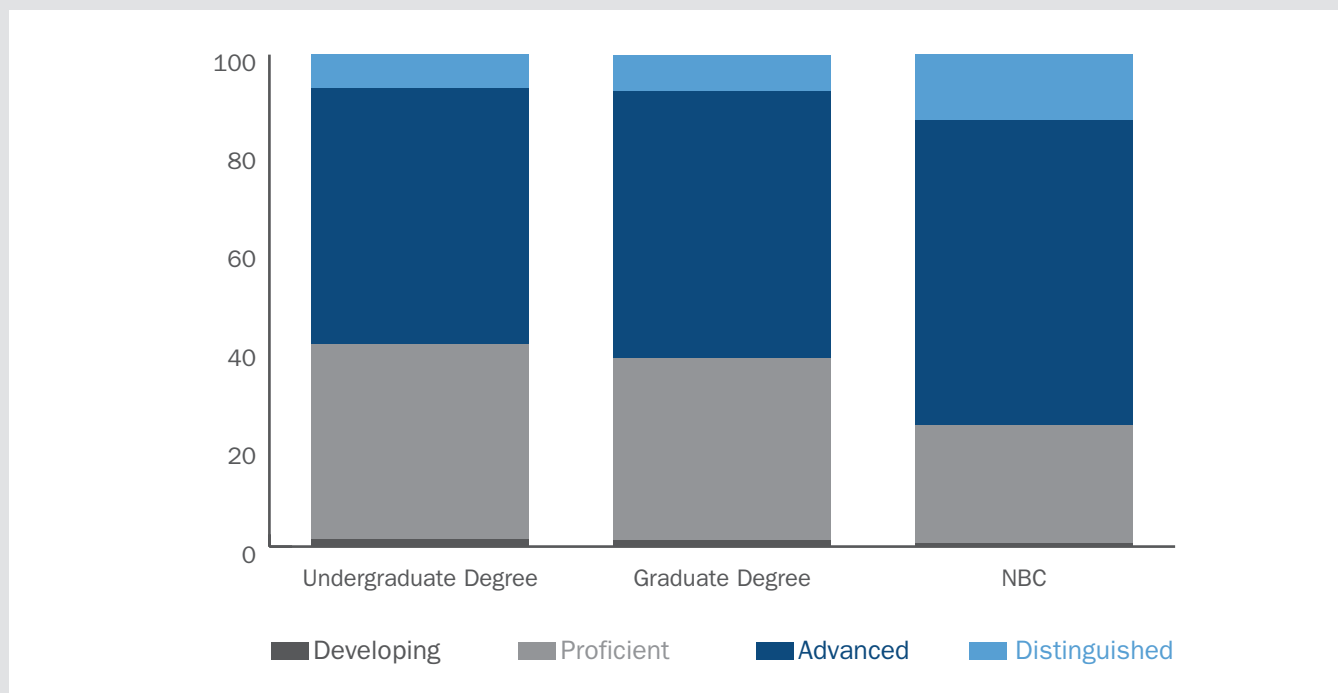
Table 3: Evaluation Rating Results—All School Levels

Teacher Credentials	Leadership	Classroom Environment	Content Knowledge	Facilitating Student Learning	Reflecting on Practice
Overall Analyses					
Graduate Degree	1.158**	1.133**	1.135**	1.124**	1.164**
Timing Analyses					
Pre-Entry	1.096**	1.087**	1.113**	1.078**	1.096**
Post-Entry	1.195**	1.166**	1.150**	1.150**	1.213**
Content-Area Analyses					
Elementary	1.217**	1.196**	1.229**	1.183**	1.285**
Mathematics	1.462**	1.083	1.211*	1.267**	1.309**
English/Reading	1.493**	1.389**	1.589**	1.458**	1.556**
Science	1.366**	1.129	1.497**	1.177**	1.422**
Social Studies	1.186**	1.290**	1.468**	1.091	1.296**
Special Education	1.121**	1.559**	0.850**	1.159**	1.182**
Administration	1.261**	1.081	1.156**	1.053	1.257**
Other	1.167**	1.113**	1.183**	1.123**	1.139**
Unclassifiable	1.085**	1.070**	1.064**	1.071**	1.087**
NBC Teacher Analyses					
NBC Teacher	2.350**	2.164**	2.405**	2.259**	2.476**

Note: Cells in this table present odds ratios for earning higher evaluation ratings in reference to teachers with undergraduate degrees only (for NBC teachers, results are in comparison to non-NBC peers). Odds ratios above '1' indicate higher evaluation ratings; odds ratios below '1' indicate lower evaluation ratings. *, *, and ** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

⁷ For these models we combine data across all school levels and run ordered logistic regressions controlling for teacher experience and school covariates. Separate analyses for elementary, middle, and high schools return comparable findings.

Figure 1: Predicted Teacher Evaluation Ratings—Facilitating Student Learning Standard



Note: This figure displays predicted probabilities of rating at developing, proficient, advanced, or distinguished on the Facilitating Student Learning evaluation standard.

Are graduate degree holders more likely to remain in North Carolina public schools?

Beyond performance, teacher retention is a key concern for policies linking higher salaries to graduate degree status—states and school districts want to invest in pay increases for teachers who will stay in the public school workforce. In North Carolina, this focus on retention is even more salient given recent increases in teacher attrition. Therefore, we estimate whether teachers with graduate degrees are more likely to return to positions in NCPS.⁸

Across all school levels, Figure 2a shows that graduate degree holders are significantly less likely to return to a position in NCPS than their peers with an undergraduate degree only. Controlling for teacher and school characteristics, 92.25 percent of undergraduates and 91.46 percent of graduate degree holders return in the following

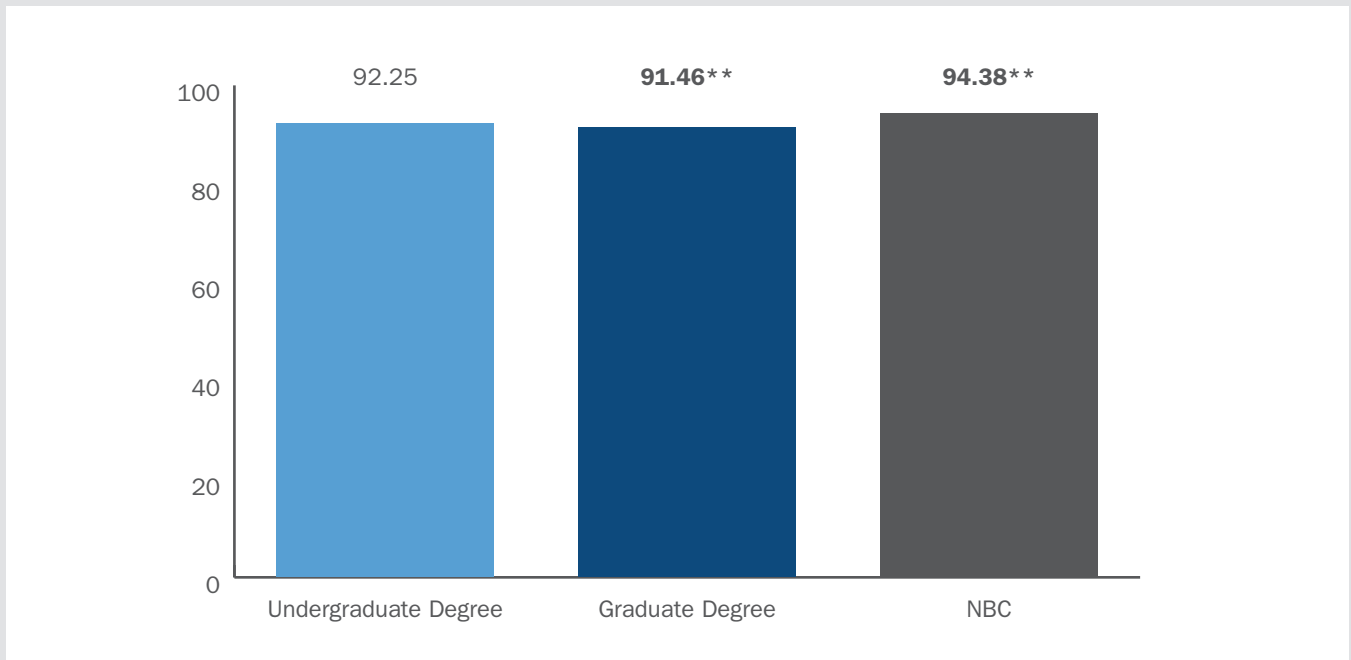
school year. Additionally, Figure 2a indicates that NBC teachers have significantly higher retention rates than their non-NBC peers—94.38 percent of NBC teachers return to NCPS in the next school year.

While graduate degree holders have lower retention rates, overall, there may be important differences in retention based on the content of the graduate degree. Essentially, certain graduate degrees may lead to additional knowledge and skills that make teachers competitive for jobs outside education, while other graduate degrees may be less portable—the content of the degree is most relevant for teaching/education jobs. This expectation is borne out by the predicted retention rates in Figure 2b. Teachers earning graduate degrees in education—from a college or school of education—are significantly more likely to return to NCPS than their undergraduate degree peers, while those with a graduate degree outside education are significantly less likely to return.⁹

⁸ We estimate these models across all school levels and in elementary, middle, and high schools separately using a logistic regression model. In this model, we control for teacher demographics and credentials and school characteristics.

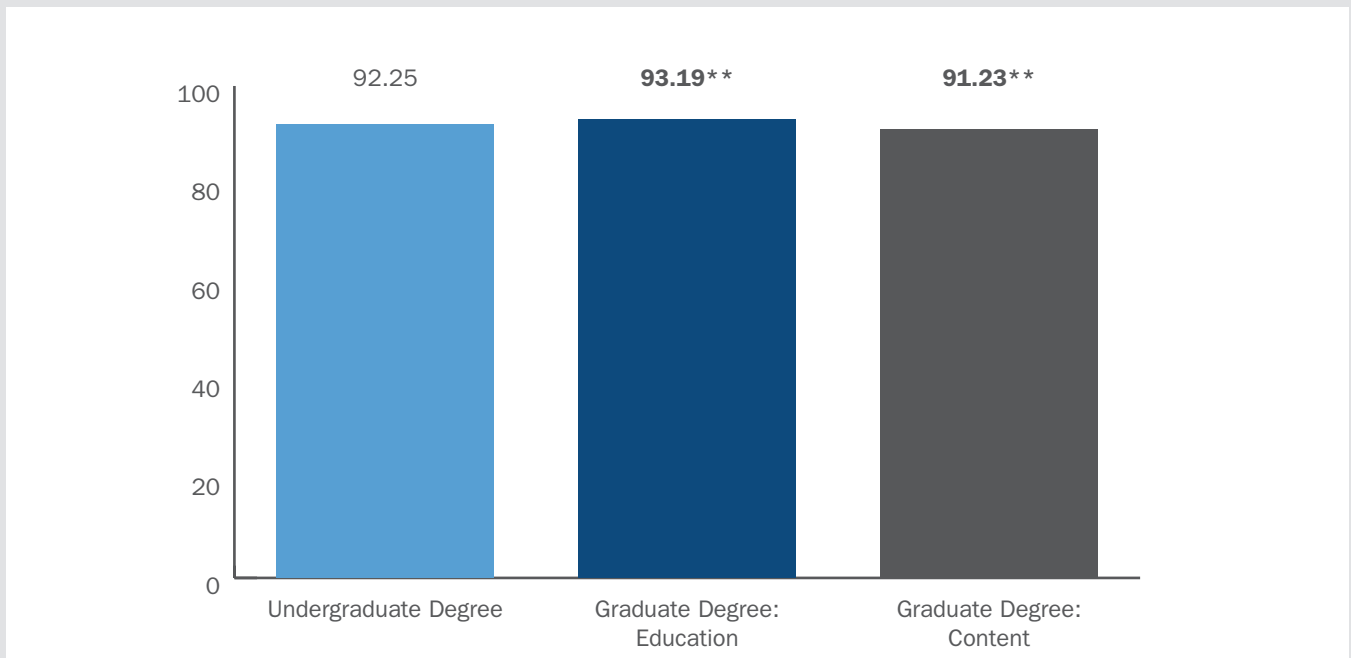
⁹ Teachers whose graduate degree content is unknown are also significantly less likely to return to NCPS than their undergraduate degree peers.

Figure 2a: Predicted Probabilities of Retention in NCPS



Note: Controlling for teacher and school characteristics, this figure displays rates of retention in NCPS for teachers with an undergraduate degree, graduate degree, or NBC. ** indicates statistically significant differences between graduate degree holders and undergraduates and between NBC teachers and non-NBC peers at the 0.01 level.

Figure 2b: Predicted Probabilities of Retention in NCPS



Note: Controlling for teacher and school characteristics, this figure displays rates of retention in NCPS for teachers with an undergraduate degree, a graduate degree in education, or a graduate degree in a content area. ** indicates statistically significant differences between undergraduates and teachers with graduate degrees in education or a content area at the 0.01 level.

Discussion

In this policy brief, we assessed the relationships between graduate degree status and three policy-relevant teacher outcomes—value-added, evaluation ratings, and persistence in NCPS. This research made two important contributions to previous work on graduate degrees. First, we examined multiple teacher performance outcomes to get a more comprehensive perspective on graduate degree impacts. Second, we coded the content-area of many graduate degrees earned at in-state universities. While this coding has limitations—it does not include graduate degrees from out-of-state universities or non-education degrees from in-state private universities—the content-area focus presents a more nuanced perspective that may be particularly important if North Carolina considers reinstating salary increases for in-area graduate degrees. Additionally, we situated these analyses within a broader policy context by showing results for another teacher credential—NBC—traditionally associated with salary increases. Overall, results indicate that in comparison to their non-NBC peers, NBC teachers are significantly more effective across all school levels, earn significantly higher evaluation ratings, and are more likely to remain in NCPS.

Regarding graduate degree outcomes, value-added results show that, overall, graduate degree holders are significantly less effective than their undergraduate degree peers in six comparisons. However, those with an in-area graduate degree are significantly more effective in four comparisons, particularly in mathematics across school levels. Whether overall or in-area, we also found that in five comparisons—concentrated in middle and high school grades—teachers are more effective after earning a graduate degree than they were before. Together, this suggests that in-area graduate degrees have positive impacts on student achievement and teacher development.

Beyond value-added, graduate degree holders earn significantly higher evaluation ratings than their undergraduate degree peers across all evaluation standards. While this suggests that graduate degree holders may have higher quality instructional practices, we note that the

differences between groups is relatively small—e.g. 59 percent of undergraduates versus 62 percent of graduate degree holders earned ratings in the top two categories for the Facilitating Student Learning standard. From a policy perspective, these teacher performance results (value-added and evaluation ratings) can be summarized as follows: overall, differences between graduate degree holders and undergraduates are relatively small and conflicting.

Lastly, retention analyses show that graduate degree holders are significantly less likely to return to positions in NCPS than their undergraduate degree peers. Like other analyses, these retention results differ based on the content of the graduate degree: compared with undergraduates, teachers with graduate degrees in education are more likely to return to NCPS while those with a graduate degree outside education are less likely to persist. Taken together, outcomes for graduate degree holders do not lend themselves to simple and straightforward policy prescriptions; instead, efforts to both reward effective teachers and incentivize teachers to pursue additional learning will require nuance and a thorough understanding of the research evidence.

For More Research on this Topic

Chingos, M.M. & Peterson, P.E. (2011). It's easier to pick a good teacher than to train one: Familiar and new results on the correlates of teacher effectiveness. *Economics of Education Review*, 30(3), 449-465.

Clotfelter, C.T., Ladd, H.F., & Vigdor, J.L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, 26(6), 673-682.

Clotfelter, C.T., Ladd, H.F., & Vigdor, J.L. (2010). Teacher credentials and student achievement in high school: A cross-subject analysis with student fixed effects. *Journal of Human Resources*, 45(3), 655-681.

Goldhaber, D. & Brewer, D. (1996). Evaluating the effect of teacher degree level on educational performance. Available from: <http://files.eric.ed.gov/libproxy.lib.unc.edu/fulltext/ED406400.pdf>

Study Author: Kevin C. Bastian

The Education Policy Initiative at Carolina is a policy research and outreach unit affiliated with the Department of Public Policy and housed in the College and Arts and Sciences at the University of North Carolina at Chapel Hill.



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL



UNC
COLLEGE OF
ARTS & SCIENCES