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Abstract

The United States has a well-documented teacher shortage crisis. Areas such as Science, Technology, Engineering and Mathematics (STEM) continue to experience shortages. Since teachers have the greatest impact on student achievement, the lack of highly qualified teachers potentially affects the academic and economic stability of the United States. This paper provides model recommendations for addressing teacher shortages in STEM and other critical shortage areas. These recommendations can be implemented at the local, district, state or national levels. Utilization of the models can potentially influence student achievement, human resource—talent acquisition, teacher preparation, policy development and professional development.

Keywords

Grow Your Own, GYO, Science, Technology, Engineering and Mathematics (STEM), Teacher Shortage, Alternative Pathways to Teacher Licensure, Human Resources, Teacher Shortage Recommendations, State and Federal Funding

1. Introduction

Over the past two decades in the United States, increasingly greater numbers of teachers have left the teaching profession (Antonucci, 2022; García & Weiss, 2019; Earley & Ross, 2005). At the beginning of the 2022 school year, school districts across America reported increased teacher vacancies. In a June 22, 2022 article in the Wall Street Journal, COVID (safety) protocols, political battles and school safety issues were issues that attributed to teachers leaving the profession (Dill, 2022). Hard to fill areas include Science, Mathematics and Special Educa-

tion. With courses like Algebra serving as the gatekeeper course for students entering into math and science careers, a teacher shortage has the definitive potential to affect the global effectiveness of America. This is especially concerning for underrepresented groups and in urban communities where a lack of teachers could potentially hinder both the academic and economic growth of the next generation of learners (Smith & Cortes, 2022; Wang et al., 2017; U.S. Bureau of Labor Statistics, 2019). Per, the U.S. Bureau of Labor Statistics (Torpey, 2018), more than 270,000 primary and secondary education teachers are expected to leave the profession each year, on average, from 2016 to 2026. Per District Administration's website, "according to the Florida Education Association, there are as many as 8000 teacher vacancies in Florida fueled by massive teacher shortages. Kansas finds itself in its worst teacher shortage ever" (Ward, 2022). In 2021, the Tennessee Department of Education issued 1354 emergency teaching credentials. These credentials allowed Tennessee educators to teach without completing a state approved licensure program ("*A Crisis: There's 1,000 Teacher Openings in Middle Tennessee. The Breakdown per District.* WTVF, 2022).

Research indicates that teachers have the greatest impact on student achievement (Oppen et al., 2019). Of particular concern is the high number (and percentage) of vacancies in urban and rural school districts. According to the U.S. Department of Education, "These shortages impact educational opportunity for students, and research shows that educator shortages disproportionately impact students of color, students from low-income backgrounds, students with disabilities, and students from rural communities." (USDOE Factsheet, 2022).

In an effort to encourage more individuals to enter the teaching profession and to stop the number of teachers leaving, several "Grow Your Own" initiatives were developed. Grow Your Own refers to an entity's programming or efforts to develop, train and assist individuals in the acquisition of a K12 teaching license. K12 represents grades kindergarten (K) through 12th grade. K12 students are typically ages 5 - 18.

The goal of "Grow Your Own" initiatives is to develop teachers within a community or state to fill vacancies particularly in high needs, critical shortage areas. The purpose of this paper is to provide Grow Your Own Models for attracting teachers particularly in High Needs Areas. These recommendations have implications for K12, Higher Education, academia, curriculum development, professional development, instruction, human resources, state and federal funding and policy articulation.

2. Recommendations to Address Teacher Shortage in High-Need Subject Areas

2.1. Pool-Retired Teachers

The State Department of Education (DOE) would allow retired teachers to receive full retirement pay and benefits and full teacher pay for teaching in critical shortage areas. To facilitate the process, DOE's would remove barriers to license

reactivation for retirees. For example, if a state requires passing a content assessment, paying a fee or taking coursework to reactivate a license for an individual that has retired, this might include waving the assessment, course or fee requirements.

2.2. Pool - Related Degrees - GYO State/Federal License Funding and Mentor Teacher Needed

Job Embedded - Allow regular teacher pay for those that have “Content Related” degrees for High-Need areas. (Ex. For Math - Engineering, Physics, Accounting degreed individuals). The related degree holder either should have a set number of hours in the content area (ex. 18 hrs of College level Mathematics) or have reached a particular level (ex. completed college Calculus 1 with a “C” or higher). Another option might include, individuals with related degrees who passed Pre-Calculus in college with a “C” or higher. They would be eligible to teach Middle School mathematics. The teacher candidate will continue to receive regular pay as long as they are enrolled in a state (DOE) certified “Teacher Preparation” program” (max ~5 years). Program entry might also include the successful passing of the applicable content licensure exam(s).

2.3. Pool - College Students (Junior or Higher) - GYO State/Federal License Funding and Mentor Teacher Needed

Assign college students (Junior or higher) a full time teaching schedule in a high needs area. They will receive regular teacher pay as long as they are enrolled in a state certified “Teacher Preparation” program” (max 3 years) and have passed the applicable content licensure exam. The GYO funding/scholarship would pay for the students’ completion of their junior and senior year. The degree or related degree must support a high needs teaching area.

2.4. Pool - Current Elem/”Other Subject Areas”

For teachers with certifications in a “High-Need Subject Area” but are not teaching in that area (ex. Teacher “A” has a Math and Social Studies certification but chooses to teach in Social Studies only) provide a \$5000 - \$10,000 “Cross-Over” signing bonus and/or a “2+ Step Up Increase”. The teacher would then “Cross-Over” from Social Studies to Mathematics and teach a full Mathematics schedule. If they go back to Social Studies only (non-high needs), they would revert to their original step on the pay scale.

2.5. Incentivize High Needs Areas with “Step Up Increases”

Every teacher across the district/ISD in a high needs area would receive a Step up Increase on the district/ISD salary scale.

2.6. Pool - “Current Teachers” - Resource Allocation

Review the vacancy percentage for each subject area. Hence, if School “A” has a

60% Math vacancy rate but School “B” has a 0% Math vacancy rate, a teacher might be transferred from School “B” to School “A”. The transfer should be made ONLY after looking at “minimal impact” (reviewing percentage and total number). For example, removing a teacher from a school with a staff of four would have a greater impact than removing a teacher from a school with a staff of 14. (This approach avoids systemic institutional inequities.)

2.7. Pool - “Current Teachers” - Extended Day for Students (Before and After)

If a school typically offers a 1 - 7 schedule, an 8th (or 0th) period would be added to the school day. Students would take courses in “High-Needs” subject areas. Teachers would be paid an additional 1/5 of their salary (or fraction of courses taught - ex. Teachers would be paid an additional 1/4 of their salary if their typical load is 4 classes per day and they are teaching an extra course during their planning period). This option may require changes to the teacher’s contract. Transportation costs must be factored in to address the need for early and late bus routes. Alternatively, courses could be offered online utilizing teachers across the district/ISD, state or nation (secure state license).

2.8. Pool - “Current Teachers” - Full Day +1 (Extra Class during the School Day)

For High-Needs areas, teachers would teach an additional course during their planning period. Teachers would be paid an additional 1/5 of their salary (or fraction of courses taught - ex. Teachers would be paid an additional 1/4 of their salary if their typical load is 4 classes per day and they are teaching an extra course during their planning period). This option may require changes to the teacher’s contract.

2.9. Pool - “Current Teachers” - “Overage Pay”

***Increase the class size for courses within “High-Needs” areas (Max 10 additional Students). Teachers would be paid “Overage Pay” for these courses. Overage pay might be an additional 1/10 of the teachers’ salary per class. This option may require changes to the teacher’s contract.

2.10. Pool - Current Community College/College/University Professors - Mentor Teacher Needed

For College/University professors in “High-Needs or Related Subject Areas”. Professors would be assigned a part time (1 - 4) or full time schedule with K12 teacher pay (depending upon school needs, state policy and availability). Also, Professors with at least a Masters’ degree in a related subject area (ex. Engineering, Accounting for Mathematics), would also receive full pay (partial for those teaching a partial schedule). Professors would be eligible based upon successfully passing the applicable content licensure exam(s). For pedagogical support, pro-

fessors would receive district/ISD professional development and be assigned a Mentor Teacher. The pedagogical support might also be in the form of content Methods courses.

To facilitate the process, DOE's would remove barriers to license acquisition by offering a Grade 9 - 12 content license for college/university content and related degree professors with 3 or more years of satisfactory teaching experience.

2.11. Pool - "Current Teachers" - "High-Needs Certification Cohort"

This recommendation applies to states that allow current certified teachers to add on an endorsement by taking the applicable content licensure assessment.

School Districts/ISDs would partner with a local college/university to offer a "High Needs Certification Program". The program would include content and methods courses and a "Praxis/Assessment Review".

Teachers that Pre-Test within a score range on the applicable content test would be eligible. If your state DOE does not allow current certified teachers to add on an endorsement by taking the applicable assessment, work with your state Department of Education to determine if this is a viable option. Teachers that are currently evaluated at the "satisfactory" level or above, have certain pedagogical skills. Passing the applicable content assessment (ex. Middle School Math) shows content mastery. Further district professional development can assist with the needed pedagogical content tools and support. Districts might also collaborate with local colleges or universities to provide professional development offerings.

2.12. Signing Bonuses for High-Need Subject Areas - (For Outside Certified Teachers)

External applicants for positions designated as high-need subjects will be eligible to receive signing bonuses. The signing bonuses are based on school ranking, content area and district priority. Signing bonuses will be paid out in two equal payments (less applicable taxes). One at the completion of the first semester and the remainder after the successful completion of the second semester. Districts might add a restriction indicating how long the teacher must remain in the district.

2.13. Federal or State Passage/Funding of the "TI Bill" - (Teacher Investment Bill)

Similar to the GI Bill - The TI Bill pays full tuition (up to 4 years) for those individuals that pursue education degrees in high needs areas. Each state would specify what constitutes "high needs areas" for them.

3. Program: TI Bill

Description: The TI Bill provides up to 36 months (4 regular school years) of education benefits to eligible TI service members for: Teacher Licensing Programs

Obligations for TI Service members

- Prior to program admission, content licensure testing is required to determine if content remediation is needed, to ensure successful passage on the applicable licensure exams. The DOE will work with Colleges/Universities/EPPs to set the established score range. This will be based upon the services the Colleges/Universities/EPPs can offer to ensure successful passage.
- Four-year obligation to teach full time in a public school in a high needs content area.
- Service/teaching begins in college beginning with junior/senior year
- If the four-year teaching obligation is not met, the TI Bill would convert to a student loan. For example, if an individual only teaches for three years, one fourth of their college bill would be converted to a student loan.

Benefits: Paid Tuition and Fees, Living (Housing) Stipend and Book Stipend

*Similarly, a part time 6-Year version of the TI Bill could be implemented.

The TI Bill includes creative collaborations with community colleges and universities (Education Preparation Partners - EPPs). For example:

- 2 + 2 programs where the student completes the first two years at the community college and the remaining two years at a 4 year college/university
- 2 + 2 programs where the student completes all four (4) years at the community college. The first two years would be community college courses. The university would offer the remaining courses (2 years) on the community college campus.
- 2 + 2 programs where the student completes all four (4) years at the school/district. The community college/university would partner to offer the courses at the school/district's site.

For degreed individuals, the TI Bill would pay for tuition and fees for licensure programs for state approved colleges, universities and commercial Education Preparation Partners - EPPs.

4. Intellectual Merit

The goal of these recommended models is to increase the number of individuals teaching in high needs areas. These recommendations can potentially advance knowledge in the field of educator professional development by providing models to create, train and support teachers. In addition, it potentially affects colleges/universities, school districts and state/federal entities by providing alternative teacher pipelines. The recommendations also have implications for program developers due to the impact that the models have on teacher pipelines and preparation. These recommendations can be utilized for all content areas.

5. Broader Impacts

The broader impacts of these recommendations include changes in state and federal funding, increased teacher recruitment and development, increased student achievement and increased student preparation in STEM.

Overall, the potential of the proposed activity to benefit society and contribute to the achievement of specific desired societal outcomes include:

- Decreased teacher shortages
- Increased student achievement
- Improved Grow Your Own efforts
- Development of a diverse, globally competitive workforce
- Use of best practices to inform public policy.

6. Methods & Research Process

Post Model selection - Monitor data to determine the number of teachers added. It is also important to disaggregate the data to examine subgroups (ex. Math, Science, SPED...), and by teacher (Gender, Race, Age...) the results could lead to substantive changes in marketing to specific groups and to the sharing of Human Resource and programmatic best practices.

7. Conclusion

The lack of teachers in high needs areas has both current and future impacts on students locally and the United States globally. The lack of a globally competitive STEM workforce impacts the United States technologically and economically. The current teacher shortage represents a cyclical system that is weakened further with every cycle. Hence, without K12 teachers, students are not prepared for college and beyond. Further, if students are not prepared for college, then teacher preparation programs struggle to produce more teachers. Through funding, support and collaborations, these models serve as a foundational base for entities to begin to discuss which models best fit their needs and where policy changes can be made to address the relevant issues.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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