1-1-2014

Effects of Diversity Experiences on Critical Thinking Skills Over 4 Years of College

Ernest T. Pascarella
University of Iowa

Georgianna L. Martin
University of Southern Mississippi, georgianna.martin@usm.edu

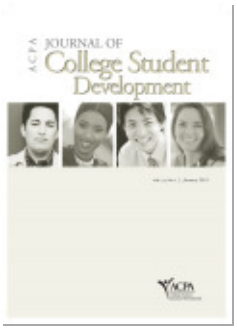
Jana M. Hanson
Kirkwood Community College

Teniell L. Trolian
University of Iowa

Benjamin Gillig
University of Iowa

See next page for additional authors

Effects of Diversity Experiences on Critical Thinking Skills Over 4 Years of College



Ernest T. Pascarella, Georgianna L. Martin, Jana M. Hanson, Teniell L. Trolian, Benjamin Gillig, Charles Blaich

Journal of College Student Development, Volume 55, Number 1, January 2014, pp. 86-92 (Article)

Published by Johns Hopkins University Press
DOI: *https://doi.org/10.1353/csd.2014.0009*

Effects of Diversity Experiences on Critical Thinking Skills Over 4 Years of College

Ernest T. Pascarella
Georgianna L. Martin
Jana M. Hanson
Teniell L. Trolian
Benjamin Gillig
Charles Blaich

The benefits of student engagement in diversity experiences on a range of college outcomes have been well documented (e.g., Chang, Denson, Saenz, & Misa, 2006; Gurin, Dey, Hurtado, & Gurin, 2002; Hurtado, 2001; Jayakumar, 2008; Kuklinski, 2006). However, the potential influence of involvement in diversity experiences during college on the cognitive and intellectual outcomes of post-secondary education is only beginning to be understood (Bowman, 2010). Gurin et al. (2002) made a convincing argument for why exposure to diversity experiences might foster the development of more complex forms of thought, including the ability to think critically. Drawing on research that spoke to the social aspects of cognitive development, they pointed out that students will be more likely to engage in effortful and complex modes of thought when they encounter new or novel situations that challenge current and comfortable modes of thinking. This often can happen in classroom settings, but also can occur in other contexts when students encounter others who are unfamiliar to them, when these encounters challenge students to think or act in new ways, when people and relationships change and produce unpredictability, and when students encounter others who hold different expectations for them.

Consistent with the argument by Gurin et al. (2002), a series of studies by Dey (1991), Chang et al. (2006), Gurin (1999), Hurtado (2001), and Kim (1996) have suggested that exposure to racial and cultural diversity during college is significantly linked to such outcomes as student self-reported gains in "problem solving," "critical thinking," "cognitive development," and "complexity of thinking." This important initial work alerted scholars to the possibility that a considerable range of cognitive/intellectual growth during college might be fostered by a student's exposure to diversity experiences. However, although student self-reported gains can be revealing and important outcomes, there are some serious concerns about their actual validity (e.g., Bowman, 2011). Inquiry that attempts to estimate the impact of diversity experiences on the development of cognitive and intellectual skills using more objective standardized measures than student self-reported gains is extremely limited. Two early investigations, analyzing the first year of the nearly 20-year-old National Study of Student Learning longitudinal database, addressed the link

Ernest T. Pascarella is Professor and the Petersen Chair in Higher Education at the University of Iowa. Georgianna L. Martin is Assistant Professor of Student Affairs/Higher Education at the University of Southern Mississippi. Jana M. Hanson is a Research Analyst at Kirkwood Community College in Iowa City, IA. Teniell L. Trolian is a doctoral student in the Higher Education and Student Affairs (HESA) Program at the University of Iowa. Benjamin Gillig is a doctoral student in the HESA Program at the University of Iowa. Charles Blaich is Director, Center of Inquiry at Wabash College and Director of the Higher Education Data Sharing Consortium. *Research supported by a grant from the Center of Inquiry in the Liberal Arts at Wabash College to the Center for Research on Undergraduate Education at The University of Iowa.*

between diversity experiences and critical thinking skills—as measured by the Critical Thinking Test of the Collegiate Assessment of Academic Proficiency (Pascarella, Palmer, Moye, & Pierson, 2001; Terenzini, Springer, Yeager, Pascarella, & Nora, 1994). These early studies indicated that, net of important confounding variables (such as precollege critical thinking skills), individual diversity experiences such as attending a racial–cultural workshop and making friends with someone of a different race were significantly and positively linked to first-year gains in critical thinking scores. The Pascarella et al. (2001) investigation, however, also suggested that the positive effects of involvement in such diversity experiences on growth in critical thinking were more pronounced for White students than for students of color.

The most recent work estimating the influence of diversity experiences on the development of cognitive skills during college analyzed the first year (2006–2007) of the Wabash National Study of Liberal Arts Education (WNS), a longitudinal study focusing on the effects of liberal arts education (Loes, Pascarella, & Umbach, 2012). Loes et al. (2012) found that, when important confounding experiences (e.g., precollege critical thinking skills and tested academic preparation) were taken into account, students' diversity experiences had no overall significant link with first-year gains on a standardized measure of critical thinking skills. However, consistent with the earlier findings of Pascarella et al. (2001), the positive effect of diversity experiences on critical thinking was significantly more pronounced for White students than for students of color. Loes et al. also reported that the effects of diversity experiences were more important for the students least academically prepared for college, as indicated by relatively low ACT scores.

The present study sought to determine if the effects of exposure to diversity experiences on critical thinking skills extended beyond the first year of college and if these effects were detectable after 4 years of postsecondary education. Specifically, we sought to determine if the 4-year effects of diversity experiences on critical thinking were general (i.e., the same for all students) or conditional (differing in magnitude for students with different precollege characteristics).

RESEARCH METHODS

Sample and Data Collection

We analyzed the 4th-year follow-up of the WNS, which is a longitudinal pretest–posttest investigation of the effects of liberal arts experiences on cognitive and noncognitive college outcomes. Our analyses were conducted on 949 fourth-year, full-time undergraduates attending 17 4-year colleges and universities (11 liberal arts colleges, three research universities, and 3 regional institutions) who completed the early Fall 2006 and the late Spring 2010 assessments of the WNS. The 949 students completing both assessments represented a 44.8 percent follow-up response rate from the 2006 precollege assessment. To adjust for response bias, a weighting algorithm was developed from population data supplied by each institution. Within each institution the sample was weighted up to the population characteristics by sex, race, and ACT (or SAT equivalent) score.

Dependent and Independent Variables

The dependent variable was the 40-minute, 32-item Critical Thinking Test (CTT) from the Collegiate Assessment of Academic Proficiency. Developed by the American College Testing Program (ACT), the CTT was designed to measure a student's ability to clarify, analyze, evaluate, and extend arguments. It consists

of four passages in a variety of formats (e.g., case studies, debates, dialogues editorials, experimental results, statistical arguments) followed by a set of multiple-choice test items. The internal consistency reliabilities for the CTT range between .81 and .82 (ACT, 1990), and it correlates .75 with Watson Glaser Critical Thinking Appraisal (Pascarella, Bohr, Nora, & Terenzini, 1995). The CTT was administered during both the 2006 and the 2010 WNS assessments. The primary independent variable in the study was the Interactional Diversity Scale (IDS; Loes et al., 2012). With an internal consistency reliability of .80, the IDS consists of nine items that assess the extent of student participation in diversity-oriented experiences and discussions with diverse peers and university staff during college. Representative items include how often a respondent: had serious conversations with students from a different race or ethnicity; participated in a racial or cultural awareness workshop; had serious conversations with students whose religious beliefs, political opinions, or personal values were very different from the respondent; shared personal feelings and problems with diverse students; and had discussions regarding intergroup relations with diverse students. (The total set of items is available from the first author or from Loes et al., 2012.) The IDS was administered during the 2010 WNS assessment, but prior to students completing the CTT.

Analytic Model and Control Variables

In developing our regression specifications, we were guided by a number of longitudinal conceptual models for studying the impact of college on students (e.g., Astin, 1993; Pascarella & Terenzini, 1991). These conceptual models argue that, to validly estimate the net impact of any single experience, one must take into account at least three additional sets of influences: student precollege characteristics, the institutional context (if the data are multi-institutional), and other college experiences that might co-vary with the particular experience in question and potentially confound its effects. The student precollege variables in our study included: demographics, such as race, sex, and parental education; ACT (or SAT equivalent) score (provided by each institution); a measure of high school social/academic involvement; and precollege measures of critical thinking skills (the Fall 2006 CTT score) and academic motivation. Institutional type was represented by a dummy variable indicating whether or not the individual attended a liberal arts college. Finally, other college experiences included major field of study (social sciences/humanities major; science, technology, engineering, or math major; or other major) and six measures of good/high impact practices in undergraduate education (Chickering & Gamson, 1987; Kuh, 2008). These six good/high impact practices included the following: working individually with a faculty member on a research project, a 23-item (α = .92) scale measuring good teaching and high quality interactions with faculty, a 31-item (α = .88) scale measuring academic challenge and high expectations, a nine-item (α = .85) scale focusing on cocurricular involvement and positive peer interactions, a nine-item (α = .83) scale measuring extent of interactions with faculty and student affairs staff, and a four-item (α = .70) scale measuring involvement in cooperative learning experiences. Detailed definitions of the good practice scales are available from the author or from Seifert, Pascarella, Goodman, Salisbury, and Blaich (2010).

Analyses

The data analyses were carried out in two steps. To estimate the general net effect of interactional diversity experiences on critical thinking skills, we regressed 2010 CTT

scores on the IDS plus all other control variables described above. To determine the presence of conditional effects of diversity experiences on growth in critical thinking skills, we created cross-product terms involving five student precollege variables—sex, race, academic motivation, 2006 CTT score, and ACT score—and the IDS. If, when added to the general effects equation, these five cross-product terms were associated with a significant increase in explained variance in 2010 CTT scores, it would indicate the presence of conditional effects (Pascarella & Terenzini, 1991). Individually significant cross-products could then be examined and interpreted substantially. All analyses are based on weighted sample estimates adjusted to the actual sample size for correct standard errors. Because our regression models were detailed and had more variables than there were individual sampling units (i.e., 17 institutions) in the data, we could not employ procedures to statistically adjust standard errors for the nesting effect in our data. Consequently we

TABLE 1.

Regression Estimates for General and Conditional Effects of Interactional Diversity on End-of-Fourth-Year Critical Thinking[a]

	General Effects Model (*N* = 949)		Conditional Effects Models: Low ACT Score[b] (*n* = 444)		Conditional Effects Models: High ACT Score[c] (*n* = 505)	
Good/High Impact Practice	Coefficient (*SE*)	*t* Ratio	Coefficient (*SE*)	*t* Ratio	Coefficient (*SE*)	*t* Ratio
Working With a Faculty Member on a Research Project	.101 (.051)	1.99	.186 (.082)	2.29	.036 (.058)	0.62
Good Teaching and High-Quality Interactions With Faculty	.047 (.025)	1.81	.087 (.035)	2.49	.006 (.037)	0.16
Academic Challenge and High Expectations	.021 (.031)	0.68	.007 (.045)	0.15	.010 (.041)	0.25
Co-Curricular Involvement and Positive Peer Interactions	.010 (.024)	0.41	.0003 (.035)	0.01	.029 (.030)	0.97
Interactions With Faculty Student Affairs Staff	–.128 (.058)	–2.21	–.140 (.084)	–1.67	–.125 (.074)	–1.68
Cooperative Learning Experiences	.033 (.064)	0.51	–.002 (.094)	–0.02	.063 (.080)	0.79
Interactional Diversity	.090 (.028)	3.26**	.189 (.041)	4.65**	–.033 (.035)	–0.96
Model R^2	.621**		.513**		.477**	

[a] Regression equations also include controls for: race (person of color vs. White), sex, parental education, ACT (or SAT equivalent) score, high school social/academic involvement, precollege critical thinking skills (Fall 2006 Critical Thinking Test score), precollege academic motivation, attendance at a liberal arts college (vs. research university or regional institution), and undergraduate major field of study. Coefficients for other conditional effects were: Sex × Interactional Diversity (ID) = .085 ($p > .20$), Race × ID = –.205 ($p > .03$), Academic Motivation × ID = .021 ($p > .50$), and Precollege Critical Thinking × ID = .030 ($p > .50$).

[b] ACT or ACT equivalent ≤ 27.

[c] ACT or ACT equivalent > 27.

**$p < .001$.

used a more stringent alpha level ($p < .01$) for statistical significance to guard against a Type I error (Raudenbush & Bryk, 2001). All continuous variables, including the dependent variable, were standardized. Thus, the regression coefficients for those variables can be considered as beta coefficients, or estimated effect sizes (i.e., the faction of standard deviation increase or decrease in critical thinking for a one standard deviation increase in the independent variable).

RESULTS

The regression estimates of the effects of interactional diversity experiences on end-of–fourth-year critical thinking skills are summarized in Table 1. Only the results for the seven good/high impact practices are shown. The control variables in the equations are listed in footnote *a*. The general effects estimates for the aggregate sample are shown in the "General effects model" columns in Table 1. As indicated in the table, net of all other influences, only interactional diversity had a significant positive estimated effect on 4th-year critical thinking skills. The magnitude of the general effect of interactional diversity was slightly less than .10 of a standard deviation.

The estimated general effect of interactional diversity on critical thinking, however, was somewhat misleading. Our test for conditional effects was associated with a significant increase in explained variance (1.3 percent increase, $F = 6.57$ with 5/925 df,$p < .001$), and the only significant individual conditional effect was ACT Score × Interactional Diversity (coefficient = .210,$p < .001$). To determine the nature of the conditional effect, we split the sample at approximately the mean ACT score and reran the general effects equation separately for the "low ACT score group" (ACT = 27 or less) and the "high ACT score group" (ACT = 28 or higher). The results of those disaggregated analyses are summarized in the "Low ACT score" and "High ACT score" columns in Table 1. As the data in those columns illustrate, interactional diversity experiences had a significantly stronger positive effect on end-of-4th-year critical thinking for the low ACT group (about .19 of a standard deviation,$p < .001$) than for the high ACT group (–.033 of a standard deviation, $p > .30$). Although none of the other conditional effects met the critical level for significance ($p < .01$), the Race × Interactional Diversity conditional effect could be considered marginally significant at $p < .05$. Consistent with previous findings from the initial year of postsecondary education, the positive effects of diversity experiences on the development of critical thinking skills over 4 years of college appeared somewhat more pronounced for White students (coefficient = .090) than for students of color (coefficient = –.053).

DISCUSSION

Our findings with an objective, standardized measure of critical thinking skills essentially support the conceptual argument of Gurin et al. (2002) that exposure to diversity experiences fosters the development of cognitive growth and more complex modes of thought. The cognitive effect of diversity experiences appears to be sustained during 4 years of college and may even increase in magnitude over time. For example, in the earlier study by Loes et al. (2012), the general effect of interactional diversity on first-year critical thinking skills was small and not significant (.04 of a standard deviation). Though still modest in absolute terms, the general cognitive effect of diversity experiences after 4 years was estimated at .09 of a standard deviation, which was significant at $p < .001$. Moreover, the 4-year effect in our findings persisted even in the presence of controls, not

only for important precollege experiences and traits (e.g., precollege critical thinking scores and ACT scores), but also for a wide range of other important college experiences.

As with previous research, however, the cognitive impact of interactional diversity over 4 years of college would appear to be more complicated than the general effects estimates discussed above would suggest. Most notably, the 4-year impact of interactional diversity in our study would appear to be contingent on the level of tested academic preparation with which a student enters postsecondary education. Students entering college with relatively low ACT (or equivalent) scores derived substantially greater 4-year critical thinking benefits from engagement in interactional diversity experiences than did their counterparts in the upper half of the ACT distribution. This suggests that, in terms of fostering the development of critical thinking skills over 4 years of college, interactional diversity may act in a compensatory manner for those students who are relatively less prepared to acquire critical thinking skills from undergraduate academic experiences when they enter college.

Although we did not find a conditional effect involving race and interactional diversity meeting the a priori level of statistical significance ($p < .01$), the effect was significant at $p < .05$. The nature of this marginally significant conditional effect was consistent with previous findings suggesting that the most pronounced cognitive benefits of diversity experiences during college may actually accrue to White students.

From the broader perspective of college impact research, our findings underscore the fact that student characteristics may often shape the developmental influence of postsecondary education. This study contributes to the mounting evidence of the educational impact of engagement in diversity experiences during college. At the same time, however, it suggests that purposefully programming exposure to diversity into the undergraduate experience may not yield the same benefits to all students. Indeed, as the undergraduate population of American colleges and universities becomes more diverse, we might legitimately anticipate an increase in such conditional impacts. Future research on the developmental impacts of diversity experiences might well profit from the routine estimation of conditional effects based on measurable student characteristics. Such inquiry could be helpful in identifying additional student subgroups for whom engagement in diversity experiences may be particularly beneficial.

Correspondence concerning this article should be addressed to Ernest Pascarella, EPLS, N491 Lindquist Center, University of Iowa, Iowa City, IA 52242; ernest-pascarella@uiowa.edu

REFERENCES

American College Testing Program. (1990). *Report on the technical characteristics of CAAP; Pilot year 1: 1988-89*. Iowa City, IA: Author.

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco, CA: Jossey-Bass.

Bowman, N. (2010). College diversity experiences and cognitive development: A meta-analysis. *Review of Educational Research*, *80*(1), 4-33.

Bowman, N. (2011). The validity of college student self-reported gains at diverse institutions. *Educational Researcher, 40*(1), 22-24.

Chang, M. J., Denson, N., Saenz, V., & Misa, K. (2006). The educational benefits of sustaining cross-racial interaction among undergraduates. *Journal of Higher Education*, *77*, 430-455.

Chickering, A., & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Dey, E. (1991). *Community service and critical thinking: An exploratory analysis of collegiate influences*. Paper presented at the conference on Setting the Agenda for an Effective Research Strategy for Combining Service and Learning in the 1990s, Racine, WI.

Gurin, P. (1999). Expert report of Patricia Gurin. In University of Michigan (Ed.), *The compelling need for diversity in education, Gratz et al., v Bollinger et al., No. 97-75237 and Grutter et al. v Bollinger et al., No. 97-75928*. Ann Arbor, MI: University of Michigan. Retrieved from http://www.umich.edu/~urel/admissions/legal/expert/gurintoc.html

Gurin, P., Dey, E., Hurtado, S., & Gurin, G. (2002). Diversity and higher education: Theory and impact on educational outcomes. *Harvard Educational Review*, *72*, 330-366.

Hurtado, S. (2001). Linking diversity and educational purpose: How diversity affects the classroom environment and student development. In G. Orfield (Ed.), *Diversity challenged: Evidence on the impact of affirmative action* (pp. 187-203). Cambridge, MA: Harvard Educational Publishing Group.

Jayakumar, U. M. (2008). Can higher education meet the needs of an increasingly diverse and global society? Campus diversity and cross-cultural workforce competencies. *Harvard Educational Review, 78*, 615-651.

Kim, M. (1996, April). *The effectiveness of women-only colleges for intellectual development*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Kuh, G. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.

Kuklinski, J. H. (2006). The scientific study of campus diversity and students' educational outcomes. *Public Opinion Quarterly*, *70*(1), 99-120.

Loes, C., Pascarella, E., & Umbach, P. (2012). The effects of diversity experiences on critical thinking skills: Who benefits? *Journal of Higher Education, 83,* 1-25.

Pascarella, E., Bohr, L., Nora, A., & Terenzini, P. (1995). Cognitive effects of 2-year and 4-year colleges: New evidence. *Educational Evaluation and Policy Analysis*, *17*(1), 83-96.

Pascarella, E., Palmer, E., Moye, M., & Pierson, C. (2001). Do diversity experiences influence the development of critical thinking? *Journal of College Student Development*, *42*, 257-271.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research*. San Francisco, CA: Jossey-Bass.

Raudenbush, S., & Bryk, A. (2001). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: SAGE.

Seifert, T., Pascarella, E., Goodman, K., Salisbury, M., & Blaich, C. (2010). Liberal arts colleges and good practices in undergraduate education: Additional evidence. *Journal of College Student Development, 51*, 1-22.

Terenzini, P., Springer, L., Yaeger, P., Pascarella, E., & Nora, A. (1994, November). *The multiple influences on students' critical thinking skills*. Paper presented at the annual meeting of the Association for the Study of Higher Education, Orlando, FL.