STEM Career Pathways for Transition-Age Youth With Disabilities

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Background: Although there is an increasing demand for workers in STEM fields, people with disabilities are underrepresented in STEM educational programs and related occupations. Among those who achieved competitive integrated employment after serving under an Individualized Plan for Employment (IPE) by the state-federal vocational rehabilitation (VR) system, only 5.3% of individuals with disabilities were engaged in STEM jobs/careers during the years 2017–2019. Of those with an employment outcome in STEM fields, 8,348 (40.9%) were transition-age youth aged 14–24.

Objective: Using Rehabilitation Service Administration (RSA-911) data for the fiscal years from 2017 to 2019, the current study investigated the characteristics of transition-age youth with disabilities aged 14–24 in the state-federal VR system that predicted employment outcomes in STEM fields.

Methods: A logistic regression analysis was used to examine the associations between individual characteristics and STEM career attainment.

Findings: Results illustrated that gender, race, living arrangement, and the receipt of general assistance/SSI/SSDI/TANF predicted employment outcomes in STEM fields.

Conclusions: The research findings provide support for the understanding of demographic characteristics of transition-age youth with disabilities successfully closed in STEM jobs/careers after serving under an IPE. A discussion of the strategies and interventions associated with promoting career development and decisions toward the STEM field for transition-age youth with disabilities is provided.

Keywords: career pathways; disability; employment; STEM; transition; youth

Rapid scientific and technological advancements in the 21st century have provided people worldwide with increased convenience and quality of life. Behind these developments is the innovative work of people in science, technology, engineering, and mathematics (STEM) occupations. As a leader in science and technology, the U.S. economic growth is primarily driven by this innovation advantage (Cardoso et al., 2013). There were nearly 8.6 million STEM jobs in the United States in May 2015, representing 6.2% of US employment (Fayer et al., 2017). Computer- and engineering-related occupations made up over half of STEM employment, with 45% and 19%, respectively. In some industries, between one- and two-thirds of employment was in STEM occupations. For example, in May 2015, STEM occupations made up over 66% of jobs in the computer systems design and related service industry. The architectural, engineering, and related services industry also had over 60% STEM employment (Fayer et al., 2017).

STEM fields have also maintained a strong momentum of development. During the past 10 years, STEM fields have experienced rapid growth in terms of new jobs. Compared to 5.2% growth in

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non-STEM occupations, employment in STEM occupations grew by 10.5% between May 2009 and May 2015 (Fayer et al., 2017). Over 800,000 new STEM jobs were added to a variety of industries. Additionally, most science and engineering occupations are projected to have a higher growth rate than the average projected growth for the overall workforce (Sargent Jr., 2017). For example, computer occupations as a group are projected to grow about three times as fast as the average between 2019 and 2029 at 11.5% and are expected to result in over half a million new jobs (Zilberman & Ice, 2021). The rapid and healthy development of the STEM fields ensures many job opportunities in the labor market in the future.

Although there is an increasing demand for workers in STEM fields, the United States is not producing enough STEM college graduates (Cardoso et al., 2013; Lawler et al., 2018). Over 99% of STEM employment requires postsecondary education for entry (Fayer et al., 2017). Nonetheless, with only around 28% of all undergraduate students majoring in STEM (National Science Foundation, 2019) and an overall shortage of STEM college graduates (Lawler et al., 2018), an emerging "STEM crisis" is occurring. There is, however, some disagreement as to the legitimacy of a STEM crisis. Lawler and colleagues (2018) argue that the demand for STEM jobs is plenty and increasing, while the supply of graduates is low. Conversely, Hawley and colleagues (2014) argue that the STEM crisis is due to an insufficient demand rather than an insufficient supply. Regardless of where one stands on an actual or supposed STEM crisis, a consensus is that there is a lack of diversity in the field, specifically as it applies to women, racial and ethnic minorities, and people with disabilities. Colwell (2003) indicated that one way to address the declining college enrollment in STEM majors is to encourage and prepare underrepresented groups, such as people with disabilities, to competently pursue STEM education and careers.

LIMITED STEM CAREER OPPORTUNITIES FOR PERSONS WITH DISABILITIES

It is well documented that the employment and labor force participation rate overall for people with disabilities is lower than for those without disabilities (Hawley et al., 2014). In fact, recent findings from the Bureau of Labor Statistics show that the employment-to-population ratio for working-age adults with disabilities has decreased from an already low 29.4% to 28.7% from December 2020 to January 2021. Conversely, the employment-to-population ratio for working-age adults without disabilities stands at around 70.5% (Bureau of Labor Statistics, 2021). If there is in fact a STEM crisis or shortage, then people with disabilities holding STEM interests may be an especially marginalized and underrepresented population.

Indeed, people with disabilities are underrepresented in STEM educational programs and its related occupations (Hawley et al., 2013; Lawler et al., 2018; NSF, 2019). This is reflected in the U.S. Department of Education's Rehabilitation Services Administration Case Service Report (RSA-911) for the fiscal years (FYs) from 2017 to 2019, which shows that a mere 5.3% of individuals with disabilities who received vocational rehabilitation (VR) services were closed with successful employment in STEM fields.

Due to numerous educational, psychological, economic, and attitudinal barriers, youth with disabilities are less likely to enroll in science or math courses or attend college to pursue postsecondary degress and careers in STEM fields compared to those without disabilities (Duerstock & Shingledecker, 2014; Lindsay et al., 2019). Further, students with disabilities who are enrolled in postsecondary education are less likely to seek out campus resources for support, hold positive attitudes of STEM fields, complete their degrees, or achieve success and persistence in STEM (Street et al., 2012). Only half of college students with disabilities are employed (Hawley et al., 2014), and only around 10% of employed scientists and engineers report having one or more disabilities (NSF, 2019). For those who do graduate and obtain employment, systemic barriers and inequities may still remain.

Even so, people with disabilities should not be deterred from STEM pursuits. In many instances, despite lower outcomes and inequities for people with disabilities in STEM fields compared to those without disabilities, we still see significant within-group differences in that vocational outcomes for STEM graduates with disabilities are higher than for non-STEM graduates with disabilities. For instance, students with disabilities who have attained STEM degrees have higher rates of labor force participation and a higher employment-to-population ratio than non-STEM graduates with disabilities (Hawley et al., 2014). Despite indications of promising within-group differences for persons with disabilities, significant barriers and challenges remain as research indicates that there is a paucity of youth with disabilities employed in STEM oocuaptions in contrast to their non-disabled counterparts (Hawley et al., 2013).

BARRIERS TO ENGAGEMENT IN STEM AMONG TRANSITION-AGE YOUTH WITH DISABILITIES

There are many internal, environmental, and systemic barriers that students with disabilities face that inhibit their successful educational and vocational outcomes, many of which have a direct relationship to the lack of people with disabilities studying or being employed in STEM contexts (Hawley et al., 2013; Street et al., 2012). Hawley et al. (2013) designate these barriers as in the categories of educational, psychological, economic, and attitudinal. Many teachers or instructors, whether in high school or postsecondary settings, lack the skills to successfully engage students with disabilities in STEM classes (educational); there is often insufficient federal funds to support special education programs that increase/improve STEM-related experiences for students with disabilities (economic); parents and teachers may hold lowered expectations of students with disabilities in STEM (attitudinal); and constantly being "redirected" or "excluded" from STEM pursuits is a significant psychological barrier that students with disabilities face (Hawley et al., 2014).

All considered, it appears that these barriers may manifest themselves in students with disabilities and lead to lower levels of self-efficacy, a lack of role models in STEM fields to inspire and offer guidance, and significant issues to accessibility—whether it be concrete physical accessibility issues or more systemic problems such as navigating administrative aspects of STEM education and employment. It can be concluded that these are among the main culprits for the lack of diversity in STEM fields and subpar outcomes for those with disabilities who hold such interests and aspirations.

CAREER DEVELOPMENT AND CHILDREN WITH DISABILITIES

Children and youth with disabilities experience many challenges in their educational and career development, including higher risk of poor self-esteem, low academic efficacy, and limited exposure to career education (Kolne & Lindsay, 2019). Mamun et al. (2018) found that adolescents with disabilities were more likely to rely on others and less involved in career-making decision processes while demonstrating more difficulty assessing their career strengths and limitations. This delayed development influences their career aspirations, potentially resulting in underemployment, and employment in jobs that entail minimal training and limited emphasis on career development (Biggs & Carter, 2016).

Research has demonstrated that targeting career awareness at an early age is important (Biggs & Carter, 2016; Gottfredson, 1981; Holland, 1990; Super 1980), that children with disabilities are often disadvantaged regarding such early explorations, and that children with disabilities tend to have limited exposure to career information and career role models (Kolne & Lindsay, 2019). These developmental limitations can manifest in the processes of circumscription and compromise as described by Gottfreson (1981). The theory of circumscription and compromise addresses the processes by which occupational aspirations are developed and sacrificed given internalized societal expectations. The process entails a progressive elimination of potential vocational alternatives (circumscription) and accommodation to external and internalized limitations regarding vocational choice (compromise). Intersectionality may further influence developmental processes as girls with disabilities have an additional layer of potential gender stereotypical expectations. Hackett and Betz (1981) proposed the importance of the concept of self-efficacy expectations to girls' career-related behaviors, postulating that low or weak career self-efficacy may restrict career options and decisions. The authors furthered that interventions designed to enhance career-related self-efficacy expectations could be an important and useful focus of career counseling. All taken together, these findings imply that supporting youth and transition-age youth with disabilities to participate and engage fully in STEM learning and disciplines early on can help increase STEM self-efficacy, promote employment opportunities, and expand their career options, which keeps our future robust and economy strong.

It is crucial to encourage transition-age youth with disabilities to foster an interest in STEM disciplines, enter STEM fields, and ensure the quality of their postsecondary education, so that we can strengthen America's STEM workforce and competitiveness in the global economy. To our knowledge, no studies have empirically examined the representation of transition-age youth with disabilities in pursuit of STEM occupations/careers. A better understanding of individual characteristics on STEM occupations/career engagement could be useful to rehabilitation administrators and practitioners in approaching transition-age youth with disabilities who pursue careers within the emerging STEM fields as well as in planning and implementing STEM pathways that mitigate barriers and improve obtainment and retention. Therefore, the purpose of this study was to investigate the characteristics of transition-age youth with disabilities, aged 14–24 (as defined under the Workforce Innovation and Opportunity Act, 2014), engaged in the state-federal VR system that predict employment outcomes in STEM fields. A logistic regression analysis was used to examine the associations between individual characteristics and STEM career attainment.

METHOD

Participants

Data for this study were extracted from the RSA-911 for FYs 2017–2019. The database contains information about people with disabilities who receive state VR services, including demographic information, duration, cost and types of services, and employment outcomes. From FY 2017 to FY 2019, a total of 1,429,488 individuals existed in the state-federal VR system. Of those with a comptetive integrated employment outcome (382,408), only 20,420 (5.3%) were employed in STEM fields. Of these 20,420, 8,348 (40.9%) transition-age youth aged between 14 and 24 were successfully engaged in STEM occupations/careers. To examine the associations between individual characteristics and STEM employment, the sample was categorized into four major disability groups: physical (e.g., mobility, manipulation, dexterity orthopedic), sensory/communicative (e.g., visual impairment/blindness, hearing impairment/deafness), cognitive (e.g., cognitive impairments), and psychiatric disabilities (e.g., psychosocial impairments).

Regarding race/ethnicity, White (93.7%) was the dominant sample characteristic followed by African American (3.1%), Hispanic or Latinx (2.5%), Asian (0.4%), American Indian or Alaska Native (0.2%), and Native Hawaiian or Pacific Islander (0.1%). Regarding gender, 4,401 females (52.8%) were employed in STEM fields compared to 3,940 males (47.2%). Regarding the type of disability, 58% of transition-age youth had cognitive disabilities, 25.4% had psychiatric disabilities, 8.5% had physical disabilities, and 8% had sensory/communicative impairments. In terms of the level of education, 47% of transition-age youth had less than a high school education, while 42.6% received a high school diploma or a high school equivalency. About 8.1% of the participants had 1 or 2 years of postsecondary education experience or an associate degree, and 2.2% had either a bachelor degree or a higher degree. Only about 1.1% of transition-age youth participants received general assistance as well as temporary assistance for needy families (TANF), 5.5% received supplemental security income (SSI), and 8.8% received social security disability insurance (SSDI). In addition, 32% of the participants received Medicaid at application for VR services, whereas 4.3% received Medicare. Lastly, the median days between application and closure was 612.5 (SD = 964.7). The demographic information of the sample is presented in Table 1.

Variables

The dependent variable used in this study was employment in STEM occupations and non-STEM occupations using the Standard Occupational Classification (SOC) codes. For STEM occupations, SOC codes that coincide with the STEM fields (e.g., 15-0000 computer and mathematical occupations, 17-0000 architecture and engineering occupations, 19-2000 physical schientists) were recoded as STEM occupations, and the rest of SOC codes were considered as non-STEM occupations.

TABLE 1. Demographic Characteristics of Transition-Age Youth Successfully Closed in STEM Jobs/Careers (N = 8,348)

Variables	*n*	%
Gender[a]		
Male	3,940	47.2
Female	4,401	52.8
Race/ethnicity[b]		
American Indian or Alaska Native	18	0.2
African American	230	3.1
Asian	30	0.4
Hispanic/Latinx	190	2.5
Native Hawaiian/Asian Pacific Islander	8	0.1
White	7,055	93.7
Disability type		
Physical	707	8.5
Sensory/communicative	675	8.0
Cognitive	4,849	58
Psychiatric	2,128	25.4
Level of education at application[c]		
Less than high school	3,914	47
High school diploma or equivalency	3,551	42.6
Some postsecondary/associate degree	680	8.1
Completed college degree or higher	184	2.2
Employment status at application		
Employed	1,038	12.4
Not employed	7,321	87.6
Living arrangement		
Private residence	8,172	97.8
Community residential	47	0.6
Rehabilitation facility/mental health/nursing home	17	0.2
Correction facility/halfway house	13	0.2
Homeless/shelter	13	0.2
Other	93	1.1
Referral source[d]		
Self-referral	2,656	32.2
Family/friends	623	7.5
Education (e.g., elementary, secondary, postsecondary, adult education and literacy program)	1,397	16.9
Employers	61	0.7
Medical/mental health providers	1,811	21.9
Community rehabilitation program/welfare agencies	169	2.1

(*continued*)

TABLE 1. Demographic Characteristics of Transition-Age Youth Successfully Closed in STEM Jobs/Careers (N = 8,348) (*continued*)

Variables	*n*	%
Other VR state agencies	50	0.6
Benefits (e.g., SSA, Veteran's benefits, etc.)	151	1.8
Other sources	1,333	16.2
General assistance recipient		
Yes	94	1.1
No	8,265	98.9
SSI recipient		
Yes	457	5.5
No	7,902	94.5
SSDI recipient		
Yes	737	8.8
No	7,622	91.2
TANF recipient		
Yes	95	1.1
No	8,264	98.9
Medicaid recipient		
Yes	2,672	32
No	5,687	68
Medicare recipient		
Yes	361	4.3
No	7,998	95.7
Days at application to exit (median)[e]	612.5	

Note. SSI= supplemental security income; SSDI = social security disability insurance; TANF = temporary assistance for needy families.
[a]*n* = 7 missing for gender; [b]*n* = 817 missing for race/ethnicity; [c]*n* = 30 missing for education level; [d]*n* = 107 missing for referral sources; [e]*n* = 2 missing for days at application to exit.

The predictor variables used in this study were the demographic characteristics of the sample, including (a) gender, (b) race/ethnicity, (c) disability type, (d) level of education, (e) employment status at application, (f) living arrangement, (g) receipt of general assistance, (h) receipt of SSI, (i) receipt of SSDI, and (j) receipt of TANF.

Data Analysis

Data were analyzed using IBM SPSS 27.0. Descriptive statistics were used to identify the demographic characteristics of transition-age youth with disabilities aged 14–24 (n = 8,348) successfully closed in STEM jobs/careers after serving under an IPE. A logistic regression analysis was conducted to examine the associations between demographic characteristics of transition-age youth aged 14–24 (n = 20,420) closed in STEM and non-STEM jobs/careers and employment outcomes in STEM fields (STEM vs. non-STEM). The odds ratios (ORs) were presented with a 95% confidence interval (CI).

RESULTS

A logistic regression analysis was conducted to examine the associations between individual characteristics and employment outcomes in STEM fields. The omnibus test for the model was found to be statistically significant: χ^2 (22, N = 133,579) = 1232.692, $p < .001$, indicating a significant effect for the combined predictor variables included in the model on employment outcomes in STEM fields. The Nagelkerke R^2 ranged from 0.01 to 0.03. The Hosmer and Lemeshow goodness of fit tests indicated nonsignificant results for the transition-age group (p = 0.234), indicating that the model for the group fits the data well.

All the demographic covariates such as gender, race/ethnicity, disability type, level of education, employment status at application, living arrangement, and receipt of general assistance, SSI, SSDI, and TANF were entered into the model as predictors of employment status in STEM jobs/careers at closure. Several demographic covariates were identified as significant predictors for the employment outcomes of transition-age youth in STEM fields (see Table 2).

TABLE 2. Results of Binary Logistic Regression

			95% CI	
Variable	***B***	**OR**	**Lower**	**Upper**
Step 1[a]				
Gender	–0.32	0.73**	0.70	0.76
Race/ethnicity				
Native Hawaiian or Other Pacific Islander	–0.19	0.83	0.60	1.15
African American	–0.04	0.96	0.91	1.02
Asian	–0.07	0.93	0.80	1.10
Hispanic/Latinx	–0.03	0.97	0.91	1.04
White	0.57	1.76**	1.65	1.87
Sensory/communicative impairments	–0.08	0.92	0.82	1.03
Cognitive disability	0.02	1.02	0.94	1.10
Psychiatric disability	0.04	1.04	0.95	1.14
Level of education at application				
High school diploma or equivalency	0.02	1.02	0.98	1.07
Some postsecondary/associate degree	–0.01	0.99	0.91	1.08
Completed college degree or higher	0.15	1.17	1.00	1.36
Employment state at application	–0.06	0.95	0.88	1.01
Living arrangement				
Community residential	–0.56	0.56**	0.43	0.78
Rehabilitation facilities/mental health agencies/nursing home	–0.60	0.55*	0.34	0.89
Correctional facility	–0.27	0.76	0.44	1.34
Homeless/shelters	–0.15	0.86	0.53	1.41
Other	–0.02	0.98	0.79	1.21
General assistance recipient	–0.71	0.49**	0.40	0.61
SSI recipient	–0.82	0.44**	0.40	0.49
SSDI recipient	–0.42	0.66**	0.61	0.71
TANF recipient	–0.29	0.75*	0.61	0.92

Note. OR = odds ratio.
[a]Demographic covariates: gender (with female as the reference group), race/ethnicity (with American Indian as the reference group), type of disability (with physical disability as the refence group), level of education (with less than HS as the reference group), employment status at application (with unemployed as the reference group), living arrangement (with private residence as the reference group), general assistance recipient (with not received as the reference group), SSI recipient (with not received as the reference group), SSDI recipient (with not received as the reference group), and TANF (with not received as the reference group).
*$p < .01$; **$p < .001$.

Gender was found to be a significant predictor for transition-age youth participants. Males were less likely to be employed in STEM fields (*OR* = 0.73; 95% CI 0.70–0.76) than females. Regarding race and ethnicity, participants who identified as White were 1.76 times more likely than those who were non-White to be employed in STEM fields (*OR* = 1.76; 95% CI 1.65–1.87). Living arrangement was also a significant predictor for employment in STEM fields. Transition-age youth living in community residential (*OR* = 0.58; 95% CI 0.43–0.78) and rehabilitation facilities/mental health agencies/nursing home (*OR* = 0.55; 95% CI 0.34–0.89) were less likely to find an employment in STEM fields than those living in private residence.

Receiving general assistance, SSI, SSDI, and TANF benefits also significantly predicted employment outcomes in STEM fields for transition-age youth. The participants receiving general assistance showed a 51% reduction in obtaining employment in STEM fields (*OR* = 0.49; 95% CI 0.40–0.61), relative to those not receiving general assistance. Similarly, those who received SSI and SSDI at the time of application showed 56% and 34% reductions in odds of obtaining employment in STEM fields compared to those who were not SSI or SSDI recipients (*OR* = 0.44; 95% CI 0.40–0.49; *OR* = 0.66; 95% CI 0.61–0.71, respectively). The results also showed that transition-age youth receiving TANF at the time of application were less likely to be employed in STEM fields (*OR* = 0.75; 95% CI 0.61–0.92) than those not receiving TANF benefits.

DISCUSSION

Appreciating the current trends in the participation of transition-age youth with disabilities in STEM fields is an essential component for understanding how to increase the representation of youth with disabilities in STEM and how to design promising interventions to promote career success for this population. The purpose of this study was to identify the characteristics of 8,348 transition-age youth with disabilities who received VR services that influence successful employment outcomes in STEM occupations/careers. Following the results of our analysis, we provide strategies and interventions associated with promoting career development and decisions toward STEM fields.

Consumer Characteristics Associated With STEM Employment Outcomes

Study results showed that female transition-age youth with disabilities were more likely to be employed in STEM fields than males. In contrast to the national trends on persons with and without disabilities in STEM (NSF, 2019) as well as previous studies (e.g., Lawler et al., 2018; Wei et al., 2013) that reported that STEM areas are perceived as male domains, our findings may reflect the positive changes toward prioritizing an inclusive workplace culture by reducing the gender disparity in STEM occupations/careers. Simply knowing this information may serve as "good news" for females with disabilities with an interest in STEM, who may have been told explicitly or implicitly that they are at a disadvantage due to their gender identity and that STEM jobs are more suited for males. In addition to serving to increase optimism and self-efficacy, this finding is also perhaps evidence of the effectiveness of some of the interventions that have been implemented in previous years to increase women participation in STEM. Such interventions and inclusive approaches lead women to enter STEM fields, thrive in STEM careers, and reach their full potential.

Despite the positive shift toward the increase of women's representation in STEM fields, the results indicated that transition-age youth with disabilities who were White were more likely to be employed in STEM fields than those of other races/ethnicities. This is congruent with NSF's report (2019) and Lee's study (2014) that also showed that racial and ethnic minorities are underrepresented in both STEM education and careers. This finding reminds us that it is important to promote a more supportive organizational structure that places a high value on equity, cultural diversity, and positive working environment where those from underrepresented minority backgrounds feel accepted, welcome, and being a valuable part of the team. Moreover, state VR agencies and rehabilitation professionals working with youth with disabilities should expand their focus on exemplary outreach and recruitment efforts for eligible minorities. Strategic alignment between K–12, postsecondary education, workforce development, and employers in STEM fields should further offer youth a guided career pathway to gain the knowledge and skills necessary to move into the STEM workforce. As part of their efforts to improve access to STEM fields for youth with disabilities, rehabilitation professionals should also monitor and implement effective mentoring strategies that mitigate barriers and improve retention in STEM fields.

It is also worth mentioning that the results of our study showed that most participants employed in STEM have either cognitive (58%) or psychiatric (25%) disabilities. Those with physical and sensory disabilities were largely underrepresented (8.5% and 8%, respectively). Our findings demonstrate consistency with all age groups who were successfully engaged in STEM fields during the years 2017 to 2019 (cognitive 31.8%, psychiatric 28.4%, sensory/communicative 21.5%, physical 18.2%). Many interventions in the literature (and described later in this article) are aimed at improving STEM opportunities for those with cognitive and psychiatric disabilities and those who experience attitudinal barriers. Although it is important to ensure the continued effectiveness of these interventions as well as to continuously develop and refine them, interventions that are targeted toward those with different types of disabilities, including sensory and physical, are worth exploring.

Results from the logistic regression analysis also indicated that certain types of living arrangements of transition-age youth with disabilities predict their employment outcomes in STEM fields. Transition-age youth with disabilities who lived in community residentials or rehabilitation facilities/mental health facilities/nursing homes at the time of application were less likely to be engaged in STEM occupations/careers than those who were living in private residences.

Lastly, the results also indicated that transition-age youth with disabilities who received general assistance, SSI, SSDI, or TANF at the time of application had significantly lower odds of finding employment in STEM fields. Relatedly, national data also show that students with disabilities are less likely to receive federal student aid than students without disabilities; therefore, they may need to rely on more general assistance such as SSI and SSDI (NSF, 2019). However, it is also well known that the receipt of disability benefits prevents participants from reaching their employment goals (Catalano et al., 2006; Chun at el., 2018; Dutta et al., 2008; Rosenthal et al., 2007). Lee et al. (2020) further indicated that limited information and knowledge about work incentivizing programs for disability beneficiaries prevents them from career exploration and achieving their potential. The consistent finding regarding the impact of disability benefits on employment outcomes calls attention to provide information and benefits counseling to help youth with disabilities and their caregivers/legal guardians understand how work and earnings can affect their benefits earlier than later, which in turn can help them promote their career development and make effective career decisions. However, it should be noted that the interpretation should be made with caution due to a relatively small proportion of this group (ranging from 1.1% to 8.8%).

Interventions/Strategies for Promoting Career Development of Transition-Age Youth in STEM Fields

Despite past and current inequities, systemic barriers, and inherent competitiveness of the STEM fields, there is high value and reward in pursuing a career in STEM. There have been several initiatives in recent years to address these concerns as they relate to people with disabilities to promote equity, improve educational experiences, and enhance the probability of successful outcomes and a better future of STEM. For instance, Street and colleagues (2012) sought to improve the academic performance and satisfaction in STEM classes for undergraduate students with disabilities. They provided an intervention that infused a peer-led team learning program based on the principles of Universal Design Instruction to a group of undergraduates with learning disabilities (LDs) and attention-deficit hyperactivity disorder (ADHD). The results showed that the intervention was successful; participants saw improvements in grade point averages (GPAs), overall skills, self-efficacy, and satisfaction (Street et al., 2012). The authors stressed the importance of peer support and peer mentors, or at least the presence of quality social engagement in academic pursuits, and the need for instructors and class facilitators to be knowledgeable of both disability and universal design.

Another notable example of an effort to improve STEM experiences for young people with disabilities is a program at the Seidenberg School of Computer Science and Information Systems of Pace University. Lawler and colleagues (2018) described the program in detail, explaining that it offers students with developmental and intellectual disabilities a certificate, non-credit, non-degree curriculum of courses in technology in fully inclusive settings. Additional elements of the program include extracurricular activities, social engagement, and the provision of non-disabled mentors. Like Street et al. (2012), Lawler emphasized the social component as a key to the success of these interventions. In addition, the program has been found to increase students' academic identity, content learning, and norms of sociability, thus improving their perception of and motivation to pursue careers in STEM and simultaneously increasing their skillset and knowledge, enhancing their marketability to employers.

Other interventions explore the role of career mentoring as a potentially viable approach for youth with disabilities to gain exposure to role models in STEM disciplines (Lindsay et al., 2019). In addition, interest in digital career discovery and assessment for youth with disabilities has grown rapidly in the past few decades. One reason for this is the potential of digital technology to provide career and occupational information and feedback in accessible formats (Shute & Rahimi, 2017). Scalise et al. (2018) reviewed the literature related to accessibility and accommodations for technology-enhanced STEM education. They emphasized that there are several frameworks that can help improve the accessibility of career-related information, including universal design frameworks and web content accessibility, by using language simplification, altering presentation modalities, and providing tools specifically designed for students with disabilities. Sukhai and Mohler (2016) also highlighted the importance of enhancing accessibility for students with disabilities into STEM education, emphasizing the integration of STEM disciplines (life and physical sciences, engineering, and mathematics) into curricula for students with physical, sensory, learning, mental health, chronic medical, and developmental disabilities. The authors provided useful resources for STEM teachers and instructors working with students with disabilities as well as global perspectives on making research or workspaces (such as laboratories) accessible for students with disabilities in STEM fields.

In regard to the outcomes of STEM interventions on youth with disabilities, Kolne and Lindsay (2019) recently provided a synthesis of research pertaining to interventions for increasing the participation of youth with disabilities in STEM. The authors identified 17 articles meeting inclusion criteria. A review of STEM-specific interventions revealed significant improvements in perceived self-advocacy, self-esteem, social skills, independence, preparation for college and employment, and perceived career options (including STEM careers). These benefits were found to exist across many delivery formats, including web-based interventions, virtual and face-to-face mentoring programs, and course-based interventions or workshops.

Implications for Rehabilitation Counseling

Rehabilitation counselors can play a significant role in working with students and consumers to promote the intrinsic and social values of STEM careers by enhancing interest in societal benefits, emphasizing extrinsic values such as earning potentials and job security, and highlighting prestige values associated with respected and stable STEM occupations. Working with individual consumers, rehabilitation counselors provide holistic career assessments considering a multitude of factors that impact a consumer's career development (e.g., family, work, personal concerns). Career counseling interventions can include activities that target work adjustment, stress, mental health, enhancement of work skills, enhancement of interpersonal skills and communication, adaptability, flexibility, and all other developments that lead to career self-agency (Zunker, 2012).

In summary, rehabilitation counselors can work collaboratively with consumers who may be interested in STEM-related career paths to address the following areas:

- Knowledge: Work with students and consumers to gain an understanding of STEM careers, the benefits of STEM professions, and the requirements of STEM workforce.
- Ability: Introduce role models and mentors to students and consumers, discuss the social impact of STEM fields, and reinforce the skills of successful STEM workers.
- Pathways: Work with students and consumers to understand that there are many potential pathways to engaging in STEM careers—certificates, associate degrees, bachelor degrees, master degrees, and doctoral degrees.

- Exposure and commitment: Integrate situational assessments and on-the-job training into rehabilitation services to facilitate students' and consumers' personal experiences and self-efficacy related to engagement in STEM careers.

As eloquently postulated by R. Roosevelt Thomas, Jr., "Creating a diverse workforce is a process, not a destination." A rehabilitation counselor can be an integral part of this journey.

Implications for Research and Limitations

The implications for research should be taken with some caution given the limitations of the current study. First, the study analyzed only fiscal year data from 2017 to 2019. With only 3 years of data, our results could be limited, especially given the dramatic social and economic changes during the current coronavirus pandemic. In addition, the RSA-911 data were recorded by VR counselors at various stages in the case service process. Thus, it is possible that if counselors did not consult the case file to verify which services were delivered and if they relied solely on memory, there could be missing or incorrect information, which could significantly influence the results of this study. Given these limitations, it is premature to make a conclusion that the specific predictors of successful employment outcomes in STEM fields identified in this study can be generalized to all transition-age youth with disabilities. Future research needs to incorporate more concurrent RSA-911 data from multiple fiscal years to investigate the relationship between key demographic variables and employment outcomes in STEM fields. Such research will have the capability to verify the findings of this study and uncover patterns in identifying factors that over time predict successful employment outcomes in STEM fields for transition-age youth with disabilities.

This study did not examine the employment outcomes in STEM fields for transition-age youth with multiple disabilities. RSA (2017) defined a secondary disability as an "individual's secondary physical or mental impairment that causes or results in a substantial impediment to employment." Therefore, future research studies need to include a variable for multiple disabilities or a secondary disability to investigate its impact on employment outcomes in STEM fields for transition-age youth with disabilities. Moreover, the current study used archival data and an ex post facto research design. Therefore, a causal relationship between variables could not be established.

Lastly, future research is needed to examine different types of VR services that predict employment outcomes in STEM fields. More in-depth studies to identify the barriers, challenges, and supports associated with the use of VR services and engagement in STEM fields for individuals with disabilities need to be conducted.

CONCLUSIONS

Persons with disabilities must be better prepared to work in STEM careers in proportion to their current workforce engagement. This will help the United States meet its high-tech labor demands, global competitiveness, and workforce challenges. In turn, the economic power of youth with disabilities could increase, leading to personal and financial independence, stronger families, and more resilient communities (National Alliance for Parnerships in Equity, 2020). Results of our analysis add to the emergent literature on transition-age youth with disabilities pursuing STEM occupations/careers along with highlighting the necessity of current and future interventions to promote career development and informed, person-driven decisions toward STEM fields.

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