A Gender Study of High School Science Teachers in Rural Florida

Susan M. Butler, Chair, Social Sciences Division, Gulf Coast State College

Abstract

The study compares faculty and school demographics in selected high school science classrooms to expand the research on women with careers in science. The classrooms are either situated in "high need Local Education Agencies" or the classrooms are situated in "low-performing schools," as categorized by the Florida Department of Education. The teachers have been separated into gender groups which were then analyzed for demographic differences as age; race/ethnicity; citizenship; educational degrees; in-field or out-of-field teaching (certification areas); base salary; supplemental salary; and years of experience. All this information provides a snapshot of science teachers and science classrooms in rural northwestern Florida. The study analyzes data to determine gender differences in the professional/personal characteristics; duties; pay; preparation; and work environment of the science teachers participating in the study. Since these teachers work in low-performing schools and districts, one use of the data is to determine the extent to which these teachers differ from the state average. Another use of the data is to compare the work environment of male and female science teachers in rural northwestern Florida school districts.

Introduction

Biology is often the dominant course in science taken by high school students. In fact, a 2000 study indicated that 91% of high school graduates took this class and that "as a universal, lab-based high school science experience nothing else approaches the important or dominance of biology" (McComas 2007, p. 28). Therefore, the instructors who teach biology interact with the majority of high school students and may provide those students with their only view of science, since "only 59% of graduates in 200 took both biology and chemistry, and fewer still, 25% completed the 'big three' science classes [number three is earth science] before finishing high school" (McComas 2007, p. 28).

In the U.S., Common Core State Standards (CCSS) are now being implemented in 45 states, as well as in Washington, DC. As part of this initiative, content literacy is being emphasized in the sciences. Ten standards address this literacy in grades 9-10 and another ten standards cover grades 11-12 (National Governors Association Center for Best Practices, Council of Chief State School Officers 2010). Florida is one of the states who has adopted these standards, but it also continues to use content standards for Biology known as Next Generation Sunshine State Standards (Florida Department of Education, Next Generation Sunshine State Standards 2013). Florida has created an end of course standardized exam to assess student knowledge of these standards. This assessment was first given in the spring of 2012 (Florida

Department of Education, Florida End of Course Assessment 2013). Scores are reported as levels one through five, with level one being the lowest in achievement. To earn credit for the biology course, a student must score at level three or above (Florida Department of Education, Office of Assessment 2013).

To enhance the content knowledge and pedagogical knowledge levels of biology instructors in preparation for the implementation of the biology end of course assessment, the Florida Department of Education disseminated a request for proposals under the category of Florida Teacher Quality Grant in August of 2011 (Florida Department of Education, Bureau of Curriculum and Instruction 2011). Gulf Coast State College and the Panhandle Area Educational Consortium, located in northwestern Florida, responded to this request and were funded for $500,000 as the *Biology Partnership: A Teacher Quality Grant* (Biology Partnership March 5, 2013). An additional $500,000 in funding was received for the 2012-2013 academic year. The science instructors who are the participants in this grant are the focus of this study.

Theoretical Foundations

This study is informed by contemporary feminist theory, which uses “the starting point of all its investigation [as]…the situation (or the situations) and experiences of women in society. Second, it seeks to describe the social world from the distinctive vantage points of women” (Lengermann and Niebrugge 2011, p. 454). The sociological perspective of feminist theory focuses primarily on inequalities between the genders. The definition of gender, then, is one of this theory’s major contributions to sociology. Gender is defined as “the social and cultural characteristics that distinguish women and men in society” (Cherlin 2013, p. 26). In feminist theory, gender is a social construction and such a pervasive one that “it usually takes a deliberate disruption of our expectations of how women and men are supposed to act to pay attention to how it is produced” (Lorber 2007, p. 276). In this socially constructed view of gender, the focus is not upon the differences in biological (sexual) characteristics between men and women, but rather in how gender shapes social identities and creates a power differential. Kerbo (2009, p. 310) describes this process of identify formation as:

> From birth, females and males are treated differently, made to dress differently, play with different toys, and are exposed to different experiences at home and elsewhere. This leads to the development of gendered identities and self-concept, and often influences choices women and men make.

Thus, gender and gendered identities are shaped within society and feminist theory maintains that the gender roles of men and women are structured in such a way as to give men dominance over women (Cherlin 2013). This is because society tends to value masculine roles over feminine ones. For example, if we examine the breadwinner-homemaker roles of men and women, we see that men as breadwinners can exert economic dominance over women (who are financially dependent upon them), therefore men have disproportionate access to "property, power, and prestige" (Henslin 2012, p. 309).

Although the gender roles of breadwinner/homemaker have diminished in modern U.S. society, in that between 58 and 62 percent of the U.S. workforce are women (Henslin 2012), inequalities still exist. Perhaps the most powerful international example of such gender inequality in recent times is that of Malala Yousafzai, the young Pakistani girl who was shot by the Taliban because she advocated education for girls (Shah 2013).

Such barriers to educating women do not exist in the U.S.; in fact, women now outnumber men among college students, as they comprise 57% of the student body. Women also dominate men in some professional degrees as dentistry (55%); law (53%), and medicine (51%). However, women are less likely to complete doctoral degrees than men. In biological science, for example, women account for 56% of graduate student enrollment, with men making up the residual 44%. Among the doctorates conferred in this area, women make up only 49% and men 51% (Henslin 2012). If these men and women use their degrees to become college professors, the women's pay will be less than that of the men. In fact, a pay gap exists between men and women throughout the U.S. workforce. Henslin (2012) found that women who work full-time average only 70% of men's salaries while Kerbo states the differential rate is 82% (Kerbo 2009). If Kerbo is correct, women's salaries continue to gain on those of men, but pay inequality is still pervasive.

This study, then, will use the feminist "standpoint" (Smith 2011, p. 344) while examining women's situations in the science classrooms of northwestern Florida.

Setting and Participants

All 33 participants in this study are members of the Biology Partnership grant. They are teachers in grades 6-12 science classrooms located in either high need northwestern Florida school districts or in low performing schools. A *high need* school district is a district "(a) that serves not fewer than 10,000 children from families with incomes below the poverty line; or (b) for which not less than 20 percent of the children served by the [district] are from families with incomes below the poverty line" (Florida Department of Education, American Recovery and Reinvestment Act 2009). In Florida, persistently *low performing schools* are those that "currently demonstrate the lowest proficiency rates in reading and mathematics with all students included and have demonstrated the lowest proficiency rates in reading and mathematics since 2002-03 with all students included" (Florida Department of Education, Bureau of Federal Educational Programs 2013). The purposes of the Biology Partnership grant are to aid the teachers in these high need districts or low performing schools by upgrading their pedagogical skills in teaching biology and by enhancing their content knowledge of biology.

Methodology

This research study uses qualitative methods in a case study approach to explore the demographic characteristics and job-related features of the particular group of grades 6-12 science teachers associated with the Biology Partnership grant. The case study approach was chosen as case studies are particularly useful for descriptive purposes. Beyond descriptions, however, case studies also allow the researcher to discover flaws or inconsistencies in existing social theories. In such an extended case method, researchers explain what they expect to find (based upon a literature review) and then perform research to see if the case conflicts with existing theory (Babbie 2011).

In this case, the researchers expect to find:

A. A pay differential between the genders, such that men will earn 18-30% more for the same work (Henslin 2012; Kerbo 2009).
B. Mental models (Cherlin 2013) that have resulted from societies continually "doing gender" (West and Zimmerman, 1987) will be apparent in the duties that the men and women perform as teachers. Such mental models may include those described by Cherlin (2013, p. 98) as: "Men are expected to be more dominant and aggressive than women, and women are expected to be nicer and more nurturing."

The entire research project strives to a) provide a snapshot of the work environment of a particular group of science teachers who teach in high need school districts or low performing schools in NW Florida; b) compare their work environments to Florida state data describing average working conditions for teachers; and c) determine if stratifications exist between the genders in this group of teachers.

To this end, data collection for the research project encompasses several methods including observations, interviews, and examinations of documents (participant-constructed products, questionnaires, content knowledge tests, etc.).

This particular paper describes findings from an instrument utilized in the qualitative study. This instrument was a broad questionnaire administered to participants in the grant project to simply determine characteristics of the group and begin to get an insight on their working conditions.

Data

The 33 participant instructors completed questionnaires which included both forced-choice, closed-ended questions and open-ended questions. The questionnaires were distributed to the respondents when they were gathered together for training, and participants were provided time for answering the questions. Participants wrote an identification code on the questionnaires, rather than their names. The codes were then used to separate the questionnaires by gender. The categories for analysis of the responses were personal/professional participant demographics, compensation, assignments/working environment, and support/resources.

Personal and Professional Demographics.

Finding in Personal and Professional Demographics

To summarize the findings in demographics, Table One is provided.

Table 1
Summary of Personal and Professional Demographic Data

Demographic	Males	Females
Gender (%)	30	70
Age (years)	30-39	40-49
Ethnicity (%)	40 Asian, 60 Caucasian	8 Asian, 92 Caucasian
Highest Degree	Ed.S.	Masters
Concentration Area(-s) for Degrees	Bachelors-split evenly among Biology Education, Chemical Engineering & other non-science degrees Masters-split evenly among Secondary Biology Education & other non-science degrees Ed.S.- Science Education	Bachelors—Elementary Education Masters-Secondary Biology Education and Science Education
Teacher Certification Areas (descending order, with 10% or more of respondents)	Biology, Chemistry, Mathematics	Middle Grades Science, Elementary Education
Method of obtaining certification (%)	55 Four-year university 44 Alternative means	35 Four year university 39 Alternative certification
Average Years of Teaching Experience (years)	9.7	13.2
Out-of-Field Teaching (%)	12	6

Gender, Age, Race/Ethnicity

Women members outnumbered male members, amounting to 70% of the grant's participants. The women were also slightly older than male participants. The median age range for the males was 30-39 years while that of females was 40-49 years. There were only two race/ethnicity categories identified for the participants, that of Asian and Caucasian. The breakdown for male participants was 40% Asian and 60% Caucasian. Females were 8% Asian and 92% Caucasian. All of the Asian participants were citizens of the Philippines, not citizens of the U.S.

Education

The highest educational degrees achieved by participants ranged from bachelor's through educational specialist graduate degrees. The number of participants who had attained only bachelor's degrees was fairly split between males and females, with 55% of the males and 52% of the females holding this degree. The remainder of the females (48%) held master's degrees, while only 33% of the males had this degree. No females held an educational specialist decree, but 11% of the males had attained this degree.

Since the respondents are all participants in a biology grant, it was expected that their educational degrees would be in science areas. While the data did show participants with science degrees, these were primarily in science education rather than in a "pure" science. For those participants with bachelor's degrees, the majority of the women majored in elementary education, followed closely by those with "pure" science degrees. During their undergraduate work, the males were split among several areas: secondary biology education, economics/finance, Christian studies, and chemical engineering.

Among the participants with master's degrees, the women predominantly attained their degrees in secondary biology education, with science education as a close second. Men with master's degrees were evenly split among secondary biology education, instructional technology, and educational management areas of concentration.

These data indicate, therefore, that among all participants, education degrees outweigh science degrees and that the males tended to have more degrees in subjects other than science or education. None of the participants earned their advanced degrees (master's, educational specialist) in a pure science (biology, chemistry, physics, or earth/space).

Teacher Certification

Turning attention now to teacher certification areas, both men and women reported multiple areas of certification. The highest percentages of both males and females were certified to teach biology (31% of each gender). Other areas of certification for the males, in descending order were chemistry (21%) and then mathematics (11%). The remaining male participant areas of certification were educational leadership (5%), elementary education (5%), middle grades integrated-science, math, language arts, social studies (5%) and special education (5%). After the biology certification, the female participant areas of certification in descending order were middle grades science (18%), elementary education (10%) and chemistry (8%). Other certification areas for the females were business education (5%), mathematics (5%), physical education (5%), middle grades integrated-science, math, language arts, social studies (4%), earth/space science (3%), educational leadership (3%), and health (3%).

If biology, chemistry, physics, earth/space, middle grades science, and middle grades integrated certification areas are considered as licenses to teach science in grades 6-12, then 57% if the males held certification in science compared to 64% of the females. Among the non-science certification areas, men were more likely than women to hold educational leadership, mathematics or special education certifications.

Teachers in Florida earn their certifications in different ways. They can graduate with bachelor's degrees in education from a state-approved initial teacher preparation (ITP) program at a four-year institution; they can obtain temporary certificates if hired by a school district and receive their professional certificate after completing the district alternative certification program (DACP); or they can be certified through other, alternative means as state-approved educator preparation programs or through additional college coursework. Analysis of data from the grant participants demonstrated that 55% of males as opposed to 35% of the females were certified through initial teacher preparation programs (ITPs). A slightly higher percentage of males than females were certified through other alternative means (44% compared to 39% of females). Females, however, were more likely to have become certified through district alternative certification programs, as 26% obtained certificates in this manner, as opposed to only 11% of the males.

Years of Teaching Experience

When queried for years of teaching experience, participants replied with periods that encompassed all spans from "less than one year" to "over 30 years." On average, however, the men had slightly less teaching experience than the females. The average years of experience for males were 9.7 years, while those for females were 13.2 years.

In-field versus Out-of-field Teaching

Male participants were more likely than females to teach outside their areas of certification, as 12% of males taught out-of-field compared to just 6% of females.

Analysis of Demographic Data

The breakdown of the grant participants by gender mirrors that of the state's teachers, as there is a 30% to 70% distribution of males/females in the grant and a 36% to 64% distribution in the state (Florida Department of Education, Education Information and Accountability Services, May, 2011). Therefore, there is nothing unique in the composition of the participants by gender.

Data on biology teachers in particular also show a similar division by gender, as McComas (2007, p. 28) found that female instructors predominate in high school biology classrooms where "47% of biology teachers are male and 52% are female."

The ages of both gender groups are below the Florida average for teachers, albeit that the state data is somewhat dated, as the latest age survey was posted in 2003. The median age range of male grant participants was 30-39; that of female participants was 40-49; that of the state's teachers was 50-59 in 2002 (Florida Department of Education, Teacher Recruitment and Retention, February 2003).

The predominance of Caucasians in the grant participant group for both genders also mirrors Florida teacher data, in these proportions of male participants--female participants--state Caucasian teachers: 60%--92%--69%. State data show 13.6% of teachers are African American and 11% are Hispanic; these racial/ethnic groups are not present in the grant participants (Florida Department of Education, Education Information and Accountability Services, 2012, May).

Among state teachers, data show that Ph.D. and Ed.S. degrees are rare, just as they are for the grant participants. Approximately 37% of state teachers hold master's degrees while 59% hold bachelor's degrees. The male group of participants more closely mirrored these state data, as 11% have Ed.S. degrees, 33% have master's, and 55% have bachelor's degrees. For women, the results were 0% Ed.S., 48% master's, and 52% bachelor's degrees. So, the women hold more masters degrees than the state average of highest degree; men hold more Ed.S. degrees than the state average. There is no state data demonstrating areas of concentration for these degrees. However, the grant females tended to have more science education degrees at the master's level than the men. At the bachelor's level, however, most women majored in elementary education whereas none of the men did. Men did major in secondary biology education at this level, while the women did not.

In the certification area, as expected, the largest percentages of participants (31% for both males and females) were certified in biology. This differs from the state data, where the largest percentage of teachers (46.3%) are certified in elementary education and only 5.5% are certified in science subjects. In fact, the science certification area was approved as a "critical teacher shortage area" for the 2013-2014 academic year (Florida Department of Education, State Board of Education Meeting, February 18, 2013).

The method by which grant participants received their certification differed from the state averages chronicled in a January 1, 2013 report from the Florida Department of Education. This report cited percentages for different routes of certification pursued by the new teachers who completed their certifications in 2010-2011. Among this group of new teachers, male percentages for district alternative certification programs and other alternative certification areas were 38.5% and 25.3% respectively, as compared to 11% and 44% within the grant. The sharpest discrepancy for males, though, was within the initial teacher preparation program (ITP) category, which is how 55% of grant males achieved certification, as opposed to only 12.4% of the male teachers in the state teacher group. Females in the grant were more likely (39%) to utilize alternative certification means rather than an ITP program (35%) for certification. The highest percentage for the state teachers was found in the ITP area (87.6%) (Florida Department of Education Teacher Preparation Study January 1, 2013). So, the grant demographics of ITP preparation for males and other alternative means for females contrast sharply with the state data, where ITP preparation was highest for females and district alternative certification programs were highest for males.

Only 6% of female participants taught outside their certification areas, but 12% of male participants taught out-of-field courses. Both genders, then, exceeded the state average for out-of-field teaching, which was 4.6% for all Florida teachers (Florida Department of Education, State Board of Education Meeting February 18, 2013).

Compensation

Findings in Compensation

To summarize the findings in compensation, Table Two is provided.

Table 2

Summary of Compensation Data

Compensation Type	Males	Females
Average Base Salary ($)	37,143	39,225
Average Salary ($) per Year of Experience (bachelor’s)	5,211/yr.	3,090/yr.
Average Salary ($) per Year of Experience (master’s)	3,833/yr.	2,825/yr.
Average Amount ($) of Supplemental Payments	633	2,975
Average Amount ($) of Personal Funds Used	641	578
Average Net Compensation ($) per Year of Experience	3,828/yr.	3,153/yr.

Base Salary

Grant participants reported different salary ranges across the genders. The ranges spanned from $20,000 to $59,999 for annual salaries. The average male salary was $37,143 while the average female salary was $39,225. Contract lengths were similar for both genders, encompassing an average of 193 days for each.

Years of Teaching Experience and Base Salary

Data on years of teaching experience highlighted differences between the genders. As reported above, the male participants had less teaching experience. Males had taught for an average of 9.7 years, while the data for females was 13.2 years. Utilizing the base salary of each group and dividing this by the years of experience can provide a ratio of comparison between the genders, showing the approximate salary each gender receives for each year of experience. For male participants, this figure was $3,829 per year of experience. Females earned $2,971 for each year of experience.

Years of Teaching Experience, Base Salary and Highest Degree

In Florida, teacher salary schedules are constructed for each degree (Florida Department of Education, Education Information and Accountability Services, August 2011). So, the genders were also broken down into categories of degrees and within these, were analyzed for salary and years of experience. At the bachelor's level, male salaries ranged from $30,000 to $40,999; the calculated average male salary at this level was $37,000. The average female salary at the bachelor's level was $38,636. Similar calculations were done at the master's level, with the following average salaries: master's level for males, $38,333; master's level for females $39,545. No calculations were done at the Ed.S. level, as no women in the participant group had received this degree.

Analyzing for years of experience at each level by gender provided the following: bachelor's level for males, 7.1 years; master's level for males, 10 years; Ed.S. level for males, 30 years; bachelor's level for females, 12.5 years; master's level for females, 14 years. These data are summarized in Table Three.

Table 3

Average Salaries and Years of Experience by Degree Level

Degree Level	Male Avg. Salary ($)	Male Avg. Years of Experience	Female Avg. Salary ($)	Female Avg. Years of Experience	Male Salary($) /Year Ratio	Female Salary($) /Year Ratio
Bachelors	37,000	7.1	38,636	12.5 yrs.	5,211/yr.	3,090/yr.
Masters	38,333	10	39,545	14 yrs.	3,833/yr.	2,825/yr.

So, when all three factors (degree, salary, and years of experience) are considered, females receive less salary per year of experience than do males.

Supplemental Payments

In addition to their base salaries, grant participants also reported receiving supplemental payments for extra duties they performed. Females, on average received extra payments totaling $2,975 per year. Males reported extra incomes of only $633. The type of duties for which male participants received extra pay included department chair or other administrative work. Women, conversely, reported multiple duties including academic team coach, science fair coordinator, volleyball assistant coach, extra teaching period, guard sponsor, girls' track coach, science, club, school leadership team, varsity softball coach, and administrative work. The only overlap between extra duties performed by the two genders, therefore, was in the area of administrative work.

Use of Personal Funds

Both genders indicated that they sometimes use personal funds to supplement inadequate supply budgets. On average, the males reported spending $641 dollars per year on supplies; women reported using $578 of personal funds per year.

Analysis of Compensation Data

The average base salary of the women is higher than that of the men by $2,082. However, when the degree levels of the participants and their years of teaching experience are considered, the ratio of salary per year of experience is significantly lower for women than for men, at both the bachelor's ($2,121 lower) and the master's ($1,008 lower) level.

It is possible to calculate net compensation by adding the average supplemental pay to the average base salary for each gender and then subtracting out the amount of personal funds used. Dividing such net compensation by average years of experience can provide an Average Net Compensation per Year of Experience. There is insufficient data, however, to quantify this for each degree level. For males, the net compensation per year of experience is $3,828; for females this figure is $3,153. Therefore, even though the women receive higher supplemental pay and use less personal funds, they still have lower net compensation per year of experience.

Florida does not collect data on supplemental pay to teachers or on amount of personal funds they may use. However, one can compare the net compensation rates of the participants to state data on average teacher compensation per year of experience (Florida Department of Education, Education Information and Accountability Services, August 2011). These data show that Florida teachers receive, on average, $3,797 for each year of experience. This is higher than the females' net compensation rate, yet lower than that of the males in the grant.

Assignments and Working Environment

Finding in Assignments and Working Environment

To summarize the findings in assignments and working environment, Table Four is provided.

Table 4

Summary of Assignments and Working Environment Data

Assignments/Working Environment Data	Males	Females
Class Size, # students	21	22
Teaching, minutes/day	300	280
Planning, minutes/day	46	73
Most frequent unpaid duty	Student clubs	Student supervision- before/after school, at lunch
Percent (%) teaching biology	23	48
Percent (%) teaching other sciences	56	50
Percent (%) teaching non-science courses	21	2

Class Size

Average class size was not significantly different for the genders, as males reported class sizes of 21 students while females reported teaching 22 students per class.

Assigned Duties

Men did indicate, however, that average class periods in their schools were 53 minutes while females reported class periods of only 46 minutes. The data showed men taught for approximately 300 minutes per day and were allowed 46 minutes of planning time. Conversely, women taught for only 280 minutes and utilized 73 minutes of planning time each day.

Both genders also revealed they performed duties other than teaching for which they received no compensation. Similar percentages of both genders performed committee work (33%

of the males; 32% of the females) and student club sponsorship (44% of the males; 36% of the females) for no pay. A larger percentage of female teachers (64%) reported supervising students before, after, or during lunch than the percentage of male teachers (33%) reporting these as unpaid duties. Females also reported mentoring other teachers (9%) and sponsoring off-campus activities (4%), but no male teachers listed these as unpaid duties.

Courses Taught

Although all respondents were participants in a biology-related professional development grant, the teachers taught diverse subjects, including other science courses (besides biology) and some courses that were not related to science.

Of the group, 48% of the women taught biology, while only 23% of the men taught this subject. Other science courses were taught by 56% of the men and 50% of the women. Courses that did not fall within the science area were taught by 21% of the men, but only 2% of the women.

Analysis of Assignments and Working Environment Data

The genders have similar class sizes, most likely as the result of a Florida law which dictates class sizes. This law is actually an amendment to the Florida constitution, which was approved by the voters in 2002. It sets limits on the number of students in core classes, as math, English, science, and social studies. The amendment gradually reduced class sizes over an eight-year span, from 2002 to 2010. Since the 2010-2011 academic year, science classes have been mandated to be at or below 25 students in grades 9 through 12 (Florida Department of Education, Class Size Reduction Amendment, 2005).

By comparing duties, women were found to teach for fewer minutes per day and plan for more minutes per day than the men. They are more likely to teach biology and science classes than non-science classes. At least 21% of the men, however, teach non-science classes.

Women are more likely to perform student supervision duties for which they are not compensated; men’s uncompensated duties are more likely to be the sponsorship of student clubs. Women and men reported performing unpaid duties in the 4 common categories of administration, committee work, student supervision, and sponsorship of student clubs. However, only the women reported parent conferences, off-campus activities (as field trips or sporting events), and mentoring other teachers as unpaid duties.

Support and Resources

Findings for Support and Resources Data

To summarize the findings in support and resources data, Table Five is provided.

Table 5

Summary of Support and Resources Data

Assignments/Working Environment Data	Males	Females
Science Department (number of teachers)	5.8	6.7
Colleagues with same schedule (number of teachers)	1.4	1.5
Science Department budget per teacher ($)	345	342

Assignments/Working Environment Data	Males	Females
Percent (%) with access to teaching equipment	Desktop computer 17 Projector & screen 31 Interactive whiteboards 12	Desktop computer 19 Projector & screen 28 Interactive whiteboards 16
Students sharing computers (Student/computer)	7.4	4.6
Most valuable (useful) equipment	Digital microscope	Digital microscope
Wish list items	Science kits, models, digital probes, microscopes & slides, mass spectrometer	Science kits, models, classroom clicker response units, document camera, balances, hot plates, scales, electrophoresis chamber, iPad

Science Department Sizes/Colleagues/Budgets

Grant participants teach in some of the smallest school districts in the state of Florida. In fact, out of the ten participating school districts, six have fewer than 500 teachers. The remaining four have less than 1000 teachers (Florida Department of Education, Teacher Recruitment and Retention, February 2003). This means that schools in these districts have small numbers of teachers, as well, which makes science departments also small. For males, the average science department size was 5.8 teachers; for women, there were 6.7 teachers in the department. Participants were also asked to identify the number of teaching colleagues present in their school. Colleagues were defined as *those teachers whose schedules most closely matched your* *own*. The average number of colleagues reported for men was 1.4 teachers; for females, this was 1.5 teachers.

Small science departments with low teacher numbers also tend to have small budgets. Men reported average annual science department budgets of $2,000. Partitioning this amount out over the average department size of 5.8 teachers provides each teacher with $345 per year to spend. The science departments of the women participants averaged 6.7 teachers and had budgets of $2,290. Therefore, women teachers could expect an annual $342 to be spent for their science classrooms.

Technology and Equipment

Men and women indicated similar access to teaching technologies, as desktop computers, laptop computers, projectors, screens, DVD players, document cameras, and interactive whiteboards. The majority of participants listed access to desktop computers, projectors and screens, and interactive whiteboards. Fewer numbers of participants had laptops or document cameras. Fifty percent of female teachers indicated that their students had daily access to computers; 70% of males also reported this. Participants were then asked if students were required to share computers and if so, how many students were required to share one computer. The average number of students sharing computers in classrooms taught by males was 7.4 students. Female-led classrooms had 4.6 students sharing computers.

Most Valuable Equipment

As the grant provided teachers with science equipment, as well as teaching equipment, participants were asked to identify the most valuable piece of equipment they had received so far, in terms of usefulness, not cost. In descending order, the males identified the digital microscope, a laminator, various models (plant cell, DNA), and a hot plate. The women identified the same first two items (digital microscope and laminator), but these two were followed by various manipulatives, then models, then a digital scale.

Wish List

Participants were also queried to construct a “wish list” of teaching/science equipment they hoped the grant would provide to them. The top five items listed by the men (in descending order) were science kits (any kind), models of cells and anatomical body parts, digital probes for data collection, microscopes and slides, and a mass spectrometer. Women listed science kits (any kind), models of brain, body, reproductive systems, classroom clicker response units, document camera, and an iPad.

Analysis of Support and Resources Data

Because the grant participants were from small districts, it is not surprising that they work in small science departments and have few colleagues who teach similar schedules.

Women worked in slightly larger departments. Both genders had the same average number of colleagues. Both genders had access to similar teaching equipment, although fewer students in women's classrooms had to share a computer. Both genders thought the digital microscope provided to participants by the grant was the most useful piece of equipment. The laminator was second in usefulness for both genders. (The grant activities used many small laminated manipulatives, so respondents who wished to use the activities in their own classes needed access to a laminator.)

Top items on the wish lists of both genders were science kits. Several respondents wrote they wanted these because they appreciated the time saved by having pre-packaged kits with classroom sets of materials. Models were also a top item for both genders, since participants felt these were too expensive to purchase with their small budgets. The men identified the most expensive item on the wish lists, which was the mass spectrometer.

Conclusions

As stated previously, purposes of the entire research project were to a) provide a snapshot of the work environment of a particular group of science teachers who teach in high need school districts or low performing schools in rural northwestern Florida; b) analyze their work environments by comparing these to Florida state teacher data describing average working conditions for teachers; and c) determine if stratifications exist between the genders in this group of teachers.

The many parameters covered in the questionnaires helped provide a view of the work environment of grant participants. From these data, it was possible to compare grant participants to averages for all Florida teachers. In these comparisons, it was found that the grant participants from high need districts or low performing schools:

- Taught out-of-field more often
- Had smaller science departments and fewer colleagues
- Had lower base pay than state averages for secondary teachers

Participant responses to the questionnaire were also analyzed for gender differences. Findings indicate that women participants:

- Were older and had more years of teaching experience
- Achieved certification through alternative means, while men utilized 4-year education programs for certification
- Had higher base salaries, but lower net compensation for each year of experience
- Taught fewer minutes per day and had longer planning periods
- Were required more often than men to provide student supervision

- Had more diverse unpaid duties than men and included mentoring other teachers as a duty
- Had fewer students sharing computers

In the case study, the researcher identified two characteristics that she would expect to find after analyzing the data:

A. A pay differential between the genders, such that men earn 18-30% more for the same work (Henslin 2012; Kerbo 2009).
B. Existence of mental models in the duties that the men and women perform as teachers.

A base salary pay differential was found, but it advantaged the female teachers rather than the males. Looking only at average base salary, the men appeared to earn only 94% of the average pay for women. However, since women had more teaching experience, a method of compensating for this was needed. Therefore, salary per year of experience was calculated and the two results compared. Furthermore, both genders earned supplemental pay for duties and both contributed some of their own personal funds towards buying classroom supplies. Taking these factors into consideration led to the calculation of net compensation per year of experience. Net compensation showed that women earned only 82% of the money paid to the men. Therefore, Expectation A was validated in the data.

The idea of mental models of women as nurturers (Expectation B) was also supported by the data. Women were more likely than men to supervise students or mentor other teachers as forms of unpaid duties.

Discussion

Since the expectations of this extended case study research were supported by the data, the project reaffirmed rather than contradicted existing theories of gender stratification in pay and work functions. In fact, the study supported other precepts, as well. For example, in the participant group, men obtained higher degrees than women and were more likely to major in a science, while the women majored in education.

The pay differential was somewhat surprising, as teacher pay in Florida is performed utilizing salary schedules. An additional year of experience leads to another step up the salary schedule. Schedules are usually differentiated by degree. So, the group of women with more experience should have higher net salaries than the men, particularly since they also reported greater amounts of supplemental pay. Further research should be conducted to uncover more underlying factors that influence compensation besides years of experience and degree to help explain this. Perhaps in this case, experience is not an advantage, as the women may have started in years when salary schedules were lower and are still being impacted by this.

This research study will continue to gather data throughout the 2013-2014 academic year. This future data may be used to determine why participants elect to participate in professional development and how teachers in high need districts or low performing schools different from "average" state teachers. Student data will also be collected, in order to measure how teacher-participants impacted student achievement.

References

Babbie, E. 2011. *The basics of social research*. Belmont, CA: Wadsworth/Cengage.

Biology Partnership. 2013. "Biology Partnership." Accessed March 5, 2013. http://www.paec.org/biologypartnership.

Cherlin, A. J. 2013. *Public and private families*. New York: McGraw-Hill.

Florida Department of Education. 2013. "Florida end-of-course assessments." Retrieved on March 5, 2013 from http://fcat.fldoe.org/eoc/.

Florida Department of Education. 2013. "Next generation sunshine state standards-science." Retrieved on March 5, 2013 from http://www.fldoe.org/BII/curriculum/SSS/.

Florida Department of Education, American Recovery and Reinvestment Act. 2009. "U.S. Department of Education Race to the Top Definitions." Retrieved on March 5, 2013 from www.fldoe.org/arra/pdf/usdef.pdf.

Florida Department of Education/Bureau of Curriculum and Instruction. 2011. "Florida teacher quality grant call for proposals." Retrieved on March 5, 2013 from http://www.fldoe.org/BII/resources.asp.

Florida Department of Education Bureau of Federal Educational Programs. 2013. "Florida's definition of persistently lowest-performing schools." Retrieved on March 5, 2013 from http://www.fldoe.org/bsa/title1/parta-1003a-1003g.asp.

Florida Department of Education, Class Size Reduction Amendment. 2005. "Florida's class size reduction amendment history." Retrieved on March 5, 2013 from http://www.fldoe.org/classsize/.

Florida Department of Education, Education Information and Accountability Services. 2011, May. *Gender representation among professionals in Florida's public schools, 2011-2012*. Data Report, Series 2011-30D. Retrieved on February 3, 2013 from http://www.fldoe.org/eias/eiaspubs/pubstaff.asp.

Florida Department of Education, Education Information and Accountability Services. 2011, August. *Teacher Salary, Experience, and Degree Level, 2010-2011*. Data Report, Series 2012-03D. Retrieved on February 3, 2013 from http://www.fldoe.org/eias/eiaspubs/pubstaff.asp.

Florida Department of Education, Education Information and Accountability Services. 2012, May. *Teacher demographics in Florida's public schools, Fall 2011*. Data Report, Series 2012-20D. Retrieved on February 3, 2013 from http://www.fldoe.org/eias/eiaspubs/pubstaff.asp.

Florida Department of Education/Office of Assessment. 2013, January. "2012-2013 Biology I end of course assessment fact sheet." Retrieved on March 5, 2013 from http://fcat.fldoe.org/eoc/.

Florida Department of Education, State Board of Education Meeting. 2013, February 18. "State Board of Education Action Item: Approval of critical teacher shortage areas for 2013-14." Retrieved on March 5, 2013 from http://www.fldoe.org/board/meetings/2013_02_18/critical.pdf.

Florida Department of Education, Teacher Preparation Study. 2013, January 1. "Teachers from Florida teacher preparation programs: A report on state approved teacher preparation programs with results of surveys of 2010-2011 program completers." Retrieved on March 7, 2013 from http://search.fldoe.org/default.asp?cx=012683245092260330905%3Aalo4lmikgz4&cof=FORID%3A11&q=Beginning+Teachers+from+Florida+Teacher+Preparation+Programs&sa=Search&siteurl=http%3A%2F%2Fwww.fldoe.org%2Fdefault.asp.

Florida Department of Education, Teacher Recruitment and Retention. 2003, February 6. "Florida's investment in high-quality teaching." Retrieved on February 3, 2013 from http://search.fldoe.org/default.asp?cx=012683245092260330905%3Aalo4lmikgz4&cof=FORID%3A11&q=Age+of+Florida%27s+Teachers&sa=Search.

Henslin, J. 2012. *Sociology: A down-to-earth approach*. Upper Saddle River, NJ: Pearson,.

Kerbo, H. R. 2009. *Social stratification and inequality*. New York, NY: McGraw-Hill.

Lengermann, P. M. and G. Niebrugge. 2011. "Contemporary feminist theory." In *Sociological theory*, edited by G. Ritzer, 454-498. New York, NY: McGraw-Hill.

Lorber, J. 2007. "The social construction of gender." In *The inequality reader*, edited by D.B. Grusky and S. Szelenyi, S., 276-283. Boulder, CO: Westview Press.

McComas, W. 2007, Oct. "Biology education: Under the microscope-examining the history and current state of biology education." *The Science Teacher*, Oct. 2007, p. 28.

National Governors Association Center for Best Practices, Council of Chief State School Officers. 2010. "Common core state standards: Grades 6-12 Literacy in history/social studies, science, and technical subjects." National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington, DC. Retrieved on March 5, 2013 from http://www.corestandards.org/ELA-Literacy/RST/9-10.

Shah, S. 2013. "Malala Yousafzai, Pakistani girl shot for wanting to go to school, vows to battle on." *Miami Herald*, February 4. Retrieved on March 5, 2013 from http://www.miamiherald.com/2013/02/04/3217012/malala-yousafzai-pakistani-girl.html.

Smith, D. E. 2011. "Sociology from women's experience: A reaffirmation." In *Social Theory: Roots and Branches*, edited by P. Kivisto, 344-354. New York, NY: Oxford University Press.

West, C., and D.H. Zimmerman. 1987. "Doing gender." *Gender and Society, 2*: 125-151.

Published by the Forum on Public Policy