NATIONAL MENTORING RESOURCE CENTER
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Mentoring for Enhancing Career Interests and Exploration

A National Mentoring Resource Center Research Review

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Summary

This review examines research on the role of mentoring on career interest and exploration for adolescents under 18 years of age. The report is organized around four questions:

1. What are the effects of mentoring on career interests and exploration (CIE) among youth?
2. What factors condition or shape the effects of mentoring on CIE?
3. What intervening processes are most important for linking mentoring to beneficial effects on CIE?
4. To what extent have efforts to provide mentoring to youth with CIE as a priority outcome reached and engaged the intended youth, been implemented with high quality, and been adopted and sustained by host organizations and settings?

Based on this review, the following conclusions were developed:

1. While a broad range of mentoring programs target CIE outcomes, few programs have been rigorously evaluated for their effects on these outcomes and even less evidence is available concerning whether relatively immediate benefits carry over into later stages of development (e.g., career interests at the stage of entering higher education or the workforce).

2. Mentoring programs aiming to promote career interest and exploration have demonstrated some success in promoting career-related outcomes for youth.
3. Many programs have successfully created targeted interventions, both for specific fields of study (e.g., STEM-related fields) and specific populations of youth (e.g., youth in foster care).
4. Utilizing same-sex mentors, specifically for youth that identify as female with an interest in traditionally male-dominated fields, may be critical for increasing female engagement in those fields.
5. Mentoring helps middle-schoolers build skills and gain knowledge related to CIE outcomes, whereas older youth, who are closer to entering the job market, benefit more from mentor support around career decision-making.
6. Connecting youth who lack role models or encouragement at home with career mentors can help them to expand their imagined future possibilities and provide them with a source of career-specific support and encouragement. However, mentoring alone may be insufficient for promoting CIE outcomes in these youth; they may benefit from additional academic and career-related support.
7. Mentors can find ways to engage in career-focused mentoring while participating in fun activities that both pique youth's interests and promote bonding.
8. A variety of program models, including group mentoring and e-mentoring, may be effective at improving CIE outcomes for youth.
9. Self-efficacy and perception of future-self appear to be important to the processes by which mentoring improves youth career aspirations. However, reducing social barriers and strengthening social connections may be just as important.
10. Having conversations with their mentor related to program-relevant content may relate to better CIE outcomes for youth.

The review provides many points for programs to consider as they work to connect youth to career-related outcomes, such as considering the youth being reached as well as the goal of the program; although career exploration is something that every mentoring program can scaffold at some level, targeted interventions should consider the specific needs and strengths of the population engaged in programming. Practitioners are also encouraged to train mentors in relational skills, encouraging mentors to create personal bonds and provide social support to their mentees in addition to career support. Finally, practitioners are encouraged to push funders and industry partners to invest in more rigorous evaluations that help grow our knowledge of how mentoring programs can promote CIE for youth.

Introduction

"What do you want to be when you grow up?" Children frequently hear this question from adults in their life, and it takes on added significance as children move into adolescence and young adulthood. Exploring career interests and developing a career are lifelong processes that begin in childhood. In fact, many adults have reported that decisions made during their childhood had an impact on their career.[1,2] However, knowledge about the breadth of career options that are available is often limited in children and adolescents, with children reporting generic interests such as becoming a doctor, police officer, firefighter, athlete, or teacher.[3] With increasing cognitive complexity, older children also begin to consider their interests, abilities, and the job requirements when thinking about their future career choice.[4] Career interests appear to become more crystalized by high school, supporting the value of creating career exploration opportunities for elementary and middle school-age children.[5]

Formal schooling through high school is intended to provide young people with the knowledge they need to prepare for a career and the world of adult work. Within the school context, school counselors have a role in advising youth on career opportunities such as what knowledge and skills are needed to follow a given career path. However, career exploration is just one domain of the work of school counselors outlined by the American School Counselor Association (ASCA), which also includes helping students succeed in school and supporting social and emotional development and skills.[6]

In high school, students begin to select courses that are more specialized to prepare for a specific career path and may have the opportunity to attend career and technical education programs that focus on a specific occupational domain such as STEM, the arts, or manufacturing; however, many students do not have access to these opportunities and researchers have called for strategies to support a more intentional career development experiences for children.[7] Exploring career options and cultivating career interests is a dynamic process but one that can sometimes be left up to individuals to do on their own, outside of formal school contexts.

Mentoring is one specific strategy to foster career interests and exploration in young people. Using mentoring as a tool to support Career Interests and Exploration (CIE) is intuitively appealing and is a popular idea, salient in the mentoring practice and policy landscape. In fact, a national survey of mentoring programs found that 26% of programs reported CIE enhancement as a goal, and 44% of programs reported offering college and career readiness services.[8]

Mentoring to Support Youths' Career Interests and Exploration

Following the leading theory of youth mentoring relationships,[9] the mentoring relationship can have an influence on the development of children's social-emotional outcomes, cognitive skills, and identity. Mentoring is important to consider in relation to supporting career interests and exploration in young people for several reasons. First, the mentoring relationships may provide the young person with a connection to a caring adult who is focused on understanding and cultivating the young person's interests and helping them achieve their goals. Second, the mentor serves as a role model to the young person by sharing their own experiences in identifying their career interests and the path they took to obtaining their career. Having a mentor and role model who shares

some characteristics of the young person, such as similar gender, race, culture, or disability status, may be particularly beneficial for young people who are exploring career interests to which they have had very little exposure or if they are from a group that is underrepresented in a given career. Third, mentors can serve as an advocate for the mentee by connecting the mentee to unique opportunities to explore their career interests or connecting their mentee to other caring adults who can help support the mentee's career interests and exploration.[10]

Results of a study utilizing secondary data from a nationally representative longitudinal study provide some evidence that youth with access to a mentor were significantly more likely to experience upward mobility.[10] However, youth from low-income communities did not experience the same outcome. These findings highlight the potential for mentoring to have a significant impact on the lives of youth, but also the importance of investigating the particular mechanisms and conditions through which mentoring can support outcomes for youth from different backgrounds.

Overview of this Review

This review examines research on the role mentoring relationships can have in supporting youth career interest and exploration. Specifically, the review addresses the following questions:

1. What are the effects of mentoring on career interests and exploration (CIE) among youth?
2. What factors condition or shape the effects of mentoring on CIE?
3. What intervening processes are most important for linking mentoring to beneficial effects on CIE?
4. To what extent have efforts to provide mentoring to youth with CIE as a priority outcome reached and engaged the intended youth, been implemented with high quality, and been adopted and sustained by host organizations and settings?

The scope of the review was limited to mentoring as defined by the National Mentoring Resource Center (i.e., relationships and activities that take place between youth [i.e., mentees] and older or more experienced persons [i.e., mentors] who are acting in a nonprofessional helping capacity — whether through a program or more informally — to provide support that has its aim or realistic potential benefitting one or more areas of the young person's development; for further detail, see What is Mentoring?). This definition excludes services and supports that are offered in formal professional roles by those with advanced education or training (e.g., school counselors) as well as those that are exclusively or predominantly didactic in orientation (e.g., structured curriculum). To be within scope of the review, studies also needed to report findings that pertain to one or more of the 4 primary questions outlined above and focus on mentoring as provided to youth 17 years of age or younger. Studies included quantitative or qualitative research and could have focused on either formal, structured interventions, programs involving mentoring, or more informal mentoring occurring outside the context of a program designed for this purpose.

A final key requirement was that the studies had to examine mentoring in relation to career interests or exploration. These outcomes have been operationalized in the literature in many ways, such as intentions or goals to pursue a specific career (e.g.,

Bennet, 2006),[11] attitudes about school or work (e.g., Linnehan, 2003),[12] attitudes about a specific career, self-efficacy (e.g., DiRenzo, Weer, & Linnehan, 2013),[13] and intentions to enroll in classes or trainings that are related to a specific career (e.g., Stoeger, Duan, Schirner, Greindl, & Ziegler, 2013).[14] Career interests include types of jobs or work that youth express a desire or intention to pursue during adulthood. Research suggests that youths' career interests are closely intertwined with their views of how capable they are of being successful at different types of work ("self-efficacy beliefs"), as well as what they anticipate as positive and negative features of different careers ("outcome expectations"). Consequently, studies examining mentoring in relation to these types of attitudes were included in the review, although more general beliefs or attitudes were not (e.g., aspirations or expectations of attending college). Career exploration refers to learning more about various types of jobs or work; this can include researching information about specific careers (e.g., medicine, construction), such as their educational and training requirements, as well as gaining first-hand experience with activities that are involved with different careers (e.g., via an out-of-school program such as 4-H, job shadowing, or internship). Studies that examined mentoring only in relation to more traditional employment outcomes, such as completing a job training program, were not included given that these can be viewed as initial steps along a selected career path.

A literature search was conducted to identify potentially eligible journal articles, book chapters, and other types of reports, including searches of PubMed, ProQuest Dissertations & Theses, PsycINFO, and Google Scholar, using an established set of keywords. A query for potentially eligible studies was also posted to the listserv on youth mentoring and sent to the Research Board of the National Mentoring Resource Center (NMRC). Additionally, researchers reviewed their own records for evaluations and programs that fit the scope of this study. A total of 2,118 references were identified through database searches (55 of which were duplicates), and 74 references were found from researcher records. After initial title and abstract review, 101 references received a full review, and 52 studies were found to be within the scope of the review, including 28 quantitative, 15 qualitative, and 9 mixed-methods studies. Findings from all 52 studies were considered in this review, but in the interest of brevity not all are specifically cited. All studies are included in the reference list with an asterisk to denote inclusion. References with two asterisks indicate that the article was discussed in the research section for each question.

Question 1: What are the Effects of Mentoring on Career Interests and Exploration (CIE) among Youth?

Background

The influence of a mentor is cited as a reason for pursuing a particular educational or career path because mentors provide information, guidance, and emotional support when needed.[15,16] Informal mentors such as teachers, friends of the family, coaches, or counselors are one type of mentor that may have an influence on career choices of young people.[17] In addition, formal youth-serving programs have long included mentoring to support youth in identifying and exploring career interests and making the transition to a career. Apprenticeships, for example, have been a tradition in many trades and professions in which an individual with novice-level knowledge and

skills works with experts on the job; apprentices are often connected with a mentor to hone their skills, obtain advice, and advance their career. Mentorship in the workplace for adolescents and young adults who can work represents a unique opportunity to help these young people explore their career interests and to shape their future career trajectories while they are experiencing the world of work. The study of workplace mentoring is robust for adults (e.g., Scandura & Pellegrini, 2007)[18] but much less studied in younger populations who are still in school and have not yet transitioned fully to the world of adult work.

School to work programs that prepare young people for careers or postsecondary education through instrumental support to assist with the transition to the world of full-time work represent another type of mentoring program. These programs often provide youth with career-specific preparation and training while they are in school. One study examined a one-year, school-to-work program in Philadelphia, PA to determine the impact of different types of work mentoring experiences on the self-esteem and attitudes about school and work of high school student participants.[12] All the students were from an urban high school and had an interest in a work-based program in which the students worked with an employer one or two days a week during the school year. The students were paid and received academic credit for their participation in the program. Four groups of students were compared; those who were formally paired with a mentor through the program, those who developed an informal mentoring relationship at their job in the past year, those who completed the work program but did not have a mentor, and those who expressed an interest in the school to work program but who had not participated in the program. Students with formal and informal mentors had higher self-esteem at the end of the school year compared to those who did not work at all through the program. Compared to students who worked but did not have a mentor, both groups of students who had a formal or informal mentor reported that they believed strongly in the relevance of school for work and life. This study points to the value of mentoring relationships at work for high school students, which may help counter some of the negative effects of part-time work for high-school students.[19] While the outcomes examined in this evaluation are somewhat distal to career interests, they are thought to be contributing factors to career attainment.

Unlike many positive youth development mentoring programs, which typically have generic goals of supporting positive outcomes for youth, mentoring programs that focus on career interests and exploration have more specific outcomes of interest. A recent meta-analysis of youth mentoring programs compared programs that targeted specific outcomes versus programs with a more relational, non-specific approach and found that the programs with specific outcomes demonstrated larger effects on youth outcomes,[20] supporting the potential promise of CIE mentoring programs.

The age of youth participating in CIE mentoring programs is a key factor influencing the goals and desired outcomes of the program. For younger participants, CIE programs focus primarily on exposing them to different careers and piquing their interest in particular fields or careers, such as engineering (e.g., Karp, Gale, Tan, Burnham, 2014).[21] For older youth, programs focus on solidifying career interests, building career-relevant skills, and supporting youth in overcoming barriers in pursuit of their desired career (e.g., Burgin, McConnell, & Flowers, 2015).[22] This progression of piquing to solidifying interests is in alignment with the age-related developmental changes that influence children's career development.[7,23] The research on CIE

mentoring programs described below illustrates how mentoring programs have considered this progression in their program design and evaluation.

Research

Mentoring programs have used a variety of creative methods to support the career interests and exploration of youth. Many programs target specific populations of youth who are more likely to face challenges in obtaining their educational or career goals, such as youth who have dropped out of high school[24] or youth involved in the juvenile justice system. For example, the Better Futures[i] mentoring program for youth in foster care with mental health challenges provides youth with individual peer coaching and mentoring workshops to improve their postsecondary participation and transition.[25] A small evaluation comparing participants to a control group suggests some significant impacts of the program on participants' CIE outcomes, including participation in postsecondary preparation and education, hope, and self-determination.

In addition to targeting specific populations of youth, some programs are designed to develop and support career-specific interests, such as the pursuit of STEM education and careers. These methods are sometimes combined to target a specific population of youth to help close the gap in representation of women, minorities, individuals with disabilities, and other under-represented groups in a given field. For example, a randomized trial of an in-person STEM mentoring program for 14–17-year-old students with disabilities examined the impact of the program on CIE-related outcomes such as engagement in STEM, self-efficacy, and STEM career planning as well as the impact of having a mentor who also shared the experience of having a disability.[26] Mentored students engaged in more STEM activities and had greater confidence in their general, but not STEM-specific, career planning skills. Thus, this small but rigorous study supports the impact of career-specific mentoring for youth traditionally underrepresented in STEM.

This review identified several CIE mentoring programs for youth that were set in the workplace. To help high school students explore and identify their career interests, some schools have begun to require students to complete community-based learning experiences through community service or work-based programs (e.g., Perez, 2019).[27] One such program aimed to increase students' clarity of career interests and goals and confidence in conducting a job search.[11] In this district-wide program, participating high-school students were not assigned a mentor but were asked if they had a mentor as part of their program activities, which could have been assigned by their job or include an adult they identified as a natural mentor. Having a mentor was associated with an increase in students' orientation toward a distinct career or occupational pathway over and above other types of performance feedback and encouragement from supervisors at their workplace and school staff. For older adolescents and young adults who are able to work, a sustained formal or informal mentoring relationship with a caring adult through the work context appears to impart some unique benefits. The quality of the mentoring relationship was also important; students who were satisfied with their mentors, either formal or informal, also had higher self-esteem and believed in the relevance of school to work compared to students who did not work.

[i] Better Futures has been reviewed for CrimeSolutions.gov; this review, and accompanying insights for practitioners, are available at the National Mentoring Resource Center website.

One evaluation examined whether youth who participated in a CIE mentoring experience went on to engage in additional education or training related to their specific career interest. In this case, it was an informal hospital-based mentoring program for high school students that exposed students to the medical field and allowed students to interact informally with hospital staff who, in some cases, served as mentors to the students.[28] The majority of the students that participated in the program in high school went on to enroll in college in a health science degree program, suggesting that participation in the program supported their commitment to the health profession. However, it should be noted that this is a descriptive study and that the mentoring component of this program was not well-defined and informal and the students who participated in the program presumably already had a fairly strong commitment to the medical field.

Online mentoring to promote CIE is another popular approach to connecting youth to individuals who have specific experience and expertise relevant to the youth's career interests. The iMentor online college readiness and preparation program is available for high school students in New York City. College-educated mentors are matched with high school students who they interact with through an online platform and monthly in-person events during the students' four years of high school. Students also attend a weekly in-person class. An evaluation of the program that compared students who participated in iMentor to students who did not, reported that the program did not lead to greater participation in college and career activities by participating youth.[29] The authors speculated that this was because there were overall very high rates of participation in these types of activities by all students, not just the students in the iMentor program. Students in the program did however improve in their critical thinking and self-advocacy skills, which might be beneficial for helping students make the transition from high school to college or a career. The STEM CyberMentor program for girls in Germany promotes participants' interest and pursuit of STEM careers and has been evaluated through a series of rigorous studies. A randomized controlled trial evaluated a version of this program in which over 300 11–18-year-old female students in Germany completed questionnaires at three time points.[14] Half of the students participated in the one-year, online, one-to-one mentoring program and half were in the waitlist control group. Girls who had a mentor through the online program reported maintaining their confidence in their STEM abilities and increasing their interest in STEM activities and intentions to take STEM courses or pursue STEM careers compared to girls in the waitlist control group.

In another online mentoring program, high school students were matched with multiple adult mentors, in what was referred to as an "e-mentor network." Online relationships were supplemented with a one-year curriculum that focused on self-esteem, financial knowledge, and career exploration.[13] The mentors and mentees did not share real names but communicated exclusively through an online portal using screen names. Mentors could be assigned up to five mentees and mentees could interact with up to three mentors throughout the program. The online mentoring appeared to benefit participants and the combination of an external mentor as well as a close family role model conferred additional benefits for participating students.

High school aged youth with learning disabilities were the target of another online mentoring program mentoring, the Program for Secondary Students with Learning

Disabilities,[ii] which was intended to support the identification of their career goals and interests.[30] Over the course of one semester, the high school students were mentored by college students through an online platform where they engaged in learning modules and participated in in-person visits to college campuses. Relevant to the current review, the high school students' special education teachers rated the career and educational goals of their students as realistic or unrealistic; however, the randomized controlled trial of this intervention program did not demonstrate any statistically significant differences between the intervention and control group students on their career and educational goals following the intervention.

Finally, the Brightside mentoring program includes online mentoring and, in some cases, in-person mentoring for disadvantaged youth and young adults 12-25 years with the goal of supporting their awareness and pursuit of education and career pathways.[31] A content analysis of conversations between mentors and mentees found that conversations focused on higher education (41%), schools and colleges (18%), work, employment, and employability (18%), personal and social topics (12%), and combination of other topics (11%). These findings suggest that these mentoring conversations were focused on the goals of the program, which were to support career exploration and transitions to higher education or a career pathway. In addition, a majority of participants in the Brightside program reported that it helped them to make decisions about their education and possible career.[32]

Across the studies identified there are significant limitations in terms of the rigor of the current research. The primary limitation is that many evaluations have not thoroughly measured outcomes relevant to career interests and exploration, thus limiting ability to determine which areas of career interest and exploration specifically have been enhanced. In addition, many of the evaluations have small samples and are primarily descriptive with very few studies utilizing quasi-experimental or experimental designs. Finally, most outcomes are measured immediately following participation in the program and the long-term impacts of these programs on actual career outcomes is unknown.

Conclusions

1. Mentoring programs to promote CIE come in a variety of formats and target different populations of youth and have demonstrated some promise in promoting outcomes relevant to supporting the career trajectories of youth, including orientation toward distinct career or occupation paths, development of career interests, and improved self-efficacy within specific fields of interest.
2. Virtual mentoring has demonstrated some potential to support the career interests and exploration of high school aged youth.
3. There is a lack of research examining the long-term effects of mentoring programs on CIE outcomes.

[ii] The Program for Secondary Students with Learning Disabilities has been reviewed for CrimeSolutions.gov; this review, and accompanying insights for practitioners, are available at the National Mentoring Resource Center website.

Question 2: What Factors Condition or Shape the Effects of Mentoring on CIE?

Background

The relationship between mentoring and CIE outcomes is shaped by a variety of important factors, including characteristics of the youth (e.g., age, socioeconomic status, gender), mentor (e.g., race, gender, career background), and program (e.g., program activities, program formatting, mentor to youth ratio).

Youth characteristics. Youth have a diverse range of needs when it comes to developing their career interests, which change over the course of their development. Needs related to CIE may be especially poignant at times of academic transitions, such as the transition from high school into college or the workforce.[33,34] Programs for younger youth are often intended to expose them to a wide variety of career options and potential role models, while programs for older youth often focus more on skill development and career planning.[35] Mentoring programs for older youth are more likely to target students with pre-existing interests, with the goal of maintaining that interest and engagement over time, such as the case with many STEM focused programs.[36,35] In these more targeted programs, alignment of the youths' interest with program goals could influence the program outcomes. Some older youth who are more ambivalent towards a career path may experience diminished interest regardless of their experiences with a mentor.[34] While it may be ideal to spark and nurture a youth's interest in specific career paths starting at a young age, the differential impact of mentoring on CIE for younger youth versus older has not yet been established.

Other youth characteristics can also be important factors influencing mentoring effects on CIE outcomes. According to Social Cognitive Career theory (SCCT), youth characteristics directly influence the types of support youth receive at important decision-making points over the course of their career development.[37] Because youth naturally experience varying degrees of such support, mentoring for CIE could benefit some youth more than others. Youth gender, for instance, may have implications for CIE outcomes. Findings from a study that surveyed freshman STEM majors at the beginning of college found that women unexpectedly reported higher levels of social support than men, though this may reflect the higher levels of support needed for women to enter STEM majors to begin with.[33] It is also possible this perceived support diminishes over time, as indicated by the fact that many of the women in the sample left STEM over subsequent years.

A central premise underlying a number of programs (e.g., Brightside, the Summer Academic Research Experience, iMentor)[32,38,29] seems to be that youth from lower SES families, neighborhoods, and schools may tend to lack exposure to role models for certain types of career paths, as well as the cultural and social capital needed to actively explore those careers and see them as viable options. These youth may therefore be especially likely to benefit from a program that provides this type of exposure. Youth from lower socioeconomic backgrounds are less likely to have a concrete educational plan, which could lead to greater benefits as a result of CIE mentoring compared to youth from higher socioeconomic backgrounds.[39] Youth may also experience differential benefits from mentoring based on the career paths of their family members.[36] Interviews with first generation college students in another study suggested that youth who disproportionately lack immediate family members in STEM

fields could benefit from the additional guidance of outside mentors to provide career guidance, advice, and insider knowledge.[40]

Mentor characteristics. Matching mentors based on mentee characteristics, such as gender or race, can have important implications in mentoring. Some youth see this as an important factor when assigned a mentor. However, research findings on the benefits of matching based on demographic characteristics is mixed.[41] Research on stereotype inoculation suggests that girls entering male dominated fields and Black youth entering predominately White fields may benefit from mentors matched on their race or gender, as exposure to similar role models can help the youth to picture themselves succeeding in such roles as well. Matching youth with disabilities to mentors with disabilities may also positively impact CIE outcomes, as those mentors can model how to succeed in their careers despite disability-related challenges. Like race and gender, findings on the impact of matching based on disability status on youth outcomes are mixed.[42,26]

Individual factors (e.g., developmental level of the youth, the degree to which they identify with their ethnicity), or program factors (e.g., type or frequency of mentoring activities, online formatting versus in person) may further influence how matching based on demographics relates to CIE outcomes.[42] For example, similarities based on race or gender may be less important in a highly regimented, career-focused program (e.g., an online time-limited program where conversations are focused on career-related questions, curriculum-based school mentoring), as opposed to a mentoring program with a stronger focus on developmental outcomes (e.g., a community-based mentoring program with frequent recreational outings). Furthermore, matching on career or personal interests may be as important or more important than matching on other background characteristics.[43] For example, if a mentee is looking to develop a specific skill, or is seeking exposure to a specific career, finding a mentor based on race or gender may be of lower importance than finding a mentor with the appropriate occupational background.[41]

How the youth and mentor know one another may also have implications for CIE outcomes. Youth with natural mentors in their lives may benefit from higher levels of social support compared to youth in formal mentoring programs, though formal program mentors may provide alternative benefits such as highly motivated and trained mentors. In the Philadelphia, PA school-to-work program described in the previous section, students with formal compared to informal mentors did not differ in terms of satisfaction with their mentor or in the frequency of conversations with their mentor about the relevance of school and the students' jobs, suggesting that both types of mentoring relationships can have an impact on adolescents in the workplace.[12] Youth-initiated mentoring may also be a particularly effective strategy for improving CIE outcomes for youth. Qualitative findings suggest that choosing one's own mentor helps promote closeness and trust, two markers of quality relationships which may in turn promote better CIE outcomes.[44]

The number of mentors in a youth's life may also have implications for their CIE outcomes. One-to-one mentoring can be an effective way to help youth develop career-related skills and self-efficacy, but youth may also benefit from having multiple career mentors who can provide them with support across different domains.[35]

Program characteristics. Characteristics of mentoring programs make up

another set of factors that can shape CIE outcomes for mentored youth. Findings from a recent meta-analysis suggest that interventions targeting specific goal-related skills have stronger effects on youth outcomes, including academic functioning, compared to non-specific outcomes.[20] No known research has assessed whether these mentoring program components similarly influence CIE outcomes. It's possible that goal-driven career mentoring does not have to come at the expense of fun outings or social activities for mentor-mentee pairs. The Hospital Youth Mentoring Program administered by the Johns Hopkins Medical Center connects disadvantaged youth with employees at local hospitals for career mentoring programs. Data from these programs indicate that some hospitals promote social activities between mentors and mentees, while others focus strictly on promoting career development activities. Surprisingly, there were no differences in the number of career focused conversations, or the amount of career mentoring received between these types of programs as reported by both mentors and mentees.[45]

Formatting of the mentoring program and mentor to mentee ratio might also have implications for CIE outcomes. E-mentoring offers more flexibility in terms of scheduling and locations, but technological barriers could potentially act as a hindrance.[46] Group mentoring can expand the number of youth served, and programs that assign youth multiple mentors may help promote CIE outcomes by providing youth with a range of role models to support them in their career development.

The degree to which mentors or mentoring programs incorporate career-focused mentoring could potentially influence CIE outcomes. In some informal mentoring relationships, career-focused mentoring is heavily featured. For instance, focus groups with school police officers in southern California found that many officers mentored students by sharing information about their personal career paths, helping students explore their own career options and goals, and by providing motivational support and resources.[47] Formal mentoring programs also vary in the degree to which they focus on CIE mentoring. According to a survey of six mentoring programs that participated in the Mentoring for Academic Success pilot study, implementing a curriculum focused on spark development (i.e., helping youth find their passion) did not lead to significantly higher levels of spark exploration for youth, however the additional practices were associated with more connection of sparks to education, thus suggesting they helped mentors to assist youth with developing more informed career interests.[48]

To summarize, there is reason to believe that a range of factors could be important in shaping the effectiveness of mentoring for CIE outcomes. The following section provides a summary of the findings identified in the current review.

Research

Three studies compared the impact of mentoring on CIE outcomes for different ages. A study of Puerto Rican students who completed a one-week health internship followed by nine months of distance mentoring found a similar increase in health knowledge and interest for both middle and high-schoolers post-internship. However, following the mentoring component of the intervention, middle schoolers rated their interest and knowledge significantly higher than the high schoolers.[49] This may have been due to middle schoolers having less previous exposure to health science careers, meaning they had more to learn from the mentors.

A study that compared high school and college students following a summer research program found that high school students had lower research self-efficacy compared to college students, but both groups experienced significant gains post-intervention. High-schoolers rated intent to incorporate research into their future careers lower than college students' pre-intervention and they had higher variability in their terminal degree aspirations. Following the intervention, both groups increased in their intent to pursue an MD or PhD in public health, and a majority of both groups reported intent to engage in research in their future careers.[50]

Findings from focus groups on mentored middle schoolers, high-schoolers, and college students further explain how youth at different developmental stages benefit differently from mentoring to promote CIE outcomes. While middle schoolers tended to report that mentors helped them to develop new skills and confidence, youth reported that mentors stepped in to help provide them with support at critical decision-making moments during important transitions in their lives, such as moving from high-school into college or the job market.[15]

Youths' levels of interest in science also emerged in the findings as a potentially important moderator of CIE outcomes for STEM focused mentoring evaluations. This was demonstrated in an evaluation of iSTEM, a mentoring program for Native American youth in southern Arizona that combined in-school mentoring with out-of-school science experiences. All program activities were relevant to Native American youth and the culture and geography of southern Arizona. Mentees overall showed a decreased interest in STEM careers over three years, but for the 28 students who expressed interest in a science career, that interest was maintained or improved over time.[51] Findings from qualitative studies further elucidate the influence of pre-existing interest on CIE outcomes. Interviews with girls who participated in a pre-college program to increase math and science competencies with a mentoring component found that the program helped some youth further develop their existing career goals; some were able to narrow down their career interests within a range of options, and others used the experience to decide they were no longer interested in a STEM career.[34]

Three evaluations indicated that youth family characteristics may moderate the influence of mentoring on CIE. A longitudinal study of the previously described e-mentor network program found that program participation increased youth self-efficacy and higher career aspirations, but more so for youth who already had an educational role model (i.e., an immediate family member who attended college).[13] Another longitudinal study followed eight students who participated in the Summer Academic Research Experience (SARE), a program designed to help foster academic and career success. Findings from students' essays indicated that some students needed additional coaching in academic and professional skills in addition to mentoring for CIE.[38] Finally, a study of a science enrichment program for gifted girls found that, for program participants, family encouragement was a strong predictor of motivation to pursue a career in science.[52]

Only one evaluation — of the E-mentoring Program for Secondary Students with Learning Disabilities, described in section one — investigated the effect of race and SES on CIE outcomes. In this study, neither were unrelated to transition competency, meaning the degree to which youth made plans related to their future lives.[30]

There are some cases where matching mentor and mentee characteristics could have positive effects on youth outcomes. One study found that mentor gender can have

important implications for women entering STEM. This program was a peer mentoring intervention in which 150 incoming women engineering students were randomly assigned to a male mentor, a female mentor, or to a non-mentored control group.[36] Mentors were advanced students in STEM who met one-on-one with mentees for an hour each month over the course of an academic year to engage in social activities, to give occasional advice and tutoring, and to help mentees develop career plans. One year following the end of the program, only the students who were assigned female mentors maintained the self-efficacy, motivation, and post-college engineering aspirations they reported at the onset of the intervention. They were also more likely to have stayed in their engineering major compared to both students with male mentors and those in the control group. E-mentoring matching on disability status may be less important for determining CIE outcomes. Another previously described STEM mentoring RCT for youth with disabilities found that students who were matched with mentors who also had disabilities did not differ significantly in their outcomes compared to students who were matched with mentors without disabilities.[26]

Finally, a recent evaluation of CyberMentor,[46] an intervention described in the previous section, looked across all nine year-long cycles of the program to compare the communication behavior and networking behavior across three mentoring program formats of mentoring (i.e., one-to-one, many-to-many, and hybrid). All three formats were effective at increasing girls STEM career interests and commitment.

Conclusions

1. Mentoring helps middle-schoolers build skills and gain knowledge related to CIE outcomes, whereas older youth who are closer to entering the job market benefit more from mentor support around career decision making.
2. Utilizing same-sex mentors, specifically for female youth with an interest in traditionally male-dominated fields, may be critical in increasing female engagement in those fields.
3. A variety of mentoring program formats, including group mentoring and e-mentoring, may be effective at promoting different types of CIE outcomes.
4. Connecting youth who lack role models or encouragement at home with career mentors can help them to expand their imagined future possibilities and provide them with a source of career-specific support and encouragement, but mentoring alone may be insufficient for promoting CIE outcomes in these youth; they may benefit from additional academic and career-related supports.
5. Mentoring that promotes CIE outcomes may be more beneficial for youth from lower socioeconomic backgrounds, though there is no evidence to address this possibility.

Question 3: What Intervening Processes are Most Important for Linking Mentoring to Beneficial Effects on CIE?

Background

Self-efficacy, which is a primary outcome for this review, is also a mediator described in the literature as linking mentoring to higher career aspirations.[33,36,13] Mentoring may improve both general and career-related self-efficacy (e.g., belief that one is capable of successfully interviewing for a job). Youth with improved self-efficacy may also believe they have a high level of control over their career options, leading to higher career aspirations overall.[13] Self-efficacy may also be linked to increased career aspirations indirectly, leading to higher outcomes expectations and expanded career interests, which in turn led to higher career expectations.[33]

There are several proposed means through which mentoring can improve self-efficacy. Mentors may convince youth that they have what it takes to succeed through words of support using social persuasion. This could be especially effective coming from mentors who are skilled in areas relevant to youths' career interests.[53,13] The degree to which this social persuasion occurs may be determined by the quality of the mentoring relationship, as relationships that foster open discussions and self-disclosure provide more opportunities for social persuasion to occur.[54,13,15,45] In the context of more prescriptive mentoring relationships, self-efficacy could also be improved through the completion of challenging work assigned by the mentor.[55]

Having a high-quality mentoring relationship may lead to improved CIE outcomes though means other than increased self-efficacy. When mentors perceive the relationship as particularly high quality or close, they may offer more opportunities to their mentee.[55] In turn, positive perceptions by the mentee could contribute to deeper engagement with the mentor.[13,55]

Quality mentor training and continued program support may be an effective means through which mentoring leads to both high quality mentoring relationships and improved CIE outcomes. In a study of the Hospital Youth Mentoring Program, mentors who had more training and attended more mentor-group supervision meetings had longer relationships with their mentees, participated in more social and career development activities with them, and provided them with more career guidance.[45] The quality of program staff may also lead to better CIE outcomes. Research suggests that when staff are engaged, competent, and adhere to program guidelines, youth and mentor reported relationship quality improves.[56,57]

Mentoring style may also have important implications for CIE outcomes. Mentors who engage in prescriptive mentoring are usually more goal focused and less flexible than those who take a more developmentally oriented, holistic approach. Some research suggests that relationships that emphasize trust-building and social support may encourage more youth disclosure, longer relationships, and better youth outcomes overall compared to more prescriptive mentoring relationships.[45] Engaging in fun social activities, and allowing youth to have a say in those relationship activities, may be of particular importance to forging a quality relationship and developing a close bond, which may in turn be an important predictor of CIE outcomes.[15,45,29] While recreational activities that promote bonding may help promote CIE outcomes, the degree to which mentors' conversations with mentees actually focus on program relevant contents may

also be an important factor linking mentoring to CIE outcomes in formal mentoring programs.[58,59]

Longer mentoring relationships may contribute to better CIE outcomes for youth. In a study of the National Guard ChallenGE program, a 17-month, quasi-military intervention for youth who have dropped out of high school that includes participation in a 1-year structured mentoring program, relationship duration was associated with months employed at a 3-year follow-up.[60]

Mentoring relationships can also have positive CIE impacts on mentors, which may in turn increase mentor engagement and lead to more positive outcomes for youth.[55,39] Several mentoring programs have reported positive CIE outcomes for mentors. For example, a STEM robotics mentoring program in which first-year college students mentored elementary students was reported by the student mentors as a positive influence on their pursuit of an engineering major.[61] A qualitative study of college students in a kinesiology career interest program reported that college student mentors found the experience of being a mentor had an influence on their career interests and possible selves,[62] whereas another program utilized a similar approach to introduce youth interest in coaching professions.[39,63]

Another path through which the social support provided through mentoring could promote CIE outcomes, particularly for underserved youth, is by reducing social barriers and enhancing social capital.[33,64] As youth progress through life transitions, they have access to unequal levels of resources through their social networks that can help them obtain jobs and explore career options. Mentors with professional or social connections in youths' fields of interest can help expand mentees' own social networks, which in turn can provide new opportunities for career growth.[64] Mentors without connections in youths' fields of interest can also help connect youth to job networks if they teach youth the appropriate social skills and outreach strategies needed to get a foot in the door. Being connected with a mentor could also potentially alleviate the negative effects of lacking career-related support or role models in youths' natural networks.[33,39] Youth with mentors may be exposed to careers they had not considered and have a more grounded understanding of how to accomplish their career goals.[33,39]

While the literature supports a variety of important processes linking mentoring to CIE outcomes, only five studies investigated in this review investigated the effects of these processes directly. These findings are summarized in the following section.

Research

The review found some evidence that higher self-efficacy as a result of mentoring may serve as an important precursor to having high career aspirations. In the previously described "e-mentor network" program that connected high school students to a network of mentors during school hours, support was found for a model in which the relationship between mentoring relationship quality and career aspirations was mediated by both general and career self-efficacy.[13] For youth without an educational role model in the family (i.e., someone who graduated high school), this relationship was mediated by career self-efficacy only, not general self-efficacy.

Another study suggests that mentoring may be important for maintaining self-efficacy for women entering STEM fields. In a two-year longitudinal study of a peer-mentoring intervention for incoming women engineering students, women with female

mentors maintained stable feelings of belonging and self-efficacy in engineering, which then predicted greater intentions of pursuing a career in engineering at the end of their second year in college.[36] In contrast, the women with male mentors and those with no mentors at all experienced a decline in self-efficacy.

Relationship quality and the degree to which a close mentoring relationship is formed may also influence CIE outcomes, though there was little evidence of this in the findings. A recent evaluation of iMentor found that mentees who reported closer relationships were more likely to report making a college list and comparing financial aid offers compared to pairs who were not close, though there was no effect on other college preparatory activities.[29] An evaluation of female students in CyberMentor also found that quality mentoring was not related to greater career certainty, though it was related to taking a greater number of STEM electives.[65]

When it comes to attending activities together, the type of activity appears to be more important than the frequency of activities. Attending more activities together failed to predict better CIE outcomes in the iMentor evaluation.[29] In the Youth Hospital Mentoring Program, however, youth who gave more input in choosing social activities also engaged in more career preparatory activities, including career exploration.[45] Interviews with youth who have natural mentors provide further support that leisure activities are important for fostering quality mentoring relationships. Youth report that more directive career mentoring may be most appropriate during points of decision making or transitions.[15]

Only two studies investigated the effects of mentoring style on CIE outcomes. Interestingly, whether mentors in the Youth Hospital Mentoring Program took a more developmental approach versus a more prescriptive approach did not predict relationship outcomes, suggesting that multiple styles of mentoring may be effective in promoting at least some level of career exploration for youth.[45] Findings from a study of the CyberMentor program indicate that, compared to youth in a waitlist-control group, program participant gained more certainty about their career goals, and that the degree to which mentor communication focused on program contents explained differences in program effectiveness.

Conclusions

1. Self-efficacy is an important process through which mentoring appears to improve youth career aspirations but reducing social barriers and strengthening social connections may be just as important.
2. Mentors can find ways to engage in career-focused mentoring while also participating in fun activities that peak the youths' interest and promote bonding.
3. A variety of program models, including group mentoring and e-mentoring, may be effective at improving CIE outcomes for youth.
4. Having conversations with their mentor related to program-relevant content may relate to better CIE outcomes for youth.

Question 4: To What Extent have Efforts to Provide Mentoring to Youth with CIE as a Priority Outcome Reached and Engaged the Intended Youth, been Implemented with High Quality, and been Adopted and Sustained by Host Organizations and Settings?

Background

Targeted interventions. The majority of mentoring interventions targeting CIE focus on high-school aged youth (e.g., Bennet, 2006; Burgin et al., 2015)[11,22] (see Fernandez-Repollet at al., 2018 and Karp et al., 2010 for exceptions)[49,61]. Given the focus on career exploration, this target population makes sense. However, as mentioned before, research suggests that career interests at the start of high school tend to remain stable across high school,[66] suggesting that middle-school may be an ideal time for intervention focused on career interest and exploration.

Many interventions targeting CIE focus on improving youth interest and involvement in STEM careers (e.g., Lytle, 2015),[67] to increase student intent to join the STEM field. The use of mentoring to target specific fields may be due, in part, to research highlighting the lack of interactions with natural STEM mentors by young people,[68] and the subsequent call for targeted mentoring.[38] In addition, many STEM mentoring interventions sought to utilize mentoring to address inequality within the field of STEM. For example, several researchers targeted their intervention to specific populations that are disproportionately missing from STEM careers, such as girls[69,34] and youth from historically marginalized populations.[40] However, programs also aimed to encourage youth to find work in the health field[70,71,49] and hospital settings,[72] coaching professions,[39,63] and perioperative nursing.[73] Programs tended to focus on careers that require higher education, rather than on other career paths.[32] However, examples of programs that target trade careers[24] and employment[74] were present.

Additionally, several programs target specific populations of youth, without an emphasis on specific fields of work. For example, interventions target youth that have dropped out of high school,[24] youth with disabilities,[74,30] youth in foster care,[25] and youth from low-income communities[75] with the goal of assisting youth with transitions to school or the workforce after high school.

Quality of implementation. Creative methods have been utilized to demonstrate the impact of mentoring on career outcomes. For example, researchers[76] utilized secondary data from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative survey of middle and high school students, to evaluate the role of natural mentors on career outcomes. The results of this analysis were mixed but suggested that youth with mentors in adolescence were significantly more likely to find autonomy and authority in their jobs. However, despite providing evidence for imp, there was no information specific to program implementation or the nature of the mentoring relationship. In fact, most studies lack information on program implementation, such as the structure of mentor-mentee relationships, strength of relationship, or regularity of mentor/mentee meetings.

When evaluating the role of mentoring interventions on career interests and exploration, it is important to consider the implementation of programming. Additionally, the quality of the mentoring and level of engagement by program participants are key to the effectiveness of any mentoring intervention. However, several studies discussed

challenges associated with program implementation (e.g., Merrill, 2020)[29], and researchers spoke to the challenges associated with program implementation quality and mentoring consistency, specifically within the field of mentoring.[31]

Adoption and sustainability by host organizations/settings. Most studies include "one off" programs with the intention of testing program efficacy in improving youth outcomes. Generally, mentoring interventions that aim to foster career interest and exploration did not discuss sustainability of the intervention. As has been mentioned in other systematic reviews,[77] the adoption and sustainability of programs depend on several factors, including governmental and other sources of funding. However, there are examples of long-standing programs. For example, Brightside has persisted for over a decade, offering career information and online mentoring to many youth.[32,31] ChalleNGe has been programming since 1993,[24] and the CyberMentor program has been implemented for 9 years.[46]

One program that has not yet been evaluated, but which has demonstrated sustainability and adoption across multiple sites, is the National Urban League's (NUL) *Project Ready* program (National Urban League, n.d.).[78] *Project Ready* has been implemented at affiliate sites across the U.S. since 2006 and is a comprehensive, asset-based, out-of-school time program to prepare primarily older middle school and high school students for college, work, and life. In 2014, the NUL began to intentionally integrate mentoring into the program. *Project Ready: Mentor* is built on the research-based best practices for mentoring programs outlined in the *Elements of Effective Practice for Mentoring*. All youth who participate in the *Project Ready: Mentor* program are expected to engage in program activities for a minimum of 182 hours a year. These activities include job shadowing, college preparation courses, college tours, career days, job-based training, and a one-to-one or group mentoring relationship. At the beginning of each year of participation in the program, participants complete an individual college and career development plan that guides their goals, activities, and the focus of the support they receive from their mentor and program staff during the year. Local affiliates are guided by the *Project Ready* curriculum but are also given the flexibility to decide what topics and activities are most relevant to their program participants.

Other models include creative partnerships to support mentoring efforts, such as partnerships between local school districts and universities.[71,27] Although not directly discussed in the literature, these partnerships may contribute to program sustainability and implementation, reducing costs and increasing the pool of potential mentors with connections to fields of interest for students.

Research

Several interventions were successful in improving participant involvement in STEM careers. In addition to the targeted interventions discussed under Question 1, programs have successfully targeted a number of populations. For example, the Better Futures program provides mentoring for youth in foster care with mental health challenges with the stated goal of preparing youth for postsecondary education.[25] In an evaluation of this program, a random sample of youth received the intervention, which included participation in a 3-night Summer Institute on a university campus, one-on-one peer coaching, and mentoring workshops. Those receiving the mentoring intervention

reported higher levels of career decision self-efficacy than those in the control group. Additionally, researchers[24] evaluated the previously described National Guard Youth ChalleNGe Program, which targets youth aged 16-18 who have dropped out or been expelled from high school. Results suggested that youth involved in the program were more likely to be employed and earn a higher salary than control youth three years following enrollment.

Although there was an overall lack of information on program implementation and fidelity, few studies did provide details specific to programming. In the previous evaluation of the National Guard Youth ChalleNGe Program, low adherence to the mentoring program was reported; only 76% of participants reported contact with mentors and only 36% of participants reported weekly in-person contact. In fact, several studies discussed challenges associated with program implementation (e.g., Hooley, Hutchinson, & Neary, 2016)[31]. For example, iMentor, described in detail in section one, reported multiple challenges with implementation.[29] Despite resources, participants did not communicate online with their mentors or attend activities as much as researchers expected; student participation decreased from freshman to senior year, and by 12th grade only 9% of students were meeting program benchmarks.

This evaluation highlights the challenges of implementing successful school-wide mentoring programs, but also points to the potential benefits of conducting formative research in the early stages of program development, which can help identify implementation problems early on. This finding was also apparent in the evaluation of Brightside,[32] an intervention that provides career information and online mentoring. Results of a post-intervention survey suggested that participants experienced positive outcomes; participants had a better sense of what they wanted to do as a career and were more aware of different options for their future. However, less than half of youth that participated in the program established a mentoring relationship. Despite this limitation, for youth that did engage in mentoring, the quality of mentoring was high, although areas of improvement were identified. These studies raise questions as to the mechanisms by which programs contribute to youth CIE outcomes.

Despite noted challenges, mentoring programs aimed at enhancing CIE demonstrate longevity and adaptation. For example, researchers[71] discuss a program that was initially targeted toward “elite” students that performed highly on standardized tests. However, after considering implications of this approach on issues of equity and inclusion, the intervention broadened its scope, allowing participation from all students without different effects. Another example of extended program implementation is the online STEM CyberMentor program for girls in Germany to promote participants’ interest and pursuit of STEM careers.[46] This program has been implemented since 2009 with various refinements and iterations over the years, such as testing different formats for mentoring relationships, including one-to-one, many-to-many group (three mentees and three mentors interacted online), and hybrid (two mentor-mentee dyads interacted online) mentoring.

In one evaluation of the CyberMentor program, researchers assessed the implementation of the program in multiple ways, which was made easier due to the online format of the program and requirements that all mentor and mentee communications take place through a monitored online software platform.[79] The total number of emails sent by mentees to mentors was tracked as well as the number and proportion of STEM words in the emails, the size and centrality of the mentee’s STEM

network, and the mentee's intentions to enroll in STEM subjects at school. Across the metrics included in this study, group mentoring was more successful in promoting mentee engagement with STEM mentors and supporting outcomes related to girls' STEM career exploration. Across the multiple evaluations conducted on this program, researchers provided clear detail on the way in which programs were implemented and the quality with which mentoring was delivered. However, information on program implementation and fidelity have generally been lacking in the literature.

Examples of long-lasting programs may provide creative ideas to allow for sustainability, but these models may vary in success based on different contexts and structures. Overall, despite examples of long-standing programs (e.g., ChalleNGe, CyberMentor), CIE program sustainability has not been sufficiently assessed.

Conclusions

1. There are several examples of studies that provide targeted interventions, both with regard to fields of study (e.g., STEM-related and health-related careers) and populations (e.g., gender, youth from historically marginalized populations); programs generally have been able to target the population of interest.
2. Although most studies did not address the quality of implementation, several researchers emphasize the difficulty that can be associated with implementing mentoring interventions and call for more attention to adherence and program quality.
3. Although the sustainability of programs can be impacted by a number of factors, issues of sustainability and adoption have not been systematically reviewed.

Implications for Practice

Mike Garringer – MENTOR

As noted in this review, the potential for mentoring programs to bolster career exploration and interests among youth is somewhat understudied, with a lack of rigorous research designs in available studies making it difficult to assess how well these outcomes have truly been promoted in mentoring relationships and programs. Although mentoring programs that include the specific aim of increasing career exploration and interests show promise, scant implementation details also make it a challenge to articulate what exactly "works" in these types of programs and the mentoring relationships they support, which can leave practitioners wondering as to the program structures or activities that are most important. But the review does provide a jumping off point to formulate some ideas about key factors that programs working to connect children and adolescents to career-related outcomes may want to keep in mind as they design and implement their work:

1. Consider who you are offering this type of mentoring to and the specific issues you are hoping to address as a result. All children, quite obviously, will one day grow up and enter the world of work. So, it may seem intuitive to offer mentoring relationships that can help *any and all* youth explore their strengths, think about the types of careers where they might flourish, and go deeper in their understanding of specific careers in an effort to strengthen their career intentions and planning. In some ways, career exploration is something that every mentoring program can offer at some level. But, it is also worth noting that many of the programs discussed in this review are doing work that is more specified and targeted to meet the needs of certain youth and address challenges around workforce gaps and underrepresentation of women, minorities, those with disabilities, and other groups in certain fields and industries. And it's in those more granular definitions of the "audience" for a program that important programmatic considerations would need to be addressed.

Many of the programs discussed in this review were created explicitly to address the disproportionate low representation of specific groups in a variety of industries. These programs often explicitly served BIPOC youth, girls and young women, youth with disabilities, and other marginalized groups with the intention of increasing their participation in and eventual career placement in fields where those groups are traditionally underrepresented—most commonly STEM fields, which have long histories of being spaces dominated by white males and sorely lacking in diversity.

But programs doing this focused work on behalf of groups of young people need to keep a few things in mind:

- Young people from underrepresented groups may need some deeper, more personalized forms of mentoring if they are to truly feel like they belong and can find a career in fields or industries where those who look like them are underrepresented. While much of career exploration mentoring focuses on skill development and creating familiarity with various jobs, programs for those underrepresented groups may need to also emphasize emotional support, the sharing of personal journeys by mentors, and relationships that are closer than just "career connections" in order for youth to persist in the face of

underrepresentation and discrimination. These youth may also need to see *many* examples of success from *many* mentors before they feel like they can find a home, and have a true sense of "belonging," in a marginalizing industry. They may also need mentors who are comfortable talking about issues of discrimination and exclusion and how they have overcome those barriers. Practitioners should think carefully about how the population they are serving may need different types of mentoring, particularly mentoring that puts a very human, relational touch on a form of mentoring that is often more focused on building work skills and fostering professional networking.

- Don't assume that young people of a certain group need or want to go into particular fields. The review here mentions an example from a study where youth of color were strongly encouraged to participate in a STEM mentoring program — unfortunately many of them didn't care much for STEM subjects and were not interested in those careers from the outset. While one could argue that finding out a career in a field is not right for you is a *good* outcome, it's also possible that programs can wind up pushing youth into careers where they may be underrepresented (hoping to address those diversity gaps) rather than letting the young person genuinely explore and find careers that fit their values, interests, and talents. A program making assumptions about careers youth "should" consider from an adult or industry perspective may miss the mark of a broader exploration experience that some young people may benefit from. There is a tension practitioners should consider between wanting to help youth explore careers they may never have considered but also trying to avoid pushing youth toward careers that genuinely aren't a good fit for them.
- Note that specifically seeking out youth from often-underrepresented groups may mean providing additional or even remedial academic and other supports so that those youth can participate fully in these programs. This is particularly true of STEM-focused career programs, in which some level of STEM proficiency is often required for participation. These programs, with their coursework prerequisites and other acceptance criteria, can often exacerbate inequities by unintentionally excluding the very children that most need targeted support around a particular career path. Make sure your program requirements don't inherently disenfranchise the very group you most seek to support.
- The industries (and specific careers within them) in which these youth are underrepresented often have serious culture problems within them and there has to be a recognition that improving that underrepresentation will most likely have to involve systemic changes within those fields for the benefits of all this mentoring to be realized. Models in which the mentoring program works alongside industry partners to not just mentor youth but also to transform the culture and mindsets of those workplaces may hold particular promise.

Regardless of which populations of youth a program serves, it stands to reason that a key is to get their input as to the types of careers that may interest them (at least as a starting point) and to think about what types of program practices and mentoring approaches might best welcome in groups that have historically been underrepresented. Teaching skills and making "connections," while important, is unlikely to be enough to overcome that history. An approach that builds in real relationship

depth and personal connection while also emphasizing that whatever path youth choose be a good fit for them, may yield the best results.

2. Determine your focus: Broad exposure to many paths or stronger commitment to a chosen path? There are also some likely important choice points about the focus of the mentoring itself. As noted in the review, there is often a developmental progression among young persons from initial identification of possible careers or industries of interest to stages where they gather more information, narrow their fields of interest, and start engaging in more hands-on learning and skill-building in a focused career path or ladder. Knowing there is presumably good work that mentors can do all along that pathway, programs may see more success in focusing more intently on a narrower section of that long progression.

For example, a program could decide that for their late-elementary or early middle school youth population exposing mentees to as many careers and fields as possible might be the best strategy. At those ages there are likely to be many industries with which those youth are completely unfamiliar or of which they have little understanding. They may have whole worlds of possibility opened by seeing some professions for the first time or seeing them from a new perspective. A program like this might also choose to help mentees connect their strengths and values to certain careers. Conversations with mentors can help mentees understand that they have many skills and abilities that they may not have ever thought about applying in a work context. So, the broadening of career horizons and possibilities might be a core goal in a program like this and measured through metrics such as increases in the numbers of careers in which youth express interest or their ability to list skills and strengths they think are applicable to future careers.

Alternatively, another program might decide to premise their work on deepening a young person's interest, planning, and commitment to a particular career path. In those cases, perhaps for slightly older mentees, the program may wish to connect youth to many mentors within a narrow discipline or field and emphasize deeper learning about the experience of working in that industry and substantive planning for next steps that can lead further down that career path. In a program that is helping youth narrow focus and deepen commitment, measures like sense of belonging in a career or increases in intention to pursue relevant postsecondary education might be major goals.

Following these examples, practitioners would want to spend some time refining their model in ways that reflect whether the emphasis is on expanding possibility or refining and strengthening a path already being followed. It's possible some programs, if they can create long-term enduring matches, could address both of these stages for their mentees. But given the short duration of most programs, clarifying the focus along these lines in the program's theory of change seems like good practice. This caution is further underscored by the potential demonstrated in the review for a program such as iMentor, with a range of components introduced at varying times during a student's high school years, to fail to move the needle on career exploration/interest outcomes. Perhaps in cases like this a more focused, less ambitious approach would have yielded more encouraging findings.

3. Would one mentor or *many* mentors best serve the program goals? In the review we were introduced to the STEM mentoring program for German girls studied by

Stoeger and colleagues. In this program, they sought to strengthen the commitment of girls who had already demonstrated some interest and aptitude in STEM subjects and careers. But rather than connecting each of these young women to a dedicated mentor who served as the sole delivery mechanism of the support, they offered a full and rich online community of many, many women in STEM, favoring a "volume" approach to the connections mentees were making. This approach had several advantages:

- It exposed girls to many mentors in a field of interest, letting them feel perhaps greater belonging and sense of possibility in that field.
- It helped them build their networks and connections to a variety of professionals, all of whom could be valuable "weak tie" contacts that might help later career pursuits by writing a letter of recommendation or sharing information about a recently opened job in town.
- It also exposed them to other careers, which may have opened up new pathways that were a better fit. A mentee interested in being a biologist might benefit from being mentored by chemists, herpetologists, and botanists—they might find a calling in a related discipline they never considered before.

In other instances, a single dedicated mentor might be just right for a program's goals. They may be able to build a deeper bond, offer more focused instrumental support, and endure in the longer-term ways we often want mentors to. Of course, these 1:1 and more "distributed mentoring" approaches also can be combined into programmatic experiences where youth get the best of both worlds. But we mention this here so that programs can think carefully about whether a volume approach might more readily lead to certain goals and outcomes.

4. Consider how the program can make the world of work tangible and real. As adults deep into our jobs and longer career paths, it can be easy to forget that for young people, the world of work can seem very abstract, strange, and somewhat unattainable. All young people struggle to know exactly what holding down a job is like as they have not experienced it, but they might also struggle to conceptualize concepts like career satisfaction, the value of hard work, and the joys and challenges of working collaboratively with a team. For marginalized youth, the gap between their lives and much of the world of work can seem even more distant, with certain careers and types of job feeling fairly alien and impossible to experience. Research has shown that children from lower socioeconomic backgrounds are less likely to know adults working in professional "white collar" careers, with these types of career options seeming especially distant and unattainable.[80]

Mentoring programs should do what they can to make the world of work come alive and feel available and knowable to mentees. The clearest ways to do this are direct excursions into the world of work: tours of facilities and demonstrations of equipment and technology, hands on learning that gets mentees actually doing tasks relevant to a field, longer-term exposure opportunities like job shadows, internships, and early apprenticeship experiences. Collaborative projects in which mentees work alongside industry professionals to produce something tangible are a wonderful way of making certain careers feel "real." You can tell children they can be "anything" when they grow up ad nauseum, but the best way of making careers seem attainable seems likely to be putting youth right into the environments and tasks of work. Even if your

program is focused more on that broad exposure to many careers (wide but not deep), that work can still be done in ways that involve direct, embedded experiences.

Mentors can support these efforts, even outside of formal programs, by simply talking about their jobs and work history, brining mentees to their office environments, arranging for visits to friends' workplaces (especially if in a field the mentee is interested in), and helping mentees apply for internships, leadership opportunities, and other extra-program activities that can put them in workplace or work-like settings. Anything to make the adult domain of work less abstract and more "real" will help.

5. Train mentors to be developmental in addition to sources of career knowledge. One of the challenges in career exploration mentoring programs is that many of the relationships youth form are shorter in duration and not as focused on relational bonding as relationships in other mentoring contexts. There's a wealth of programs that offer career days, job tours, short-term job shadows, and "speed interview" style career exploration activities in educational and youth development settings, and many bill themselves as "mentoring" experiences. But what they often lack are the depth of relationship, authenticity, and strong bond that characterizes most effective mentoring relationships. Mentors in these settings are often mentoring during their workday and may not have the time to fully invest in more in-depth interactions. They can also assume that because the focus is on career interests that there is little reason to engage in deeper relationship building or offering things like emotional support. Many career mentors are comfortable teaching career skills or talking about their day-to-day work experiences, but may not be more comfortable talking about the challenges of work, helping a young person who feels unsure about a career, or knowing how to offer encouragement and emotional support on both career and non-career topics.

Practitioners are encouraged to give all career mentors robust training on all the aspects of being in that "mentor" role. Tools like the *Developmental Relationships Framework* can help explain critical mentoring concepts, and the NMRC Resource Collection offers a number of resources that can help strengthen mentor understanding and skills. Although the emphasis of the relationship may be on career interests, planning, and goals, a well-rounded mentor training stands to enhance that work by encouraging mentors to focus on the whole child or adolescent with whom they will be working. It might also help them build communication and other skills that will benefit them in their own career and relationships outside the program.

As noted at the outset of these insights, we currently lack the corpus of research required to make confident statements about the potential role of mentoring relationships and programs to cultivate career exploration and interests among young persons or about the best ways to maximize this potential. Deeper and more frequent collaborations between programs and researchers could accelerate the process of filling these critical knowledge gaps and at the same time help to ensure that the emerging science of mentoring for career development is effectively integrated into practice.

A note about future research: While the review did not directly address future research that is needed, it's worth noting that practitioners have a big role to play in deepening our understanding of what works best for career exploration mentoring. As a first step, it would be great to see more programs in this space commit to ongoing data

collection and evaluation, moving beyond end-of-year satisfaction surveys and simple outcome tracking to do more rigorous qualitative and quantitative research about what they are achieving and how they are doing it. It's disappointing, particularly in well-resourced industries such as STEM, to see how little rigorous evaluation has been undertaken. One would think that these industries, which often fund these programs in an attempt to strengthen future worker pipelines, would be interested in funding rigorous evaluation alongside the program implementation. But this is an area where practitioners can push their funders and partners industries to also invest in the evaluation side of things and help grow this knowledge base.

Beyond that general plea for more research in this area, there are some specific questions that could be explored in greater detail:

- What is the ideal age or developmental stage to begin this exploration? The mapping of the sequence of exploration activities to the appropriate stage in a young person's development seems incomplete. Many of these programs start in earnest well into high school, when many possibilities may seem already "closed" to youth. So, should this work start in earlier grades? Are there apprenticeship models that can still reach those older, undecided youth? Understanding how career exploration mentoring can shift and create a true long-term pathway from initial contemplation to eventual career placement might help programs figure out better where they fit on that timeline and help define the right mentoring at the right moment.

- More research on what it takes to overcome known drop-off points. Research suggests that some groups of youth find their career interests shifting at certain ages (for example, the shift away from STEM in early high school for many girls). What is happening at these ages? How can mentors be deployed at these critical "quitting" points? Can those points be somewhat eliminated by earlier mentoring that build resiliency to the factors that turn youth away at various points? These are all worthy research questions.

- There are also some basic aspects of program implementation that could be clearer: What characteristics matter for matching? For example, when is racial or gender similarity important? And are there times when those factors would override factors like similarity of career interest? The role of program staff is also underexplored—are there models where the program staff take on critical teaching or emotional support roles that allow the mentor to focus on other aspects of career exploration? And as with much of the mentoring field, there seems to be little research illustrating the types of activities that can improve critical factors such as career identification and intentional career planning. More research can help mentors do more purposeful activity within these programs.

Additional Reading and Resources

- The National Mentoring Resource Center's resource collection offers a number of resources that practitioners may want to refer to as they go about

creating or strengthening career exploration mentoring programs: College and Career Success Mentoring Toolkit - This toolkit provides guidance on the development of mentoring programs that promote college and career success for youth. It reviews key elements of program design, recruiting and supporting mentors and mentees, and provides examples of relevant programming and data tools.

- Discovering the Possibilities: "C"ing Your Future - This 12-module curriculum and activity guide is designed to assist mentors in working with middle school youth to explore postsecondary education and possible careers.
- Exploring Possible Sparks with Your Mentee - This handout provides a list of activities that mentors can do with their mentees to explore their mentees' interests.
- K-12 Journey Map - This tool is intended to help youth and mentors track important milestones as youth make the journey from school to post-secondary education and career planning.
- STEM Mentoring Supplement to the Elements of Effective Practice for Mentoring - This resource outlines recommendations and research-informed practices for STEM mentoring programs.
- Workplace Mentoring Supplement to the Elements of Effective Practice for Mentoring - This resource outlines recommendations and research-informed practices for workplace mentoring programs.

Eleven studies were identified in the research evidence for the review but were not cited.[81,82,83,84,85,86,87,88,89,90,91]

References

*Studies denoted with a single asterisk were included in the evidence base for the review and cited.
** Studies denoted with a double asterisk were included in the evidence base for the review but not cited.

[1] Seligman, L., Weinstock, L., & Heflin, E. N. (1991). The career development of 10 year olds. *Elementary School Guidance & Counseling*, *25*(3), 172-181.

[2] Trice, A. D., & McClellan, N. (1993). Do children's career aspirations predict adult occupations? An answer from a secondary analysis of a longitudinal study. *Psychological Reports*, *72*(2), 368-370. https://doi.org/10.2466/pr0.1993.72.2.368

[3] Auger, R. W., Blackhurst, A. E., & Wahl, K. H. (2005). The development of elementary-aged children's career aspirations and expectations. *Professional School Counseling*, 322-329.

[4] Howard, K. A., & Walsh, M. E. (2010). Conceptions of career choice and attainment: Developmental levels in how children think about careers. *Journal of Vocational Behavior, 76* (2)*,* 143-152.

[5] Super, D. E., Savickas, M. L., & Super, C. M. (1996). The life-span, lifespace approach to careers. In D. Brown, L. Brooks, & Associates (Eds.), *Career choice and development* (3rd ed., pp. 121–178). Jossey-Bass.

[6] American School Counselor Association. (2021, July 30). *The role of the school counselor.* https://www.schoolcounselor.org/About-School-Counseling/School-Counselor-Roles-Ratios

[7] Watson, M., & McMahon, M. (2005). Children's career development: A research review from a learning perspective. *Journal of Vocational Behavior*, *67*(2), 119-132. https://doi.org/10.1016/j.jvb.2004.08.011

[8] Garringer, M., McQuillin, S., & McDaniel, H. (2017). Examining Youth Mentoring Services across America: Findings from the 2016 National Mentoring Program Survey. *MENTOR: National Mentoring Partnership*. http://doi.org/10.13140/RG.2.2.18166.70728

[9] Rhodes, J. E. (2005). A model of youth mentoring. In D. L. DuBois & M. J. Karcher (Eds.), *Handbook of youth mentoring* (pp. 30–43). Thousand Oaks, CA: SAGE.10.4135/9781412976664.n32005-09468-003.

[10] Gowdy, G., Miller, D., & Spencer, R. (2020). Helping those who need it the least: A counterfactual and comparative analysis of whether informal mentoring promotes economic upward mobility for low- and middle-income youth. *Youth and Society,* 1-29. 10.1177/0044118X20959241

[11] *Bennett, J. V. (2006). *Community-based learning and social support in the midwestern district high school internship program: relative influences on seniors' occupational and citizenship engagement orientations* (Doctoral dissertation, The Ohio State University).

[12] **Linnehan, F. (2003). A longitudinal study of work-based, adult–youth mentoring. *Journal of Vocational Behavior*, *63*(1), 40-54. https://doi.org/10.1016/S0001-8791(02)00012-X

[13] *DiRenzo, M. S., Weer, C. H., & Linnehan, F. (2013). Protégé career aspirations: The influence of formal e-mentor networks and family-based role models. *Journal of Vocational Behavior, 83*(1), 41–50. https://doi-org.prox.lib.ncsu.edu/10.1016/j.jvb.2013.02.007

[14] *Stoeger, H., Duan, X., Schirner, S., Greindl, T., & Ziegler, A. (2013). The effectiveness of a one year online mentoring program for girls in STEM. *Computers & Education, 69,* 408–418. https://doi-org.prox.lib.ncsu.edu/10.1016/j.compedu.2013.07.032

[15] *Liang, B., Spencer, R., Brogan, D., & Corral, M. (2008). Mentoring relationships from early adolescence through emerging adulthood: A qualitative analysis. *Journal of Vocational Behavior, 72*(2), 168–182. https://doi-org.prox.lib.ncsu.edu/10.1016/j.jvb.2007.11.005

[16] Pufall Jones, E., Flanagan, S., Zaff, J. F., McClay, C., Varga, S., Rollock, M., Hynes, M. & Cole, M. (2017). Turning Points: How Young People in Four Career Pathways Programs Describe the Relationships That Shape Their Lives. *America's Promise Alliance*.

[17] Dick, T. P., & Rallis, S. F. (1991). Factors and influences on high school students' career choices. *Journal for Research in Mathematics Education*, 22(4), 281-292. http://doi.org/10.2307/749273

[18] Scandura, T. A., & Pellegrini, E. K. (2007). Workplace mentoring: Theoretical approaches and

methodological issues. *The Blackwell handbook of mentoring: A multiple perspectives approach*, 71-91.

[19] Steinberg, L., Fegley, S., & Dornbusch, S. M. (1993). Negative impact of part-time work on adolescent adjustment: Evidence from a longitudinal study. *Developmental Psychology*, *29*(2), 171-180. https://doi.org/10.1037/0012-1649.29.2.171

[20] Christensen, K. M., Hagler, M. A., Stams, G.-J., Raposa, E. B., Burton, S., & Rhodes, J. E. (2020). Non-specific versus targeted approaches to youth mentoring: A follow-up meta-analysis. *Journal of Youth and Adolescence*, *49*(5), 959–972. https://doi.org.prox.lib.ncsu.edu/10.1007/s10964-020-01233-x

[21] **Karp, T., Gale, R., Tan, M., & Burnham, G. (2014). Hosting a pipeline of K-12 robotics competitions at a college of engineering–a review of benefits and challenges. *International Journal for Service Learning in Engineering, Humanitarian Engineering and Social Entrepreneurship*, *9*, 406-423.

[22] **Burgin, S. R., McConnell, W. J., & Flowers III, A. M. (2015). 'I Actually Contributed to Their Research': The influence of an abbreviated summer apprenticeship program in science and engineering for diverse high-school learners. *International Journal of Science Education*, *37*(3), 411-445. https://doi.org/10.1080/09500693.2014.989292

[23] Schultheiss, D. E. P. (2008). Current status and future agenda for the theory, research, and practice of childhood career development. *The Career Development Quarterly*, *57*(1), 7-24.

[24] *Millenky, M., Schwartz, S. E. O., & Rhodes, J. E. (2013). Supporting the transition to adulthood among high school dropouts: An impact study of the National Guard Youth Challenge Program. *Prevention Science, 15*(4), 448–459. https://doi-org.prox.lib.ncsu.edu/10.1007/s11121-013-0388-4

[25] *Geenen, S., Powers, L., Phillips, L., Nelson, M., McKenna, J., Winges-Yanez, N., Blanchette, L., Croskey, A., Dalton, L., Salazar, A., & Swank, P. (2015). Better futures: A randomized field test of a model for supporting young people in foster care with mental health challenges to participate in higher education. *The Journal of Behavioral Health Services and Research, 42*(2), 150-171. http://doi.org/ 10.1007/s11414-014-9451-6

[26] *Sowers, J. A., Powers, L., Schmidt, J., Keller, T. E., Turner, A., Salazar, A., & Swank, P. R. (2017). A randomized trial of a science, technology, engineering, and mathematics mentoring program. *Career Development and Transition for Exceptional Individuals*, *40*(4), 196-204. https://doi.org/10.1177/2165143416633426

[27] *Perez, V. (2019). The effect of mentors on student motivation and interest in STEM disciplines and careers. [Doctoral dissertation, California State University, Long Beach].

[28] *Danner, O. K., Lokko, C., Mobley, F., Dansby, M., Maze, M., Bradley, B., Williams, E., Matthews, L. R., Harrington, E., Mack, L., Clark, C., Wilson, K., Beech, D., Heron, S. & Childs, E. (2017). Hospital-based, Multidisciplinary, youth mentoring and medical exposure program positively influences and reinforces health care career choice: "The Reach One Each One Program Early Experience". *The American Journal of Surgery*, *213*(4), 611-616. http://doi.org/10.1016/j.amjsurg.2016.12.002

[29] *Merrill, L. (2020). *Mentoring, technology, and social and emotional learning: Findings from the evaluation of iMentor's college ready program.* The Research Alliance for New York City Schools.

[30] *Collier, M. (2009). An investigative study of the effects of e-mentoring on transition planning for secondary students with learning disabilities. [Doctoral dissertation, University of Utah].

[31] *Hooley, T., Hutchinson, J., & Neary, S. (2016). Ensuring quality in online career mentoring. *British Journal of Guidance & Counselling*, *44*(1), 26-41. http://doi.org/10.1080/03069885.2014.1002385

[32] *Hooley, T., Hutchinson, J., & Neary, S. (2014). Building motivation, achievement and progression online: Evaluating Brightside's approach to online mentoring. *International Centre for Guidance Studies, University of Derby*. http://hdl.handle.net/10545/324930

[33] Lent, R. W., Brown, S. D., Sheu, H. B., Schmidt, J., Brenner, B. R., Gloster, C. S., Wilkins, G., Schmidt, L. C., & Treistman, D. (2005). Social cognitive predictors of academic interests and goals in engineering: Utility for women and students at historically black universities. *Journal of counseling psychology*, *52*(1), 84. https://doi.org/10.1037/0022-0167.52.1.84

[34] *Packard, B. W. L., & Nguyen, D. (2003). Science career-related possible selves of adolescent girls: A longitudinal study. *Journal of Career Development*, *29*(4), 251-263. https://doi.org/10.1023/A:1022939512735

[35] Kupersmidt, J., Stelter, R., Garringer, M., & Bourgoin, J. (2015). *STEM Mentoring: Supplement to the Elements of Effective Practice for Mentoring*. Boston, MA: MENTOR: The National Mentoring Partnership. Retrieved from https://www.mentoring.org/resource/stem-mentoring-supplement-to-the-elements-of-effective-practice-for-mentoring/

[36] *Dennehy, T. C., & Dasgupta, N. (2017). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, *114*(23), 5964-5969.

[37] Lent, R. W., Brown, S. D., & Hackett, G. (2000). Contextual supports and barriers to career choice: A social cognitive analysis. *Journal of counseling psychology*, *47*(1), 36. https://doi.org/10.1037/0022-0167.47.1.36

[38] *Kabacoff, C., Srivastava, V., & Robinson, D. (2013). A summer academic research experience for disadvantaged youth. *CBE Lift Sciences Education, 12*, 410-418. http://doi.org/10.1187/cbe.12-12.0206

[39] **Walsh, D. (2003). Helping youth explore coaching as a possible future: A career club for underserved youth. [Doctoral dissertation, University of Illinois at Chicago].

[40] **Mark, S. (2016). Psychology of working narratives of STEM career exploration for non dominant youth. *Journal of Science Education Technology, 25*, 976-993. http://doi.org/10.1007/s10956-016-9646-0

[41] Blake-Beard, S., Bayne, M. L., Crosby, F. J., & Muller, C. B. (2011). Matching by race and gender in mentoring relationships: Keeping our eyes on the prize. *Journal of Social issues*, *67*(3), 622-643. https://doi.org/10.1111/j.1540-4560.2011.01717.x

[42] Pryce, J., Kelly, M. S., & Guidone, R. S. (2013). Mentor and youth matching. In D. L. DuBois & M. J. Karcher (Eds.), *Handbook of Youth Mentoring.*, (pp. 427-438). SAGE Publications.

[43] DuBois, D. L., Portillo, N., Rhodes, J. E., Silverthorn, N., & Valentine, J. C. (2011). How effective are mentoring programs for youth? A systematic assessment of the evidence. *Psychological Science in the Public Interest*, *12*(2), 57-91. https://doi.org/10.1177/1529100611414806

[44] Spencer, R., Gowdy, G., Drew, A. L., & Rhodes, J. E. (2019). "Who knows me the best and can encourage me the most?": Matching and early relationship development in youth-initiated mentoring relationships with system-involved youth. *Journal of Adolescent Research*, *34*(1), 3-29. https://doi.org/10.1177/0743558418755686

[45] *McClanahan, W. S. (1998). *Relationships in a career mentoring program: Lessons learned from the Hospital Youth Mentoring Program*. Public/Private Ventures.

[46] *Stoeger, H., Heilemann, M., Debatin, T., Hopp, M. D. S., & Schirner, S. (2020). Nine years of online mentoring for secondary school girls in STEM: an empirical comparison of three mentoring formats. *Annals of the New York Academy of Sciences*, *1483*, 153-173. http://doi.org/10.1111/nyas.14476

[47] Ghavami, N., Thornton, B. E., & Graham, S. (2021). School police officers' roles: The influence of social, developmental and historical contexts. *Journal of criminal justice*, *72*, 101724. https://doi.org/10.1016/j.jcrimjus.2020.101724

[48] DuBois, D. L., Felner, J., Heubach, J., & Mayer, N. (2014). Mentoring for academic success: A pilot study.

[49] *Fernandez-Repollet, E., Locatis, C., De Jesus-Monge, W., Maisiak, R., & Liu, W.L. (2018). Effects of summer internship and follow-up distance mentoring programs on middle and high school students perceptions and interest in health careers. *BMC medical education*, *18*, 1-6. https://doi.org/10.1186/s12909-018-1205-3

[50] *Salto, L. M., Riggs, M. L., De Leon, D. D., Casiano, C. A., & De Leon, M. (2014). Underrepresented minority high school and college students report STEM-pipeline sustaining gains after participating in the Loma Linda University Summer Health Disparities Research Program. *PloS one*, *9*(9), e108497.

[51] *Stevens, S., Andrade, R., & Page, M. (2016). Motivating young Native American students to pursue STEM learning through a culturally relevant science program. *Journal of Science Education and Technology*, *25*(6), 947-960. https://doi.org/10.1007/s10956-016-9629-1

[52] *Stake, J. E., & Mares, K. R. (2001). Science enrichment programs for gifted high school girls and boys: Predictors of program impact on science confidence and motivation. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *38*(10), 1065-1088. https://doi.org/10.1002/tea.10001

[53] Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (pp. 71–81). New York.

[54] Eby, L.T., McManus, S. E., Simon, S. A., & Russell, J. E. (2000). The protégé's perspective regarding negative mentoring experiences: The development of a taxonomy. *Journal of Vocational Behavior*, *57*(1), 1-21. http://doi.org/10.1006/jvbe.1999.1726

[55] Eby, L. T. D. T., Allen, T. D., Hoffman, B. J., Baranik, L. E., Sauer, J. B., Baldwin, S., Morrison, M. A., Kinkade, K. M., Maher, C. P., Curtis, S., & Evans, S. C. (2013). An interdisciplinary meta-analysis of the potential antecedents, correlates, and consequences of protégé perceptions of mentoring. *Psychological bulletin*, *139*(2), 441–476. https://doi.org/10.1037/a0029279

[56] Keller, T. E., Drew, A. L., Clark-Shim, H., Spencer, R., & Herrera, C. (2020). It's about time: Staff support contacts and mentor volunteer experiences. *Journal of Youth Development, 15*(4), 145–161. https://doi.org/10.5195/jyd.2020.879

[57] Keller, T. E., & DuBois, D. L. (2021). Influence of program staff on the quality of mentor–youth relationships in a community-based mentoring program. *Annals of the New York Academy of Sciences, 1483*(1), 112–126. https://doi.org/10.1111/nyas.14289

[58] *Stoeger, H., Duan, X., Schirner, S., Greindl, T., & Ziegler, A. (2013). The effectiveness of a one year online mentoring program for girls in STEM. *Computers & Education, 69,* 408–418. https://doi-org.prox.lib.ncsu.edu/10.1016/j.compedu.2013.07.032

[59] Parra, G. R., DuBois, D. L., Neville, H. A., et al. (2002). Mentoring relationships for youth: Investigation of a process-oriented model. *Journal of Community Psychology, 30*, 367– 388. https://doi.org/10.1002/jcop.10016

[60] Schwartz, S. E., Rhodes, J. E., Spencer, R., & Grossman, J. B. (2013). Youth initiated mentoring: Investigating a new approach to working with vulnerable adolescents. *American Journal of Community Psychology*, *52*(1-2), 155-169. http://doi.org/10.1007/s10464-013-9585-3.

[61] **Karp, T., Gale, R., Lowe, L. A., Medina, V., Beutlich, E. (2010). Generation NXT: Building young engineers with LEGOS. *IEEE Transactions on Education, 53* (1), 80-87.

[62] **Walsh, D. S., Veri, M. J., & Willard, J. J. (2015). Kinesiology career club: Undergraduate student mentors' perspectives on a physical activity-based teaching personal and social responsibility program. *Physical Educator*, *72*(2), 317-339.

[63] **Walsh, D. (2008). Helping youth in underserved communities envision possible futures. *Research Quarterly for Exercise and Sport, 79*(2), 209-221. http://doi.org/10.1080/02701367.2008.10599484

[64] Raffo, C., & Reeves, M. (2000). Youth transitions and social exclusion: Developments in social capital theory. *Journal of Youth Studies*, *3*(2), 147-166. https://doi.org/10.1080/713684372

[65] **Stoeger, H., Debatin, T., Heilemann, M., & Ziegler, A. (2019). Online mentoring for talented girls in STEM: The role of relationship quality and changes in learning environments in explaining mentoring success. *New Directions for Child and Adolescent Development, 168,* 75–99. https://doi.org/10.1002/cad.20320

[66] Sadler, P. M., Sonnert, G., Hazari, Z., & Tai, R. (2012). Stability and volatility of STEM career interest in high school: A gender study. *Science Education*, *96*(3), 411-427. https://doi.org/10.1002/sce.21007

[67] Lytle, R. (2015). The effect of GK-12 graduate fellow interactions on high school student attitudes toward science and career path. [Doctoral dissertation, Middle Tennessee State University].

[68] **Kitts, K. (2009). The paradox of middle and high school students' attitudes towards science versus their attitudes about science as a career. *Journal of Geoscience Education, 57*(2), 159-164. https://doi.org/10.5408/1.3544253

[69] **Reid, P. & Roberts, S. (2006). Gaining options: A mathematics program for potentially talented at-risk adolescent girls. *Merrill-Palmer Quarterly, 52*(2), 288-304. http://doi.org/10.1353/mpq.2006.0019

[70] Rashied-Henry, K., Fraser-White, M., Roberts, C., Wilson, T., Morgan, R., Brown, H., Shaw, R., Jean-Louis, G., Graham, Y., Brown, C., & Browne, R. (2012). Engaging minority high school students as health disparities interns: Findings and policy implications of a summer youth pipeline program. *Journal of the National Medical Association, 104*(9-10), 412-419. http://doi.org/10.1016/s0027-9684(15)30194-2

[71] *MacIver, M. & Farley, E. (2005). Preparing urban students for health careers: A longitudinal study of a university-high school partnership. *Urban Education, 40*(2), 190-222. http://doi.org/10.1177/0042085904272750

[72] **Mikos-Schild, S. (1997). The effects of a mentor program for junior volunteers at Good Samaritan hospital: A pilot study. [Doctoral dissertation, Pepperdine University].

[73] **Timmons, L. (2007). Mentoring high school students in a perioperative setting. *AORN Journal, 85*(4), 747-753. http://doi.org/10.1016/S0001-2092(07)60149-5

[74] **Sabbatino, E. D., & Macrine, S. L. (2007). Start on success: A model transition program for high school students with disabilities. *Preventing School Failure: Alternative Education for Children and Youth*, *52*(1), 33-39. https://doi.org/10.1002/sce.21007

[75] **Houston, I. (1999). The influences of intentional mentoring on the career aspirations and educational expectations of middle school African-American adolescents participating in a college preparatory program. [Doctoral dissertation, University of South Carolina].

[76] **McDonald, S. & Lambert, J. (2014). The long arm of mentoring: A counterfactual analysis of natural youth mentoring and employment outcomes in early careers. *American Journal of Community Psychology, 54*(3-4), 262-273. http://doi.org/10.1007/s10464-014-9670-2

[77] DuBois, D. L. & Felner, J. (2016). Mentoring for youth with backgrounds of involvement in commercial sex activity. *National Mentoring Resource Center Population Review. http://nationalmentoringresourcecenter.org/images/PDF/CSEC_Population_Review_Final.pdf*

[78] National Urban League. (n.d.). https://nul.org/program/project-ready

[79] *Stoeger, H., Hopp, M., & Ziegler, A. (2017). Online mentoring as an extracurricular measure to encourage talented girls in STEM (Sciene, Technology, Engineering, and Mathematics): An empirical study of one-on-one ersus group mentoring. *Gifted Child Quarterly,* 1-11. http://doi.org/10.1177/0016986217702215

[80] Bruce, M., & Bridgeland, J. (2014). The mentoring effect: Young people's perspectives on the outcomes and availability of mentoring. Washington, D.C.: Civic Enterprises with Hart Research Associates for MENTOR: The National Mentoring Partnership.

[81] **Carr, T., Kenefic, L., & Ranco, D. (2017). Wabanaki youth in science (WaYS): A tribal mentoring and educational program integrating traditional ecological knowledge and western science. *Journal of Forestry, 115*(5), 480-483. https://doi.org/10.5849/jof.16-066.

[82] **Clarke, L. O. (2009). Effects of a school-based adult mentoring intervention on low income, urban high school freshman judge to be at risk for drop-out: A replication and extension. [Doctoral dissertation, Rutgers University].

[83] **Hopp, M., Stoeger, H., & Ziegler, A. (2020). The supporting role of mentees' peers in online mentoring: A longitudinal social network analysis of peer influence. *Frontiers in Psychology, 11*(1929), 1-17. 10.3389/fpsyg.2020.01929

[84] **Malone, M. (2006). Guiding youth to careers: Do mentoring programs benefit urban youth? *College Undergraduate Research Electronic Journal.*

[85] **McMahon, M., Limerick, B., & Gillies, J. (2004). Mentoring as a career guidance activity: Fostering non-traditional career exploration for girls. *Canadian Journal of Career Development, 3,* 5-11.

[86] **Price, C. A., Kares, G., Segovia, G., & Loyd, A. B. (2019). Staff matter: Gender differences in science, technology, engineering or math (STEM) career interest development in adolescent youth. *Applied Developmental Science,*

23(3), 239-254. 10.1080/10888691.2017.1398090

[87] **Rischard, K. (2015). STEM up: A STEM undergraduate program to help middle school Youth select STEM majors and careers through cognitive apprenticeship. [Masters dissertation, University of Arizona].

[88] **Shandra, C. & Hogan, D. (2008). School-to-work program participation and the post-high school employment of young adults with disabilities. *Journal of Vocational Rehabilitation, 29*, 117-130.

[89] **Stoeger, H., Schirner, S., Laemmle, L., Obergriesser, S., Heilemann, M., & Ziegler, A. (2016). A contextual perspective on talented female participants and their development in extracurricular STEM programs. *Annals of the New York Academy of Sciences, 1377*, 53–66. https://doi.org/10.1111/nyas.13116

[90] **Stumbo, N., Blegen, A., Lindahl-Lewis, P. (2008). Two mentorship case studies of high school and university students with disabilities: Milestones and lessons. *Journal of rehabilitation, 74*(3), 45-51.

[91] **Zeldin, S., & Charner, I. (1996). School-to-Work Opportunities through the Lens of Youth Development. Education Reform and School-to-Work Transition Series.