

Gender, Urbanicity, and Ability¹

THEODORE COLADARCI, PH.D.² AND WALTER G. MCINTIRE, PH.D.²

This paper presents the results of an analysis of the relative contributions of gender and urbanicity in explaining variability among high school students on six measures of academic achievement and cognitive functioning. When adjustments for SES were made, gender and urbanicity independently accounted for little variance on these measures. The High School and Beyond data base (1980-1982) was utilized. Implications for rural educators and future research are suggested.

Psychologists have long investigated differences between males and females on such variables as aptitude, academic achievement, and personality (8, 9, 11). While gender differences have been declining over recent decades (3, 7), their magnitude has been found to vary by site and context (4). Interestingly, urbanicity is a context variable that remains to be examined in this regard. That is, does the magnitude of gender differences on various ability measures depend on whether subjects are from urban, suburban, or rural contexts?

The present study was designed to address this question. Specifically, we examined the relative contributions of gender and context in explaining variability among high school students on measures of vocabulary, reading comprehension, mathematics, perceptual discrimination, paired-associate memory, and spatial reasoning.

Method

We employed the High School and Beyond (HSB) data base, a nationally representative sample of high school seniors in 1980 (10). HSB subjects were drawn from the 11,995 students who composed the 1980 senior cohort and participated in the 1982 follow-up study. The *N* for these analyses varied from 9,849 to 10,064, depending on the variables involved.

We conducted all analyses with a modified HSB sampling weight in effect. For each subject, the HSB weight for the 1980 senior cohort, BYWT, was divided by the mean BYWT for these subjects to create the modified weight. This modified weight corrects for oversampling while preserving the sample size. For these weighted data, 48.4% of the students were male and 51.6% were female. Regarding context, 20.0%, 49.4%, and 30.6% of these students were attending urban, suburban, and rural schools, respectively.

The ability measures are briefly described here. For more detailed discussion of these measures and their

psychometric properties, see Heyns and Hilton (6). *Vocabulary*, which had 27 items, measured vocabulary through a synonym format. *Reading* was a 20-item test of reading comprehension. *Mathematics* had 33 items that called for quantitative comparisons. *Mosaic Comparisons*, an 89-item test, assessed the speed and accuracy with which one makes perceptual discriminations. *Picture-Number* was a paired-associate memory test containing 15 items. Finally, *Visualization* comprised 16 items asking one to visualize the shape a flat surface would assume if folded in a specified manner.

Results

Our discussion below focused on the magnitude of the results, rather than their statistical significance. Indeed, with *N*s ranging from 9,849 to 10,064, even trivial correlations or mean differences can be statistically significant.

Means, standard deviations, and intercorrelations are presented in Table 1. As would be expected, strong positive correlations ($r_s = .62$ to $.71$) were found among Vocabulary, Reading, and Mathematics. Positive, if smaller, correlations ($r_s = .18$ to $.34$) also were observed among Mosaic Comparisons, Picture-Number, and Visualization. Given that these three measures represent considerably different constructs, the smaller intercorrelations were not surprising. Similar correlations were found between the first and second sets of measures ($r_s = .21$ to $.49$).

To assess the relative contributions of gender and context for explaining variability in each of the six ability measures, we performed on each measure a two (gender) by three (context) analysis of covariance where socio-economic status (SES) served as the covariate. Instead of merely examining the statistical significance of each variance component, we determined the proportion of the total sum of squares in each measure that was

¹A version of this paper was presented at the 1988 meeting of the American Educational Research Association in New Orleans. We wish to thank Scott F. Marion for his assistance in carrying out the statistical analyses and Sara Sheppard for preparing the tables.

²College of Education, University of Maine.

accounted for by the three variance components: SES, each main effect, and the interaction between gender and context.

As Table 2 shows, between 11 and 14 percent of the total variability in Vocabulary, Reading, and Mathematics was accounted for by SES; gender and context independently accounted for negligible variability in these measures. Further, SES accounted for slightly more than 5 percent of the variability in Visualization, 4 percent for Mosaic Comparisons, and 2 percent for Picture-Number. Gender independently accounted for 1.6 percent of the variability in Mosaic. Interestingly, for no other measure did either gender or context account for more than one percent of the total variability. Similarly, the interaction between gender and context independently accounted for no discernible variability in any measure.

The negligible contribution of gender and context is illustrated further by the adjusted means in Table 3. Here, gender differences on the six ability measures have been adjusted for SES and context differences between males and females; context means have been adjusted for SES and gender differences among the three levels of context. Clearly, these adjusted-mean differences

are small. For context, the greatest difference was found for Mosaic Comparisons, where suburban students outperformed rural students by roughly one-tenth of one standard deviation. Adjusted-mean differences are slightly larger by gender, with males scoring higher on Mathematics and Visualization and females on Mosaic and Picture Number.

Discussion

Our research clearly revealed that, with socioeconomic status controlled, gender and context (rural, suburban, and urban schools) independently explained negligible to little variability among high school students on measures of vocabulary, reading comprehension, mathematics, perceptual discrimination, paired-associate memory, and spatial reasoning.

The absence of any gender effect in our results supports the conclusions of others regarding the diminishing differences between males and females on many cognitive tests, particularly in representative samples of youth. For example, the meta-analysis by Linn and Hyde (7) led to their assertion that "the magnitude of the gender difference in verbal ability is currently so small that it

TABLE 1
Means, Standard Deviations and Intercorrelations

Measure	M	SD	Range	Intercorrelations				
				1	2	3	4	5
1. Vocabulary	50.07	9.25	26-74					
2. Reading	50.04	10.02	24-72	.71				
3. Mathematics	50.19	9.06	26-70	.62	.63			
4. Mosaic Comparisons	50.10	9.19	5-75	.28	.31	.37		
5. Picture-Number	50.10	9.94	18-60	.21	.22	.28	.29	
6. Visualization	50.04	10.01	25-77	.41	.44	.49	.34	.18

Note: All correlations are statistically significant ($\alpha = .05$).

TABLE 2
Proportion of Total Sum of Squares Accounted for by
SES, Context and Gender, and the Context X Gender Interaction

Measure	Main Effects			
	SES	Context	Gender	Context X Gender
Vocabulary	14.11%	.06%	.03%	.05%
Reading	11.01%	.02%	.04%	.14%
Mathematics	14.11%	.04%	.80%	.02%
Mosaic Comparisons	3.87%	.26%	1.60%	.08%
Picture-Number	1.87%	.03%	.06%	.09%
Visualization	5.25%	.09%	1.00%	.11%

Note: Percents exceeding .03% are statistically significant ($\alpha = .05$).

TABLE 3
Adjusted Means

Measure	Urban	Context		Gender	
		Suburban	Rural	Male	Female
Vocabulary	50.10	50.47	49.94	50.39	50.09
Reading	49.97	50.32	50.25	50.02	50.41
Mathematics	50.13	50.53	50.18	51.18	49.59
Mosaic Comparisons	49.85	50.68	49.67	49.01	51.28
Picture-Number	50.01	50.07	50.41	49.38	50.89
Visualization	49.76	50.45	49.87	51.18	49.17

Note: Each mean is adjusted for SES and the other main effect.

can effectively be considered to be zero." Feingold (3) drew similar conclusions about the nature of gender differences on most subtests of the *Differential Aptitude Tests*. And Chipman (1, p. 48) had this to say:

"The subject of sex differences in behavior and intellectual performance is far too sexy a topic, of much more interest than it should be. . . . How much, after all, do we know about a particular individual on any of these dimensions because we know that the individual is male or female? Not much."

These findings also carry preliminary implications for rural education. For example, according to DeYoung (2, p. 129) there is little research that bears on "the strengths and weaknesses of rural school performance." Admittedly, we did not examine any school-level characteristics beyond urbanicity, nor did we use the school as the unit of analysis. Nonetheless, our failure to obtain context effects on any of the ability tests—particularly vocabulary, reading, and mathematics—should come as good news to rural educators. That is, individual differences on these measures appear to be independent of school urbanicity. An important task now before rural education researchers is to examine the differences among rural schools on academic outcomes and, further, the school-level characteristics that account for these differences (5).

REFERENCES

1. Chipman, S.F. (1988). Far too sexy a topic [Review of *The psychology of gender differences*]. *Educational Researcher*, 17(3), 46-49.
2. DeYoung, A.J. (1987). The status of American rural education research: an integrated review and commentary. *Review of Educational Research*, 57, 123-148.
3. Feingold, A. (1988). Cognitive gender differences are disappearing. *American Psychologist*, 43, 95-103.
4. Fennema, E. (1987). Sex-related differences in education: Myths, realities, and interventions. In V. Koehler (Ed.), *Educator's handbook: Research into practice*. New York: Longman.
5. Helge, D. (1986). Establishing an empirically determined national rural education research agenda. *Research in Rural Education*, 3, 99-105.
6. Heyns, B., & Hilton, T.L. (1982). The cognitive tests for High School and Beyond: An assessment. *Sociology of Education*, 55, 89-102.
7. Linn, M., & Hyde, J. (1988, April). *Gender differences in verbal ability: Results from meta-analysis*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans.
8. Maccoby, E.E. (Ed.). (1966). *The development of sex differences*. Stanford, CA: Stanford University Press.
9. Maccoby, E.E. and Jacklin, C. (1974). *Psychology of sex differences*. Stanford, CA: Stanford University Press.
10. National Opinion Research Center (1983). *High School and Beyond 1980 Senior Cohort First Follow-up (1982): Data File User's Manual*. Chicago: The author.
11. Tittle, C.K. (1988). Gender research and education. *American Psychologist*, 41, 1161-1168.