Perceptions of College Students With and Without Disabilities and Effects of STEM and non-STEM Enrollment on Student Engagement and Institutional Involvement

Brad Hedrick
Mügé Dizén
Kim Collins
John Evans
Tom Grayson
University of Illinois at Urbana-Champaign

Abstract

In a college student sample (n = 4,467) chosen among the National Survey of Student Engagement (NSSE) participants in 2006, group differences based on disability (i.e., no disability, single primary disability, multiple primary disabilities) were examined on five NSSE benchmarks of student engagement and institutional performance (i.e., academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, supportive campus environment) and taking into account curricular status (i.e., Science, Technology, Engineering, and Mathematics-STEM, non-STEM). Students with disabilities differed from their counterparts without disabilities in their perceptions related to student-faculty interactions and the extent to which they experienced supportive campus environments. Students with disabilities were significantly more favorable in their perceptions of student-faculty interactions, but reported significantly less favorable supportiveness of their respective campus environments. Although curricular status had independent effects on most of the measured outcomes, no compounding effects of curricular status on disability status were found.

According to recent statistics from the U.S. Department of Education, up to 11% of all undergraduates report having a disability (National Center for Education Statistics, 2006). Previous research has found that students with disabilities who enroll in postsecondary education are less prepared academically for college, have lower overall retention rates (Horn & Berktold, 1999), take longer to obtain a degree (Freiden, 2004; Stodden, Conway, & Chang, 2003) and have lower persistence rates than their counterparts without disabilities (Horn & Berktold, 1999). According to National Organization on Disabilities survey (2000), only 12% of individuals with disabilities graduate from college, as opposed to 23% of their non-disabled counterparts. In addition, even though the underrepresentation of persons with disabilities in Science, Technology, Engineering, and Mathematics (STEM) majors has been shrinking (National Postsecondary Student Aid Study, 2004), and approximately 7% of all scientists were individuals with disabilities, they are still underrepresented (i.e., 2%) among those younger than age 35, compared to 15% of those between ages 65–75 (National Science Foundation, 2006). Higher education is one of the most effective means of diminishing the negative consequences of disability (Stodden, Jones, & Chang, 2002).

Research on experiences and perceptions of students with disabilities in postsecondary education mostly focused on student factors like self-determination skills as being critical in transitioning, adjusting, and remaining in college (e.g., Getzel & Briel, 2006; Stodden, Galloway, & Stodden, 2003; Thoma & Wehmeyer, 2005; Wehman, 2001). In addition to self-determination skills, self-management skills such as time management, organizational skills, and study skills have also been identified as important student variables (e.g., Mull, Sitlington, & Alper, 2001). Research has also looked at the barriers to the access and utilization of disability support services on campuses (e.g., Dowrick, Anderson, Heyer, & Acosta, 2005; Getzel, 2008) as variables that impact persistence and retention in postsecondary edu-

cation. The goal of this study is to extend the literature on experiences and perceptions of students with disabilities in postsecondary education by looking at their perceptions of student engagement and institutional performance that have been extensively documented as leading to student achievement and other desired outcomes of college (e.g., Pascarella & Terenzini, 2005; Pike, 2006; Tinto, 1987, 1993). More specifically, we examined if and how college students with disabilities differed from their counterparts without disabilities in terms of student engagement and perceptions of institutional performance.

The construct of student engagement generally refers to the quality of effort and involvement in productive learning activities and highlights the importance of student involvement, student effort, and student time on task (e.g., Kuh, 2009). However, student engagement is not only conceptualized as an indicator of "student performance," but also as an indicator of "institutional performance," and it also highlights the role that institutions have in inducing students to take part in educationally purposeful activities (e.g., Kuh, 2001, 2003; Kuh, Schuh, & Whitt, 1991). The National Survey of Student Engagement (NSSE) Institute developed five benchmarks to measure various aspects of student engagement and institutional performance:

- Academic Challenge measures the level of academic effort and expectations set for students by the institutions;
- Active and Collaborative Learning measures the level of involvement in learning in different settings as well as collaborating with others;
- Student-Faculty Interaction measures the amount of learning first-hand by interacting with faculty members both inside and outside the classroom;
- Enriching Educational Experiences measures the amount of complementary learning opportunities in and out of class augmenting academic programs and having diverse set of experiences to integrate and apply knowledge; and
- Supportive Campus Environment measures if the environments are committed to student success and cultivating positive working and social relations among different groups.

Even though engagement in effective educational practices generally benefits all students, the conditional and compensatory effects for specific student groups have been documented (Cruce, Wolniak, Seifert, & Pascarella, 2006; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella & Terenzini, 2005). Conditional effects are the differences in the amount of learning or development experienced by one group of students relative to other groups. Compensatory effects indicate differences among various groups of students, like students who may start college underprepared, and their differential gains and benefits compared with their relatively advantaged peers. For example, Kuh et al. (2008) documented compensatory effects of student engagement for historically underserved students in terms of earning higher grades and persistence. Since students with disabilities in postsecondary education are shown to be less prepared academically for college and have lower persistence rates than their counterparts without disabilities, it appears that the assessment of student engagement may be critical to the identification of effective interventions for ameliorating the aforementioned negative consequences of disability.

The first goal of this study was to examine, if and how, college students with disabilities differed from their counterparts without disabilities on five benchmarks of student engagement and institutional performance in a nationally representative sample: (a) Academic Challenge, (b) Active and Collaborative Learning, (c) Student-Faculty Interaction, (d) Enriching Educational Experiences, and (e) Supportive Campus Environment. The second goal was to assess whether STEM and non-STEM curricular status compounded any effects of disability status in terms of student engagement and institutional performance.

Method

Participants and Procedure

NSSE is an annual survey obtaining information from random samples of first-year and senior students in four-year colleges and universities nationwide about various aspects of undergraduate experience since 2000. Ten disability-related questions were added to the end of the NSSE since the core survey does not include questions that assess disability status. A randomly selected sample of institutions (n = 56) among all the participating institutions (n = 557) received these additional disability questions, resulting in 16,995 total respondents. Participants were first asked if they had a disability that affected their ability to succeed as a student. Students

who answered "yes" to the disability question were then asked to identify their primary disability as well as all the other secondary disabilities among ten categories: (1) mobility impairment, (2) blindness/low vision, (3) deaf/hard of hearing, (4) learning disability, (5) attention deficit/hyperactivity disorder, (6) autism-spectrum disorder, (7) speech disorder, (8) psychological condition, (9) medical/systemic impairment, and (10) brain injury.

Demographics and sample characteristics. Participants were 4,467 undergraduate students (64.6% female) chosen among the participating students (n = 16,995) in the NSSE Survey in 2006. Of those participants who specified their ethnicity, the majority (81.3%) were White. In addition, 1% were American Indian or Native American, 5.2% were Black or African American, 4.6% were Asian or Asian American, 1.6% were Mexican or Mexican American, and 6.3% were from various other ethnicities. A total of 4.4% indicated themselves as being international students or as foreign nationals. Overall, 30.7% of students with disabilities (i.e., single or multiple disabilities) were classified as being enrolled in STEM curricular, compared to 29.4% students in the no disability comparison group.

Disability groupings. Overall, 7.9% of the students responded as having a disability (n = 1,335) that affected their ability to succeed. The disability conditions indicated by the respondents were learning disability (24%), attention deficit/hyperactivity disorder (23%), psychological condition (16%), medical/systemic impairment (10%), deaf/hard of hearing (8%), mobility impairment (6%), blindness/low vision (6%), speech disorder (4%), brain injury (2%), and autism-spectrum disorder (1%). Respondents who identified only one "primary" disability were classified into a single disability group (n = 1052). If two or more conditions were identified as "primary," they were grouped under the multiple disability group (n = 283). In addition, a random sample of students (n = 3,132) matched by gender, race, and institutional type was selected among the students that indicated no disabilities (n = 15,660) to serve as a no disability comparison group resulting in three groups: (1) no disability group (n = 3,132), (2) single disability group (n = 1,052), and (3) multiple disability group (n = 283), resulting in a total sample size of 4,467.

Curricular groupings. All participants (n = 4,467) were classified into two curricular groups (i.e., STEM, non-STEM) based on the alignment of their academic major with the National Science Foundation Division of Human Resource Development (HRD) field of study categories. The STEM group was comprised of the science, technology, engineering, and mathematics majors and the non-STEM group consisted of all remaining majors. Three investigators assigned all NSSE majors (n = 85) into STEM and non-STEM categories by consensus according to the NSF guidelines. All three raters had to agree for a major to belong to the STEM group. Any major that was not unanimously identified as a STEM group was assigned to the non-STEM group. Of the total students, 63.4% (n = 2,833) were identified as enrolled in STEM curricula, leaving 36.6% (n = 1,634) enrolled in non-STEM curricula.

Measures

Five index scores were computed by NSSE for each of the benchmarks of student engagement and institutional performance: (a) Academic Challenge, (b) Active and Collaborative Learning, (c) Student-Faculty Interaction, (d) Enriching Educational Experiences, and (e) Supportive Campus. The index scores are the students' average response to items within the index, after all items have been placed on a 100-point scale. Index scores were created for all students that answered three-fifths or more of the items within the group.

Academic challenge. Index score measures the time spent preparing for class, the amount of reading, writing, and deep learning required, as well as the amount of institutional expectations for academic performance. It was computed by averaging eleven items in the survey ($\alpha = .73$). Sample items are:

- "During the current school year, about how much reading and writing have you done?"
- "During the current school year, how much has your coursework emphasized analyzing the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components?"
- "To what extent does your institution emphasize spending significant amounts of time studying and on academic work?"

Active and collaborative learning. Index score measures the extent of class participation, working collaboratively with other students inside and outside of class, and tutoring and involvement with a community-based project. It was computed by averaging six items in the survey ($\alpha = .68$). Sample items are "In your

experience at your institution during the current school year, about how often have you -- asked questions in class or contributed to class discussions, --made a class presentation, --worked with other students on projects during class?"

Student-faculty interaction. Index score measures the extent of talking with faculty members and advisors, discussing ideas from classes with faculty members outside of class, getting prompt feedback on academic performance, and working with faculty on research projects. It was computed by averaging the six items in the survey ($\alpha = .76$). Sample items are "In your experience at your institution during the current school year, about how often have you -- discussed grades or assignments with an instructor, --talked about career plans with a faculty member or advisor, --discussed ideas from your readings or classes with faculty members outside of class?"

Enriching educational experiences. Index score that measures extent of interaction with students of different racial or ethnic backgrounds or with different political opinions or values, using electronic technology, participating in activities such as internships, community service, study abroad, co-curricular activities, and culminating senior experience. It was computed by averaging twelve items in the survey ($\alpha = .65$). Sample items are:

- "In your experience at your institution during the current school year, about how often have you had serious conversations with students who are very different from you in terms of their religious beliefs, political opinions, or personal values"
- "About how many hours do you spend in a typical 7-day week participating in co-curricular activities?"
- "To what extent does your institution emphasize encouraging contact among students from different economic, social, and racial or ethnic backgrounds?"

Supportive campus environment. Index score measures extent to which students perceive the campus helps them succeed academically and socially, assists them in coping with non-academic responsibilities, and promotes supportive relations among students and their peers, faculty members, and administrative personnel and offices. It is computed by averaging six items in the survey ($\alpha = .76$). Sample items are "To what extent does your institution emphasize -- providing support you need to thrive socially, --providing support you need to help you succeed academically, --help you cope with your non-academic responsibilities (work, family, etc)?"

Results

An analysis of variance (ANOVA) was conducted for each of the NSSE benchmarks (i.e., academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, supportive campus) to evaluate the effect of disability status and curricular groupings. The between-subjects factors were disability status with three levels (i.e., no disability, single disability, multiple disabilities), and curricular status with two levels (i.e., STEM, non-STEM). Post-hoc tests were conducted to evaluate pairwise differences among the means using a Tukey HSD test when significant differences were noted.

The two-way ANOVA testing differences in academic challenge found no significant main effect for disability status, $F(2, 4459) = 1.35$, $p < 0.26$. However, the main effect for curricular status was significant, $F(1, 4459) = 8.89$, $p < 0.01$, $\eta p2 = .002$ with a small effect size. The mean of STEM students for perceived academic challenge was 56.31 (SD = 14.11) and the non-STEM students was 55.02 (SD = 13.87) indicating that STEM students perceived greater levels of academic challenge than non-STEM students. There was no significant interaction between the curricular status and disability status, $F(2, 4459) = 0.11$, $p < 0.90$.

The two-way ANOVA testing differences in active and collaborative learning found no significant main effects for either disability status, $F(2, 4461 = 2.20$, $p < 0.11)$ or curricular status, $F(1, 4461) = 0.67$, $p < 0.41$ or for their interaction term, $F(2, 4461) = 0.37$, $p < 0.41$ indicating that students did not differ in their perceived opportunity for and exposure to active and collaborative learning depending on their disability status or curricular status.

The two-way ANOVA testing differences in enriching educational experiences did not find a significant main effect for disability status, $F(2, 4456) = 0.80$, $p < 0.45$. However, the main effect for curricular status was significant, $F(1, 4456) = 6.00$, $p < 0.02$, $\eta p2 = .001$ with a small effect size. The mean of STEM students for enriching educational experiences was 38.31 (SD = 18.16) and the non-STEM students was 36.95 (SD =

17.73) indicating that STEM students perceived greater levels of enriching educational experiences than non-STEM students. There was no significant interaction between disability status and curricular status, $F (2, 4461) = 1.26$, $p < 0.28$.

The two-way ANOVA testing differences in the level of perceived student-faculty interaction identified two main effects for both disability status $F (2, 4457) = 7.21$, $p < 0.001$, $\eta p2 = .003$ and curricular status $F (1, 4457) = 11.60$, $p < 0.001$, $\eta p2 = .003$ with small effect sizes. The pairwise differences among the means using a Tukey HSD test found that even though students with single ($M = 41.38$; $SD = 20.25$) and multiple disabilities ($M = 42.25$; $SD = 21.23$) did not differ from each other; they both differed from students without disabilities ($M = 39.03$; $SD = 20.56$) in their levels of perceived student-faculty interactions, indicating more favorable perceptions of their student-faculty interactions. In addition, STEM students ($M = 41.17$; $SD = 21.43$) differed from non-STEM students ($M = 38.99$; $SD = 20.01$) in their level of perceived student-faculty interactions indicating more favorable student-faculty interactions than non-STEM students. There was no significant interaction between disability status and curricular status, $F (2, 4457) = 0.07$, $p < 0.93$.

Finally, the two-way ANOVA testing differences in supportive campus environment also found two main effects for both disability status $F (2, 4458) = 11.26$, $p < 0.001$, $\eta p2 = .005$ and curricular status $F (1, 4458) = 9.94$, $p < 0.01$, $\eta p2 = .002$ with small effect sizes. Similar to the findings with perceived student-faculty interaction, the pairwise differences among the means using a Tukey HSD test found that students with single ($M = 57.78$; $SD = 20.24$) and multiple disabilities ($M = 56.67$; $SD = 19.63$) did not differ from each other. However, they both differed from students without disabilities ($M = 60.13$; $SD = 18.57$) in their perceptions of supportive campus environment with both reporting lower levels of supportiveness. Furthermore, STEM students ($M = 58.11$; $SD = 19.00$) also differed from non-STEM students ($M = 59.97$; $SD = 19.11$) in their levels of perceived campus supportiveness, indicating that they also perceived the campus environment less favorably. There was no significant interaction between the curricular status and disability status, $F (2, 4458) = 1.06$, $p < 0.35$.

Discussion

The current study examined group differences based on disability (i.e., no disability, single disability, multiple disabilities) on five NSSE benchmarks of student engagement and institutional performance (i.e., academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, supportive campus environment), taking into account curricular status (i.e., STEM, non-STEM) in a nationally representative student sample. Results revealed that student with disabilities (i.e., single and multiple) differed from students without disabilities in two of the measured outcomes (i.e., student faculty interaction, supportive campus environment) even though the effects sizes were small. Namely, students with disabilities reported perceiving their student-faculty interactions as more favorable than students without disabilities. In contrast, they reported less favorable ratings on the supportiveness of their respective campus environments compared to students without disabilities. However, no differences were found between the two disability groups (i.e., single and multiple) in terms of their perceptions on either of these benchmarks.

These findings suggest that despite their sense of greater opportunity to engage with faculty in and outside the classroom on academic matters, compared to the students without disabilities, students with disabilities perceive their institutions as being less committed to support them socially, assist them in coping with non-academic responsibilities, and generally promote their engagement in supportive relationships (e.g., peers, faculty members). In other words, students with disabilities report greater opportunities to engage with faculty on academic performance matters. These results can also be due to students with disabilities being more engaged than students without disabilities in terms of eliciting faculty interactions. It is conceivable that some of these interactions can be about discussing academic accommodations or negotiating alternative forms of evaluation due to the nature of their disability. However, in terms of social or non-academic responsibilities and the quality of their relationships with their peers, faculty members, and personnel, students with disabilities perceive their campuses as being less supportive than students without disabilities. These findings highlight the importance of improving the quality of relationships of students with disabilities in non-academic or co-curricular areas and making the campus climate more welcoming so that

students with disabilities truly feel more connected to the overall campus community. Future research needs to delineate the specific factors that could contribute the supportiveness of the campus environment for students with disabilities.

Other findings include the lack of differences between students with and without disabilities regarding their perceptions of the amount of academic challenges provided by their institutions, the active and collaborative learning opportunities presented to them, and the enriching educational experiences provided to them by their respective campuses. These findings indicate that students with disabilities have similar levels of academic challenges and expectations compared to their counterparts without disabilities. Furthermore, the perceptions of students with and without disabilities did not vary in terms of their perceived levels of exposure to diverse student populations, diverse opinions and values, diversified technologies, and diverse set of activities (e.g., internships, study abroad). Finally, students with and without disabilities also reported similar amounts of enriching educational experiences (e.g., levels of class participation, working collaboratively with other students inside and outside of class). The absence of differences in these areas is promising in that it indicates egalitarian access to such enrichment experiences. Future research will need to focus on the experiences of different disability subtypes (e.g., mobility, blind, deaf, LD) to see if there are within-group differences for various outcomes (including but not confined to the NSSE benchmarks).

This study did not find any interactions between disability status and curricular type on any of the NSSE benchmarks, indicating that the impact of disability status was not compounded by curricular status. Overall, the lack of interactive effects is an important finding indicating that there were no additive effects of curricular status on disability status. Namely, students with disabilities did not differ from students without disabilities on any of the outcome measures based on their curricular enrollment status (i.e., STEM or non-STEM). Notably, however, significant group differences between STEM majors and non-STEM majors were observed on all but one NSSE benchmark (i.e., academic challenge, enriching educational experiences, student faculty interaction, supportive campus environment) even though the effect size were small. Namely, students in STEM majors reported that their institutions were providing them with greater academic challenges and opportunities for engagement in enriching educational experiences, and that they had more favorable student-faculty interactions but, in contrast, they reported their respective campus environments to be less supportive than did their peers in non-STEM majors. The only outcome on which STEM majors did not differ from non-STEM majors was in their perceived opportunity for participating in active and collaborative learning. These findings are important in understanding the experiences of STEM majors. It is somewhat remarkable that STEM major's perceptions of having less supportive campus environments mirror the perceptions of students with disabilities in the sense that both groups (i.e., STEM majors and students with disabilities) report having less supportive campus environments contrasting with their other more favorable perceptions on the above measured outcomes.

These findings draw attention to the importance of understanding and tailoring to the specific needs of various student populations (e.g., students with disabilities, STEM majors) in terms of the support they need over and beyond academics and the need to tailor services across various domains of life (e.g., social, work, family) as well as making sure that various campus groups (e.g., administrative personnel, offices) are aware and attuned to such needs while interacting with various student populations (e.g., students with disabilities, STEM majors).

Another important finding of this study was the lack of differences between individuals with single primary disabilities and those reporting multiple primary disabilities on NSSE benchmarks. In addition, the effect sizes were small for the observed group differences. It is conceivable that these could be an artifact of having created these groups by collapsing across various "types" of disabilities. More detailed groupings (e.g., primary psychiatric disability versus multiple psychiatric disabilities) might uncover more group differences, including but not confined to, the outcome measures included in the present study. Future research needs to tease apart how experiences of such groups differ from one another in order to reach a better understanding of their characteristics.

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About the Authors

Brad Hedrick received his B.A. degree in political science and M.S. in Recreation Administration from the University of North Carolina at Chapel Hill, and Ph.D. in Leisure Studies from the University of Illinois at Urbana-Champaign. He is currently serving as the Director of the Division of Disability Resources and Education Services <http://www.disability.uiuc.edu/> (DRES) at the University of Illinois. He has 35 years of professional experience in the fields of rehabilitation and postsecondary disability support services, and has extensive experience and expertise in the administration of adapted sports and recreation for persons with disabilities. His present research focuses on postsecondary disability access and impact assessment. He can be reached by email at: bhedrick@illinois.edu.

Mügé Dizén received her BA degree in psychology from Boğaziçi University, Istanbul, Turkey and Ph.D. from University of Illinois at Urbana-Champaign. Her experience includes working as a psychologist for University of Illinois at Urbana-Champaign and serving college students. She is currently at the Disability Resources and Educational Services at UIUC. Her research interests includes perceptions of self and others, attributions, and affective experiences. She can be reached by email at: dizen@uiuc.edu.

Dr. Kimberly Collins received her Bachelor's degree from Illinois Wesleyan University with a major in biology and a minor in psychology. She then obtained her Master's degree in Rehabilitation Counseling Psychology from the University of Texas Southwestern Medical Center in Dallas and her Ph.D. in Counseling Psychology from the University of Illinois at Urbana-Champaign. Dr. Collins has been employed at Disability Resources and Educational Services at the University of Illinois as a clinical psychologist for the past 11 years and assistant director for the past 4 years where she initiated increased support programs for students with ADHD, acquired brain injury, Asperger's/Autism, and psychiatric disabilities. She can be reached by email at: kdcollin@illinois.edu.

John Andrew Evans received his BA degree in education from Southern Illinois University at Carbondale and Ph.D. in Educational Psychology from the University of Illinois. His experience includes administering educational assessment protocols for elementary and secondary students and he is a past chair of the Illinois State Board of Educations' Assessment Advisory Board. He has been an Assistant Professor in the Department of Educational Psychology and Special Education at Southern Illinois University at Carbondale teaching inferential statistics, experimental design and item response theory. He is currently the Executive Director for Information Systems within the University of Illinois Office for Planning and Budgeting. His research interests include the impact of cognitive assessment on state and national policy and he is currently instrumental in establishing the Illinois Higher Education Data Consortium. He can be reached by email at: jaevans@uillinois.edu

Thomas E. Grayson received his BA degree in psychology from Rutgers and Ph.D. in Educational Psychology from the University of Illinois. His experience includes administering alternative school programs for youth at risk of school failure at the Illinois State Board of Education, Director of the Transition Research Institute at the University of Illinois, and Assistant Professor in the Department of Special Education at the University of Illinois. He is currently the Director of Evaluation and Assessment in the Office of the Vice Chancellor for Student Affairs. His research interests include performance-based evaluation and use of concept mapping technology to conceptualize complex organizations, programs, policies and issues for the purpose of strategic planning and evaluation. He can be reached by email at: tgrayson@illinois.edu.