Student Decision-Making and Demographics in Ivy Tech Community College Information Technology Programs: How Race, Gender, and Age Contribute to IT Education and Career Choices

Justin Vinton

Community college students make decisions about their education and careers based on a multitude of factors. Prior research has established that students' demographic characteristics, including race, gender, and age, can influence these decision-making processes (Tinto, 1993; Voorhees, 1986; Statista, 2023; Zhai & Monzon, 2001; Ma & Liu, 2015; Byrd et al., 2019; Jaschik, 2019; National Center for Science and Engineering Statistics, 2023). In addition, recent research within the context of community college information technology (IT) programs reveals that the same demographic influences play a role in shaping students' pathways within the IT industry given its highly racialized and gendered dynamics (Fry et al., 2021) and the tendency for IT workers to be on the younger end of the student age spectrum (CompTIA, 2023). Community colleges, which are becoming more involved in providing access to education and careers in IT to a wider range of students, can play a central role in understanding and addressing the ways in which these dynamics influence how students in demographic groups that are underrepresented in IT—e.g., people of color, women, and older students—perceive and make academic and career decisions within these programs.

Because IT occupations often pay better than careers outside STEM fields (Fry et al., 2021), it is important to understand the factors that contribute to the significant underrepresentation of marginalized demographic groups in IT, including what motivates student decision-making (Fry et al., 2021; NCES, 2023). This is an especially urgent task given that the groups that are underrepresented in IT generally experience significant earnings gaps compared to white males (Wilson & Darity, Jr., 2022). The role of demographic factors in community college decision-making must be carefully examined because influences that affect educational decisions in the community college context are directly linked to career decisions and occupational trends in IT. Current research in this area regarding race, gender, age, and their potential intersections can help inform our understanding of decision-making around IT programs and careers among students in this context.

The choices high school and community college students make about IT education and careers may be impacted not only by their demographic background characteristics and experiences but also by the information and resources they receive from community colleges. Therefore, arriving at a deeper understanding of both of these dynamics should help identify and illuminate ways to advance more equitable access to well-paying IT careers through community college programs. In terms of race, disparities that may influence students' decisions can occur both before entering higher education—potentially regarding information access and perceived opportunities—as well as before and during college—potentially involving issues of enrollment, advising, guidance, and financial assistance. For example, Black students are less likely to enter college compared to white students, and although they are well represented in college STEM programs, Black students are less likely than white students to attain degrees (Ma & Liu, 2015; Wilson & Darity, Jr., 2022). This may indicate that underrepresented populations lack access to sufficient information, support, and resources to make informed decisions about STEM and IT programs and careers. Moreover, these racial disparities are far from negligible in the labor market, given the almost 15 percent earnings gap between Black and white workers in the US that exists even when controlling for regional factors (Wilson & Darity, Jr., 2022). In addition to an earnings gap between Black and white workers, there is an employment gap in IT: only about 9 percent of workers in STEM occupations are Black (NCES, 2023; Fry et al., 2021), and Black executives occupy only 3 percent of C-suite offices in technology-related firms (Brown et al., 2023).

Gendered differences in decision-making are also important, as women are largely underrepresented in STEM occupations (NCES, 2023; Fry et al., 2021). This is especially salient when gender is considered as an intersecting identity with race. Even in high school, where women are more likely to graduate than men, there are significant gaps in graduation rates when both men and women of color are compared with their white counterparts (Reeves & Kalkat, 2023). These intersectional trends may influence how prospective students make decisions about community college and careers in IT after high school.

The effects of intersecting racial and gender identities in decision-making may also reflect racialized and gendered pay differentials. For example, although women across all racial and ethnic groups are more likely than men to enroll in college (Byrd et al., 2019; Jaschik, 2019), they earn less pay than their male counterparts (Kochhar, 2023). When it comes to STEM in particular, women and Black workers experience a sizable earnings gap compared to white men. According to median annual earnings, white women earn 73 percent, Black men earn 76 percent, and Black women earn 63 percent compared to the earnings of white males. This is true even when controlling for similar qualifications and job characteristics, and despite the fact that more Black women earn bachelor's degrees in STEM (62%) compared to Black men (37%) (Fry et al., 2021). As people of color and/or female students may be aware that they are underrepresented in STEM and IT, and paid less than their white counterparts, they may consequently choose not to pursue these occupations, which would only perpetuate differences in representation and pay. These contraindicated disparities imply that the critical differences in outcomes are correlated with demographic factors, which can further impact decision-making of students in underrepresented groups.

Some research focusing on community colleges demonstrates that female students have higher full-time enrollment and persistence rates than their male counterparts (Voorhees, 1986; Statista, 2023). Interestingly, however, other work has shown that students who are female, older, and employed—regardless of whether they work part or full time—are

more likely to withdraw from their programs during the semester (Zhai & Monzon, 2001). As discussed below, this is likely due to a number of challenges that more strongly affect, or are more likely to affect, women and thus are more likely to influence their decisions. These issues may be especially relevant for women and underrepresented groups when they make choices about whether to enter or continue education for a career in IT. For example, research has linked gender differences in technical skills to differences in levels of self-efficacy with regard to computing tasks (Shashaani, 1993; Shashaani & Khalili, 2001; Busch, 1995), and to the general underrepresentation of women in IT careers, where women represent only about 25 percent of the computing workforce and 15 percent of the engineering workforce (Fry et al., 2021). Understanding these demographically influenced decisions to continue or leave community college is critical for the programs that are designed to educate, motivate, and advise students in IT, particularly if these programs want to expand student representation.

Another factor that should be considered is age. Around 56 percent of workers in the IT industry are between 25 and 44 years old (CompTIA, 2023). Since students in different age groups may have different motivations, goals, and challenges, age is likely a strong factor in students' decisions whether to enter into or continue IT education. Age may be a particularly influential factor in decisions made by students in community colleges, which have more age-diverse student populations than four-year universities (Zhai & Monzon, 2001). If this is true, it may help explain why older students are more likely to stop out of community college programs (Tinto, 1993). Combining the influence of both age and gender on enrollment decision-making, research has shown that there was a higher proportion of younger students (18–24) than older students (25 and over) who applied but did not enroll in community college, whereas students who enrolled but withdrew tended to be older (25 and over), female, and have part- or full-time jobs (Zhai & Monzon, 2001). Consequently, these students' decisions to exit may have further implications in the IT industry, leading it to skew younger.

This research brief is part of a larger study on student decision-making in the Ivy Tech School of IT. Ivy Tech is the largest single-accredited community college system in the United States, serving over 150,000 students. It offers over 70 programs across 8 different schools that operate in over 40 locations in the state of Indiana. This brief explores how race, gender, and age may affect community college students' decision-making about their education and careers in IT. Student surveys administered over four years yield insights on how these demographic factors may have influenced important decisions in a number of areas, including course requirements, awareness and advising, educational and career goals, and challenges attending college. These are critical choices students make that may affect program and career outcomes in IT.

In this issue brief we add to the growing body of knowledge on IT student decision-making and demographic influences in the context of community colleges. One of the main takeaways is that despite certain differences in factors influencing decision-making across gender, there is still a significant gap in enrollment between younger male and older female students. We highlight this and other findings in the sections below. While some of our findings follow trends identified in previous research around representation in IT (e.g., Fry et al., 2021), we offer more detailed explanation and context in specific areas of student decision-making that we believe is important to consider. The following section discusses our research setting and survey methods. It is followed by sections detailing our findings and analysis, key takeaways, and conclusion.

Methods and Survey Design

Our sample consists of over 900 Ivy Tech IT students from 5 different cohorts who were administered an online survey using Qualtrics software between Fall 2018 and Fall 2021. The student cohorts were defined by semester enrollment as follows: Fall 2018, Spring 2019, Fall 2019, Fall 2020, and Fall 2021. For the COVID-19 analyses, both cohorts beyond Fall 2019 were considered post-pandemic, while Fall 2019 and prior cohorts were considered pre-pandemic. The Fall 2018 and Spring 2019 cohorts were administered the same survey; all other cohorts were administered unique surveys. Because some questions in the surveys differed across cohorts, sample sizes varied for those analyses. Primary questions, however, with the exception of age, were asked of each cohort, offering repeated cross-sectional comparisons over time. Questions regarding age were not asked before the Fall 2019 survey; thus, analyses involving age do not include students from the Fall 2018 or Spring 2019 cohorts. Table 1 offers a simple breakdown of the number of students surveyed from each cohort.

Table 1: Total sample population by cohort

Student Cohorts	Frequency	Percent	Cumulative
Fall 2018 (First Semester)	368	40.57	40.57
Spring 2019 (Third Semester)	52	5.73	46.31
Fall 2019 (First Semester)	173	19.07	65.38
Fall 2020 (First Semester/Post-Pandemic)	116	12.79	78.17
Fall 2021 (First Semester/Post-Pandemic)	198	21.83	100.00
Total	**907**	**100.00**	

Enrollment Demographics

People of color were largely underrepresented in Ivy Tech IT program enrollment. As shown in Table 2, white/Caucasian students made up the overwhelming majority of enrollment (76%). The race category with the next highest enrollment was African American/Black (11%), followed by Mexican/Chicano (5%). No other race category surpassed an enrollment of 4 percent. This racial underrepresentation reflects other trends in higher education and presents evidence that issues of equity persist with regard to both access to information about IT programs and careers as well as race-related differences in students' decision-making processes related to IT education (Fry et al., 2021; Brown et al., 2023). There was a slightly higher proportion of African American/Black students among females (13%) than among males (11%). This is an interesting finding in the light of the significant gender gap in IT enrollment, which we discuss next in tandem with age.

Most students enrolled in Ivy Tech IT programs were younger men, while women who were enrolled were more likely to be both older and more educated. Similar to other trends in higher education, our sample indicated that students 18–24 years of age comprised the majority of Ivy Tech IT enrollment (64%). The sample also skewed heavily male. Only one-fifth of the IT students in our sample were female; fully 80 percent of students were male. While a majority of female students (56%) were 25 or older, only about 30 percent of male students fell into that age group. This finding suggests that women in IT were more likely to be pursuing education for a second career, whereas

men were more likely to have chosen IT as their initial path to further education. Across demographic groups, older students were more likely to have prior education. According to Table 3, the proportion of female students in our sample who had already earned a bachelor's degree upon enrollment in an Ivy Tech IT program was more than double the proportion of males who had done so (13% of females vs. 6% of males). This finding further supports the idea that female respondents were more likely than males to be pursuing education in IT for a second career.

Table 2: Respondent demographics: Age and race/ethnicity by gender

	Male		Female		Total Sample	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
Age***						
18–24	227	70.7	36	44.4	263	65.4
25+	94	29.3	45	55.6	139	34.6
White/Caucasian***	503	78.3	124	66.3	627	75.6
African American/Black	69	10.7	25	13.4	94	11.3
American Indian/Alaska Native	8	1.2	1	0.5	9	1.1
East Asian	22	3.4	10	5.3	32	3.9
South Asian**	14	2.2	10	5.3	24	2.9
Native American/Pacific Islander*	11	1.7	0	0.0	11	1.3
Mexican/Chicano	39	6.1	6	3.2	45	5.4
Puerto Rican	7	1.1	3	1.6	10	1.2

Education, Goals/Intentions, and Awareness

Women enrolled at Ivy Tech were more likely than men to be enrolled in an Ivy Tech IT program part time rather than full time. Although a majority of students of both genders and across age groups were enrolled full time, a larger share of women (47%) than men (40%) were enrolled part time, and almost half (47%) of students 25 or over were enrolled part time compared to about a third (32%) of their younger counterparts. This suggests that both older students and women are more likely to be working while attending classes or to face other challenges related to responsibilities outside school. A higher proportion of men (38%) than women (28%) pursued a bachelor's degree, which may be related to both the tendency for men to be younger entering IT programs and the increased likelihood of women already having a bachelor's degree upon arrival at Ivy Tech.

Table 3: Educational attainment and goals of respondents, by gender

	Male		Female	
	Freq.	**%**	**Freq.**	**%**
Current Level of Education***				
GED	44	6.9	12	6.5
High school diploma	487	75.9	105	56.5
Associate degree	52	8.1	32	17.2
Bachelor's degree	36	5.6	24	12.9
Graduate degree	8	1.2	10	5.4
Enrolled Part Time or Full Time*				
Part time	257	40.1	88	47.1
Full time	384	59.9	99	52.9
Goals				
Any Certificate*	299	46.6	74	39.6
Associate Degree (Applied or Science)	341	53.1	97	51.9
Earning Credits to Transfer	129	20.1	31	16.6
Gaining Skills (Not Credential)	34	5.3	14	7.5
Bachelor's Degree***	252	39.3	52	27.8
Master Degree	61	9.5	17	9.1
Undecided	67	10.4	16	8.6

NOTE: * $p < .10$; ** $p < .05$; *** $p < .01$

Additionally, as shown in Table 4, there were gendered differences in perceptions about math in IT programs. A higher share of men (36%) than women (21%) intended to complete Calculus as the most advanced level of math, while a higher share of women (58%) were concerned about math requirements than men (55%). These differences may reflect women's perceived lack of skills or familiarity with subjects related to IT and computing (e.g., Busch, 1995), as well as the tendency for men to be more confident in their pursuit of more advanced IT careers.

Table 4: Math concerns and long-term intentions of respondents, by gender

	Male		Female	
	Freq.	**%**	**Freq.**	**%**
Highest Level of Math Intended to Complete***				
Quantitative Reasoning	52	13.5	23	21.1
College Algebra	195	50.6	63	57.8
Calculus	138	35.8	23	21.1
Concerned About Taking Math Requirement*	350	54.6	109	58.3

NOTE: * $p < .10$; ** $p < .05$; *** $p < .01$

Looking at Ivy Tech IT program pathways, Figure 1 shows that more men than women were aware of both the Transfer Single Articulation Pathways (TSAP) degree program (59% of men vs. 47% of women) and the Trine University pathway (17% of men vs. 11% of women). The majority-male awareness of TSAP may be connected to the relative youth of the male population in the sample. TSAP is designed to allow students to transfer to any public Indiana four-year university as a junior after their time at Ivy Tech without losing any credits. As evidenced above, a greater proportion of male than female students had the goal of pursuing traditional education, such as a bachelor's degree. Further, more female than male students already held a bachelor's degree when they enrolled in Ivy Tech.

Figure 1. Awareness of Transfer Pathways
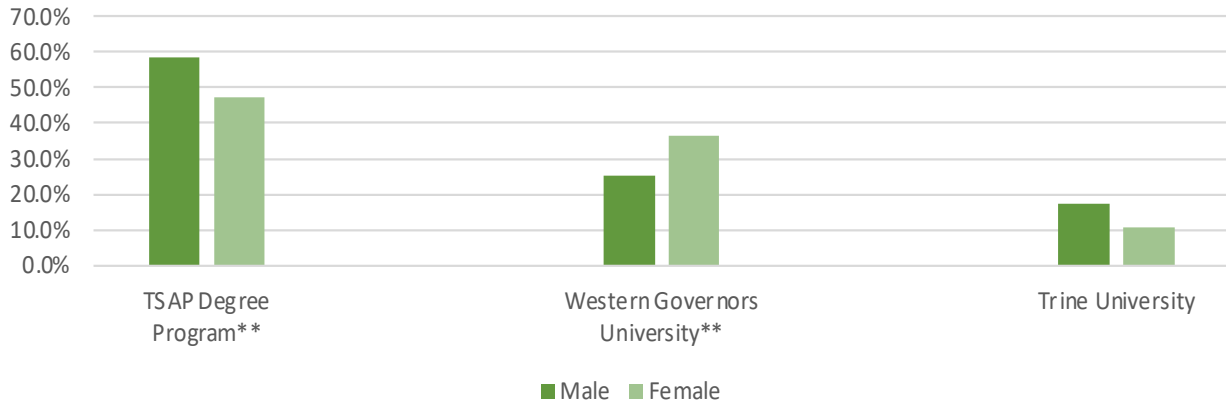
NOTE: * $p < .10$; ** $p < .05$; *** $p < .01$
Figure 1 displays a gender breakdown of Ivy Tech IT students' awareness of three transfer pathways available to them. The majority of students aware of two of the three pathways was male.

Conversely, more women (36%) than men (25%) were aware of the Western Governor University (WGU) pathway, which provides an opportunity for Ivy Tech two-year credential earners to transfer to select online, competency-based programs at WGU. This pathway provides students with options to advance more quickly and offers multiple scholarships. The higher level of awareness of the WGU pathway among women in the sample may reflect a stronger interest in quicker access to more advanced credentials, such as certifications, and to the workplace. This pathway allows students to transfer from Ivy Tech to WGU in a way that saves both time and money compared with completing an entire four-year program at WGU. These trends also reflect the gender differences observed between the two main age categories, with more women in Ivy Tech's IT programs being nontraditional older students (25 or older) and more men being traditional younger students (18–24).
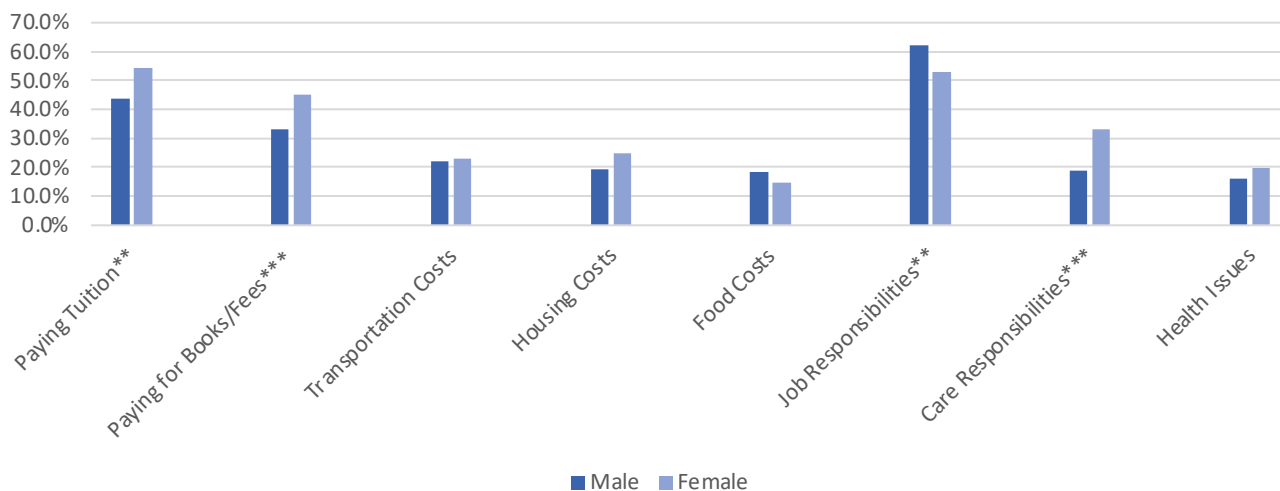
Challenges

While more male than female respondents cited job responsibilities as a challenge to attending school, women in the sample may have faced more challenges overall, particularly concerning care responsibilities and costs associated with attending higher education. A majority of all students indicated they had challenges with job responsibilities. Comparing across gender categories, Figure 2 shows that a higher share of men (62%) compared to women (53%) responded that they had difficulty with job responsibilities. Women outpaced men, however, in most other categories. A higher proportion of women indicated they faced challenges paying tuition (54%), paying for

books/fees (45%), and attending to care responsibilities (33%). Although not statistically significant, a higher proportion of women also indicated they faced challenges meeting housing costs (25%) and dealing with health issues (20%). The largest gap between men and women—about 15 percentage points—was for care responsibilities. These challenges may be especially burdensome for older women, as our findings by age indicate that older students faced more challenges than younger students across these variables. These results imply that women were more often sacrificing work to attend school part time and that they were more likely to be primary caregivers of families. They may also reflect the gender wage gap across the labor market in which women earn less than men despite similar education, qualifications, and job characteristics (Fry et al., 2021).

The responses of the men in our sample may indicate that they were more likely to be the primary financial providers for families or to experience wage and labor market issues. The higher proportion of younger male than female students in the sample (see Table 2) may also indicate that younger men were more likely to be concerned about obtaining a job or pursuing a career out of high school or higher education, or that they were overworked in a job they already had while attending school.

Figure 2. Challenges That Make Attending School Difficult

NOTE: * *p* < .10; ** *p* < .05; *** *p* < .01

Figure 2: Students in the sample most often cited job responsibilities and paying tuition costs as their most significant challenges. Responses differed by gender, with students reporting challenges with job responsibilities being more likely to be male and students reporting issues with paying for books and tuition skewing female. Females were also more likely to report facing challenges related to care responsibilities.

Key Takeaways

Based on the selected survey analyses above, we offer three important takeaways to this brief, along with reflections and suggestions on how to improve IT education at community colleges for a wider range of students.

1. ***There were large general discrepancies in IT enrollment between men and women.*** This coincides with broader trends in higher education, where women are more likely to go to college than men but less likely to pursue IT. Taking women of color and younger women into account only exacerbated these issues. This suggests that these issues are largely due to the current lack of representation in IT occupations and

the interest and perceived opportunities women have in IT before they enter higher education. Ivy Tech may offer benefits to a younger demographic, especially woman of color, by engaging students earlier on in their secondary education in order to expose them to and garner interest in potential IT certificates, degrees, and career pathways beyond that of a traditional four-year education. This may have an especially positive effect on students that are underrepresented in IT careers, who may have greater concerns about obtaining education and skills on fundamental IT subjects like math.

2. ***Women IT students seemed to be older and more nontraditional in terms of pursuing more direct employment pathways than their male counterparts.*** Here, Ivy Tech may be already attempting to meet these interests through implementation of new programs, such as the Ivy+ IT Academy, which now offers in-person, hybrid, and virtual accelerated skills training certificates and boot camps in IT. Similarly, the IvyWorks Indy Women in Tech program at Ivy Tech is specifically designed to help support women in IT and includes networking, career development, scholarships, and other supports. This program is only accessible at certain campuses, however, which limits its reach.

3. ***Challenges may remain, particularly regarding the numerous financial and care challenges faced by IT students, and especially women.*** In general, Ivy Tech should continue to consider ways to financially assist students so they can effectively balance their IT education with other demands, such as working and caring for children or elderly family members while attending classes.

Conclusion

While research on demographic intersectionality in education is not new (Ma & Liu, 2015; Zhai & Monzon, 2001; Fry et al., 2021; Byrd et al., 2019; Jaschik, 2019), we hope this brief encourages more research and policy development focused on community colleges and IT. As evidenced from the data above, the underrepresentation of women and people of color in Ivy Tech Community College IT programs is apparent. Data also revealed that female IT students in our sample may have had specialized needs and faced more significant challenges than their male counterparts. The issues we found in our analyses, however, are reflected by similar demographic trends in the IT industry in general. The underrepresentation of women and people of color at the community college level, and the challenges they may face if they do enroll, may contribute to the persistence of those trends. As we focus on IT in the community college context, we believe our research is an important step toward better understanding the student journey in these fast-growing and forward-looking kinds of technical programs. We hope our work here encourages future research and coordination with community colleges and policymakers in order to widen representation in growing educational pathways to IT careers, and we further recommend that much of that attention should be directed toward women and people of color earlier on in their education.

References

Brown, J. S., Finney, M., McMillan, M., & Perkins, C. (2023). *How to close the Black tech talent gap*. McKinsey Institute for Black Economic Mobility.

Busch, T. (1995). Gender differences in self-efficacy and attitudes toward computers. *Journal of Educational Computing Research, 12*(2), 147–58.

Byrd, W. C., Brunn-Bevel, R. J., & Ovink, S. M. (2019). Tips of icebergs in the ocean: Reflections on future research for embracing intersectionality in higher education. In W. C. Byrd, R. J. Brunn-Bevel, & S. M. Ovink (Eds.), *Intersectionality and higher education: Identity and inequality on college campuses. Rutgers University Press.*

CompTIA. (2023). *CompTIA workforce and learning trends 2023: Unlocking the potential of talent mobility.*

Fry, R., Kennedy, B., & Funk, C. (2021). *STEM jobs see uneven progress in increasing gender, racial and ethnic diversity.* Pew Research Center. https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Jaschik, S. (2019). *Intersectionality and higher education*. Inside Higher Ed. https://www.insidehighered.com/news/2019/04/30/editors-discuss-their-new-book-intersectionality-higher-education

Kochhar, R. (2023). *The enduring grip of the gender pay gap*. Pew Research Center.

Ma, Y., & Liu, Y. (2015). Race and STEM degree attainment. *Sociology Compass, 9*(7), 609–18.

National Center for Science and Engineering Statistics/NCES. (2023). *Diversity and STEM: Women, minorities, and persons with disabilities.* Directorate for Social, Behavioral and Economic Sciences, National Science Foundation. https://ncses.nsf.gov/pubs/nsf23315/

Reeves, R. V., & Kalkat, S. (2023). *Racial disparities in the high school graduation gender gap*. Brookings Institution.

Shashaani, L. (1993). Gender-based differences in attitudes toward computers. *Computers & Education, 20*(2), 169–181.

Shashaani, L., & Khalili, A. (2001). Gender and computers: Similarities and differences in Iranian college students' attitudes toward computers. *Computers & Education, 37*(3), 363–375.

Statista (2023). *Share of for-credit students enrolled in community colleges in the United States in 2020, by gender* [Chart]. Statista Research Department.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition.* University of Chicago Press.

Voorhees, R. (1986). Toward building models of community college persistence: A log-linear analysis [Conference presentation]. Association of Institutional Research (AIR) Annual Forum, Orlando, FL.

Wilson, V., & Darity, W., Jr. (2022). *Understanding Black-white disparities in labor market outcomes requires models that account for persistent discrimination and unequal bargaining power.* Economic Policy Institute.

Zhai, L., & Monzon, R. (2001). *Community college student retention: Student characteristics and withdrawal reasons* [Conference presentation]. Annual Meeting of the California Association for Institutional Research, Sacramento, CA.

About the Author

Justin Vinton is a researcher with the Education and Employment Research Center at the Rutgers School of Management and Labor Relations

Acknowledgements

The Education and Employment Research Center

Rutgers' Education and Employment Research Center (EERC) is housed within the School of Management and Labor Relations. EERC conducts research and evaluation on programs and policies at the intersection of education and employment. Our work strives to improve policy and practice so that institutions may provide educational programs and pathways that ensure individuals obtain the education needed for success in the workplace, and employers have a skilled workforce to meet their human resource needs. For more information on our mission and current research, visit smlr.rutgers.edu/eerc.

EERC Areas of Focus

Community College Innovation	Student Choices and Pathways	STEM and Technician Education	Noncredit Education and Non-Degree Credentials	Education and Labor Market Connections

Rutgers' School of Management and Labor Relations

Rutgers' School of Management and Labor Relations (SMLR) is the leading source of expertise on the world of work, building effective and sustainable organizations, and the changing employment relationship. The school is comprised of two departments—one focused on all aspects of strategic human resource management and the other dedicated to the social science specialties related to labor studies and employment relations. In addition, SMLR provides many continuing education and certificate programs taught by world-class researchers and expert practitioners. For more information, visit smlr.rutgers.edu.

National Science Foundation

The U.S. National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In Fiscal Year 2022, its budget is $8.8 billion. NSF funds research in all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives more than 50,000 competitive proposals for funding and makes about 12,000 new funding awards.

With a focus on two-year Institutions of Higher Education (IHEs), the Advanced Technological Education (ATE) program supports the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions (grades 7-12, IHEs), industry, and economic development agencies to promote improvement in the education of science and engineering technicians at the undergraduate and secondary institution school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways; and other activities.