Economics of Education Review 34 (2013) 69–75

Contents lists available at SciVerse ScienceDirect

Economics of Education Review

journal homepage: www.elsevier.com/locate/econedurev

The effect of same-gender teacher assignment on student achievement in the elementary and secondary grades: Evidence from panel data

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ARTICLE INFO

Article history:
Received 25 January 2012
Received in revised form 7 January 2013
Accepted 12 January 2013

JEL classification:
I24

Keywords:
Educational economics
Impact of schooling
Student/teacher gender assignment

ABSTRACT

We utilize information from a rich administrative panel dataset following the universe of test-taking public school students in Florida over a period of five years to estimate the relationship between same-gender teacher assignment and student achievement. We estimate how a student's achievement changes as he/she is assigned to teachers of different genders throughout his/her academic career, holding constant both observed and unobserved factors related to academic outcomes. We also provide estimates from models that evaluate how the relative performance of male and female student assigned to the same teacher or in the same classroom relates to the gender of the teacher. We find no statistically distinguishable relationship between same-gender teacher assignments and student math or reading achievement in elementary school. We find a statistically significant relationship between being assigned to a female teacher and student achievement in middle and high school, however the magnitude of the effect is small.

1. Introduction

In the United States, female and male academic performance differs considerably by age and subject category. Despite students beginning kindergarten on equal footing, by the time male and female students transition from middle school to high school, a clear academic disparity has developed where female students typically outperform their male peers in subjects of reading and writing and male students outperform female students in areas of science and mathematics (Dee, 2006; Freeman, 2004; McCrea, 2010; Robinson & Lubienski, 2011). This disparity, commonly referred to as the "gender gap", raises concerns of equity in a national education system designed around the concept of equal access and opportunity for all students.

Addressing the gender gap in student outcomes has become a significant policy concern (Novotney, 2011; Smithers & Robinson, 2006). Among the several policy levers suggested to address this gap is the use of same-sex schools and teacher assignments (see for instance, Dee, 2006). Same-gender teachers might serve as better role models for students (Ammermuller & Dolton, 2006; Carrington, Tymms, & Merrel, 2008; Francis et al., 2006; Krieg, 2005; Nixon & Robinson, 1999). Further, assignment to a same-gender teacher could influence student achievement through teacher expectations of the student's performance (Ehrenberg, Goldhaber, & Brewer, 1995; Carrington, Tymms, & Merrell, 2008; Nixon & Robinson, 1999; Rosenthal & Jacobson, 1968).

There is some reason to suspect that the effects of same-gender teacher assignments might differ by student gender and age. At 10 years of age, a student's gender stereotype resembles that of an adult (Ruble & Martin, 1998). Female students around the ages of 11–13 begin to understand and apply gender stereotypes. Coincidentally, this is the age span where a disparity between mathematics performance between male and female students begins to emerge and mathematics becomes viewed as a male domain (Ambady, Shih, Kim & Pittinsky, 2001; Hyde, Fennema, Ryan, Forst, & Hopp, 1990).

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0272-7757/$ – see front matter
http://dx.doi.org/10.1016/j.econedurev.2013.01.007

A considerable amount of research has demonstrated differences between male and female teachers in their perception and treatment of male versus female students (Krieg, 2005; McCandless, Bush & Carden, 1976; Meece, 1987; Rodriguez, 2002; Stake & Katz, 1982). However, whether such factors result in differences in the academic outcomes for male and female students when assigned to teachers of a particular gender in elementary and secondary school is an unresolved research question. Results from prior research evaluating the impact of assignment to a same-gender teacher in earlier grades where the gender gap develops have been mixed (Bettinger & Long, 2005; Canes & Rosen, 1995; Ehrenberg, Goldhaber, & Brewer, 1995; Dee, 2005, 2006, 2007; Gibb, Fergusson, & Horwood, 2008; Neumark & Gardecki, 1996; Nixon & Robinson, 1999; Robst, Keil, & Russo, 1998; Rothstein, 1995). The most convincing estimates to date come from Dee (2007) which replicated panel-data procedures in the cross-sectional National Educational Longitudinal Study (NELS) by taking advantage of the fact that this study matched students with teachers in multiple subjects. Dee found that assignment to a same-gender teacher significantly improved student achievement.

Though mitigated in Dee's recent paper, a limitation of the body of research looking at the effect of being assigned to a same-gender teacher is its utilization of cross-sectional data. Panel data techniques matching individual students to multiple teachers – thus, often teachers of both genders – over time, could substantially improve upon estimation of the same-gender teacher effect by better accounting for unobserved student heterogeneity.

In this study we expand upon prior research by estimating the effect of teacher gender on the reading and math achievement of male and female students using a rich administrative dataset that follows the universe of test-taking students enrolled in Florida public schools in grades three through ten over a period of five years. We apply the first difference estimator to hold constant time-invariant characteristics about students and teachers. Essentially, our analysis estimates how individual students' achievement change as they are assigned to teachers of different genders throughout their academic career.

We found no significant relationship between teacher gender and the achievement of either male or female students in elementary grades. We do, however, find a statistically significant relationship between teacher gender and student achievement in middle and high school grades. In contrast to prior research, we found evidence that both female and male middle and high school students benefited when they were assigned to a female teacher, although male students appear to benefit less from having a female math teacher than their female peers.

2. Data

We utilized a rich dataset provided by the Florida Department of Education that contains extensive information about individual students and teachers over time. The student-level dataset contains observable characteristics for the universe of test-taking Florida public school students in grades three through ten for each year from 2000–2001 to 2004–2005. More than 1.7 million students attached to more than 13,000 teachers in more than 3000 schools are represented in the dataset and used in the most inclusive analyses.

Along with demographic information, the dataset includes each student's scores on the math and reading portions of the state's mandated standardized exam, the Florida Comprehensive Assessment Test (FCAT). A unique student identifier allowed us to track students throughout their academic careers.

The data includes unique identifiers for teachers as well as an identifier for the specific class (that is, a grouping of students being taught by a particular teacher in a given year) that is present in both the student and teacher datasets. This allowed us to match students to particular teachers and classrooms. Finally, the dataset also includes an identifier for the course number of a class, so we also knew the class type as well as the particular teacher for a given student, which is particularly important in the middle and high school grades when students tend to have different teachers for each academic subject.

A challenge to effectively utilizing this dataset for estimation is that students are very often assigned to more than one classroom and/or more than one teacher for a given academic subject, particularly in middle and high school grades. This is problematic because the unit of observation in the analysis must be for a single student-year observation and its pairing with single teacher-year information. When creating the dataset, we assumed that only one teacher was responsible for each student's academic growth in a particular subject (math or reading). At the elementary level it is likely that the classroom teacher was most responsible for students' achievement in math and reading. To arrive at a single student-year observation matched to a single teacher we develop a series of screening rules to eliminate additional observations of a student–teacher-year match where we had multiple such observations.The first screens were intended to match the student to the teacher most responsible for their score in the subject under consideration. For elementary grades, we first used observations for students enrolled in a general class (i.e. a class designated as "Third Grade"). We then matched students to teachers in classes aligned with the subject that was being evaluated–math or reading. In the next screen, when students continued to have more than one student–teacher-year observation, we excluded such matches where the teacher was listed as not being "full time". The idea being that most part time teachers are unlikely to be the child's primary teacher in a given classroom or subject. If, after these screens, we were still left with multiple observations of a student–teacher-year match, we randomly determined which observation to include. In middle school and high school grades we were able to match students to a single teacher with our screens before resorting to random matching for about 99 percent of students in both math and reading. For elementary grades, we were able to match about 93 percent of students to a single teacher before resorting to a random match. Approximately 98 percent of students

Table 1
Summary statistics.

	Math		Reading	
	Mean	Std. deviation	Mean	Std. deviation
Math score	−0.02	0.98	−0.01	0.98
Asian	0.02	0.14	0.02	0.14
African-American	0.26	0.44	0.25	0.43
Hispanic	0.23	0.42	0.22	0.42
Indian	0.00	0.06	0.00	0.06
Free or reduced lunch	0.47	0.50	0.46	0.50
Grade 4	0.14	0.34	0.14	0.35
Grade 6	0.16	0.37	0.15	0.36
Grade 7	0.16	0.37	0.15	0.36
Grade 8	0.15	0.35	0.15	0.36
Grade 9	0.14	0.35	0.15	0.36
Grade 10	0.12	0.32	0.12	0.32
Limited English proficient LF	0.03	0.18	0.04	0.18
Limited English proficient LN	0.00	0.03	0.00	0.02
Limited English proficient LP	0.00	0.03	0.00	0.03
Limited English proficient LZ	0.10	0.30	0.10	0.29
Individual education plan	0.15	0.36	0.15	0.36
Teacher taught between 4 and 6 years	0.23	0.42	0.22	0.42
Teacher taught 7 or more years	0.40	0.49	0.39	0.49
Female teacher	0.71	0.45	0.85	0.36

were assigned to fewer than two teachers prior to random assignment.

Table 1 provides summary statistics for students included in the main math and reading regressions. About equal portions of students are found in each grade. A near majority of all students are either Hispanic or African-American. Most students observed in the sample are assigned to teachers who have taught for more than four years. And the large majority of teachers in the sample are female.

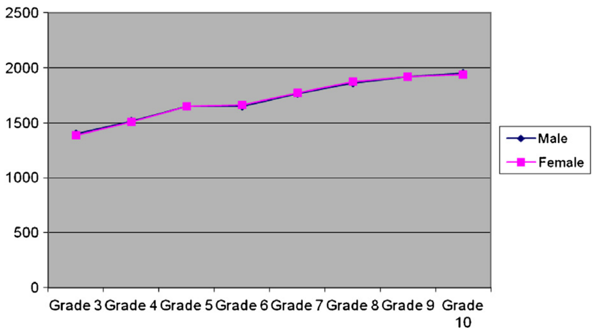

Fig. 1. Student math scores by gender.

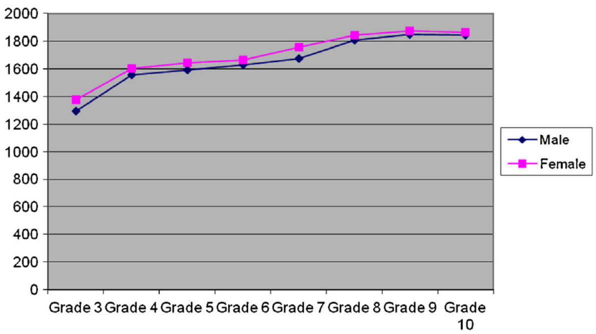

Fig. 2. Student reading scores by gender.

Figs. 1 and 2 trace the relative achievement of male and female students by grade on the math and reading FCAT exam in 2005, respectively. Interestingly, there was not a meaningful gender achievement gap among Florida students in either subject. This result differs from the national picture, for instance on the National Assessment of Educational Progress. While the fact that the gender gap does not appear to be represented in Florida's case is somewhat strange given evidence of the gap on exams outside of Florida, it should not itself impede our estimation of the relationship between same gender assignments and student achievement.

3. Methodology

Our procedure takes advantage of the panel nature of the dataset to examine the relationship between teacher gender and the proficiency of male and female students. Our primary approach accounts for unobserved student heterogeneity through the use of fixed-effects at the student level. We estimate models taking the form:

$$y_{ijst} = \beta_0 + \beta_1 X_{ijst} + \beta_2 Z_{ijst} + \beta_3 FemaleTeach_{ijst} + \phi_t + \alpha_i + \varepsilon_{ijst} \quad (1)$$

where y_{ijst} is the test score of student i, assigned to teacher j, in school s, during year t; X is a vector of time-variant observed student characteristics; Z is the years of experience of the student's teacher; *FemaleTeach* is an indicator that equals one if the student's teacher is female; φ is a fixed-effect for the school year; α is a student fixed-effect; and ε is a stochastic term clustered by school.

The use of a student fixed-effect in (1) accounts for student heterogeneity by estimating the coefficients within, rather than across students. We also report models that remove the student fixed-effect and replace

Table 2
Effects of teacher gender on student math achievement.

	Female students							
	All grades			Elementary grades			Grades 6–10	
Female teacher	0.0246*** [9.316]	0.0197*** [8.374]	0.0196*** [8.430]	0.00415 [0.712]	−0.000768 [−0.0529]	0.0059 [0.485]	0.0281*** [9.675]	0.0206*** [7.452]
	Male students							
	All grades			Elementary grades			Grades 6–10	
Female teacher	0.0151*** [5.359]	0.0141*** [5.533]	0.0136*** [5.440]	−0.0011 [−0.195]	−0.00735 [−0.556]	−0.00606 [−0.569]	0.0182*** [5.734]	0.0125*** [3.641]
Excludes third grade	YES	YES	NO	YES	YES	NO	N/A	N/A
Prior test score	YES	NO	NO	YES	NO	NO	YES	NO
Time invariant student characteristics	YES	NO	NO	YES	NO	NO	YES	NO
Time variant student characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES
Grade level	YES	YES	YES	YES	YES	YES	YES	YES
Teacher years of experience	YES	YES	YES	YES	YES	YES	YES	YES
School fixed-effect	YES	NO	NO	YES	NO	NO	YES	NO
Student fixed-effect	NO	YES	YES	NO	YES	YES	NO	YES

Dependent variable is the student's score on the FCAT math test. Time invariant student characteristics include race/ethnicity, gender, indicators for whether the student is eligible for free or reduced priced lunch, and. Time variant student characteristics is an indicator for whether the student is identified as having limited proficiency in English. *T*-statistics based on standard errors clustered by school in brackets.

*** $p < 0.01$.

it with a fixed-effect for the student's school. When estimating models that exclude the student fixed-effect, we include time-invariant student characteristics as well as the student's test score in the prior year to account for historical schooling and unobserved student heterogeneity.[1]

We are interested in whether the effect of a teacher's gender differs according to student gender. Because student gender is a time-invariant characteristic, and thus cannot be estimated in a model that includes a student fixed-effect, we estimate (1) separately for male and female students. We can interpret β_3 as the relationship between being taught by a female teacher rather than a male teacher and the student's test score at the end of the year. If there is an additional impact of being assigned to a same-gender teacher, then we would expect β_3 to be larger when the model is restricted to female students than when it is restricted to only include male students.

Though we account for unobserved student heterogeneity through fixed-effects or by accounting for prior student proficiency, we are not able to directly account for non-random matches of students to teachers of a particular gender. This would be a problem if, for example, female teachers are more likely to be assigned higher achieving students whose ability is not entirely captured by the controls in the model (see for example, Rothstein 2009). To test the robustness of our results to this problem, we estimated models that account for twice-lagged student test scores (Rothstein, 2007). Though not reported here for space considerations, we found that accounting for twice-lagged scores had no meaningful influence on the relationship of interest.

4. Results

In this section, we discuss individually the estimation results. To ease interpretation, the test scores have been standardized by grade and year prior to estimation to have a mean of zero and a standard deviation of one. As mentioned previously, all standard errors are clustered by school.

When considering the results, we are interested both in the coefficient estimates overall and in the difference in the coefficient estimates for models considering students of particular genders. If there is an effect from being assigned to a same gender teacher, we would expect that the estimated effect of having a female teacher would be larger for female students than it is for male students.

Table 2 reports estimates from models that include all grade levels as well as models restricted to include only elementary or middle/high school grades. Separate results are given for regressions restricted to female and male students. In order to evaluate the robustness of our findings, we report results from models that include either a student or school fixed effect. Further, in order to test whether any differences between models that utilize a student fixed-effect and those that account for prior test scores are due to the fact that the latter regressions exclude third grade students, we also report the results of regressions that include a student fixed-effect and exclude third grade test scores. Thus, Table 2 includes sixteen regressions in total.

As shown in the table, the results from estimations that include all grade levels show a statistically significant

[1] Since testing begins in the third grade, these models exclude third grade students. We tested whether any differences between the school and student fixed-effects models were due to this additional sample restriction by also estimating models that include a student fixed-effect but exclude third grade students. Results from student fixed-effects models were very similar whether or not third grade students were included.

Table 3
Effect of Teacher gender on student reading achievement.

	Female students							
	All grades			Elementary grades			Grades 6–10	
Female teacher	0.0109***	0.00700***	0.00758***	0.0145***	0.00772	0.00987	0.00972***	0.00950***
	[4.060]	[2.853]	[3.128]	[3.291]	[0.670]	[1.065]	[3.012]	[3.014]
	Male students							
	All grades			Elementary grades			Grades 6–10	
Female teacher	0.0156***	0.00887***	0.00939***	0.0142***	0.0161	0.0149	0.0157***	0.00723*
	[5.738]	[3.400]	[3.671]	[3.113]	[1.352]	[1.579]	[4.807]	[1.943]
Excludes third grade	YES	YES	NO	YES	YES	NO	N/A	N/A
Prior test score	YES	NO	NO	YES	NO	NO	YES	NO
Time invariant student characteristics	YES	NO	NO	YES	NO	NO	YES	NO
Time variant student characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES
Grade level	YES	YES	YES	YES	YES	YES	YES	YES
Teacher years of experience	YES	YES	YES	YES	YES	YES	YES	YES
School fixed-effect	YES	NO	NO	YES	NO	NO	YES	NO
Student fixed-effect	NO	YES	YES	NO	YES	YES	NO	YES

* $p < 0.10$.
*** $p < 0.01$.

positive relationship between having a female teacher and math achievement for both male and female students. Though a direct significance test is not possible, it appears that female students benefit from having a female teacher in math slightly more than do male students, though the magnitude of the difference in the estimated effect of having a female teacher is mild.

The remainder of Table 2 evaluates whether the relationship between teacher gender and student achievement differs for students in elementary and middle/high school grades. We find no statistically distinguishable relationship between teacher gender and student achievement in the elementary grades. However, when we look at grades six through ten, the results become significant, demonstrating that the contribution to student achievement for female teachers occurs after the elementary grades. Thus, the effect of teacher gender on student achievement found in the overall model appears to be driven by the relationship found for older students.

Table 3 reports the results from similar analyses looking at the effects of teacher gender on student reading achievement. As in math, we find that female teachers contribute to reading achievement for both female and male students, though the effect is only significant in the middle/high school grades. In the case of reading, however, the effect of having a female teacher is very similar by student gender, and in most cases the effect is actually larger for male students than for female students.

Though statistically significant, the magnitude for the effect of having a female teacher appears to be quite mild.

Table 4
Effect of teacher gender on student math achievement by grade.

	Female students						
	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Female teacher	0.00768	0.00279	0.0280***	0.0367***	0.0179***	0.0341***	0.0224***
	[0.890]	[0.393]	[4.066]	[6.141]	[2.874]	[6.123]	[4.340]
	Male students						
	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Female teacher	0.00876	−0.0029	0.0241***	0.0215***	0.00759	0.0259***	0.0119**
	[1.075]	[−0.423]	[3.153]	[3.164]	[1.213]	[4.892]	[2.242]
Prior test score	YES	YES	YES	YES	YES	YES	YES
Time invariant student characteristics	YES	YES	YES	YES	YES	YES	YES
Time variant student characteristics	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES
Teacher years of experience	YES	YES	YES	YES	YES	YES	YES
School fixed-effect	YES	YES	YES	YES	YES	YES	YES

Dependent variable is the student's score on the FCAT math test. Time invariant student characteristics include race/ethnicity, gender, indicators for whether the student is eligible for free or reduced priced lunch, and. Time variant student characteristics is an indicator for whether the student is identified as having limited proficiency in English. *T*-statistics based on standard errors clustered by school in brackets.
** $p < 0.05$.
*** $p < 0.01$.

Table 5
Effect of teacher gender on student reading achievement by grade.

	Female students						
	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Female teacher	0.00934	0.0115**	0.00642	0.0133**	0.0148**	0.00354	0.0161**
	[1.259]	[2.139]	[0.963]	[2.116]	[2.145]	[0.547]	[2.261]
	Male students						
	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Female teacher	0.0106	0.00675	0.0133*	0.0121*	0.0187**	0.00904	0.0256***
	[1.427]	[1.199]	[1.916]	[1.840]	[2.508]	[1.372]	[3.280]
Prior test score	YES	YES	YES	YES	YES	YES	YES
Time invariant student characteristics	YES	YES	YES	YES	YES	YES	YES
Time variant student characteristics	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES
Teacher years of experience	YES	YES	YES	YES	YES	YES	YES
School fixed-effect	YES	YES	YES	YES	YES	YES	YES

Dependent variable is the student's score on the FCAT reading test. Time invariant student characteristics include race/ethnicity, gender, indicators for whether the student is eligible for free or reduced priced lunch, and. Time variant student characteristics is an indicator for whether the student is identified as having limited proficiency in English. *T*-statistics based on standard errors clustered by school in brackets.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

However, when considered in context of the gender test score gap nationally, the results appear somewhat larger. For instance, female students in the eighth grade scored about 0.03 standard deviations below their peers in math on the 2011 administration of the National Assessment of Educational Progress, and according to the results from Table 3, female middle/high school students benefit from having a female teacher by about 0.009 standard deviations in math achievement.

In addition, the effect of having a same-gender teacher for female students is also of a seemingly small but potentially meaningful magnitude. As reported in Table 2, the estimated effect of being taught in middle/high school grades by a female teacher is about 0.008 standard deviations greater for female students than it is for male students. However, the differential effect by gender of having a female teacher is much smaller in reading.

In order to map the effect over a student's academic career in greater detail, Tables 4 and 5 report the results of regressions restricted to students of particular grade levels. Since most students are only observed in a grade once, these regressions only use a school fixed-effect for this analysis and account for student heterogeneity by controlling for the prior year's test score.

As the previous regressions would suggest, the results for contribution to math achievement by grade for both female and male students are insignificant in the elementary school grades but begin to become significant in middle school. Consistent with the prior results, female teachers contribute to female student math and reading achievement at a slightly higher rate than they do for male students.

5. Conclusion

Addressing the gap in performance between male and female students is a significant policy concern. One interesting policy lever that has been considered to reduce the gender achievement gap is to assign students to teachers of the same gender. Teachers of the same gender could theoretically improve a student's achievement by serving as high-quality role models or because they are more inclined to think positively about the student's potential.

This paper adds to previous research measuring the relationship between being assigned to a same-gender teacher and student achievement in math and reading. We take advantage of a rich panel dataset following a large number of students over a period of five years. Thus, our model is able to estimate how the same students fare when assigned to a male or female teacher as they proceed through their academic careers.

We find that both male and female students in Florida benefit from assignment to a female teacher. However, female students appear to benefit somewhat more from assignment to a female teacher than do male students in math. The effect of assignment to a female teacher in reading is relatively similar for students of each gender. These effects occur during the 6th through 10th grade levels, which supports previous research indicating that students begin to recognize gender stereotypes between 10 and 12 years of age (Ambady, Shih, Kim & Pittinsky, 2001; Hyde, Fennema, Ryan, Forst & Hopp, 1990; Ruble & Martin, 1998).

Our results may not lend themselves directly to making large-scale policy changes to K-12 education in relation to how students are assigned to teachers. However, our results do inform the community about the effects of gender role-modeling on education and academic achievement. Stakeholders within the educational policy community should take these results into consideration when making decisions regarding teacher development.

References

Ambady, N., Shih, M., Kim, A., & Pittinsky, T. L. (2001). Stereotype susceptibility in children: Effects of identity activation on quantitative performance. *Psychological Science, 12*(5), 385–390 http://dx.doi.org/10.1111/1467-9280.00371

Ammermuller, A., & Dolton, P. (2006). *Pupil–teacher gender interaction effects on scholastic outcomes in England and the USA*. ZEW – Centre for European Economic Research: Discussion Paper No. 06-060. http://dx.doi.org/10.2139/ssrn.927689.

Bettinger, E. P., & Long, B. T. (2005). Remediation at the community college: Student participation and outcomes. *New Directions for Community Colleges, 2005*(129), 17–26.

Canes, B. J., & Rosen, H. S. (1995). Following in her footsteps? Faculty gender composition and women's choices of college majors. *Industrial and labor relations review,* 486–504.

Carrington, B., Tymms, P., & Merrell, C. (2008). Role models, school improvement and the 'gender gap' do men bring out the best in boys and women the best in girls? *British Educational Research Journal, 34*(3), 315–327 http://dx.doi.org/10.1080/01411920701532202

Dee, T. S. (2005). A teacher like me: Does race, ethnicity, or gender matter? *American Economic Review, 95*(2), 158–165, Retrieved from http://www.jstor.org/stable/i387679.

Dee, T. (2006). The why chromosome: How a teacher's gender affects boys and girls. *Education Next, 6*(4), 68, Retrieved from http://http://educationnext.org/the-why-chromosome/.

Dee, T. S. (2007). Teachers and the gender gaps in student achievement. *Journal of Human Resources, 42*(3), 528 http://dx.doi.org/10.3368/jhr.XLII.3.528

Ehrenberg, R. G., Goldhaber, D. D., Brewer, D. J. (1995). *Do teachers' race, gender, and ethnicity matter? Evidence from NELS88*. The National Bureau of Economic Research: Working Paper No. 4669. Retrieved from http://www.nber.org/papers/w4669.

Francis, B., Skelton, C., Carrington, B., Hutchings, M., Read, B., & Hall, I. (2006). A perfect match? Pupils' and teachers' views of the impact of matching and learners by gender. *Research Papers in Education, 23*(1), 21–36 http://dx.doi.org/10.1080/02671520701692510

Freeman, C. (2004). *Trends in educational equity of girls & women: 2004* (No. NCES 2005-016). U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.

Gibb, S. J., Fergusson, D. M., & Horwood, L. J. (2008). Effects of single-sex and coeducational schooling on the gender gap in educational achievement. *Australian Journal of education, 52*(3). Retrieved from http://research.acer.edu.au/aje/vol52/iss3/7.

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin, 107*(2), 139–155 http://dx.doi.org/10.1037/0033-2909.107.2.139

Hyde, J. S., Fennema, E., Ryan, M., Forst, L. A., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. *Psychology of Women Quarterly, 14*(3), 299–324 http://dx.doi.org/10.1111/j.1471-6402.1990.tb00022.x

Krieg, J. M. (2005). Student gender and teacher gender: What is the impact on high stakes test scores? *Current Issues in Education, 8*(9). Retrieved from http://cle.ed.asu.edu/volume8/number9/.

McCandless, B. R., Bush, C., & Carden, A. I. (1976). Reinforcing contingencies for sex-role behaviors in preschool children. *Contemporary educational psychology, 1*(3), 241–246 http://dx.doi.org/10.1016/0361-476X(76)90030-8

McCrea, B. (2010). Engaging girls in STEM. *THE Journal Retrieved from http://www.carlsbadusd.k12.ca.us/Pdfs/News/BoardBlast/Engaging_Girls_in_STEM1010.pdf.*

Meece, J. L. (1987). The influence of school experiences on the development of gender schemata. *New Directions for Child and Adolescent Development, 38*, 57–73 http://dx.doi.org/10.1002/cd.23219873806

Neumark, D., & Gardecki, R., (1996). *Women helping women? Role-model and mentoring effects on female Ph. D. student in economics* (No. w5733). National Bureau of Economic Research.

Nixon, L. A., & Robinson, M. D. (1999). The educational attainment of young women: Role model effects of female high school faculty. *Demography, 36*(2), 185–194 http://dx.doi.org/10.2307/2648107

Novotney, A. (2011). Coed versus single sex ed: Does separating boys and girls improve their education? *American Psychological Association, 42*(2), 58, Retrieved from http://www.apa.org/monitor/2011/02/coed.aspx.

Robinson, J. P., & Lubienski, S. T. (2011). The development of gender achievement gaps in mathematics and reading during elementary and middle school: Examining direct cognitive assessments and teacher ratings. *American Educational Research Journal, 48*(2), 268–302 http://dx.doi.org/10.3102/0002831210372249

Robst, J., Keil, J., & Russo, D. (1998). The effect of gender composition of faculty on student retention. *Economics of Education Review, 17*(4), 429–439.

Rodriguez, N. (2002). *Gender differences in disciplinary approaches*. ERIC Document: SP041019.

Rosenthal, R., & Jacobson, L. (1968). Pygmalion in the classroom. *The Urban Review, 3*(1), 16–20 http://dx.doi.org/10.1007/bf02322211

Rothstein, F. A., (1995). Gender and multiple income strategies in rural mexico. *Women In Latin America*, 167.

Rothstein, J. (2007). *Do value-added models add value? Tracking, fixed effects and causal inference*. CEPS Working Paper No. 159. Retrieved from http://www.princeton.edu/ceps/workingpapers/159rothstein.pdf.

Ruble, D. N., & Martin, C. L. (1998). *Social, emotional, and personality development* Gender development: Handbook of child psychology, Vol. 3, (5th ed.). Hoboken, NJ, US: John Wiley & Sons Inc.. pp. 933–1016.

Smithers, A., & Robinson, P. (2006). *The paradox of single-sex and co-educational schooling*. Buckingham. UK Carmichael Press.

Stake, J. E., & Katz, J. F. (1982). Teacher–pupil relationships in the elementary school classroom: Teacher-gender and pupil-gender differences. *American Educational Research Journal, 19*(3), 465–471 http://dx.doi.org/10.3102/00028312019003465