



Rural Schools Need Support to Increase Computer Science Teacher Capacity – Reducing Certification Requirements is Not a Promising Solution

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Executive Summary

Most schools in rural areas do not have teachers who are certified to teach computer science (CS), which prevents them from offering CS courses. Although reducing certification requirements may seem like an effective way to increase the number of teachers who can teach CS, our findings suggest that reducing CS certification requirements is unlikely to increase schools' capacity to offer CS courses.

We investigated how capacity to offer CS courses differs by school locale (e.g., rural versus urban) and how teacher certification requirements relate to whether schools offer CS courses. We found that less than a quarter of schools in rural areas have teachers certified to teach computer science (CS), compared to about half of schools in urban and suburban areas. Contrary to what might be expected, we also found that schools that do not require CS certification (i.e., charter schools) offer CS courses at *lower* rates than school that require CS certification (i.e., non-charter public schools).

Policies beyond reducing CS certification requirements are needed to increase schools' capacity to offer CS courses for students. For schools in rural areas that are especially in need of support to bring CS to their students, it is critical to expand professional learning in rural areas through virtual options that are more accessible to geographically dispersed teachers.

What We Studied

To provide students with equitable access to computer science (CS) education, schools and school districts need to have sufficient capacity to offer CS courses. Although many things contribute to the capacity to offer CS, including funding and educational policy, one key factor is the availability of teachers that are qualified to teach CS courses. In fact, a primary reason cited by principals (63%) and superintendents (74%) for not offering CS courses at their schools is a lack of qualified teachers (Google Inc. & Gallup Inc., 2016). This issue may be especially challenging in smaller, rural districts that lack the resources of their larger urban and suburban counterparts (Warner et al., 2019).

Another factor that may affect the ability to offer CS courses is the requirement for CS teachers to be certified to teach CS. For Texas schools, this can be assessed by comparing charter schools to non-charter schools. Texas has had a CS teacher certification requirement for non-charter public school teachers for over two decades. These teachers must earn a Grades 8-12 CS Certification in order to teach courses like Computer Science I, Computer Science II, and AP CS A. For both pre-service and in-service teachers, this certification is obtained by passing a rigorous exam. Charter schools in Texas, on the other hand, do not require a CS certification to teach CS courses. This exemption is in place largely because it is expected that reducing teacher requirements will give schools more flexibility to offer innovative educational opportunities for students. If certification requirements adversely impact the capacity of schools to offer CS courses, we would expect charter schools in Texas to offer CS courses at higher rates than non-charter schools.

In this study, we considered how CS teacher capacity in Texas varies by school locale. We also examined the relationship between the requirement for teacher certification and access to CS in schools.

Research Questions

1. Does capacity vary across schools based on locale type (specifically, city/suburban vs. rural/town)?
2. Are schools that are not required to employ certified CS teachers more likely to offer CS courses?

How We Analyzed the Data

We examined 2018-19 data from all public Texas high schools and students, obtained through the Texas Education Research Center. In the 2018-19 school year, there were 2,084 high schools in Texas serving over 1.5 million high school students.

To answer our first research question, we defined a school's capacity to offer CS courses by whether they employed a CS-certified teacher. We then compared the percent of non-charter public schools designated as city, suburban, town, and rural (locale categories determined by the Texas Education Agency, with some categories combined for simplification) that employed a CS-certified teacher.

For our second research question, CS certification was not a relevant measure for charter schools, since they do not require certification. Thus, we defined capacity as whether a school offered a CS course. We then compared the percent of charter and non-charter schools that offered CS courses.

What We Discovered

With respect to how capacity to offer CS varies by locale, we found that a higher percent of schools in city and suburban areas employed a CS-certified teacher than schools in town and rural areas. For non-charter public schools, 43% of the 476 schools categorized as "city" and 52% of the 333 "suburban" schools employed a CS-certified teacher. In comparison, only 22% of the 266 "town" schools and 18% of the 673 "rural" schools employed a CS-certified teacher. Based on these patterns, we simplified the comparison between locales by combining city with suburban and town with rural. A chi-square test for independence confirmed the difference between city/suburban and town/rural schools was statistically significant ($\chi^2=145.61$, $p<.001$). These data align with prior findings that schools in rural areas or towns are less likely to offer CS courses, both in Texas (Texas Advanced Computing Center, 2020) and nationally (Code.org, 2018).

Based on the findings above, we utilized the combined locale types (i.e., city with suburban and town with rural) for the comparison between charter and non-charter schools in Figure 1 to answer our second research question. Contrary to what might be expected, we found that charter schools are less likely to offer CS courses than non-charter schools ($\chi^2=43.04$, $p<.001$). For non-charter schools, 63% of city-suburban and 40% of town-rural schools offered CS courses. Meanwhile, only 32% of city-suburban charter schools and 24% of town-rural charter schools offered CS courses.

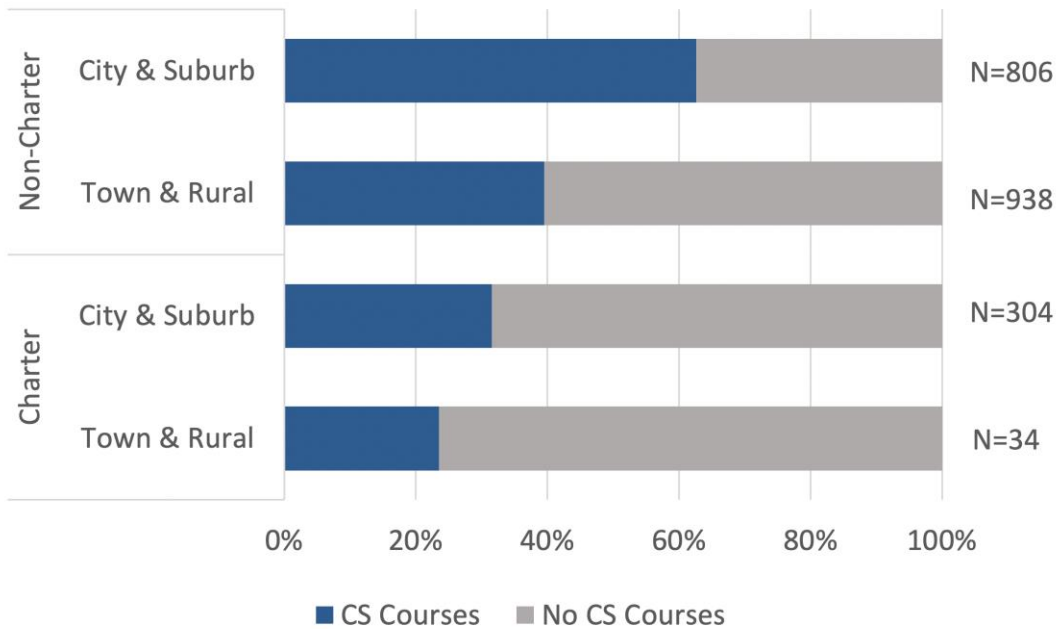


Figure 1. Percent of Texas high schools that do and do not offer CS courses (2018-19)

Policy Recommendations

The disparities in teacher capacity by locale suggest that rural communities may need additional support to grow their teacher capacity in CS. Policies related to funding for teacher professional development should explicitly address the needs of rural educators, for example, by including virtual or online options for CS teacher training that are more accessible to rural communities.

Many states have just recently started to define pathways and criteria for secondary CS teacher certification. This is in stark contrast with core subject areas such as math and science, or even electives such as music or art, that have established certification pathways and criteria. In 2017, only 28 states had some sort of CS teacher certification or endorsement process, and this number increased to 42 states by 2023 (Code.org et al., 2023).

When considering establishing a formal CS teacher certification, one potential concern to states is that more barriers to teaching CS could reduce the number of teachers able to teach CS courses, thus reducing the number of students who can take CS. For example, Michigan phased out its rigorous CS certification pathway in 2017 because subjects like CS were “hard to fill or do not attract enough teaching candidates” (Michigan Education Agency, 2017). Now, Michigan allows any certified teacher who “displays strong computer science skills” to teach CS. Other states with no formal CS teacher certification, such as Nebraska, authorize teachers certified in math or business to teach CS courses. Currently, states aim to strike a balance between the quality assurance provided by formal certification processed with regulatory flexibility to avoid barriers to teacher certification that could result in limiting student access to CS.

However, our findings suggest that this approach may not result in the intended outcomes. The lack of a requirement that courses be taught by certified CS teachers was not associated with an increased student access to CS courses in Texas. Since charter schools are likely to serve a larger percentage of students of color and low-income students than their non-charter counterparts (Texas Charter Schools Association, 2016), it is actually possible that historically marginalized students in Texas have been negatively impacted by the notion that deregulation fosters innovation. However, further research is needed to determine whether the relationship identified here is causal.

The full version of this study can be found at: <https://doi.org/10.1177/14782103221074467>

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