# Science and Mathematics Teacher Retention: A Collective Analysis and Comparison between Master Teachers and other Teachers

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## Project

A collaborative research project (NSF NOYCE Track 4) to study the impact of Noyce MTF programs on teacher retention through motivation, leadership, and social networks. Eight universities are involved.

## Problem Statement

Teacher turnover presents significant challenges for U.S. public schools for over decades, particularly for science and mathematics in high-need schools[1]. Factors such as self-efficacy, leadership, autonomy, and social networks may help mitigate the adversities feeding into teacher turnover.

## Theoretical Framework

### Teachers' Self-efficacy for Teaching
Teachers' self-efficacy beliefs is an important factor in fostering constructive learning, student motivation, and higher academic performance[2], which impact job satisfaction and retention or attrition in the profession[3].

### Teacher Leadership Skills
Opportunities to develop leadership skills and engage in collaborative school-work environment to improve school culture and instruction can support and sustain high-qualified teacher in the profession[4].

### Principal Support and Teacher-school Fit
Most of the teachers leave the profession for reasons including dissatisfaction, lack of support, autonomy, and lack of collaboration opportunities[5].

### Diversity Dispositions
Positive diversity dispositions are associated with persisting in teaching in high-need schools[6].

### Professional Social Networks
Some features of teachers' social network (e.g., density) support their persistence and correlated with their self-efficacy[7,8].

## Research Questions

(1) How do Master Teaching Fellows (MTFs) compare to non-MTFs in terms of their self-efficacy, leadership engagement, diversity dispositions, school-work environment, social network characteristics, and retention?
(2) To what extent do these factors relate to their retention? Is there a difference between MTFs and non-MTFs regarding this relation?

## Methods

- Survey of 167 science and mathematics teachers (85 MTFs and 82 non-MTFs)
- Multinomial logistics regression analysis on retention as the outcome (3-levels)

### Demographics





Total number of years taught

Mean = 18.86
Std. Dev = 7.81
N = 167
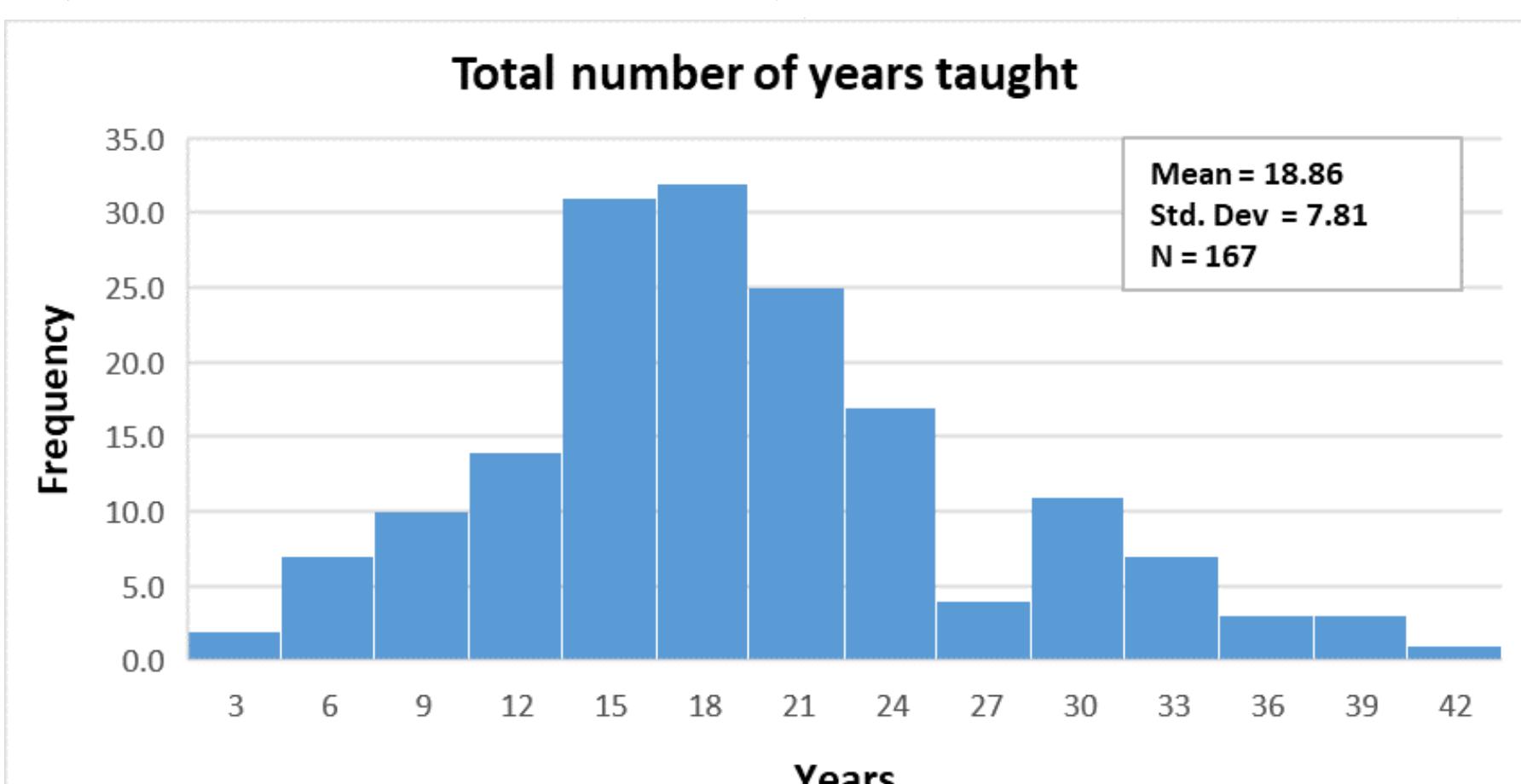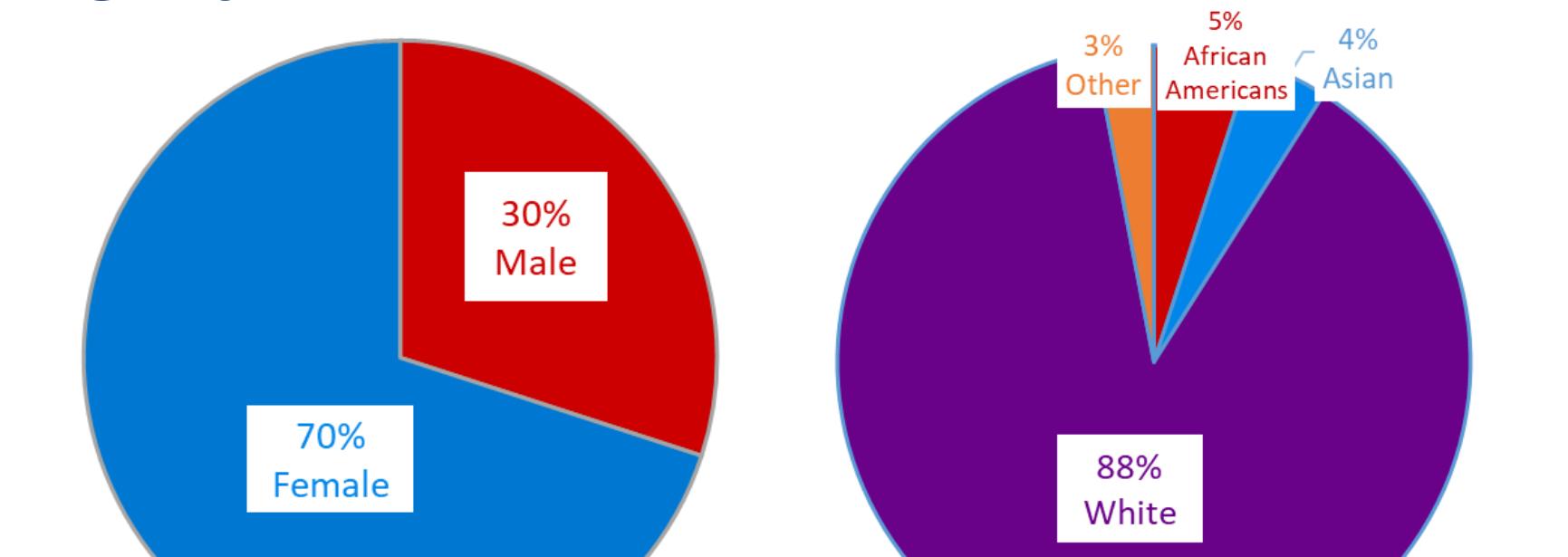
| Retention status | | | | | |
|---|---|---|---|---|---|
| | | Stayer[a] | Shifter | Leaver | Total |
| Role | Non-MTF | 67 | 13 | 2 | 82 |
| | MTF | 51 | 24 | 10 | 85 |
| | Total | 118 | 37 | 12 | 167 |

[a]Implies staying in teaching and includes mover teachers (~12%).

## Results

### Comparison (MTFs and non-MTFs)

| Variables | t | df | p | Mean dif. | S.E. | 95% C.I. Low. | 95% C.I. Up. |
|---|---|---|---|---|---|---|---|
| Self-efficacy | 2.32 | 165 | .02 | 0.18 | 0.08 | 0.03 | 0.33 |
| Leadership engagement | 1.13 | 165 | .26 | 0.12 | 0.10 | -0.08 | 0.32 |
| Teacher-school fit | -0.83 | 165 | .41 | -0.10 | 0.12 | -0.33 | 0.13 |
| Diversity dispositions | 1.81 | 165 | .27 | 0.06 | 0.03 | -0.01 | 0.12 |
| Community connections | 0.40 | 165 | .69 | 0.05 | 0.11 | -0.18 | 0.27 |
| Teaching network (TN) size | 0.65 | 165 | .52 | 0.45 | 0.69 | -0.92 | 1.81 |
| Leadership network (LN) size | 3.18 | 165 | .00 | 1.91 | 0.60 | 0.72 | 3.10 |
| TN geographic reach | 3.52 | 165 | .00 | 0.21 | 0.06 | 0.09 | 0.33 |
| LN geographic reach | 2.91 | 165 | .01 | 0.28 | 0.10 | 0.09 | 0.46 |
| LN bridging | 2.72 | 165 | .01 | 0.44 | 0.16 | 0.12 | 0.77 |
| Retention | | | | | | | |
| Staying | -3.22 | 165 | .00 | -0.24 | 0.07 | -0.38 | -0.09 |
| Shifting | 2.24 | 165 | .03 | 0.14 | 0.06 | 0.02 | 0.27 |
| Leaving | 1.42 | 165 | .16 | 0.06 | 0.04 | -0.02 | 0.14 |

- MTFs' self-efficacy, leadership network size, and leadership bridging role are significantly higher than those of non-MTFs.
- MTFs' geographic area of networks is significantly greater than that of non-MTFs.
- MTFs are more likely to assume leadership roles.

### Regression Results

| Variables | Shifter[a] B | Shifter[a] S.E | Shifter[a] Exp (B) | Leaver[a] B | Leaver[a] S.E | Leaver[a] Exp (B) |
|---|---|---|---|---|---|---|
| Intercept | -14.38 | 7.25 | | 1.88 | 7.01 | |
| Experience | -0.09 | 0.05 | 0.91* | 0.06 | 0.05 | 1.06 |
| Self-efficacy | 0.96 | 0.58 | 2.60 | 1.77 | 0.98 | 5.88 |
| Leadership engagement | 1.31 | 0.34 | 3.67 | 0.88 | 0.52 | 2.40 |
| Teacher-school fit | 0.77 | 0.52 | 2.16 | -1.33 | 0.53 | 0.27 |
| Diversity dispositions | -0.97 | 1.39 | 0.38 | -3.63 | 2.41 | 0.03 |
| Community connections | -0.51 | 0.38 | 0.60 | 0.92 | 0.76 | 2.50 |
| Teaching network (TN) size | 0.32 | 0.15 | 1.37* | -0.15 | 0.13 | 0.86 |
| Leadership network (LN) size | 0.30 | 0.10 | 1.12 | 0.14 | 0.11 | 1.15 |
| LN geographic reach | 0.90 | 0.42 | 2.46 | 0.10 | 0.63 | 1.11 |
| TN bridging | 0.34 | 0.20 | 1.40* | 1.07 | 0.38 | 2.87 |
| LN bridging | 0.94 | 0.26 | 2.50 | 0.99 | 0.40 | 2.70 |

[a] The reference category: Stayer. *Only for MTFs

- MTFs tend to move to a leadership position at a younger age than non-MTFs.
- Shifters and leavers have slightly higher levels of self-efficacy compared to stayers.
- Higher level of leadership activities were associated with shifting to a leadership position.
- Leavers have lower degrees of teacher-school fit compared to stayers.
- Leadership network size is positively associated with shifting to a leadership position. (Same holds for TN for MTFs only).
- Shifters and leavers have more bridging roles in their networks.

## Discussion & Conclusions

- More positive outcomes for MTFs from six Noyce programs compared to non-MTFs.
- Teacher-school fit has a negative impact on teacher retention.
- Engagement in leadership activities and having larger networks attracts shifting (leaving the classroom).
- Open-ended responses indicate that shifters feel having more impact.

## References

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