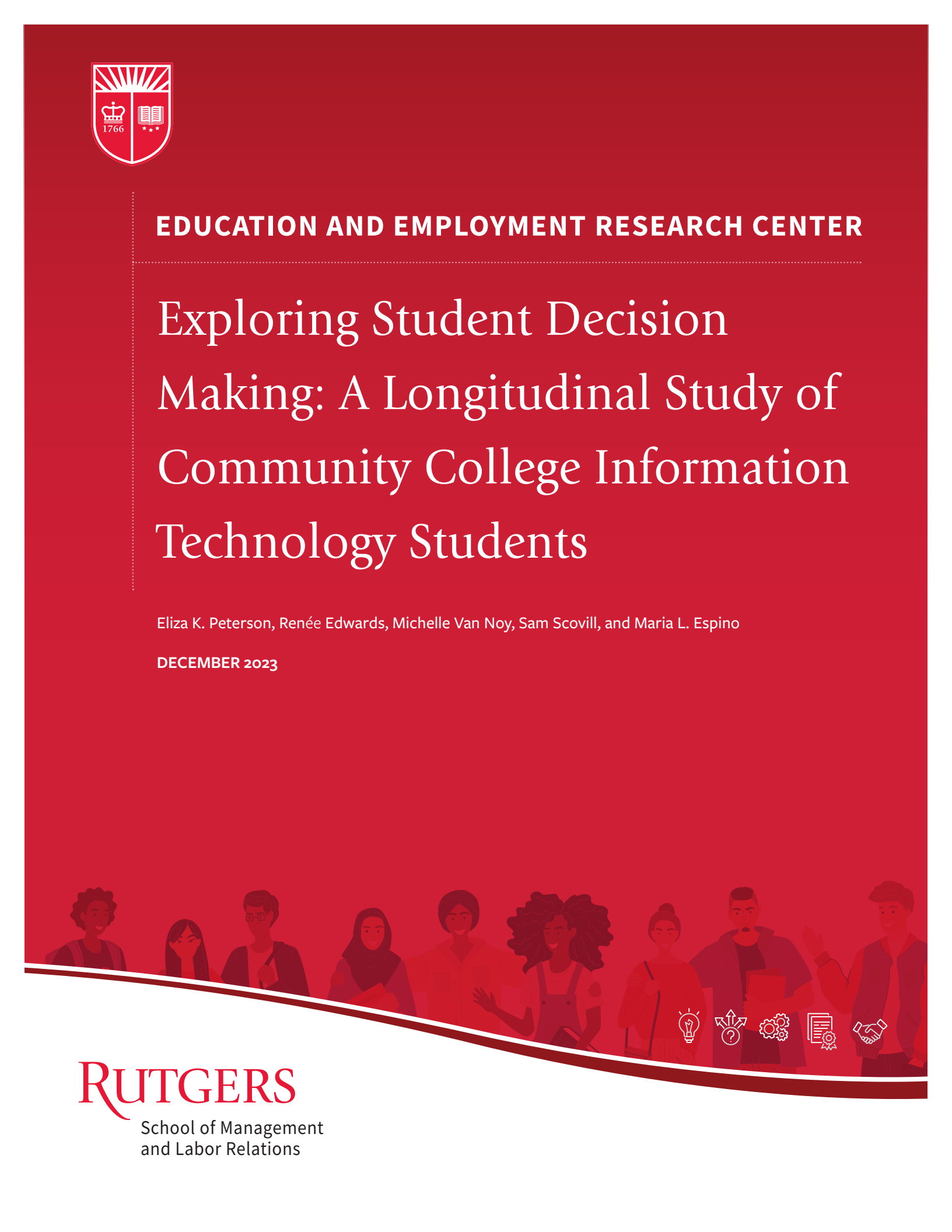

EDUCATION AND EMPLOYMENT RESEARCH CENTER

Exploring Student Decision Making: A Longitudinal Study of Community College Information Technology Students

Eliza K. Peterson, Renée Edwards, Michelle Van Noy, Sam Scovill, and Maria L. Espino

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Introduction/Abstract

How do students in technician programs make decisions about what program or major to pursue? How do they decide on a career path? Given the myriad choices available to students in technical fields through various educational and career pathways, how do they seek out and make sense of information? What drives a student to make one choice over another, and what factors are weighed in considering a direction? How important is a student's social circle, cultural background, financial status, or family when considering various options? This paper explores the decision-making characteristics of 26 students pursuing information technology (IT) certificates or degrees at Ivy Tech Community College in Indiana. Students were followed for three years and interviewed throughout their decision-making process. Culture, family, social circles, financial status, access to scholarships/grants, gender, and race/ethnicity all had roles in shaping the choice set of the participants. Study participants were found to approach program and career considerations broadly at first, seeking information from multiple sources and relying largely on general and open-sourced information. Over time and with increased age and maturity, students' information-seeking became more systematic and targeted. Influential factors like social networks, self-efficacy, enjoyment/interest in the field, and outcomes expectations guided students through their decision-making process. The most potent of these factors were early interest in IT, engagement in IT-related hobbies, and time spent in the workplace. These factors seemed to propel students toward IT careers and in many ways help them gain entry. In addition, high school graduation and key experiences in the workplace served as turning points, or pivotal moments, in their decision-making processes.

Framing Literature

Student decision-making about college and careers is a complex, multifaceted process. Individuals are influenced by their sociocultural environment, the information they gather, the people around them, the events they experience, and other factors when making decisions about education and careers. Students also weigh factors important to them and seek information in varying ways and at various levels of engagement. Numerous theoretical perspectives provide insight into the decision-making process around majors and careers, though few studies have examined this process for community college students specifically. This section presents a brief review of relevant community college and decision-making research that pulls together literature from the fields of higher education, economics, and sociology.

Community College Context

To fully understand the experience of our Ivy Tech IT student sample, it is important to first understand the greater forces at play in the community college space. Student development theory is an important backdrop to any such discussion. A 1984 study by Astin (1984) focuses on student motivations, arguing that the more involved students are in their institution (studying, student organizations, time spent on campus, etc.), the more they will get out of college. Bean and Metzner (1985) build off previous models of student development theory and propose that nontraditional students, who heavily populate community colleges, are disproportionately impacted by external environmental factors. Later, Tinto (1987) posits that retention rates are higher when students feel both formally and informally integrated in academic and social spaces within their college. Though this model was developed based on the experiences of four-year students, it has been shown to have some, albeit limited, utility with community college students as well (Halpin, 1990). These and similar studies of community college students and their experiences, placed within the context of several decades' worth of work focused on student development theory in general, would lead to what is now known as the guided pathways movement.

Ivy Tech is among the many institutions that have been influenced by the guided pathways movement, one of the most significant community college reforms of the past two decades. Community college practitioners and scholars alike find that students are overwhelmed with the wide array of options provided to them (the "cafeteria" model) and that these feelings can lead to suboptimal decision-making about program choice and persistence—effects that are exacerbated by preexisting class and status differences between students (Scott-Clayton, 2011; Dougherty, 2023). Guided pathways streamline community college students' decision-making process with the aim of promoting completion and student success (Bailey et al., 2015). Guided pathways reforms have been shown to improve student outcomes in terms of early indications of success like credit momentum as well as retention and on-time graduation rates (Scrivener et al., 2012; Jenkins et al., 2018).

Despite the significant influence of the guided pathways movement, there is a gap at this intersection of student decision-making, community college scholarship, and pathway reform work. Student decision-making work tends to focus on students at four-year institutions, and pathways movement work tends to focus on institutional-level

change; in between, there is limited information about how community college students make decisions within the new, pathways-influenced structure of public two-year institutions (Chase et al., 2021).

Determinants of Choice Set

When making decisions about their education and career, individuals are influenced by various elements of their social contexts. These elements shape the choices that are available or accessible to each person and, just as importantly, shape the choices that individuals perceive as being available or accessible to them (Lent et al., 1994, 1996; Brown & Lent, 2005). College and career choice sets can be formed based on elements such as class culture, social and family networks, or socioeconomic status and modulated by student identity factors like gender or race/ethnicity (Pulliam et al., 2017; Strada Education Network & Gallup, 2017; Reay et al., 2001; Ma, 2009; Whiston & Keller, 2004). All of these elements can serve to expand or contract the information that an individual has access to, as well as the choice set that an individual has or feels that they have (Dougherty, 2023). Class culture, for example, played a notable role in our sample.

Culture

Indiana's Rust Belt roots influenced the way Ivy Tech students made decisions about their educational and career pathways. Their decisions were impacted by various factors associated with blue-collar culture and legacies of manufacturing and factory work (Chen, 2019; Wilson & Wouters, 2003). While information about educational programs and careers may be passed from community members, mentors, peers, and school officials, the decision-making process can be very personal (Arcidiacono et al., 2012; Berger, 1988; Jensen, 2010; Willis & Rosen, 1979). Residents of Rust Belt cities have been economically burdened by the costs and changes in these areas caused by the decline of manufacturing (Eide, 2017; Francis, 2022). Being raised in a blue-collar community provides generational norms relative to work in the region's historic industry: manufacturing and factory work (Altreiter & Flecker, 2020; Bettencourt, 2020; Francis, 2022). These cultural values are passed down through families and friends, with students assimilating these values as they develop. Historically, the factory has been a site of assimilation for immigrants, and in the modern era, the working class in the region is becoming less white and more female as immigrants reshape the landscape of the urban and rural Midwest (Korman, 1965; Meyer, 1980; Pottie-Sherman, 2020; Winant, 2021). These demographic shifts are not represented in our sample, likely due to the chronic underrepresentation of women and minorities in IT (Nadeem, 2021).

Family/Social Circles

Family, friends, and social circles play an important role in influencing the way that individuals think about, and make decisions about, education and careers. Ecological perspectives posit multiple group-level (gender, race/ethnicity, family, and social class) and societal-level (culture, differences from and influences from mainstream culture) influences on these decision-making processes (Bronfenbrenner, 1977; Fouad & Katamneni, 2008). Similarly, Hodkinson and Sparkes' (1997) theory of careership, a way of looking at decision-making over the "life course," offers comprehensive ways to see how social context interacts with the individual to shape choice sets and how social context frames individual choice. They further emphasize that "everything takes place within a macro-context which has political, economic, cultural, geographical and historical dimensions" (Hodkinson

& Sparkes, 1997). Other theories factor in social context and examine the role of the social expectations associated with careers and how people view their fit within that social structure (Gottfredson, 1981, 2002). Wang (2012, 2013) argues that specific social considerations, like first-generation status, employment status, and socioeconomic status, influence the way students navigate their career decision-making. Social cognitive career theory (SCCT) presents a model that considers not just wider societal- and group-level influences, but also individual influences, blending the two together to paint a picture of the decision-making process. SCCT posits that there are different levels of social-context influence: some are proximate, as in one's social networks, etc. and others are more distant, like the culture at large (Lent et al., 2000). Taken together, these works demonstrate the importance of family, environment, and cultural norms to students as they navigate their choice of career paths within the constraints of their financial needs, work fit, and current life circumstances .

Financial Status, Scholarships, and Grants

As educational and career opportunities become clearer to students, they contemplate the ways in which they can succeed and excel in a major while thinking about potential earnings when they graduate (Arcidiacono et al., 2010). Students will often weigh the cost of obtaining the degree against the perceived rewards, such as salary, that come from these choices (Becker, 1994). Students from lower socioeconomic groups tend to choose majors in fields like technology, health, and business, which may lead to higher-paying positions directly out of college, attempting to maximize their return on investment (Ma, 2009).

Grants and scholarships also play a role in community college student education and employment outcomes. Evidence indicates that the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant, for example, had a positive impact on these measures (Blume et al., 2019). Such opportunities can heavily influence an individual's choice set.

Gender

Initial college major choice and the college-to-career transition have been identified as the most critical stages in the STEM pipeline for women (Speer, 2021). Social and structural factors impact female decision-making in the field of IT: career choice in IT, persistence in IT careers, and advancement in these careers (Ahuja, 2002; Armstrong et al., 2018). Female STEM undergraduates are less likely to major in computer science, but those who do are less likely to be out of the labor force at age 30 than are women in other STEM majors (Speer, 2021). Women are underrepresented in IT careers, and so far, the 21st century has seen that gender gap widen rather than narrow. The proportion of women in the computing workforce declined from 30 percent in 2000 to about 25 percent in 2016, and recent data indicate that proportion has remained relatively stable ever since (Nadeem, 2021).

Women face various sociocultural barriers on their path toward IT careers, and they are underrepresented in IT undergraduate education (Rocha et al., 2023; National Center for Science and Engineering Statistics, 2023). Genuine interest in the field has been shown to be a major factor for women who do choose a major in IT or the information sciences (Croasdell et al., 2011). Similarly, early computer interest and video gaming as a hobby has been connected to female community college students' interest in majoring in IT, and video gaming has been connected to female interest in IT careers (Denner et al., 2015; Carr et al., 2013).

Women, particularly older ones, experience community college differently than their male counterparts. IT fields are often perceived as generally unfriendly to female and underrepresented minority students, and this perception seems to bear out in research; women in community college IT programs have been found to face both social and institutional barriers to success (Morris & Daniel, 2008; Marco-Bujosa et al., 2021). For example, one study found that community college students who withdraw mid-semester tend to be older female students with full- or part-time jobs (Zhai & Monzon, 2001). Further, in the workplace, women tend to receive insufficient employer support when returning from maternity leave (Rocha et al., 2023).

Race/Ethnicity

As individuals make education and career decisions, race and ethnicity contribute to shaping their horizon for action . In the United States, Black and Hispanic workers are generally underrepresented in computing careers (Nadeem, 2021). This is especially true of females from these minoritized groups (McAlear et al., 2019; Nadeem, 2021). Asian workers, on the other hand, occupy a significant proportion of the computing workforce, holding one in five computing jobs in the country; despite representing 20 percent of the workforce, however, they still may face racism in the workplace (Chow, 2023; Nadeem, 2021). This uneven representation begins in the classroom, before students enter the workforce, and may shape how students view opportunities in the field. For example, white and Asian male students have been found to express a stronger sense of belonging in the field of IT than their peers (Metcalf et al., 2018). At the same time, despite their position as the dominant group in the field, some white men in IT feel that equity efforts to promote the inclusion of women and minorities in the field have created a form of "reverse discrimination" that prevents them from achieving career success (Armstrong et al., 2012). Many influences are at play when considering representation and perceptions of diversity in IT. Such perceptions of belonging can influence decisions about pursuing a program or career in tech—i.e., who chooses an IT educational program or career, and why. In this way, representation and perceptions of diversity in IT can be a key influence in decision-making.

Another explanation for why different racial groups choose to pursue IT education and careers heterogeneously is the "digital divide." Digital divide is a term that describes the differences in computer access, internet usage patterns, IT course enrollments, and computer literacy across racial and gender lines. These differences tend to be exacerbated for African American women, Latina women, and those living in areas of concentrated poverty (Hawkins & Paris, 1997; Jackson et al., 2008; Mossberger et al., 2006; Ritzhaupt et al., 2020; Smith, 2005).

These various differences can manifest in student decision-making: African American and Latino individuals tend not to persist in STEM educational programs despite high levels of interest (Anderson & Kim, 2006; Ma & Liu, 2015; Riegle-Crumb et al., 2011). They are also less likely to pursue technology careers and more likely to leave their jobs due to unfair treatment (Scott, 2017; Zarrett & Malanchuk, 2005). Researchers have observed patterns of difference in IT program selection as well; young African Americans may be more likely to select "soft" IT areas like information technology support or information systems rather than the more math-intensive programs like computer science or computer engineering (Sax et al., 2020; Zarrett & Malanchuk, 2005). High-level coursework in math and science during high school may encourage students to choose to

persist in STEM fields such as IT, but often, Black and Latino students lack access to such courses (Lee & Luykx, 2006; Margolis, 2010; Tyson et al., 2007).

Certain supports can promote IT persistence for members of underrepresented groups. For example, IT career exposure, digital skills, computer access, social supports, and technology usage autonomy have been identified as factors that facilitate the persistence of African American and Latino students in the field of IT, as well as engineering knowledge more generally (Dika et al., 2020; Fuller et al., 2015).

Approaches to Decision-Making Over Time

Decision style plays a key role in employment and education decision-making. Students, particularly those of different classes and age groups, have different ways of engaging with and analyzing the resources (social networks, websites, etc.) available to them throughout their decision-making processes (Dougherty, 2023; Kelly & Hatcher, 2013). Decision-making styles can be broadly sorted into two groups: systematic or idiosyncratic. Some individuals show traits of both styles of decision-making, leaning on either approach at different times in their decision-making journeys. Interacting with and impacting these decision styles is social context, which includes considerations such as social capital, family background, and other factors (Bourdieu, 1977; Fouad & Kantamneni, 2008). With age often comes a more clear-eyed and pointed evaluation of these varying contextual and personal factors in the decision-making process (Kelly & Hatcher, 2013). In this sample, decision style was found to be more of a mutable than an intrinsic characteristic—participants often changed their approach to decision-making over time.

Systematic Decision-Making and Engagement

One body of literature posits decision-making as a systematic process: individuals will gather information in an organized fashion in order to make choices about education and careers. Super's "life-span approach" presents different stages of career development based on a self-concept that changes over time (1980). In this approach, individuals make decisions after systematically looking for and then analyzing data about careers. Holland (1985) instead highlights the idea of person-environment fit in the decision-making process, arguing that students seek a career path that fits their personal interests. Finding this fit is crucial to choosing a career and completing the degree that will deliver the student to that end goal (Holland, 1985). Lent, Brown & Hackett's (1994) social cognitive career theory builds upon these theories by proposing various mechanisms by which individuals make iterative, systematic career choices. Other theorists posit systematic decision-making processes, such as Gottfredson (1981, 2002), whose circumscription and compromise model demonstrates how systematic decision-making traits will, at times, interact with more chance-based, idiosyncratic traits.

Idiosyncratic Decision-Making and Engagement

Another body of literature suggests decision-making depends on idiosyncratic moments or chance-based encounters. Scholars in this camp include Krumboltz (1996, 2009), whose happenstance learning theory proposes that career decision-making is based on exploration via planned or unplanned events or encounters.

Sociological careership espouses a similar perspective, though it emphasizes the importance of the social context and habitus rather than specific events that influence the decision-making process (Hodkinson & Sparkes, 1997). These perspectives suggest that decision-making is a process that is guided by chance and encounters that may or may not be planned that occur within the social nexus of an individual's life.

Part of what aligns individuals with one decision-making style over another is the way in which they gather and analyze information. A hallmark of an idiosyncratic decision style is a lack of active engagement in the process of seeking out information about education and career decisions. Some research suggests that older individuals are more actively engaged in the process of information-gathering than their younger counterparts and thus are less likely to take an idiosyncratic approach to decision-making (Loo, 2000; Kelly & Hatcher, 2013).

Information Sourcing

Students generally source information in varying ways as they endeavor to make decisions about educational programs and careers. They seek and evaluate information from social networks, online research, institutional initiatives, and other avenues to make pragmatic decisions (Somers et al., 2006). The idea that individuals have full freedom of choice when it comes to college and careers is somewhat illusory—less privileged students have access to information that is lower in quantity and quality as compared to their more privileged peers, which in turn has a negative impact on their decision-making (Dougherty, 2023). In recent years, for example, the internet has become an important place for students to seek information when making decisions about education and potential career paths, making the digital divide of particular relevance here. In addition, information sourcing can change as individuals gain age and experience. Research suggests that there is a difference in the way that people of various age groups source information about community college from the internet; young people tend to seek information about cost, financial aid, and institution location, whereas older students tend to seek information about flexibility, college services, and postdegree success rates (Zastrow & Stoner, 2007). Research also indicates that acquiring information from employers is important because it creates greater alignment between college and career choices (D'Amico et al., 2019).

Patterns in Decision Status Over Time

As a student's interest in a career in IT continues to increase through the decision-making process, each activity and behavior is informed by the way they advocate for themselves and increase their sense of self-efficacy. Two studies examine the decision-making process over time and the influence of key individual traits such as self-efficacy and outcome expectations (Brown & Lent, 2005; Lent et al., 2000). Lent et al. (2000) find that the decision-making process is iterative and nonlinear, allowing students' ideas and actions to lead to numerous attempts to understand the individual factors that affect it. Other literature presents career decision-making as a learning process, arguing that students choose a career path as they learn about themselves and the skills they possess (Krumboltz, 1996). This growing self-awareness encourages students to further explore their level of interest and enjoyment in the career path they choose. There is a high level of interplay between decision style, engagement, and various factors (e.g., hobbies, social networks, experiences, etc.) that influence choices about college and careers.

Influential Factors in Decision-Making

In the previous section, we discussed theoretical perspectives that address the ways in which individuals make decisions about a career or a major. They identify various factors involved in decision-making and consider the degree to which these factors are individually determined versus based in social context. Among the range of factors that emerge from these studies, several are common across multiple perspectives. Those factors include some that are focused on rational, individual career-matching (e.g., ability/self-efficacy, enjoyment/interest, earnings/outcomes expectations) and others that focus on a student's outlook on the full range of what is possible versus the range of what is possible for them based on their social context. Even as these various influences and factors affect students' decision-making processes, they also intrinsically view the various attributes they hold and want to focus on as part of their major and career decisions.

Influential factors in decision-making for the IT students in our study included IT-related hobbies, social networks, workplace experiences, and the aforementioned career-matching considerations: ability/self-efficacy, enjoyment or personal interest in the field, and earnings/outcomes expectations. We discuss each of these factors in the section that follows.

IT-Related Hobbies

Out-of-the-classroom passions and hobbies can play a significant role in the decision-making process. In career and technical work, these interests can range from entrepreneurship endeavors to video games and computer creations (Carrico et al., 2019; Demetry, 2017; Huang et al., 2020; Naizer, 1993). The seed of IT career interest is often planted early, in the form of role models, access to computers, hobbies, and more (Messersmith et al., 2008). Ashton (2010) discusses the transition from a passion for gaming to a passion for game design—in other words, from hobby to career—in a group of game design students, suggesting that higher education serves as a crucible for changing gamers into designers. There is a noted connection between childhood and adolescent hobbies like electronics, coding, or video gaming and pursuit of a STEM major or career (Naizer, 1993; Hewner & Guzdial, 2008; Papastergiou, 2008). Early interest is a major decision-making factor for many students, both in IT and beyond.

Social Networks

Early interest in IT can also be sparked by a student's social circle. Students' social networks—the people they meet at work and at school, as well as close family and friends—have significant influence on students as they make decisions (Canché et al., 2014). It is crucial for students to be able to internalize and reflect on the information they receive from community members, mentors, peers, and school officials when making decisions (Arcidiacono et al., 2012; Berger, 1988; Jensen, 2010; Wang, 2012, 2013; Willis & Rosen, 1979). These resources can help students develop their decision-making skills, especially in a vocational or community college setting (Wang, 2012, 2013). The key elements of a student's social networks are personal connections, academic connections, and workplace connections.

Personal Connections

Family and friends often play a significant role in student decision-making about education and careers. Community college students perceive their peers and family members as honest sources for information, and many rely heavily on word of mouth as an information source when making decisions (Somers et al., 2006). First-year students of traditional college age are especially reliant on parental involvement and support when making program choices (Workman, 2015).

Academic Connections

When focusing on community college students—especially career and technical students—academic connections comprise support systems that are pivotal for their success (Wang, 2009; Wang et al., 2017). These support systems include but are not limited to university officials, professors, advisors, and peers (Musoba et al., 2018; Wang et al., 2017). Each of these connections can help students navigate and understand the various program offerings available to them, provide academic support, and allow them to feel part of a campus community.

Workplace Connections

Time spent in the workforce is central for the career development of aspiring IT professionals, in large part due to the connections that are made there with coworkers and supervisors. These individuals wield a strong influence on decisions to stay or leave the field (Messersmith et al., 2008). Workplace connections can develop based on the events students experience and the guidance they receive within different workplaces while they navigate their educational and career choices.

Workplace Experiences

Careership theory is based on the concept that people view what is possible for themselves in a way that is inherently embedded within a social context (Hodkinson & Sparkes, 1997). Workplace experiences can expand this worldview by demonstrating vocational possibilities that individuals may not have previously considered as well as by eliminating career paths that they had previously considered possible in theory but disliked in practice (Smith & Green, 2005). Research indicates that workplace experiences can foster self-efficacy in high schoolers (Cunnien, et al., 2009), while internships have a particularly high impact on college students (Kuh, 2008). Regardless of the form they take, workplace experiences can be pivotal in helping students decide if a career or field is right for them.

Career-Matching Considerations

Individuals take many factors into account when deciding on a career pathway. These considerations are shaped by their environment and experiences. Community college students typically want to find a career that matches well with their skills and desires, and, if applicable, the educational path that will prepare them for that role. Notable considerations that individuals weigh when making decisions about what career to pursue are personal ability/self-efficacy (Am I good at this?), enjoyment (Do I like doing this?), and outcome expectations (How will I be able to benefit from this career financially, professionally, and personally?).

Ability/Self-Efficacy

Self-efficacy—a person's confidence or belief in their ability to achieve goals—is another influential factor in the decision-making process. Career decision self-efficacy has been shown to be connected to an unprepared student's ability to become enmeshed in the college environment (Peterson, 1993). Kelly & Hatcher (2013) find that older students have higher self-efficacy, which can lead to more confidence in career decisions. Ability and feelings of self-efficacy can bolster an individual's enjoyment of their career.

Enjoyment

One of the most influential factors in student decision-making is enjoyment—how much they think they will take pleasure in the experience of a given major or career. Enjoyment, along with perception of ability, has been shown to be quite influential on major choice (Beffy et al., 2012). Enjoyment tends to play a larger role in major decisions than expected labor-market outcomes, though economic factors are still important (Baker et al., 2018).

Earnings/Outcomes Expectations

As educational and career opportunities become clearer to students, they consider not only their ability to succeed in a given program or major but also the potential post-graduation earnings associated with it (Arcidiacono et al., 2010). Students will often weigh the cost of obtaining the degree against the perceived rewards that come from it (e.g., salary, prestige), though these calculations are not always based on the most accurate information (Arcidiacono et al., 2010). The weight of these various considerations differs across individuals as well as for unique individuals across different points in time.

Turning Points

Careership theory finds that the decision-making process is an often-bumpy path with occasional moments of personal change, called turning points, dispersed along the way (Hodkinson & Sparkes, 1997). At these turning points, people are required to assess themselves and the information they have in order to make decisions. These turning points may occur at different times in life (e.g., childhood, high school, college, post-college, workforce entry) and can generally be characterized as either self-directed or external as well as either individual or institutional. Hodkinson & Sparkes (1997) distinguish individual and institutional turning points, explaining that individual turning points are those in which individuals are "instrumental in precipitating a transformation, in response to a range of factors in [their] personal life in the field," whereas institutional turning points are "determined by external structures of the institutions involved."

Summary

Within the vast array of literature perspectives, common themes are found: 1) students may approach information-seeking in either a systematic or idiosyncratic manner, 2) social networks are an essential component and source of information for students, 3) student self-perceptions and their sociocultural environments influence their educational and career horizons, 4) students weigh various factors when making decisions, and these factors interplay with their backgrounds and perspectives, and 5) IT students benefit academically and professionally from early formative interest-sparking experiences and opportunities.

These literature-based concepts are explored in detail through our analysis of the nearly 70 interviews comprising our sample. We first explain the methodology and process of data collection and analysis then present key findings from the study. Our final sections include a summation of the study and recommendations for practitioners to consider relative to helping students make decisions about pursuing education and careers in technician fields.

Methods

This report is part of a larger multi-year research partnership between Ivy Tech Community College (Ivy Tech) and Rutgers' Education and Employment Research Center (EERC) focused on student decision-making in Ivy Tech's School of IT. Participants were asked to volunteer for the longitudinal study through an electronically administered survey instrument.[1] Interviews were conducted three times over a three-year period, spaced roughly a year apart . A total of 41 students participated in the initial round of interviews (Spring–Summer 2019), 23 completed the second round (Summer 2020)[2], and 18 completed the third round (Summer 2021). Selection criteria for the longitudinal study included students who 1) were in their first or third year of a program at the School of IT[3], 2) volunteered to participate in the longitudinal study, and 3) completed at least two of the three rounds of interviews.[4] Twenty-six students completed two or more rounds of interviews and were included in the study.

Interviews were semi-structured and guided by a literature-based interview protocol, using a somewhat phenomenological approach (Farrell, 2020).[5] They were conducted via Zoom and phone calls, recorded, and then transcribed either manually or by Ottter.ai transcription software, with quality control by a research assistant. First-round interviews established basic information about participants and provided a retrospective view of their childhood and early adult decision-making. Later interviews served as updates on progress and pathways, explorations of decisions made since the most recent interview, and inquiries about future plans.

Interview transcripts were coded using NVivo qualitative data analysis software. We used a combined deductive and inductive approach to coding. We began with a deductive approach by creating a preliminary codebook grounded in a comprehensive literature review. Next, we piloted inductive coding on an interview transcript, adding codes we developed to capture themes and categories that emerged from those data. As we coded each interview transcript in NVivo, we also completed a case study template for each participant that included general information such as their basic demographic characteristics, major/program, and the timing of their first interview; their level of decision certainty; their measurements on key independent and key intervening variables; and any other relevant information.[6] The general information section was sourced partly from the pre-interview surveys and partly from the interviews themselves. We used these case study templates to create summaries we could compare to one another in our search for the common threads among participants that guide this analysis.

1 See Appendix A for the survey sampling framework. Participants in the longitudinal study were incentivized with a $25 Amazon e-gift card after completion of each interview.

2 Given the timing of the second-round interviews (Summer 2020), it is likely the Covid-19 pandemic was at least partially responsible for the attrition between the first and second rounds of the interviews.

3 See Appendix A for the full survey sampling framework.

4 Typically, participants who completed a second-round interview also completed a third-round interview, although five participants completed only first- and second-round interviews, and one participant completed only first- and third-round interviews. Almost half of the participants completed only a first-round interview and thus were excluded from this analysis.

5 See Appendix B and Appendix C for the student interview protocols.

6 See Appendix D for the case study template.

Single Interviewees

Of the 42 students who participated in the first set of interviews, 16 did not return for a second or third (38%), making them ineligible for consideration as longitudinal participants. The single-interviewee group, when compared to the longitudinal sample, included a slightly smaller percentage of females (25% vs. 27%), more white students (69% vs. 58%), and students with similar levels of educational attainment. Especially of note is that the single-interviewee group had a larger percentage of part-time students (50% vs. 42%), and that almost a quarter of the single interviewees were taking IT courses but had not yet selected a program. All of the longitudinal participants, on the other hand, had selected an IT program at the time of the pre-interview survey. Part-time students and those who were not formally enrolled in a program may be less systematic in their decision style and may have felt they did not have information to contribute to a decision-making study, or they were no longer students at the time of the later interviews.

Sample Demographics

The longitudinal study sample was composed of 26 students who participated in two or more interviews conducted between 2019 and 2021. Most participants had a high school diploma or equivalent, and nine already had a college degree. Slightly more students attended college full time rather than part time. White men in their 20s and 30s comprised the largest demographic group in this sample, although the sample includes a larger percentage of females and nonwhite students than our broader survey sample of students in the School of IT.[7]

The racial/ethnic and gender demographics of our longitudinal sample diverge somewhat from greater trends observed in the Ivy Tech IT completers data for the 2020–21 school year obtained from NCES. Our longitudinal sample is more diverse (32% nonwhite vs. 21% nonwhite)[8] and has more women (35% female vs. 22% female) than the population of IT 2020–21 completers from Ivy Tech. In the NCES sample, 75 percent of the 1,717 Ivy Tech students earning degrees or certificates in the field of computer and information sciences and support services were white, 10 percent were black, 5 percent declined to share their race/ethnicity, 4 percent were Asian, 3 percent were multiracial, 2 percent were Hispanic, and a very small number of students had American Indian/Alaska Native or Native Hawaiian/Other Pacific Islander backgrounds (US Department of Education, NCES, 2021).

7 See Appendix A for the survey sampling framework. Surveys completed as part of the larger ATE study each semester from Fall 2018 through Fall 2021 indicated that 74 percent of IT student respondents identified themselves as white, and 78 percent identified themselves as male. These numbers are substantially larger than those observed in the sample examined here, in which 58 percent identified as white, and 69 percent identified as male.

8 Excluding participants who declined to share race/ethnicity data.

Findings

In this section, we describe our findings from the longitudinal interviews, distilling key decision-making elements as framed by research, citing examples from participants, and exploring how decisions were made and changed over time. We begin the section with an exploration of a set of elements we define as the **determinants of students' choice set**—the wide range of socioeconomic and cultural contexts in which individuals are embedded—and how those contexts influenced how students perceived their range of educational and career choices. Next, we explore **approaches to decision-making over time**—how age seemed to interact with decision-making over the life course. We then narrow our focus to understand the complicated interplay of **influential factors in decision-making**—the experiences, people, and individual elements that guided participants' decision-making process. We conclude this section with a discussion of **turning points**—moments in participants' lives that were especially salient or exerted significant pressure with regard to decisions they made in the past.

Determinants of Students' Choice Sets

What determines the set of choices a student has available to them relative to school, program/major, and career? This set of choices is not the same for every student; the range may vary in size and content depending on the social and structural forces in which the student is embedded. Among study participants, culture, family, social circles, finances, gender, and race/ethnicity were key determinants of choice—¬variables that either constrained or supported students' educational and career decisions. All of these characteristics and influences worked to shape the unique choice sets available to each participant, and they navigated the decision-making process with varying decision styles and levels of engagement.

Culture

Blue-collar, working-class culture played an important role in participants' college and career decision-making process. The legacy of the factory played into this culture in a significant way. This is not surprising given Indiana's history as a major manufacturing hub in the first half of the 20th century. Although manufacturing has faced a significant decline in Indiana, as in most Rust Belt states, many of our participants were raised in factory towns or by families with strong ties to local factories. As one participant put it, "My mother worked in an office, my father worked in a factory—typical Indiana." These experiences were formative for many of our participants, guiding their perceptions of work and helping them determine the characteristics that they did or did not desire in a future career.

There seemed to be a dichotomy in the minds of many of our participants between jobs where you "work with your brain" and jobs where you "work with your hands." In interviews, the latter was usually associated with factory work but also occasionally associated with lineman or trade-type work. Most participants held a negative view of factory work and were pursuing IT as an alternative—and preferable—form of employment. This dichotomy was evident throughout the interviews and seemed to lead participants to seek information about

types of employment that were not factory-related. One participant recalled her experience in a factory:

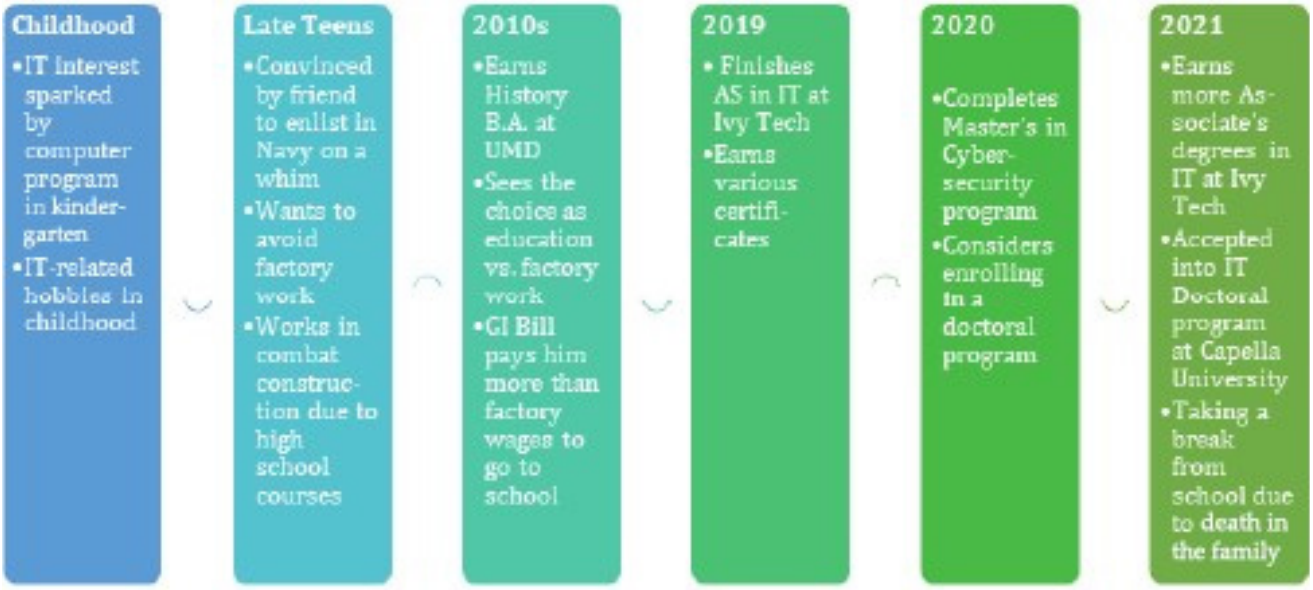
> *Literally those two weeks I was like "No, I can't do this."... It's awful. So I just thought "I'd rather work in an office; I'd rather work with computers." I'd rather use my brain because I'm not the type of person who can stand at a job and do the same thing for ten hours. I want to do something that is going to challenge me and be interesting.*

This participant used a process of elimination to rule out the type of job she did not want rather than searching out experiences that would guide her toward what she did want. By the time of her second interview, she had not made much progress in figuring out what specific career she wanted, but she expressed again that she wanted to be challenged and did not want "factory work," stating, "I don't really care what it is, I just want something ... that is not super boring."

Some participants described a cultural pull toward the factory. One participant expressed a strong desire to, as he put it, "break from this 'blue-collar guy'" role he was expected to take on because of where he was raised. He described the cultural pull of the area to settle with blue-collar factory-type jobs this way:

> *I grew up in a factory town. They said I'd never be anything but trouble, they said I should just stay. They literally got me my vocational certification so that they could get me into the factories as fast as they could.*

Figure 1. Turning Away from the Factory: Student Example



Flowchart depicting one student's educational and career journey. He had an interest in computers from a young age but ended up enlisting in the Navy due to a happenstance discussion with a friend and a desire to avoid factory work. After retirement from the military, he pursued various degrees and certificates in IT.

This participant decided to pursue his IT education because "the military is paying for it on the GI bill, and they pay more for that than if I went out and started working in a factory, so why not?" His decision-making process, depicted in Figure 1, was winding, but it is indicative of a larger trend among participants whose decisions were influenced by a desire to escape the pathway to factory labor. Another emphasized both the prevalence of factory work in the area as well as the negative view of this type of labor, especially when considering it relative to an IT career:

> *I've seen a lot of people grow old in factories, and they don't feel too good. Rarely I'll find someone who does. They're dirty places, and it's pretty much all we have in Lafayette. As for IT, again it's not going anywhere. People are concerned about losing their jobs to robots or whatever in a factory. Worst case scenario, that does happen, and they'll just be hiring engineers to manage those robots, and IT specialists. So it just seems like the best place to be right now.*

These passages are indicative of a larger trend within the sample—career and education decision-making that was characterized as much by an opposition to the factory as it was an attraction to a certain IT role. One participant nicely summed up this trend of avoidance of the factory, stating, "I just want to trade moving boxes in a warehouse [for] writing code in an office." Likewise, a participant studying automation and robotics told us, "I want to be programming switches, not on the factory floor."

The concept of loyalty came up frequently in our interviews, and its role in the culture of factory towns seemed to exert significant pressure on some participants' decision-making. This strong focus on loyalty is likely a legacy of participants' personal ties to relatives—parents, grandparents, great-grandparents—who worked for large local manufacturers in the past. Many spoke of family members who were loyal to the same company for generations, or of companies as having reputations of being either "loyal" or "not loyal" to their employees. This perception was influential in career decision-making: some participants discussed not wanting to work for specific companies they believed were "not loyal." The concept of loyalty was highly noticeable after the start of the pandemic. Several participants who were job searching or had recently taken a job during this time spoke of how companies treated their employees during the pandemic, many conflating even those benefits required by law with "loyalty." One participant said he had taken a job at the start of the pandemic that he did not intend to keep. He planned to only stay in the job for a short time to gain experience and then apply elsewhere. Though he had not yet even received training when the company shut down, the company continued to pay his salary for two weeks while he stayed home, unable to work. He described the company as being "very loyal to their employees" and said that weighed heavily in his decision-making. When contacted again a year later, he was still working for the same employer and had no plans of changing jobs.

Family/Social Circles

Family was both a constraint and a support in participants' decision-making. While many participants cited family as a major source of support, certain familial expectations or responsibilities proved constraining. Some participants expressed that they felt their career and program choices were limited by the influence of their families. For younger students, this constraining influence mostly took the form of families' negative

judgments or opinions about their potential career and education decisions. For older students, this influence generally took the form of caretaking responsibilities for children or elderly relatives.

Familial expectations about what program or career a participant should pursue, often for pragmatic reasons, proved influential to young participants (or older participants reflecting on the past). One student said his family had a major influence on his choices:

> *They didn't "pick" this major for me, but they didn't agree with the other things I had in mind. For example, before I started high school I wanted to study astronomy. They didn't really support that, so I had to look for other options. They just said with astronomy there aren't a lot of jobs, and it's going to be hard to find a job.*

This participant was guided to pick a more "practical" education and career pathway by his family, which constrained his choice set and led him to pursue IT. In a later interview, he expanded on this story, saying: "I know my parents wanted me to be an engineer growing up, but then I just kind of did my own research and thought computer science would probably be the best option for me." By the time of his final interview, this participant had completed his associate's in software development and was completing a remote IT internship before starting his bachelor's in computer science at Purdue University. He relied most heavily on internet research in his program decision-making process, but he also had guidance from Ivy Tech advisors and found his internship through LinkedIn. Though his parents initially steered him away from astronomy with the intention of pushing him toward engineering, he ultimately was able to forge his own path with the help of online resources and Ivy Tech advisors.

The families of some participants limited, or tried to limit, participants' choice sets by attempting to guide them away from secondary education and encouraging them to enter directly into the workforce. For example, one returning student, who initially started at Ivy Tech for computer science in 1995, quickly ended up stopping out because "I started … farming with my dad; that's what he wanted me to do." He farmed with his father for a bit and then ended up working at a newspaper for 20 years before returning to Ivy Tech to begin a cybersecurity program.

For older students, especially those in their late thirties and older, familial constraints/support seemed to have shifted from that of parental opinions to caretaking responsibilities. One participant said,

> *My parents didn't love the idea of me going into teaching when I first switched to that back in college, and I did it anyway. Nowadays, it's a little different. I mean, I definitely talk to my wife a lot more about things—when I first took this job, we knew the schedule was going to be kind of squirrely, and, you know, we're dealing with that.*

Many older participants discussed taking into consideration their caretaking responsibilities, typically for a child, when making employment or educational choices. Some participants were not able to pursue certain institutions, educational paths, or career paths due to these responsibilities. One participant said she chose to attend Ivy Tech (over other schools) because she was limited to choosing from schools with high levels of

schedule flexibility and online classes:

> *I take* [*classes*] *one at a time because I'm a working parent. … I take* [*classes*] *online, so I like that Ivy Tech offers* [*online classes*] *to me. I put my kids to bed at eight o'clock and stay up and work on my homework online which is really nice.*

She discussed how her family was both a constraint on and a support for her decisions:

> *I'm a working mom with two young kids and a husband. My time is limited, having two small kids,* [*I think about*] *what I'm able to pursue—I don't want to ignore my children. So my family's a big influence on that, you know. My husband's always "you want to go for it, go for it!" Never deny me. You know what, it's nice to have that support.*

Caretaking responsibilities proved to be a major consideration for many members of the sample. They limited participants' choices in the sense of what type of educational institution they could attend (flexible schedules, remote options, cost, etc.) as well as what types of careers they would consider (stability, salary expectations, location, etc.). For example, one participant mentioned that he wanted a job that would allow him to stay close to home: "Now, as my parents are growing older, just being within a certain radius of them is important." Another participant explained that the pandemic showed him the benefits of remote work with regard to family caretaking responsibilities:

> *Because the pandemic gives me the opportunity to be more at home, take care of my daughter, and be with my family as well. … So going forward, I'll be looking for any job or educational programs to get into that will allow me, that is, to give me the time to be around my family.*

Family responsibilities guided many of our participants away from enrolling in school at a certain time; many mentioned putting it "on hold" until their responsibilities were less demanding. The following student, for example, described the impact of a family adoption:

> *I just pretty much can't work and sleep and go to school and be a decent parent. Maybe there are people who can, but I'm not one of them. It's too much for me. So I just waited, you know, I didn't start at Ivy Tech until she was in high school. You know, just life on pause for a bit.*

Families and the responsibilities that they come with had an impact on many aspects of decision-making among our sample. While family support and guidance proved to be essential to the success of many participants, at the same time, the families of many participants also served as a constraint on their choice set .

Most participants' considerations about their program and career options were influenced by their social circles. This is because members of participants' social circles exposed participants to a wider range of information sources and influences than they may have been able to access on their own or through family members. Participants with friends in the IT field were able to ask questions and learn about various careers and salary expectations. For example, one participant said,

> *The person that* [*gave*] *me full details about the program is one of my friends. Because I'm from Africa. So he studied at a college in California. UCLA or something. He was doing well in the program; he's already graduated and has a good job. He was the one that persuaded me to go* [*to school for programming*]. *"You will easily get a job when you know how to program,"* [*he said*].

While some participants were encouraged by members of their social network, more felt that they had limited social circles, which translated to difficulty finding information about careers in IT or finding a place to work. Many were from rural areas, and some even suggested that they may have to move to a more metropolitan area to find an attractive IT job. One participant said,

> *I live in a very small town. And there's not a whole lot of tech and stuff around here. So you don't really have anybody to bounce these ideas off of, or just talk about what it's like to actually have a job in this field, which is difficult. And it's kind of scary, you know … you've got to go way out of your comfort zone, or city, just to get an idea of what the work is like.*

Some participants experienced these feelings of limitation based on location and lack of valuable network connections. Many did not know anyone in the field of IT, and when asked, some vaguely mentioned a distant or tenuous connection such as: "my stepsister's husband does [work in IT] now. Like software or something. I don't really know" or "my father was a janitor at a computing center." Some participants expressed a feeling of unease when their career paths diverged from those of their childhood social circles. For example, one participant said

> *I grew up in a factory town, they said I'd never be anything but trouble, they said I should just stay. They literally got me my vocational certification so that they could get me into the factories as fast as they could. So like, moving into a different level of society is freakin' insane. It's just a different world.*

This participant was considering a graduate degree in the IT field at the time of his final interview and seemed struck by the disconnect between his childhood social context and his current one. Others expressed that their social context had an impact on their college and career decisions in other, more specific ways. One participant said she believed she would have completed her education sooner if she had received additional guidance relative to her education:

> *It took me six years to get my first bachelor's degree because I was the first person in my family to go to college. So it would have been nice to have somebody, like a mentor, or experience. I knew I wanted to work in the lab, but just didn't know what pathway to get there. Eventually I figured it out. But I could have saved myself maybe a year or two of time. So it would have been nice, maybe, to have more of a mentor.*

The social environment inhabited by our participants was hugely influential in their career and program decision-making process. The limited social networks caused by small towns, and the nature of the expertise of many of these networks (e.g., blue-collar instead of professionalized) colored the decision-making process of many of our participants.

Financial Status, Scholarships, and Grants

Financial status constrained the decisions of many participants relative to school, program, and career choice. Financial constraint primarily manifested relative to three areas: school choice, program choice (particularly whether to start or stop), and career choice. Ivy Tech, like many other community colleges, is seen as an accessible option in terms of financial demands and scheduling flexibility. Indeed, most participants (22 out of 26) specifically cited Ivy Tech's affordability as a factor in deciding where to attend school. One participant said: "I chose Ivy Tech specifically because their tuition was not expensive, and they have good programs from what I heard from other friends."

Many participants described weighing the cost of program enrollment against the quality of education offered during their decision-making process and ultimately deciding that Ivy Tech was a good choice to balance these two objectives. These sentiments were reflected in the comments of a participant who told us that when she considered school options, she also weighed the fact that she was undecided about her career pathway at the time. This indecision made her reluctant to attend more expensive schools:

> *I ended up going to Ivy Tech because it was a lot cheaper than other places around here, and it was a very good place to start compared to going to a four-year* [*university*] *and having to pay that much money, especially when I didn't know what I wanted to do.*

Another student mentioned that she felt going to Ivy Tech would help her maximize the value of her education:

> *I don't think they really tell students this in high school, but* [*at*] *these* [*community*] *colleges you get a really good education for a lower price. I am paying for this out-of-pocket, and it is really affordable to get all of the certifications rather than trying to get into a four-year program.*

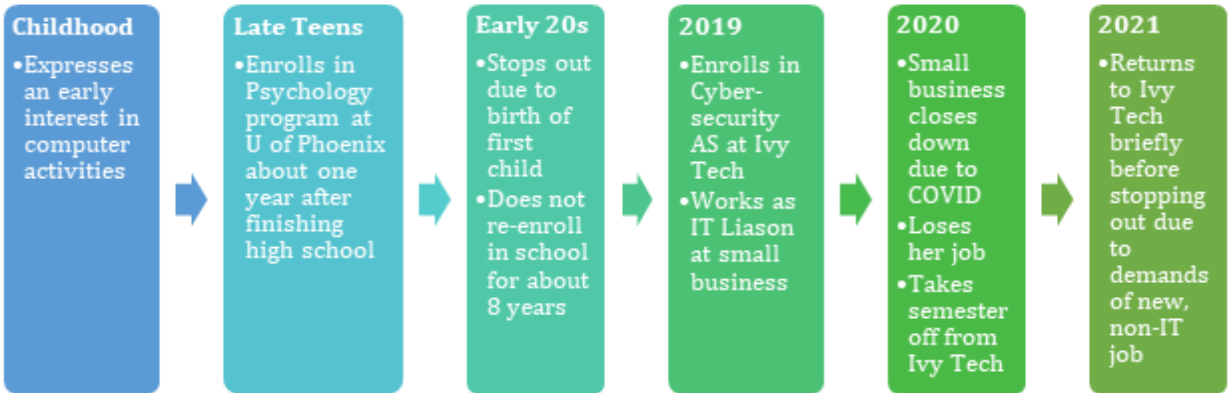
By the time of her final interview, she was in her last semester of the Ivy Tech cybersecurity program and working in IT as a part-time security analyst. During that interview, she added that she still wanted to pursue a bachelor's degree and was hoping to begin working full time after she graduated, which would help her afford it: "once I [start working] full time, I can afford it more. Or maybe my employer will pay for some." Hoping a future employer would help with tuition was a fairly common thread among participants. Many expressed a desire to have further education subsidized by an employer.

Some participants' financial constraints were exacerbated by family responsibilities. One participant explained her choice to attend Ivy Tech this way:

> *Once I realized that* [*I wanted to pursue IT*]*, it was kind of a financial decision to attend Ivy Tech. I thought about what I can do. I'm the sole provider for a family of four, and I had to figure out what could work around my current work schedule. … I work full time. I'm on call regularly, so I just had to find something that would work with me never knowing what hours I'm going to be working.*

She ended up stopping out of the Ivy Tech IT program due to a combination of family issues and COVID-related job loss. By the time of the third interview, she had secured a non-IT job and had briefly attempted returning to school before realizing that it was not compatible with her new work schedule. Given her family's financial situation, work had to take precedence over her education, a problem faced by many of our participants. Her decision-making process over time is shown in Figure 2.

Figure 2. Financial Constraints: Student Example



Flowchart depicting one student's educational and career journey. She had an early interest in computers that she returned to school to pursue, but she eventually ended up stopping out of her IT program due to financial constraints and the demands of a new job.

Scholarships and Grant Requirements

Scholarships and grant requirements can both support and constrain decisions. Above and beyond Ivy Tech's low tuition rates, programs like Pell, TAACCCT, and Indiana's Next Level Jobs Workforce Ready grants serve to make their programs even more financially accessible to students . Pell grants help students with high financial need who have not received a degree or professional certification previously. Both TAACCCT and Workforce Ready grants target nontraditional students (adults over the age of 25). TAACCCT programs specifically targeted workers who have been laid off or "dislocated" from the workforce because of, for example, a factory closing or the moving of jobs overseas. Participation in the TAACCCT or Workforce Ready programs required students to choose from a select group of programs geared toward high-demand careers in the state of Indiana.[9]

Although the support allows for free or substantially reduced cost, the program parameters also constrain students' choice sets. Many (but not all) Ivy Tech IT programs are covered under the Workforce Ready umbrella. One participant said that she was introduced to the grant by a transition team that oversaw the process of helping laid-off factory workers. Of the program options, she ended up choosing between cybersecurity and software development because "those were the only two options with computers. I knew [Ivy Tech] had other [programs] with computers, but those were the only two that were offered with this particular grant." By the time of her final interview, she had completed all of her cybersecurity coursework and was finishing up her

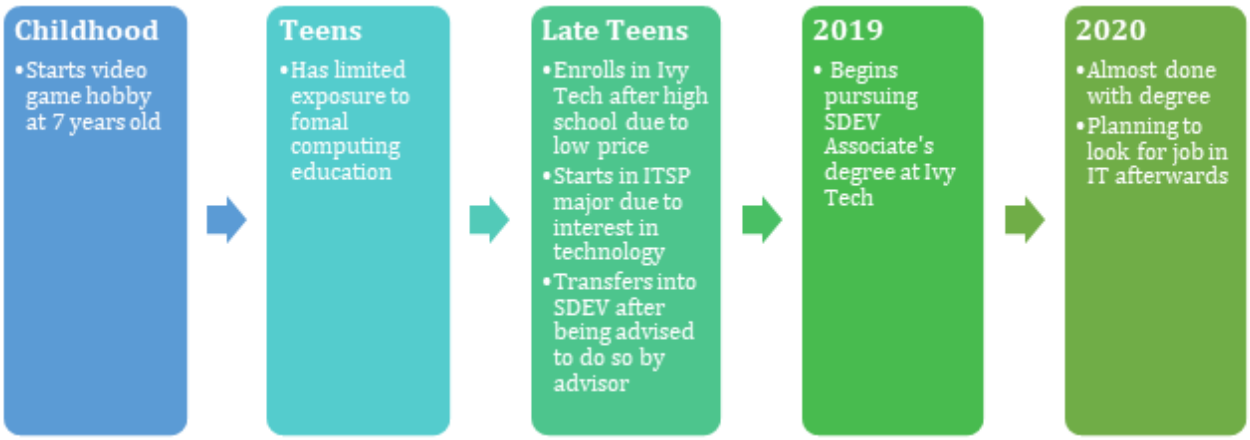
9 For more about the Workforce Ready Grant program, see Peterson et al., 2023.

general education requirements. She mentioned that she was benefiting from the TAACCCT grant as well as the Workforce Ready grant, so she was able to balance school with caretaking responsibilities without having to worry about full-time employment.

Gender

Gender may serve as a constraint on women's desire to pursue IT, particularly with regard to their choice to persist in and complete an IT educational program or to pursue an IT-related career. The women in the sample tended to be second-career seekers and/or nontraditional aged; in fact, all but one of the women were age 30 or older. Only two of the nine women were still formally IT-involved at the end of the study.[10] To compare, over half of the men in the sample (11 of 17) were still formally IT-involved at the time of their final interview. One woman who was still engaged with IT at the end of the study was working as a part-time security analyst while finishing up her degree. She had received support from the Indy Women in Tech initiative, which she told us she "joined and [found] they were really helpful in networking for potential jobs." The other woman in the sample who remained formally involved in IT was finishing up her degree in software development, and she had a female IT mentor at Ivy Tech. She described this mentor, the IT advisor, as "an absolute sweetheart," adding "I love her to death. She convinced me to 'come over to the dark side' as she described it and try out software development." This participant was the youngest woman in the sample—she was 21 at the time of her final interview. Her decision process is depicted in Figure 3.

Figure 3. Impact of Gender: Student Example



Flowchart depicting a female student's decision-making process. She had a longtime interest in IT grounded in her video gaming hobby but did not have access to robust IT education in her K–12 years. She enrolled at Ivy Tech in an IT support/helpdesk (ITSP) program due to cost concerns, but after receiving advice from a female mentor at the school, she switched into software development.

10 We define "formally involved in IT" as a participant either having secured an IT-related job or continuing their education in an IT-related program of study.

Both of these women had gender-specific mentors, a trait that they did not share with most of the other women in the sample. (One other woman had a female mentor, but not in IT.) It is difficult to make any sweeping claims about female-specific supports and mentorship based on this single data point, but these distinctions are interesting to note, especially considering how few women in the sample ended up still being formally involved in IT at the time of their last interview with our team. This disproportionate outcome is complicated by the fact that there are fewer women than men in the study, due in part to the longtime underrepresentation of women in IT majors. Despite these factors, only one woman in our sample truly touched on these feelings in her interview, stating "I understand that it is a largely male-dominated field, and a lot of times, being a woman and trying to get a job in technology can be very difficult. And then once you get a job, earning respect and earning your place, basically [is difficult]."

The absence of this narrative by other women in the sample is notable given the common conception that a "boys club" mentality is part of what drives women away from IT majors and careers. Though almost none of our female interviewees pointed to sexism as a barrier, most did not end up in an IT education program or career by the time of their last interview. This lack of IT persistence could also be due to the fact that early interest and IT-related hobbies were less common characteristics in the female sample when compared to the male sample, and these characteristics may be connected to success in academic IT programs and careers. About half (5 out of 9) of the women in the sample had an early-established interest in IT, and only three out of the nine had an IT-related hobby. In the male sample, all but one had an early-established IT interest, and all but four had an IT-related hobby.[11]

Race/Ethnicity

Students' racial/ethnic backgrounds may influence their decisions to enter the field of IT, to remain in the field, and to pursue an IT career; this impact is most profound among women of color. Of the nine women in the sample, six were white, two were Asian, and one was Latina. Both women who persisted in IT were white, and both had IT-related hobbies. The limited number of nonwhite women in the sample is consistent with the literature–women, particularly African American/Black and Latina women, are much less likely than men to pursue an IT educational program or career (McAlear et al., 2019; Nadeem, 2021) . In terms of race/ethnicity, the field of IT is dominated by white and Asian men; most minorities are not well-represented in the field. Our sample reflects this imbalance: of the seventeen men in the sample, only four identified as being nonwhite. Several participants, when reflecting on their identity as white men in a predominantly male group, discussed race and ethnicity in terms of opportunity, often framing the discussion in a negative light. One participant, for example, expressed feeling held back by his white male identity, making statements like, "If you're a cis white gendered male in this society, you are at a disadvantage [relative] to everyone else. You're passed up for everything," and, "They are just not writing as many scholarships for people like me now." Many participants seemed uncomfortable or unwilling to discuss race/ethnicity. One participant skirted the discussion by saying, "I'm not sure if I fit into the modern world, working world honestly. Got a lot of new little rules and regulations," without specifying further.

11 For more about this topic, see Peterson, E. K. (2023)

One of the few participants to bring up race directly was the only Arab American participant in the sample. He mentioned that for him, fitting in was not really a concern, and that "for computer science, usually, there's a lot of brown people you could say, so I didn't really think about that much." Though this participant was a recent immigrant, and, with the exception of a vibrant and growing Arab community in Indianapolis, the overall population of Arab Americans in Indiana is small, he felt a strong sense of belonging in the field of IT. This feeling may have been aided by the high levels of Asian American representation in the field (Indiana, 2019). Overall, however, race was not a highly discussed topic in our sample, and most participants did not express or mention that their race/ethnicity factored into their decision-making process. Our sample supports prior literature which finds that racial/ethnic background impacts who chooses to enter the field of IT by its lack of diversity but does not help to explain the way that this pre-sorting works, perhaps due to the small sample size, or a reluctance on the part of participants to discuss this sensitive topic. Notable is the fact that one round of these interviews was conducted in the Summer of 2020, a time of widespread racial justice protests in the United States, which may have led people to be even more reticent than usual on the topic.

Approaches to Decision-Making Over Time

Determinants such as financial status and social circles heavily color what individuals think of as possible in terms of education and careers, but the matter of how they engage with these possibilities before choosing them is also an essential part of the decision-making process. Individuals vary in their approach to decision-making: some are systematic decision-makers who tend to actively seek out information, usually from a variety of sources, and use that information to make their decision[12], while others are idiosyncratic decision-makers who are more likely to be influenced by chance and one-off encounters.[13] Still others use a combination of both. Both approaches were evident in our study. One student who exemplified a systematic approach said,

> *I did a lot of research on my own on the side. I was curious about what the jobs look like and what it looks like out in the job market. I was looking into what's happening in the IT world … With all this new technology always coming out, I want to know if I should focus on something new or build up my skills working with something that has been worked on for a few years already.*

Another said,

> *I am going to be 39 this year. By the time I graduate [with my bachelor's degree], I may be pushing 50. To have a degree plus the experience I have—I think that would be a rather unstoppable combination.*

Another student who exemplified a less systematic, more idiosyncratic approach described his decision-making as being based on a series of interests and whims. He said, "I'm not tied to anything—I'm open to whatever. I'm going with the flow, and whatever comes up, I will take." After failing IT courses because of mathematics

12 See Holland, 1985; Lent et al., 2000.

13 For example, see Krumboltz, 2009.

requirements, he assumed all IT programs required calculus and tried kinesiology instead because he "liked to work out." After a chance encounter meeting a new roommate who was enrolled in a software development program at Ivy Tech, he switched to software development.

Idiosyncratic decision-making tended to be more prevalent among people in the earlier stages of their education and career journeys. Many participants who were either currently in their early 20s, or who were describing their decision-making process at that age, said they did not know exactly what they wanted to do, or that they were trying out various educational paths to find one that suited them. For example, one student said,

> *I started school, and I didn't really know what I wanted to do. I did my prerequisites, those went well, and then out of nowhere I was looking at the programs and was like, "Oh, they offer computer stuff. I really like technology. Let's try that out."*

Another student said, "I'm lost as far as career goes. I'm taking classes, and I hope something just comes about." Some students had switched majors/programs multiple times trying to find one they liked. Some were pursuing a second degree or second career because they had already tried one and were not satisfied.

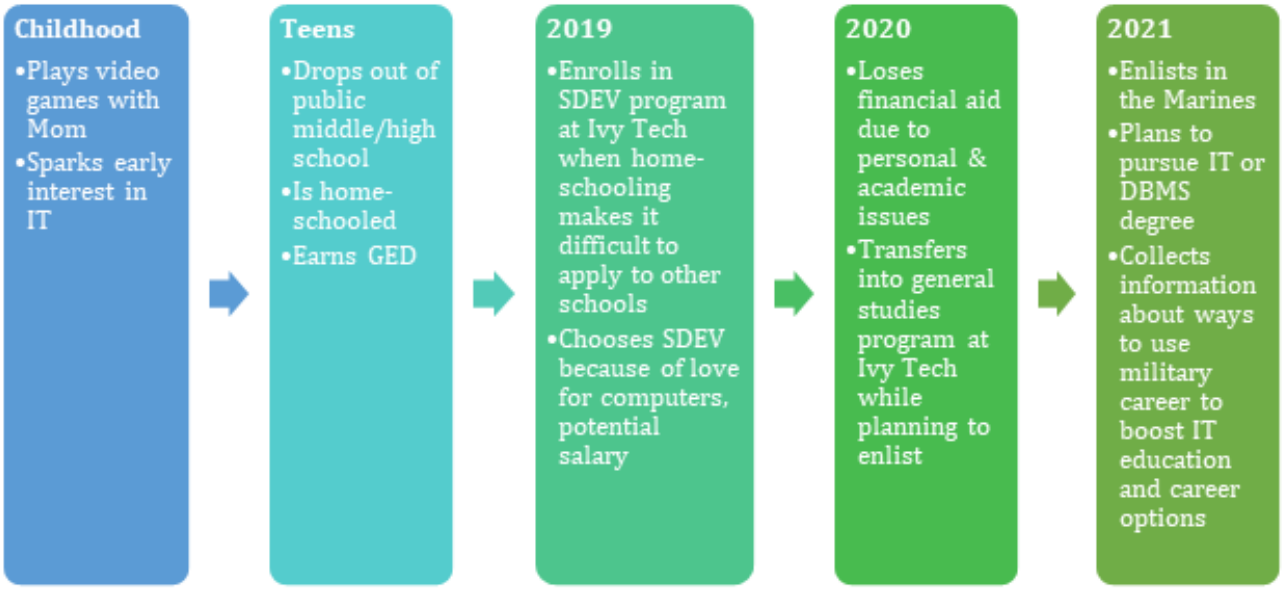
A trend that emerged from our sample was that participants seemed to get more engaged in their decision-making over time, becoming more systematic in the process as they gained experience and age/maturity. One student in his early twenties exemplified this transition[14], describing the change in his approach to decision-making and problem-solving in general this way:

> [*When*] *I see a problem present itself, I go and try to collect as much information … that I can and then go ahead on it. And if I can't figure it out after that, or fix the problem, then I go and ask for help from other people. But whereas, like, before … if there's a problem, well, I'm gonna go ask someone else to go and fix the problem straight out without doing anything to try to fix it myself.*

Moving from a somewhat turbulent transition into college, this participant ended up gaining drive and purpose after enlisting with the Marines. His time in the service helped him develop a more systematic problem-solving approach that he also applied to his decision-making process, which is displayed in Figure 4.

14 This change was even evident in the way he conducted himself in interviews for this study. In the first round, the interviewer noted that it was "difficult to get the interviewee to speak much," but by the second round, the interviewee was "more talkative, more relaxed, gave more insight into his life, [and] seemed completely engaged."

Figure 4. Increased Engagement over Time: Student Example



Flowchart depicting one student's decision-making process. This student's educational and career journey started with an early video game hobby and continued on to an unconventional K–12 experience that turned out to be a disadvantage when he initially enrolled in Ivy Tech. He was able to gain a strong sense of direction when he left Ivy Tech and enlisted in the Marines. Though this put a temporary pause on schooling, he developed a plan to pursue an IT education and career in the future.

Most participants mentioned that upon receiving more information on prospects in their field and guidance from advisors, they started thinking of their career in a relatively more focused way and approached their decision-making more systematically. Almost all of the older participants with career experience who had returned to school to either shift careers or try a new career described their early decision-making as being more idiosyncratic than the approach they had taken more recently. One such student said,

> *I think it's an age factor. When I was younger, I got into the military because I got drunk. Once I had more luxury to make decisions, I could make decisions more slowly. I didn't want to walk onto one more construction site. I knew I didn't want to do that, so I had to make better decisions.*

There seemed to be a strong thread of desire for pragmatism and practical education choices among many of our older participants, especially those who were further along in their educational or career journey. These participants described trying to make the best education and career decisions they could given the information and opportunities to which they had access. Therefore, rather than sitting on one side of a dichotomy of decision-making approaches (systematic versus idiosyncratic), there seemed to be a transition among participants from one approach to the other over time.

Participants tended to use online information to make decisions. Gathering information from online sources was the predominant method of information-gathering among participants. Using online sources to gather information is generally common, especially among young adults, and given this sample's affinity for IT, it is not surprising that they spent a considerable amount of time searching for information online. The most

common sources of information mentioned by participants were Google, YouTube, job boards such as Indeed, networking sites such as LinkedIn, and the Ivy Tech website. Key information students found online included in-demand jobs, average salaries for different career paths, and common locations of jobs. When one student was asked where he found information about educational programs, he said he had conducted "just kind of basic searches" and pointed out, "I can easily Google the curriculum and what classes I need to take to finish my major." Another student mentioned using the internet to find information about salary expectations by "just Google [searching] the salaries and such."

Many students discussed using online sources to gather information about the types of careers available in IT and to try to decide which would be best for them. Most students mentioned looking for what types of jobs were most "in-demand," and many also researched where certain types of jobs were generally located (i.e., locally, regionally, or nationally). Some students already had multiple degrees and were trying to decide what additional schooling would help them best leverage their education. For example, one participant already had a JD and an MBA and was gathering information about what additional education would be best for him to pursue a teaching license. He researched the question online and found key information about the need for teachers with IT training, which led him to his current program. He found that licensed teachers with IT experience are "really in-demand … so that is why I picked [IT]." He went on to mention that he could teach without further education, but by receiving additional training, he is "not only learning something new" but also doing something that might help him stand out among other applicants. At the time of his third interview, he had received his emergency teaching permit[15] and was teaching social studies at a local high school while also teaching as an adjunct at Ivy Tech.

Participants toggled between multiple sources of information. Participants in our sample showed a predilection toward toggling (switching back and forth) between information sources and using multiple sources of information at once to inform their career and program decisions. Drawing together data; advice and anecdotes from personal contacts; their own experiences; and other information they gathered, students combined sources to make thoughtful decisions about their career and educational journeys. One student described this process in the following way:

> *I would say one of my professors* [*was an influence*]*, because I have talked to him a lot about this kind of stuff, and he kind of influenced me and talked to me about what is going to be good for me or better for me. Also going online and searching for stuff.*

For this particular student, institutional guidance proved to be a stronger influence on his decision-making than his independent online research, but he considered both types of information when making decisions about his educational pathway. Other participants leaned more heavily on workplace connections, such as the following student, who said that he got his information through a toggling process:

15 An emergency teaching permit is a temporary credential granted in states with a shortage of licensed teachers in a given participant area. A recipient must have at least a bachelor's degree and must be working toward a teaching license in the area they want to teach. For more, see Bien, 2022.

> *I looked online at what [Ivy Tech] offered, and then [after] just listening and talking to the physician I work with, I just went in and said, "I want to start with this." You know, see where this informatics takes me, and if it takes me a different route, I'll take a different route, but it was kind of my starting point not knowing too much about IT.*

This participant, like many in our sample, did not get their information from one place or person, they pulled together information from various sources, though the sources varied depending on the participant. When asked where they got most of their information about IT occupations, another student exemplified this toggling attitude when he described getting his information "here and there. Picking it up a little bit everywhere," further elaborating that social connections and media were influential and that, in the end, "It's all been pieced together." Toggling between different sources proved to be an essential part of the information-gathering step of the decision-making process for many of the participants in the sample. The way that these sources confirm or even contradict each other helped participants feel more confident about their program and career choices.

Patterns in Decision Status Over Time

During each longitudinal interview, students were assessed for how certain they were of their current educational and career decisions. For example, if a student had declared a program or decided on a career path, how sure of that declaration were they? In every interview, the strength of participants' educational program and career choice choices were recorded as "undecided," "decided but changing or unsure," or "decided and sure." This allowed us to track how confident participants felt about their decisions over time. Although technician programs are closely linked to career choice, students were assessed for education and career choices separately to capture any variance in their thinking about each pathway. Decision status is useful as a tool to gauge shifting patterns of thought about programs and career choice, but it should be interpreted cautiously.[16]

Certainty about program decisions decreased after exposure to all available program options but increased over time. Certainty about programs decreased between interview rounds one and two before trending back upward in round three to a slightly lower level than shown in the initial interviews. Data indicate that participants were generally not exposed to all IT program options when they first decided to enroll and that exposure to a wider array of options tended to decrease their program certainty. Once they completed entry-level courses and prerequisites, they gained information and narrowed their program options.[17] These students may have initially enrolled in a program such as computer science or cybersecurity because they were familiar with the terminology only to find those programs were not the best fit for them when they became aware of other program options. Many students in our sample indicated they learned about other IT program options only

16 It is important to note the changing sample size over the course of the three interview rounds. Although the calculations for certainty are based on an N of 26, the N size of participants decreased over time: Round 1: 26, Round 2: 25, Round 3: 18. Not all participants participated in all three rounds. Certainty is also based to some degree on interviewer inference; it is meant to be used as a tool for gauging decision status but is not a definitive metric.

17 Sixteen of the twenty-six participants switched majors or stopped out through the course of the study. Stopping out was thus more common than program persistence among our participants, but a few transitioned into a coding bootcamp or switched into a program outside the field of IT.

after participating in courses. This is likely a contributing factor in students' overall decreased program certainty between Years 1 and 2, and the uptick in program certainty by Year 3. When disaggregating the data, we can see that 70 percent of the sample ended up either increasing or maintaining their program certainty, whereas 31 percent decreased in program certainty.[18]

Participants with unrealistic expectations about IT careers became less certain of their decisions over time. Some participants ended the study less sure of their program and career decisions than when they began. This group had a few characteristics in common: they did not have accurate information or expectations about entry-level IT salaries when they enrolled in their program, and they became increasingly unsure of their decision when exposed to the variety of pathways within IT fields. Some participants began working in the field before realizing entry-level wages did not meet their salary needs or expectations, especially students who entered work in the field of ITSP, more commonly known as "IT helpdesk" or "IT support." Entry-level wages in this field are generally lower than in other IT fields.

One student in his early 30s at the time of his first interview went from being "decided and sure" of his program to "undecided" over the course of the study. He also transitioned from being "decided and changing" about his career to "decided and sure" before going back to "decided and changing" at the time of the last interview. As an IT-hobbyist, he felt sure of his decision to enroll in an ITSP program at first, but he became increasingly indecisive when he started working in IT support and realized that entry-level wages did not match his salary expectations. He was very unsure of whether or not he would continue to get more education at the time of his final interview. Careerwise, he was also somewhat indecisive by the end of the study. Though he was content in his role as a low voltage technician, he expressed that he still had a lingering desire to pursue IT networking.

Older, more experienced participants tended to keep their decisions unchanged. Over half of the sample showed no change in their program decision status over time, meaning that at the time of their last interview, they were no more or less sure about their decision than when they were first interviewed. Participants without a change in their decision status tended to be sure of their decisions at the beginning of the study and remain sure throughout. These participants tended to be older, with more work and/or educational experience, and were often extremely systematic in their decision-making process. They tended to be slower to make decisions overall, but once they made a decision, they tended to stay with it.

One example of this trend is a participant in her 40s who was extraordinarily sure of both her career and program decisions during each of her three interviews. She was a well-educated laboratory technician with multiple science-based bachelor's degrees pursuing IT to supplement her knowledge about the laboratory software packages she used. Though her path was winding. once she made decisions, she tended to stand behind them with confidence. During interviews she provided compelling evidence for her decisions, which were based on extensive research she had conducted over time. She said she was destined to be a "lab person," a belief that

18 This was calculated by counting numbers of sample participants that moved from Undecided status to Decided but Changing/Unsure or Decided and Sure status throughout the course of multiple interviews.

gave her confidence in both her career and program decisions. Perhaps part of the reason she was so certain about her decisions was her work experience, which gave her a wide base of career information to draw from while making decisions.

Increased career information caused participants to become more confident about their career decisions over time. Among the group as a whole, certainty about careers showed an increase over time. This is likely because students tended to gain more information about IT careers as they progressed through their educational programs. Faculty, for example, were a rich resource for students as they contemplated various career choices available to them, providing students with real-world insight as they selected and changed their majors to align with these options. Increased exposure to faculty also increased career exposure.

In addition, students gained confidence over time relative to seeking information; therefore they expanded their information-seeking and used relevant information to narrow their choices. Participants with work experience used their workplace, including supervisors and coworkers, as guides to increase their decision certainty over time. Another trend in the data was that nearly all participants with military experience spoke of some moment of clarity during their service that led to increased certainty in their career decisions.

An example of this phenomenon is found in one participant who became increasingly certain in both his career and program decisions throughout the course of the study. He was a gaming hobbyist who parlayed that experience into an IT career. He began his education in a general IT degree but later changed programs to networking. He was deployed to Jordan for a year during the study and returned with increased clarity on his decisions. He talked through how he refined his career decisions by self-examination of what he likes to do and consideration of what the respective jobs entail:

> *A lot of those* [*general IT*] *jobs are in call centers ...* [*you're*] *on a phone a lot, versus someone that actually goes into networking. They have a lot more hands-on activities, like being in a server room, actually going through designing topography and implementing it physically into buildings.*

As he gathered more career information, he was better able to sense what he did and did not want in a career, thus allowing him to make a more informed decision about what types of jobs to pursue.

Influential Factors in Decision-Making

What factors influence a student to make a decision can vary by age, socioeconomic status, stage of life, etc. However, several common trends were evident in study participants relative to influential factors leading to or otherwise impacting a decision. Students were often influenced to explore an IT career by engagement with an **IT-related hobby**; such students were often particularly well-suited to seize opportunities in IT. Participants were also influenced to varying degrees by their **social networks**—people that they connected with in their personal, academic, and professional lives—and by **institutional structures** as they navigated education and career decisions. **Workplace experiences** like internships and jobs influenced students as they selected a career pathway. In addition , **career-matching considerations** like ability/self-efficacy, enjoyment, and outcome expectations played a role in students' decision-making processes.

IT Hobbies and Early IT Interest

One of the most significant trends among the factors that influenced student decision-making in the sample was the prominence of IT-related hobbies and early interest in IT. These hobbies included programming, running video game servers, PC-building, and more. Participant interest in IT was often sparked at a young age, and many participants described a moment of epiphany in which they realized that their personal interest could be a career pathway—a moment our team dubbed the "hobby-to-career reckoning." These hobbies, at times, could give students an edge in classes and career opportunities in a way that influenced the decisions they made about education and career pathways.

Having an IT-related hobby helped participants seize opportunities. Participants in our sample who were previously involved in IT-related hobbies such as programming or video gaming seemed better able than their non-IT-hobbyist peers to seize the IT-related opportunities afforded to them, even if they had no professional IT experience. These results imply that early IT interests may be helpful in advancing students more quickly through IT education later in life. Some students in the sample were similarly granted the chance to explore IT prior to program enrollment, in this case through cross-training in an IT-adjacent workplace role . For example, one student was working in a non-IT role at a nonprofit when she started a project that involved data input and was instructed to work on it in the IT office. While in the IT office, she began having conversations with the IT specialists; that experience sparked an interest in IT that led to her decision to enroll in the Ivy Tech IT program. When asked if she had any previous interest in the program, she said, "No I did not. None at all." At the time of her final interview, she was slowly but surely working her way through the ITSP coursework, though she mentioned in both interviews that she struggled with retention due in part to her schedule, her limited background knowledge, and cognitive limitations from a previous stroke.

Students with IT-related hobbies and early interest in IT are good candidates for IT education and careers. Common among most of our participants was an early interest in IT and an IT-related hobby. Most students discussed in detail the first time they were exposed to IT or computers and what that experience meant to them. For most, this early interest led to an IT-related hobby they maintained over time, which helped them build practical skills and knowledge that they could utilize later both in the classroom and in the workplace. Educational institutions, faculty, and staff should assess students for their early interests and ask about hobbies to tailor information to their experience and abilities . Developing partnerships with local high school IT-related clubs such as robotics, gaming, or coding could create additional pipelines of students well-suited to IT education and careers.

Social Networks

People instrumental in helping participants make specific decisions regarding their education and careers generally fell into one of three categories: personal, academic, or professional connections. These different types of connections tended to guide students' decision-making processes in different ways.

Personal Connections

Personal connections within a student's social network were very important to participants when making program and career decisions. Personal connections included students' friends and family members; they often helped participants select a career field or an institution or connected them to an internship or workplace. When students discussed where they felt they had received information most directly related to specific decisions they had made about their IT education or careers, most spoke of information or advice that came from personal contacts. Most students mentioned one to three key people that helped them make specific choices, and many discussed using these connections as a "sounding board" to help them talk through options and make decisions. Participants described their personal connections as informal advisors, expressing a sense that those individuals had valuable insight into their own personality and skills. For example, one student explained that his sister saw that he should be in the IT field before he did:

> *Well, actually, my sister had pushed* [*me*]*, saying "you need to go into computers, you love computers, and it's a great field." And I remember pushing back at her and saying that "*[*a bachelor's degree in*] *business is a solid degree, and if I don't like the field, I can always get a job somewhere else." And in hindsight it was the most ridiculous argument.*

He reiterated these sentiments in the second round of interviews:

> *I didn't consider myself good enough for IT work until my sister reminded me* [*that*] *I'm really good at it. She kept nudging me toward, you know, saying "You don't like math, you don't like these things." I don't.* [*I like*] *math, but not sitting around* [*doing*] *accounting. Which is probably what I would have been doing.*

Another participant mentioned that his brother was extremely influential in his career and education decision-making process, saying,

> *My brother is a very free-spirited person. And I always ask him for opinions, as he is way more a "go with the flow" type. And so that helps me because I am a very logistical person when it comes to making job decisions. And so it's just good to get the opposite dynamic.*

One student said that his cousin worked in IT and influenced him to some degree: "He would ask me to come to his work and ask me to help with some stuff. I was able to learn some stuff from him about the different majors."

For many, the choice to begin or return to school was made with the help of family members, including spouses, siblings, cousins, and others. One participant, for example, was heavily influenced by his wife to pursue IT educational programs. When discussing his educational path and choices he made about attending college, he said,

> *I guess I have to give some credit to my wife. So, before I did the boot camp, before I even went to Ivy Tech, I was just working in an Amazon warehouse. And, you know, I don't have a college degree, and I've got a child, and I'm not exactly—I'm not old, but I'm not young—and I just didn't think I could transition into a professional career. I just didn't really feel like it was possible. And I guess it was her encouragement—or insistence—that convinced me that it was worth trying. Yeah, without that personal support network I'd still be moving boxes now, for sure.*

Several participants reported having a family member or partner who alerted them about job opportunities at their own workplaces. For example, one participant explained, "Well, actually, my current job—my sister was working there. So I mean, she was definitely a huge influence on [me receiving] it." Another participant said he found out about his current job because "I just have a girlfriend that works for the same company that helped me know they were hiring." The support, guidance, and connections provided by students' families proved to be essential to their decision to enter careers in IT.

Personal connections seemed to be particularly influential in the school-choice process of our participants. Many students mentioned that family or friends had recommended that they attend Ivy Tech. One student moved from overseas to attend Ivy Tech at the recommendation of friends, saying, "I chose Ivy Tech specifically because their tuition was not expensive, and they have good programs from what I heard from other friends. So basically, one of my friends told me about Ivy Tech, and I decided to go there because of the tuition." Other participants were guided by friends toward certain IT pathways, such as one participant who reported, "A family friend turned me on to the advanced automation program at Ivy Tech, robotics and programming and stuff." One participant exemplifies several of these themes; he was heavily influenced by his wife to pursue more education and was guided onto a particular pathway by a close friend. About his wife's significant influence on his educational decisions, he said "I think my wife definitely influenced me to go ahead and go with [attending] school." He also said that, once he decided to go back to school, he was further advised by his roommate to pursue a degree in cybersecurity:

> *I was moving, and my roommate, a friend, was coming back from the military, and he was ready to enroll in school, and the military was paying for it. And he was telling me about his program, and it was cybersecurity. And he told me it didn't require calculus. I thought I had to have calculus for any of the computer programs. He told me he met with an advisor, and he was telling me about all the courses he could take. And I was like "this sounds really good." So, I went with that.*

Whether it was encouraging the participant to enroll in a program, return to school, pursue IT, or choose a particular specialty, personal contacts proved to be vitally important to the decision-making process of many members of this sample.

Academic/Institutional Connections

Academic/institutional connections within participants' social networks helped them connect their career interests with an educational pathway. Academic connections were people such as faculty members, advisors, or other staff our participants made contact with at an educational institution. These contacts often helped our participants develop specific academic and career plans by helping them narrow down what specific area of IT they should focus on, providing academic advice (scheduling, courseload, requirements, etc.) and suggesting specific career paths. For example, one student discussed how an instructor was instrumental in helping them choose between two different IT programs:

> *One of my teachers, actually, I had talked back and forth with them about [choosing between] software development or computer science. And they definitely were helpful in me figuring that out for myself; they gave me some pointers about which career fields might be more linked to which degree. And that definitely influenced my choice.*

Another student echoed this, discussing how important an instructor's opinion was in his choice to switch from Ivy Tech's computer science program into the school's software development program:

> *I was talking to one of the professors. We were talking a lot about computer science and software* [*development degrees*] *and other things in the IT department. I felt like* [*both*] *computer science and software development were perfect for me and what I like.*

This student's instructor helped him develop a plan to pursue both interests: he ended up pursuing an associate's degree in software development and planned to pursue a bachelor's degree in computer science later. At the time of the third interview, he was taking a break from schooling after earning the associate's in software development but was looking to enroll in a bachelor's degree in computer science in the near future.

Professional Connections

Professional connections within a participant's social network had a considerable impact on students' decision-making, regardless of age. These connections included bosses, managers, coworkers, or other people who participants met in the workplace; they often served as mentors and helped students decide whether to pursue further education or higher-level roles within the workplace or field . Many participants mentioned they had a mentor-mentee type of relationship with a manager, supervisor, or business owner whom they met in the workplace. These relationships often proved to be beneficial to students and helped guide their decisions in significant ways. Workplace peers did not seem nearly as influential on their decision-making process as superiors; most influential connections involved a mentorship dynamic between the student and a boss or manager. These connections tended to help our participants make decisions by showing them potential upward pathways within the workplace, encouraging them to pursue further education and giving them general career guidance. For example, one student said his manager helped him understand the process for promotions in his field and gave him advice about how to secure a position in his area of interest. Another said his boss helped him "outline a good pathway" to the certificates he wanted to receive. This workplace mentorship pattern can manifest in even more direct forms of influence. For example, one student mentioned that his boss "had created a second tier in our department because we grew so much." Eventually his employer offered him and another coworker "a pure project-based position," guiding him directly into a new, more advanced IT role. Promotions—both in title and hours—and role changes were common ways that managers influenced the career pathways of our participants, guiding them into or through the field of IT.

Institutional Structures

College structure and institutional influences played a role in participants' decision-making. Ivy Tech's School of IT is structured in such a way that students generally take one or two universal introductory courses during their first or second semester, regardless of the program they have chosen. These courses include an introduction to all Ivy Tech IT programs and careers, connecting educational and career pathways by explaining which IT programs lead to which careers. One student described the importance of this introductory course to their decision-making process:

> *It was during IvyT111 that my idea changed. Instead of it [being] "I am doing this because it makes me money," it was going to be "I am doing what I enjoy, and what I think my hobby is going to be, I should turn into a career."*

In addition to introductory courses, nearly all of Ivy Tech's campuses include an IT-specific advisor who is able to coach students relative to the various IT program options and course scheduling. General advisors at Ivy Tech (who may not be versed in IT program specifics) also regularly meet and communicate with IT faculty, which helps ensure advisors have accurate and up-to-date information about the IT programs and course offerings at the institution. And like many community colleges, Ivy Tech faculty often either currently work in the field or have previously worked in the field, increasing the amount of career-specific information and network resources students are exposed to. Many participants discussed conversations with faculty and advisors that influenced their program and career decisions. Participants were often guided through turning points—times of forced decision-making such as a job layoff or college graduation—by institutional faculty and staff.

Workplace Experiences

Workplace experiences proved to be very influential on the decision-making process of participants. Time spent in the workplace, be it through an internship, part-time job, family business, or other work endeavor, provided students with valuable information that they used to make decisions. Even in a non-IT workplace, participants could be exposed to IT-related work experiences, which also played a role in the decision-making process.

The information participants gathered from their own and others' experiences within the workplace had a major impact on their decision-making about education and careers. Workplace experiences included internships as well as temporary, part-, and full-time employment. Most participants were not working in IT prior to enrolling at Ivy Tech, but experiences they encountered in their non-IT workplaces led them to make decisions about pursuing education or careers in IT. One participant was taking IT courses to supplement a future engineering career. He had an influential experience doing multiple internships with a family business. The experience of working in two different engineering environments was essential to helping him choose between career paths :

> *I've had an interest [in engineering] since a young age. My grandfather owns a company in Southern Indiana. They do automotive lighting for trucks and trailers—semis and things like that. I took an internship with those guys after high school. But I guess before that, hanging around the office, around the engineers, gave me the kind of mindset of, you know, "This is where I could be if I worked hard." I was on the edge: "Do I want to do mechanical engineering? Do I want to do electrical?" And then I did an internship my first year in the mechanical engineering department ... and hated it. Absolutely hated it. So then the next summer I did an internship in the office with the electrical team, and I had a little lab station, and that's when I was like, "Okay this is exactly what I want to do." So I guess having the experience and having a good support system was the biggest influence on me.*

This student was able to drill into the specifics of which type of engineering he wanted to pursue based on these internships.

Even students who took internships in areas outside of their interests often found the workplace to be beneficial to their decision-making. A student who had moved to the United States only a few years prior to his interview had been able to get an internship through the college, but it was not in an area of interest to him. He discussed how he started the internship knowing it was not going to be ideal but found that it was "actually more enjoyable than I thought it would be, just because I was working with students with similar interests." Despite the fact that the internship did not neatly align with his specific IT interests, he was able to glean a lot from the experience. He enjoyed the work, and it gave him the opportunity to connect with like-minded peers, which proved to be valuable. Another student spoke about his high school internship:

> *I started doing graphic design for three years during high school. Then, [during] my senior internship, I ended up working with the IT director at my high school. I think that's when he first got me interested in broader things besides just graphics on the computer. They were setting up the Linux systems at the time. They were putting those in the English wing. I got to see, for the first time, an image being deployed to several computers at once. I think that was the original spark. That was almost 13 years ago.*

This student started a degree in IT support (ITSP), but after an overseas military deployment followed by an interstate move, he ended up at a college that did not offer ITSP, which led him to pursue a degree in networking.

IT is prevalent in a multitude of work environments, increasing exposure to the field for participants even when working in unrelated fields. IT has a space in a wider variety of workplaces than many other career pathways. Many of our participants, regardless of age, were able to discover or foster their interest in IT through an experience at a non-IT-based workplace. For example, one student was in a food service administration position but had the opportunity to work with databases through his job. He had a knack for the complicated user interface that many others lacked, and the experience helped him narrow his interests within the field of IT:

> *It was a food service administrative position where everything was computer-based. There were a lot of numbers that came into my office. It was sort of my job to make sense of all of that and log that into every database we had. I think what perplexed people in the past with that was that the user interface was not easy for most people; it's mainly text-based, and I think anyone who has worked in older computer systems might get it. I think they just wanted someone who was easily able to understand that system and all of the tweaks and problems that it had with internet connections and knowing how to clear the cache and things like that.*

This experience showed him how much he enjoyed working in IT, which, in part, inspired his decision to enroll in the Ivy Tech IT program. By the time of his final interview, he had switched from ITSP to networking but was on track to finish an IT degree. Workplace experiences often helped participants match their interests with the career pathways that were most appropriate for them.

Career-Matching Considerations

Participants had to juggle many considerations when choosing a program and career pathway. Many of these considerations had to do with how well they felt they "matched" with the IT careers within their choice set. These types of considerations fell into three main categories: belief in ability/self-efficacy, personal enjoyment, and anticipated career outcomes.

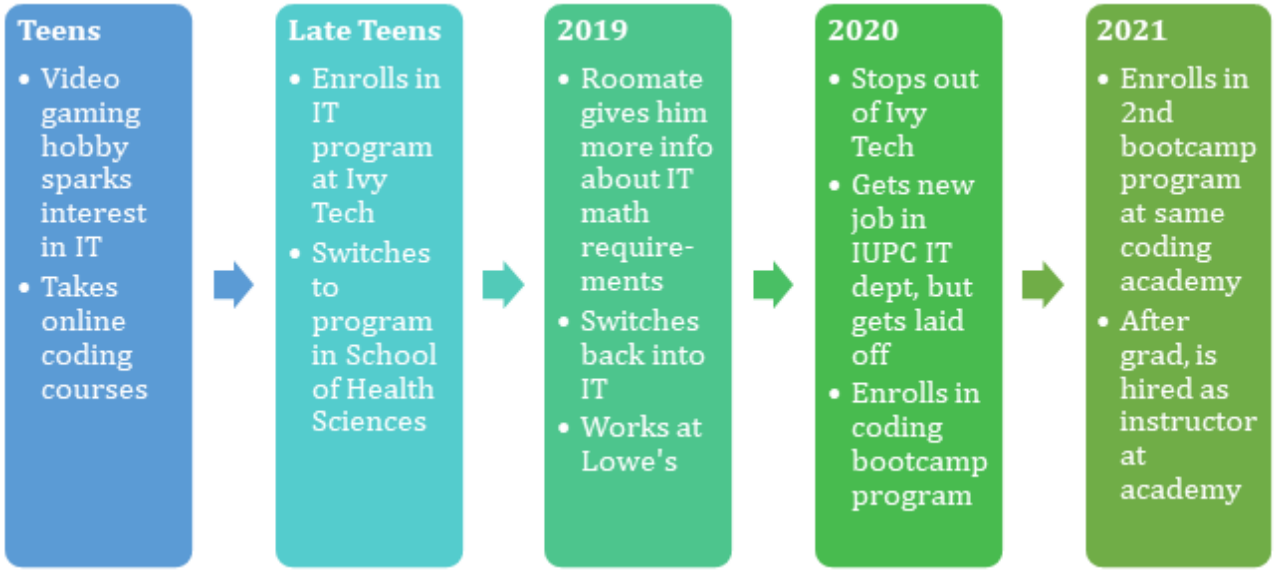
Belief in Ability/Self-Efficacy

Many participants were unsure of their ability to excel in postsecondary education. Many participants did not excel in high school and were insecure in their ability to succeed in college. One participant said, "I felt so scared in the beginning. ... I felt almost embarrassed to put myself out there." Additionally, many older students had been out of school for a long time and were hesitant to start again. Many participants struggled with the juxtaposition between feeling confident about the study material (IT) while at the same time feeling apprehensive about the educational process. Many students recounted failing and retaking courses. One said he struggled with "failing so many times" and " having a lot more shortcomings than I thought I would with this degree, failing and retaking so many classes." Some students moved in and out of IT programs as they searched for an educational pathway they could excel at. One such participant described this pattern:

> *Originally I was in the computer science program. And I was deterred from it because of the math requirements. I got all the way up to calculus, and I couldn't pass calculus. I tried two times, took it for two semesters, and I failed both times. ... Then kinesiology, and I lost my confidence, I guess. I was betting it all on computers when I went to school and didn't have a back-up plan.*

This student ultimately ended up in a coding bootcamp program, where he gained experience and confidence. He ended up getting hired as an instructor at the bootcamp that he had attended. His story is depicted in the flowchart in Figure 5.

Figure 5. Increased Self-Efficacy Gained from Experience: Student Example



Flowchart depicting one student's decision-making process. This student's educational and career journey were marked by the influence of personal connections and an iterative process of decision-making that was bolstered by workplace experience and a bootcamp.

With regard to their ability to succeed academically, most participants' confidence levels increased over time. Several spoke of earning high grades, joining honors programs, and of wanting to pursue additional education. For example, one student said: "Now I'm really enjoying it [school] again. I want to take my education as far as I can take it. Grad school? I would do that." Many participants expressed a high sense of self-efficacy in IT skills, specifically.

Most participants were confident in their ability to work in IT, which factored into their decision-making process. Across several theoretical perspectives, and evident in our sample, is the weighing of ability as a primary factor in students' decision-making about their education/career path. Internal questions such as *Am I good at it?, Can I do it?, and Can I see myself doing it?* weigh strongly in consideration of an individuals' career choice. Ability, personality, performance, and potential earnings are important factors in career selection.[19] Most students in our sample perceived themselves to be "good at doing computers," a phrase often repeated by many students. Many had hobbies or side-hustles such as building and hosting gaming servers, creating video games, or assisting family and friends with IT help and troubleshooting that helped increase their confidence.

The idea that people have a mental horizon for action inherently shaped by a social context is a bedrock of careership theory. Individuals are influenced by their social networks and cultural traditions, which can be updated through ongoing experiences but are difficult to dramatically change. Because individuals filter

19 For supporting materials, see discussions of person-environment fit (Holland, 1985, 1997; Judge and Kristof-Brown, 2004) and other human capital models as well as SCCT (Lent et al., 2000).

opportunities through these lenses, they impact how a person develops aspirations and hold preferences. Super (1980) argued that an individual's self-concept is a core organizing idea that influences decision-making within an individual's life course.[20] These concepts often presented themselves in interviews as participants considered education and careers in terms of "Is IT something for someone like me?" One student envisioned himself in an IT career because he saw his identity as very closely tied to IT:

> *Any time my computer goes down I fix it myself. I built my own system. All that just kind of comes naturally to me. I joke that I think in binary: all in ones and zeros. That's kind of how it is. I am very numbers oriented, not very visual. I can't remember a name for the life of me, but give me a string of numbers, and I'll remember it.*

While many of our participants described strong self-identification with IT and the world of computers, many also mentioned that they felt somewhat insecure in that identity, or that they felt a need to prove themselves and their IT skills. One participant expressed this as a feeling of being left behind or lesser than her peers:

> *Really the goal is to get that knowledge and experience that school provides, the university experience that allows my peers to shine in areas that I am not. … I think that really is my primary objective. To be able to continue to elevate myself and remain on the level of my peers.*

Some participants also reported the importance of certain experiences toward boosting their sense of self-efficacy, and, in turn, sparking career and employment decisions. One participant said,

> *My boyfriend recently switched jobs to one he loves. He went from working for GM to working with computers. I started helping him study for the A+ certification, and it reminded me of how much I liked working with computers. So I switched to IT.*

Upon reflection, she realized that she had served in this role in the past:

> *When I was in junior high, my dad also studied to fix computers. I helped him study for that as well. … Ever since, I have always been drawn to people who work with computers and [like to] pick their brain about it.*

These experiences shored up her sense of self-efficacy regarding the field of IT, especially when combined with her IT hobby. Many of our participants reported similar feelings, saying they had confidence in the knowledge they were "good at/with computers" and that it influenced their decisions about their education and career.

20 See Super, 1980.

Personal Enjoyment

Participants wanted to pursue a career they would enjoy. Whether or not a person believes a prospective career matches their personal interests and values is a critical element of decision-making. People tend to make decisions based on their preferences—what they like to do—as well as their own perceptions about their ability to perform the tasks. One participant in our sample exemplified this attitude:

> *My main goal is to work on something that brings me joy in life. I don't want to work a job that would make me depressed and not want to actually go to work. I feel like that's something that's been affecting my decision more and more now when it comes to career and education.*

Another student echoed this sentiment:

> *I want a career where I will be satisfied with everything that I am doing. … Something that is satisfying for me is something that makes me happy.* [*Where*] *I wake up in the morning, and I get to the office, and I have a deep sense of belonging.*

This student mentioned valuing career satisfaction about equally as much as being able to support and provide for his family. Participants seemed to focus on the concept of work/life balance when speaking of "enjoyment" rather than of simply liking IT. Both those students who pursued IT as a hobby and those who did not spoke of an IT career as something they would "enjoy" because of their perceptions of the work/life balance or the sense of belonging a career in the field would offer to them.

Anticipated Career Outcomes

Participants made decisions based on outcome expectations, especially potential earnings, often without verification. Considerations of "Will I earn enough?" often include the weighing of other factors, including time trade-offs. IT as a field is often considered to be a lucrative one, and many students believe they can begin making a very good salary in a short period of time by securing a short-term credential and entering the workforce. The belief that IT program completers could begin an entry-level position with above-average pay seemed to be common among participants; in many cases, this led to disillusionment as students gained information about potential careers in the field while moving through their various programs. In several cases, students entered jobs in the field only to subsequently leave them due to low starting wages. In other cases, students never took jobs in IT because the pay was higher at their non-IT job.

Turning Points

Certain turning points, or moments in time when an individual makes a key decision related to their career arc, emerged throughout our sample. Some participants experienced multiple turning points. The two most common turning points in the study were high school graduation and events related to the workforce.

High school graduation was a turning point for many participants. At this juncture, some participants had a clear vision for their future and had intentionally gathered information to make decisions about their postsecondary life. For example, one participant had wanted to go to medical school, which prompted her to

get a bachelor's degree in biology. Many, however, made decisions based purely on chance-based encounters, nonroutine events, very little information, or "whims." Examples include students who joined the military because they "got drunk" or needed to "straighten out," those who moved to a new town because they heard Ivy Tech was affordable (but had not researched or considered an educational path yet), and those who moved from state to state because they had planned to go to college out of state but "had to go back" when they discovered they would have to pay out-of-state tuition as a new resident.

Many students in the sample had only recently graduated from high school and found themselves forced to make decisions about whether to continue their education or join the workforce. Other, older students, upon reflecting on their past with the benefit of hindsight, recognized the transition out of high school as a key moment in their educational or career pathways and often wished they had taken a more systematic approach to their decision-making at that time. One participant, whose college experience was interrupted by various life and job events, talked about what they wish they had done differently when they reached the high school graduation turning point:

> *If I go way back, one of the things I really regret was not taking the SAT in high school. … That would have opened up my education opportunities a lot earlier in my life. … I had to overcome so many hurdles because of that. I could have already been done today.*

Other students echoed these sentiments, expressing regret about their earlier decisions and noting that they wished they had "tried harder"; these students often dismissed their choices with an offhand comment that "things had worked out" in the end, but still felt somewhat regretful that they had not been more systematically engaged during this critical time.

For many participants, the workplace was the setting of key turning points in their decision-making about educational programs and careers. Many things can happen in the workplace that spark a change in one's career or educational trajectory, such as getting laid off, being cross-trained, meeting an influential person, and discovering personal preferences.

The workplace can have a deterring effect—driving a participant away from certain programs or careers—or an attracting effect—driving a participant toward certain programs or careers. One participant described his extreme dissatisfaction with his current job as the impetus for his enrollment at Ivy Tech:

> *Right now I work in retail. I've worked there for five, six years. Worked my way up to management and realized, "You know what? I hate this. I need to do something else." I work with computers all day. I like them, so I decided, "Why not go into something with that?"*

This participant experienced a turning point when he became so disenchanted with his employment that he enrolled in an educational program—one he was still pursuing at the time of the final interview.

Cross-training within a non-IT setting was another way that workplaces provided participants with information about IT programs and careers. IT is a pervasive industry that plays a role within many types of employers, which

means that access to IT work and information about the field is readily available even to people employed in unrelated industries. Many of our participants had their IT interest piqued or encouraged by the opportunity to explore the area within their non-IT workplace. One participant explained how this happened to him:

> *I originally tried culinary school. That was something I figured out I'm not passionate about. Then I ended up getting into food service in the Army. And then I got into admin work when they discovered that I am actually really good with computers.*

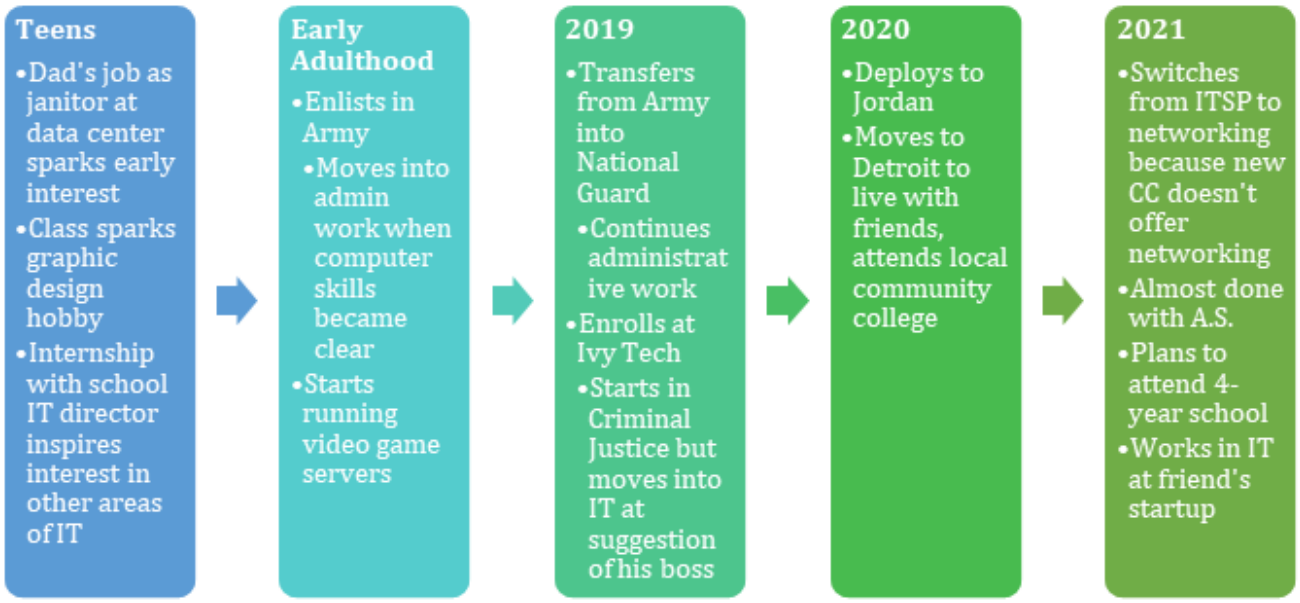
This set him on the path of enrolling in an IT program, which he had nearly completed at the time of his final interview. His decision-making pathway is outlined in Figure 6.

Another participant had a similar experience when he was exposed to an IT role at his Amazon warehouse job. This experience was formative for him, leading to his decision to enroll in an IT program at Ivy Tech:

> *I just worked at an Amazon warehouse. The data analyst was going on paternity leave. I ended up filling in for him. I just had a great time having a job where I was writing SQL queries and sitting on a chair instead of filling boxes. It was just really fun, and I was just like, "What am I doing? I have to go to school." That's why I enrolled.*

Though he stopped out of Ivy Tech, he completed a coding bootcamp with a training institution and secured a software engineering position with a prominent financial services company.

Figure 6. Workplace as Turning Point: Student Example



Flowchart depicting one student's decision-making process. This student had a longtime interest in IT that was sparked by visiting his father at work at a local data center. He had some formative experiences in high school and early adulthood that raised his interest in IT further. Ultimately, however, one of the strongest forces at play was the workplace, particularly when he was in the Army and was moved from food services into a computer-based administrative role after his computing talents were discovered.

Key Takeaways

There was a general learning process involved in decision-making that became evident in our sample: Students began with an early STEM identity beginning in elementary or middle school that they carried throughout their lives. At some point, they started seeking information about education and careers in IT. They started searching broadly, with open-source information (noninstitutional, nonroutine information sources such as job boards and Google). As they gained confidence in seeking and finding information, they began to ask more targeted questions and gather more information from coworkers, family members, or friends employed in IT. Students in this sample were also enrolled in an educational institution and so were able to seek information from institutional resources such as instructors and advisors. Younger students who recently graduated from high school or were just beginning to think about career options tended to seek information broadly and from multiple sources. In contrast, second-career, returning, and more mature students were more systematically engaged in decision-making, implying that their skills in seeking information relevant to them and their interests had improved over time.

Participants' choice sets were defined by a number of factors including local culture, family, social circles, financial status and opportunities, gender, and race/ethnicity, each of which played substantial roles in the decision-making of participants, regardless of age or maturity. Younger participants tended to yield to the opinions and desires of their parents and social circle, whereas older participants made decisions with spouses and children in mind.

Two of the most pervasive factors in decision-making evident in this sample were the early development of a STEM/IT identity and engagement with an IT-related hobby. Students tended to identify as "being tech-y" or "good with computers" and were driven by an intrinsic interest in and identification with IT. Almost all the participants had an interest in IT that was sparked before they graduated from high school. Most of the participants had IT-related hobbies, which included video gaming, independent study of IT, PC/console building, coding/programming, video game modification/development/server management, and providing technical assistance for friends and family who needed help with technology and artistic activities (e.g., photo/video editing, graphic design). While there were some students with an early IT interest but no IT hobby, all of the students with IT-related hobbies had an early-established interest in IT. Further analysis may reveal that early interest in IT and IT-related hobbies may be associated with having more persistence in IT educational programs, successful completion of IT educational programs, and success in IT careers. One of the biggest factors in stopping out of an IT program or abandoning the pursuit of an IT career for participants was the realization that an entry-level IT salary did not meet their expectations.

Recommendations for Practice

For community college technician programs, this study presents valuable information about where students seek information, how they process it, and what determines their choice set. It also presents insight into how and when students reconsider and revise their own decisions and how engaged they may be over time relative to decision-making. Community college technician program faculty and staff should use this information to inform resources and practices.

Keep institutional websites updated and engage potential students through online platforms. Students seek information online, especially in early stages of information-seeking. Although much of this online information is sourced through Google and job boards, students are also making use of institutional websites. Keeping websites and program/course information up-to-date and easy to understand is thus important. Posting career information and how careers link to programs/majors on institutional websites is helpful as well.

Increase general education about IT majors/programs and careers. Because the opinions and advice of students' family and social networks are key influences on their decision-making, it is important to ensure that accurate information is being broadly deployed. More education about all facets of IT education and careers is necessary. Institutions should participate in events, podcasts, advertising, and other modes of communication to share general information about IT careers and salaries as well as more specific information about available pathways and programs.

Because the workplace is a key source of IT education and career information, engage employers in student outreach and recruitment. There were three main ways in which experiences in the workplace helped participants make decisions about IT educational programs and career pathways. They drew influence from (1) cross-training in IT during their tenure at a non-IT focused workplace, (2) receiving mentorship from a coworker or superior, and (3) experiencing hands-on learning that helped them narrow down their interests. One potential way to connect more community college students to valuable work experiences is to identify local employers with cross-training needs for which IT students would be a good fit. Distributing program information to employers, visiting employer worksites, or engaging employers to reach potential students could all be beneficial to an institution.

Students with IT-related hobbies and early interest in IT are good candidates for IT education and careers. Common among most of our participants was an early interest in IT and engagement with an IT-related hobby. Most students discussed in detail the first time they were exposed to IT or computers and what that experience meant to them. For most, this early interest led to an IT-related hobby they maintained over time, giving them practical skills and knowledge that they were able to utilize both in the classroom and in the workplace. Educational institutions, faculty, and staff should assess students for their early interests and ask about hobbies to tailor information to those interests. Developing partnerships with local high school IT-related clubs (e.g., robotics, gaming, or coding) could create additional pipelines of students well-suited to IT education and careers.

Institutional staff should consider the age/maturity of students in terms of how and what information is provided. Younger students—those just out of high school—and those who have not yet entered the workforce have different information-seeking habits and fewer information sources available to

them compared with those who are older, already employed, or looking for a second career . Students in the study gained confidence and became more engaged and targeted in information-seeking over time and with maturity. They also weighed different factors as they became caregivers and spouses. Keeping this in mind in terms of how and what information is provided to students will help them find and use the information that is pertinent to their situation and level of engagement.

IT advisors and faculty should foster realistic expectations about entry-level IT salaries and earnings. Another common theme among study participants was unrealistic expectations about the financial rewards of IT careers, especially with regard to entry-level salaries. Many students were unable to take entry-level positions, especially in the field of ITSP, because they made more at their non-IT job. It is worth nothing that many of the students who became less certain over time about their decision to enter an IT career had initially reported unrealistic salary expectations. Understanding realistic salaries can help students make important decisions about their career.

IT advisors and faculty should educate students about career information as early and often as possible. Since trends in study data indicated that increased career information led to more career decision certainty, exposure to career information is important. Many students pointed to their introductory courses as valuable in providing career information. Another way students often said they received career information that helped them make informed decisions was by working with faculty and advisors.

Institutions should offer navigators or other support staff to help students increase their confidence and ability to succeed in postsecondary education. Many students in the study lacked confidence in their ability to be successful in postsecondary education, regardless of their confidence in their IT abilities. Most discussed gaining confidence over time, but some stopped out prior to experiencing academic success. In addition, although our sample was mostly homogeneous, a few students discussed being concerned that cultural differences related to coming from other countries would present barriers to success in their programs. Coaches and navigators are instrumental in fostering success in postsecondary education in an equitable way.

Institutions should consider offering mentorship opportunities, especially for women wishing to enter male-dominated fields such as IT. Faculty or alumni mentors, or women from local IT employers, can make excellent mentors for women entering IT-related programs. Although we did not have a large sample of women, those in our study seemed to benefit from women mentors.

Institutional staff should be aware that a major factor for students stopping out of an IT program or not pursuing an IT career is finances. Many students began an IT program at Ivy Tech because it was an affordable school option, and many were working while attending school. These students are at risk of stopping out due to scheduling constraints and financial hardships. Many students discussed not being able to pay for programs without working or expressed having to struggle to balance work and school. Ivy Tech has worked with the state to secure funding through initiatives such as Next Level Jobs Workforce Ready grants, which allow students to pursue in-demand jobs in the state, including IT positions. Institutional administrators and staff should consider tapping into state resources and leveraging grant funds to increase student stability.

Conclusion

This exploration of decision-making among students in IT programs at Ivy Tech Community College sheds light on the experiences and decision-making processes of community college technician students in general. Participants showed varying levels of engagement in information-seeking and decision-making styles that are connected to age and experience. Participants indicated that internet research and people in their lives (personal, workplace, and academic connections) influenced their decisions. Participants also indicated that various determinants—local culture, family responsibilities and expectations, social circles, financial status, and scholarships and grant requirements—constrained or supported their decision-making process in several ways. Influential personal factors like social connections, college structures, feelings of self-efficacy, enjoyment of work, and workplace experiences shaped their decisions about IT careers and education. IT-related hobbies and early IT interest also appeared to facilitate student decision-making and promote feelings of competence and efficacy in field-related skills. These are all valuable insights for institutional faculty, staff, and administrators considering policy and practice changes at a programmatic or institutional level.

Though this research focused specifically on the decision-making of Ivy Tech IT students, the findings from this work can guide us toward more comprehensive applications and avenues for further research. Students in the sample were navigating a meta-major of sorts, so this work may help shine a light on student decision-making within the context of the guided pathways reform movement. The student decision-making process within the meta-major context is very different from navigating the cafeteria model of the past. Most research on guided pathways, however, centers on institution-level efforts, faculty perceptions, and campus case studies.[21] The decision-making process that community college students engage within these pathways are not fully explored, though there is a limited amount of early research on the subject.[22] Overall, knowledge about student experiences and their thought process is limited and vague, and this work aims to help fill that gap. The more we know about how students navigate within meta-majors/pathways, the more we can do to promote student success.

This work also presents an opportunity to explore the way that meta-majors can expand students' perception of their potential career and academic opportunities. A common thread in this sample was the limited information participants received prior to enrollment about the variety of opportunities within the larger umbrella of IT, a horizon that often broadened after integration into the academic and social environment of the community college. Many participants began with a very narrow idea of what it means to "do computers," and their view was expanded over time, raising the question of whether similar decision-making processes occur in other community college–favored meta-majors such as allied health, nursing, or advanced manufacturing.

How do students navigate toward certain pathways, and how do they navigate within these pathways? How can we ensure that students have access to quality information about potential education and career opportunities? Do the decision-making tendencies of the IT students in this sample (e.g., hobby-to-career reckoning, focus on workplace experiences) resonate with students in other subject areas? These questions and others raised by this work are fertile ground for further research and are particularly important given the perennial community college issue of student attrition and the budgetary threats that loom over the higher education industry.

21 See, for example, Boehman et al. (2021); Rife & Conner (2017); Center for Community College Student Engagement (2020).

22 For example, see Fink (2017); Rinkenbaugh (2023); Madison (2022); Baker (2018).

References

Ahuja, M. (2002). Women in the information technology profession: A literature review, synthesis and research agenda. *European Journal of Information Systems*, *11*, 20–34. https://doi.org/10.1057/palgrave/ejis/3000417

Altreiter, C., & Flecker, J. (2020). 'I get money for what I like doing best': The class origin of young blue-collar workers and their commitment to work. *Work, Employment and Society, 34*(6), 1097–113.

Anderson, E. L., & Kim, D. (2006). Increasing the success of minority students in science and technology [Report]. *American Council on Education*. https://vtechworks.lib.vt.edu/handle/10919/86900

Arcidiacono, P., Hotz, V. J., & Kang, S. (2010). Modeling college major choices using elicited measures of expectations and counterfactuals [Working Paper Series, No. 15729]. *National Bureau of Economic Research.* https://doi.org/10.3386/w15729

Arcidiacono, P., Hotz, V. J., & Kang, S. (2012). Modeling college major choices using elicited measures of expectations and counterfactuals. *Journal of Econometrics, 166*(1), 3–16.

Armstrong, D. J., Nelms, J. E., Riemenschneider, C. K., & Reid, M. F. (2012). Revisiting the barriers facing women in information systems. *Journal of Computer Information Systems, 53*(2), 65-74.

Armstrong, D. J., Riemenschneider, C. K., & Giddens, L. G. (2018). The advancement and persistence of women in the information technology profession: An extension of Ahuja's gendered theory of IT career stages. *Information Systems Journal, 28*(6), 1082–1124. https://doi.org/10.1111/isj.12185

Ashton, D. (2010). Player, student, designer: Games design students and changing relationships with games. *Games and Culture, 5*(3), 256–77.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*(4), 297–308.

Bailey, T. R., Jaggars, S. S., & Jenkins, D. (2015). *Redesigning America's community colleges: A clearer path to student success.* Harvard University Press.

Baker, R. (2018). Understanding college students' major choices using social network analysis. *Research in Higher Education, 59*(2), 198–225. https://doi.org/10.1007/s11162-017-9463-1

Baker, R., Bettinger, E., Jacob, B., & Marinescu, I. (2018). The effect of labor market information on community college students' major choice. *Economics of Education Review, 65*, 18–30. https://doi.org/10.1016/j.econedurev.2018.05.005

Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55*(4), 485–540. JSTOR. https://doi.org/10.2307/1170245

Becker, G. S. (1994) *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago Press.

Beffy, M., Fougère, D., & Maurel, A. (2012). Choosing the field of study in postsecondary education: Do expected earnings matter? *The Review of Economics and Statistics, 94*(1), 334–47. https://doi.org/10.1162/REST_a_00212

Berger, M. C. (1988). Predicted future earnings and choice of college major. *Industrial and Labor Relations Review, 41*(3), 418–29.

Bettencourt, G. M. (2020). "When I think about working class, I think about people that work for what they have": How working-class students engage in meaning making about their social class identity. *Journal of College Student Development, 61*(2), 154–70.

Bien, K. (Reporter). (2022, September 26). Operation education: Schools use emergency permits amid teacher shortage [news report]. *WSBT22 News*. Sinclair Broadcast Group. https://wsbt.com/news/operation-education/operation-education-schools-use-emergency-permits-amid-teacher-shortage

Blume, G., Meza, E., Bragg, D., & Love, I. (2019). Estimating the impact of nation's largest single investment in community colleges. *New America*. http://newamerica.org/education-policy/reports/estimating-impact-taaccct/

Boehman, J., Eynon, B., de Goeas-Malone, M., Goodman, E., & Rogers-Cooper, J. (2021). Making learning matter: Building guided learning pathways at LaGuardia Community College. *International Journal of Teaching and Learning in Higher Education, 33*(1), 89–99.

Bourdieu, P. (1977). *Outline of a theory of practice* (R. Nice, Trans.) [Cambridge Studies in Social and Cultural Anthropology]. Cambridge University Press. https://doi.org/10.1017/CBO9780511812507

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513–31. https://doi.org/10.1037/0003-066X.32.7.513

Brown, S. D., & Lent, R. W. (2005). Career development and counseling: Putting theory and research to work. John Wiley & Sons.

Canché, M. S. G., D'Amico, M. M., Rios-Aguilar, C., & Salas, S. (2014). It's who you know: Leveraging social networks for college and careers. *Community College Enterprise, 20*(1), 17–34.

Carr, M., Ward, R., King, N., Goodson, S., & Robinson, S. J. (2013). 'Girls don't play video games': How gender identity in hobbies can affect career choice. In N. Webber & D. Riha (Eds.), *Exploring Videogames: Culture, Design and Identity* (pp. 123–32). Brill. https://doi.org/10.1163/9781848882409_014

Carrico, C., Matusovich, H. M., & Paretti, M. C. (2019). A qualitative analysis of career choice pathways of college-oriented rural central Appalachian high school students. *Journal of Career Development, 46*(2), 94–111.

Center for Community College Student Engagement. (2020). Building momentum: Using guided pathways to redesign the student experience. Austin, TX: The University of Texas at Austin, College of Education, Department of Educational Leadership and Policy, Program in Higher Education Leadership. https://cccse.org/sites/default/files/BuildingMomentum.pdf

Chase, M. M., Bensimon, E., & Robinson, J. (2021). The implementation of a large-scale pathway reform: How department chairs make sense of and navigate a pathway initiative in a community college. *Community College Journal of Research and Practice, 45*(9), 631–648. https://doi.org/10.1080/10668926.2020.1741476

Chen, C. (2019). *Rust Belt city revitalization: Estimating the effects of input stock on post-recession economic recovery of 51 Rust Belt cities* (Paper 1437) [Undergraduate Research Thesis, William & Mary]. https://scholarworks.wm.edu/honorstheses/1437

Chow, T. Y. (2023). Privileged but not in power: How Asian American tech workers use racial strategies to deflect and confront race and racism. *Qualitative Sociology, 46*(1), 129–152. https://doi.org/10.1007/s11133-022-09527-1

Croasdell, D., McLeod, A., & Simkin, M. G. (2011). Why don't more women major in information systems? *Information Technology & People, 24*(2), 158–83. https://doi.org/10.1108/09593841111137340

Cunnien, K. A., Martinrogers, N., & Mortimer, J. T. (2009). Adolescent work experience and self-efficacy. *The International journal of sociology and social policy, 29*(3/4), 164–175. https://doi.org/10.1108/01443330910947534

D'Amico, M. M., Canché, M. S. G., Rios-Aguilar, C., & Salas, S. (2019). An exploration of college and career alignment for community college students. *The Review of Higher Education, 43*(1), 53–83.

Demetry, D. (2017). Pop-up to professional: Emerging entrepreneurial identity and evolving vocabularies of motive. *Academy of Management Discoveries, 3*(2), 187–207.

Denner, J., Werner, L., & O'Connor, L. (2015). Women in community college: Factors related to intentions to pursue computer science. *NASPA Journal About Women in Higher Education, 8*(2), 156–71. https://doi.org/10.1080/19407882.2015.1057166

Dika, S. L., Green, C. S., Smith, A. C., Pando, M. A., Tempest, B. Q., & Foxx, K. A. (2020). Navigating support networks to reach the prize: Perceptions of success among engineering persisters of color. *Journal of Women and Minorities in Science and Engineering, 26*(6), 579–607. https://doi.org/10.1615/JWomenMinorScienEng.2020034024

Dougherty, K. J. (2023). Choice is not always good: Reducing the role of informational inequality in producing and legitimating higher education inequality (Working Paper No. 133). *Community College Research Center, Teachers College, Columbia University*.

Eide, S. (2017, October). Rust Belt cities and their burden of legacy costs. *Manhattan Institute*. https://media4.manhattan-institute.org/sites/default/files/R-SE-1017.pdf

Farrell, E. (2020). Researching lived experience in education: Misunderstood or missed opportunity? *International Journal of Qualitative Methods, 19*. https://doi.org/10.1177/1609406920942066

Fink, J. (2017). What do students think of guided pathways? [Research brief]. *Community College Research Center, Teachers College, Columbia University*. https://ccrc.tc.columbia.edu/publications/what-do-students-think-guided-pathways.html

Fouad, N. A., & Kantamneni, N. (2008). Contextual factors in vocational psychology: Intersections of individual, group and societal dimensions. In S. D. Brown and R. W. Lent (Eds.), *Handbook of Counseling Psychology, 4th ed.* (p. 408–25). John Wiley & Sons.

Francis, R. D. (2022). Movin' on up? The role of growing up rural in shaping why working-class men do—and don't—seek to improve their labor-market prospects. *RSF: The Russell Sage Foundation Journal of the Social Sciences, 8*(4), 68–86.

Fuller, K., Kvasny, L., Trauth, E. M., & Joshi, K. D. (2015, June). Understanding Career Choice of African American Men Majoring in Information Technology. In *Proceedings of the 2015 ACM SIGMIS Conference on Computers and People Research*, 41–48. https://doi.org/10.1145/2751957.2751961

Gottfredson, L. S. (1981). Circumscription and compromise: A developmental theory of occupational aspirations. *Journal of Counseling Psychology, 28*, 545–79. https://doi.org/10.1037/0022-0167.28.6.545

Gottfredson, L. (2002). Gottfredson's theory of circumscription, compromise, and self-creation. In D. Brown (Ed.), *Career Choice and Development* (pp. 85–148). Jossey-Bass.

Halpin, R. L. (1990). An application of the Tinto model to the analysis of freshman persistence in a community college. *Community College Review, 17*(4), 22–32. https://doi.org/10.1177/009155219001700405

Hawkins, R., & Paris, A. E. (1997). Computer literacy and computer use among college students: Differences in black and white. *The Journal of Negro Education, 66*(2), 147–158. https://doi.org/10.2307/2967224

Hewner, M., & Guzdial, M. (2008, September). Attitudes about computing in postsecondary graduates. In *ICER '08: Proceedings of the Fourth International Workshop on Computing Education Research* (pp. 71–78). https://doi.org/10.1145/1404520.1404528

Hodkinson, P., & Sparkes, A. C. (1997). Careership: A sociological theory of career decision making. *British Journal of Sociology of Education, 18*(1), 29–44.

Holland, J. L. (1997). *Making vocational choices: A theory of vocational personalities and work environments (3rd ed)*. Psychological Assessment Resources.

Holland, J. L. (1985). Making vocational choices: A theory of vocational personalities and work environments. *Prentice Hall*.

Huang, Y., Baruah, B., & Ward, T. (2020, 17–18 February). Does entrepreneurial motivation help build resilience and facilitate success in SMEs? A study of founder-entrepreneurs from high-tech software SMEs in China applied research. In *International Conference on Business & Interdisciplinary Studies (ARICBIS)* (pp. 17-18).

Indiana. (2019, November 6). Yalla count me in! https://yallacountmein.org/states/indiana

Jackson, L. A., Zhao, Y., Kolenic III, A., Fitzgerald, H. E., Harold, R., & Von Eye, A. (2008). Race, gender, and information technology use: The new digital divide. *Cyberpsychology & Behavior: The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society, 11*(4), 437–442. https://doi.org/10.1089/cpb.2007.0157

Jensen, R. (2010). The (perceived) returns to education and the demand for schooling. *Quarterly Journal of Economics, 125*(2), 515–48. https://doi.org/10.1162/qjec.2010.125.2.515

Jenkins, D., Brown, A. E., Fink, J., Lahr, H., & Yanagiura, T. (2018). Building guided pathways to community college student success: Promising practices and early evidence from Tennessee. *Community College Research Center, Teachers College, Columbia University.* https://eric.ed.gov/?id=ED588524

Judge, T. A., & Kristof-Brown, A. (2004). Personality, interactional psychology, and person-organization fit. In B. Schneider & D. B. Smith (Eds.), *Personality and organizations* (pp. 111–134). Lawrence Erlbaum Associates.

Kelly, R. R., & Hatcher, T. (2013). Decision-making self-efficacy and barriers in career decision making among community college students. *Community College Journal of Research and Practice, 37*(2), 103-113.

Korman, G. (1965). Americanization at the factory gate. *ILR Review, 18*(3), 396-419.

Krumboltz, J. D. (2009). The happenstance learning theory. *Journal of career assessment, 17*(2), 135-154. https://doi.org/10.1177/1069072708328861

Krumboltz, J. D. (1996). A learning theory of career counseling. *Handbook of Career Counseling Theory and Practice*, 55–80.

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

Lee, O., & Luykx, A. (2006). Science education and student diversity: Synthesis and research agenda. *Cambridge University Press.* https://doi.org/10.1017/CBO9780511617508

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of vocational behavior, 45*(1), 79-122. https://doi.org/10.1006/jvbe.1994.1027

Lent, R. W., Brown, S. D., & Hackett, G. (1996). Career development from a social cognitive perspective. In D. Brown, L. Brooks, & Associates, *Career choice and development* (3rd ed., pp. 373–421). San Francisco: Jossey-Bass.

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

Loo, R. (2000). A psychometric evaluation of the general decision-making style inventory. *Personality and individual differences, 29*(5), 895-905. https://doi.org/10.1016/S0191-8869(99)00241-X

Ma, Y. (2009). Family socioeconomic status, parental involvement, and college major choices—gender, race/ethnic, and nativity patterns. *Sociological Perspectives, 52*(2), 211-234. https://doi.org/10.1525/sop.2009.52.2.211

Ma, Y., & Liu, Y. (2015). Race and STEM degree attainment. *Sociology Compass, 9*(7), 609-618. https://doi.org/10.1111/soc4.12274

Madison Sr., C. Y. (2022). *An exploration of the experiences of students in a guided pathways model program* [PhD Thesis, Kansas State University].

Marco-Bujosa, L. M., Joy, L., & Sorrentino, R. (2021). Nevertheless, she persisted: A comparison of male and female experiences in community college STEM programs. *Community College Journal of Research and Practice, 45*(8), 541-559. https://doi.org/10.1080/10668926.2020.1727382

Margolis, J. (2010). *Stuck in the Shallow End: Education, Race, and Computing.* MIT Press.

McAlear, F., Scott, A., Scott, K., & Weiss, S. (2018). Women and girls of color in computing. Kapor Center/ASU CGEST.

McAlear, F., Scott, A., Scott, K., Burge, J., & Koshy, S. (2019, February). Women and girls of color in computing: exploring current trends, emerging opportunities, and strategies for meaningful impact. In *Proceedings of the 50th ACM Technical Symposium on Computer Science Education* (pp. 1225-1227). https://doi.org/10.1145/3287324.3287341

Messersmith, E. E., Garrett, J. L., Davis-Kean, P. E., Malanchuk, O., & Eccles, J. S. (2008). Career development from adolescence through emerging adulthood: Insights from information technology occupations. *Journal of Adolescent Research, 23*(2), 206-227. https://doi.org/10.1177/0743558407310723

Metcalf, H. E., Crenshaw, T. L., Chambers, E. W., & Heeren, C. (2018, February). Diversity across a decade: A case study on undergraduate computing culture at the University of Illinois. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education* (pp. 610-615). https://doi.org/10.1145/3159450.3159497

Meyer, S. (1980). Adapting the immigrant to the line: Americanization in the Ford factory, 1914-1921. *Journal of Social History, 14*(1), 67-82.

Morris, L. K., & Daniel, L. G. (2008). Perceptions of a chilly climate: Differences in traditional and non-traditional majors for women. *Research in Higher Education, 49*, 256-273. https://doi.org/10.1007/s11162-007-9078-z

Mossberger, K., Tolbert, C. J., & Gilbert, M. (2006). Race, place, and information technology. *Urban Affairs Review, 41*(5), 583-620. https://doi.org/10.1177/1078087405283511

Musoba, G. D., Jones, V. A., & Nicholas, T. (2018). From open door to limited access: Transfer students and the challenges of choosing a major. Journal of College Student Development, 59(6), 716-733.

Nadeem, R. (2021, April 1). *STEM jobs see uneven progress in increasing gender, racial and ethnic diversity.* Pew Research Center Science & Society. https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Naizer, G. L. (1993). Science and engineering professors: Why did they choose science as a career? *School Science and Mathematics, 93*(6), 321-321.

National Center for Science and Engineering Statistics. (2023). *Diversity and STEM: Women, minorities, and persons with disabilities 2023* (Special Report 23-315). National Science Foundation. https://ncses.nsf.gov/wmpd

Papastergiou, M. (2008). Are computer science and information technology still masculine fields? High school students' perceptions and career choices. *Computers & Education, 51*(2), 594–608. https://doi.org/10.1016/j.compedu.2007.06.009

Peterson, E. K., Van Noy, M., Scovill, S. & Edwards, R. (2023). *Not 'just a hobby': The influence of early interest and hobbies on community college IT student decision-making* [Manuscript in preparation].

Peterson, E. K., Scovill, S., & Van Noy, M. (2023). *Exploring Indiana's Workforce Ready Grants: How do short-term training grants impact student decision making?* Rutgers University, School of Management and Labor Relations, Education and Employment Research Center. https://smlr.rutgers.edu/sites/default/files/Documents/Centers/EERC/Exploring%20Indiana%27s%20Workforce%20Ready%20Grants%20_Ivy%20Tech%20ATE_EERC_Sept.%202023.pdf

Peterson, S. L. (1993). Career decision-making self-efficacy and institutional integration of underprepared college students. *Research in higher education, 34*, 659-685. https://doi.org/10.1007/BF00992155

Pottie-Sherman, Y. (2020). Rust and reinvention: Im/migration and urban change in the American Rust Belt. *Geography Compass, 14*(3), e12482. https://doi.org/10.1111/gec3.12482

Pulliam, N., Ieva, K. P., & Burlew, L. (2017). The relationship between perceived career barriers and career decision self-efficacy on initial career choice among low-income, first generation, pre-freshman, college-bound students. *Journal of College Access, 3*(2), 7.

Reay, D., Davies, J., David, M., & Ball, S. J. (2001). Choices of degree or degrees of choice? Class, 'race' and the higher education choice process. *Sociology, 35*(4), 855-874. https://doi.org/10.1017/S0038038501008550

Riegleo-Crumb, C., Moore, C., & Ramos-Wada, A. (2011). Who wants to have a career in science or math? Exploring adolescents' future aspirations by gender and race/ethnicity. *Science Education, 95*(3), 458-476. https://doi.org/10.1002/sce.20431

Rife, M. C., & Conner, C. (2017). Intentionally linking gateway-course transformation efforts with guided pathways. *New Directions for Higher Education, 2017*(180), 89-97. https://doi.org/10.1002/he.20264

Rinkenbaugh, H. M. (2023). *Student perceptions about the impact of guided pathways, faculty mentors, and the early alert system on academic success and degree completion at a midwestern community college* [PhD Thesis]. Baker University.

Ritzhaupt, A. D., Cheng, L., Luo, W., & Hohlfeld, T. N. (2020). The digital divide in formal educational settings: The past, present, and future relevance. In *Handbook of Research in Educational Communications and Technology: Learning Design* (pp. 483–504). Springer International Publishing. https://doi.org/10.1007/978-3-030-36119-8_23

Rocha, L., Canedo, E. D., Pereira, C. P., Bezerra, C., & Mendes, F. F. (2023, May). Investigating the Perceived Impact of Maternity on Software Engineering: a Women's Perspective. In *2023 IEEE/ACM 16th International Conference on Cooperative and Human Aspects of Software Engineering* (CHASE) (pp. 138-149). IEEE. https://doi.org/10.1109/CHASE58964.2023.00023

Sax, L. J., George, K., Harris, D., & Payton, F. C. (2020). Reframing the representation of black students in undergraduate computing. *Journal of Women and Minorities in Science and Engineering, 26*(4). https://doi.org/10.1615/JWomenMinorScienEng.2020028576

Scott, A. (2017). *Tech Leavers Study: A First-of-its-kind Analysis of why People Volunarily Left Jobs in Tech*. Kapor Center for Social Impact.

Scott-Clayton, J. (2011). *The shapeless river: Does a lack of structure inhibit students' progress at community colleges?* (Working Paper No. 25) [Assessment of Evidence Series]. Community College Research Center, Teachers College, Columbia University.

Scrivener, S., Weiss, M. J., Sommo, C., & Fresques, H. (2012). What can a multifaceted program do for community college students?: Early results from an evaluation of Accelerated Study in Associate Programs (ASAP) for developmental education students. MDRC. http://files.eric.ed.gov/fulltext/ED532840.pdf

Smith, S. M. (2005). The digital divide: Gender and racial differences in information technology education. *Information Technology, Learning, and Performance Journal, 23*(1), 13. Social Science Premium Collection.

Smith, E., & Green, A. (2005). *How workplace experiences while at school affect career pathways. A national vocational education and training research and evaluation program report*. National Centre for Vocational Education Research.

Somers, P., Haines, K., Keene, B., Bauer, J., Pfeiffer, M., McCluskey, J., Settle, J., & Sparks, B. (2006). Towards a theory of choice for community college students. *Community College Journal of Research and Practice, 30*(1), 53-67. https://doi.org/10.1080/10668920500248886

Speer, J. (2021). Bye Bye Ms. American Sci: Women and the leaky stem pipeline (SSRN Scholarly Paper 3913037). https://papers.ssrn.com/abstract=3913037

Strada Education Network & Gallup. (2017). Major influence: Where students get valued advice on what to study in college. https://news.gallup.com/reports/219236/major-influence-students-advice-study.aspx

Super, D. E. (1980). A life-span, life-space approach to career development. *Journal of vocational behavior, 16*(3), 282-298. https://doi.org/10.1016/0001-8791(80)90056-1

Tinto, V. (2012). *Leaving college: Rethinking the causes and cures of student attrition* (1st ed.). University of Chicago press.

Tyson, W., Lee, R., Borman, K. M., & Hanson, M. A. (2007). Science, technology, engineering, and mathematics (STEM) pathways: High school science and math coursework and postsecondary degree attainment. *Journal of Education for Students placed at risk, 12*(3), 243-270. https://doi.org/10.1080/10824660701601266

US Department of Education, National Center for Educational Statistics. (2021). Integrated Postsecondary Education Data System (IPEDS) (Completers) [dataset].

Wang, X. (2013). Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. *American Educational Research Journal, 50*(5), 1081-1121.

Wang, X. (2012). Factors contributing to the upward transfer of baccalaureate aspirants beginning at community colleges. The Journal of Higher Education, 83(6), 851-875.

Wang, X. (2009). Baccalaureate attainment and college persistence of community college transfer students at four-year institutions. *Research in Higher Education, 50,* 570-588.

Wang, X., Wang, Y., & Prevost, A. (2017). A researcher–practitioner partnership on remedial math contextualization in career and technical education programs. *New Directions for Community Colleges, 2017*(178), 23-34. https://doi.org/10.1002/cc.20250

Whiston, S. C., & Keller, B. K. (2004). The influences of the family of origin on career development: A review and analysis. *The counseling psychologist, 32*(4), 493-568. https://doi.org/10.1177/0011000004265660

Willis, R. J., & Rosen, S. (1979). Education and self-selection. *Journal of political Economy, 87*(5, Part 2), S7-S36.

Wilson, D., & Wouters, J. (2003). Spatiality and growth discourse: the restructuring of America's Rust Belt cities. *Journal of Urban Affairs, 25*(2), 123-138.

Winant, G. (2021). *The next shift: The fall of industry and the rise of health care in Rust Belt America*. Harvard University Press. http://ebookcentral.proquest.com/lib/rutgers-ebooks/detail.action?docID=6532315

Workman, J. L. (2015). Parental influence on exploratory students' college choice, major, and career decision making. *College Student Journal, 49*(1), 23-30.

Zarrett, N. R., & Malanchuk, O. (2005). Who's computing? Gender and race differences in young adults' decisions to pursue an information technology career. *New directions for child and adolescent development, 2005*(110), 65-84. https://doi.org/10.1002/cd.150

Zastrow, P., & Stoner, M. (2007). Mass appeal. *Community College Journal, 78*(2), 28. Social Science Premium Collection.

Zhai, L., & Monzon, R. (2001). Community college student retention: Student characteristics and withdrawal reasons. https://eric.ed.gov/?id=ED473676

Appendix A: Survey Sampling

Our team determined that procuring survey data from first- and third-semester students would provide a strong baseline for the initial survey. However, we wanted to avoid duplication in each set as much as possible. The first-semester students from all IT programs take many of the same introductory courses. These courses typically include Informatics Fundamentals (INFM 109) along with Hardware / Software Support (ITSP 135), Computing Logic (SDEV 120), and Introduction to Data Analytics (DBMS 110) . By the time students are in their third semester, they are specializing in their specific academic program.

We determined that the best way to reach a unique cohort of first-year students was to distribute the survey to INFM 109 students in the classroom, believing that participation would be highest if students took the survey during class time. As mentioned, third-semester students typically enroll in courses specific to their program, so we believed it was possible to choose classes in which to administer the survey that would likely have very little overlap in population with other advanced courses or with those who took the survey in INFM 109. For example, it would be unusual for a student to enroll in both an advanced software development course and an advanced cybersecurity or networking course at the same time. Students in some of the following courses were given the survey: Network Protocol Analysis (CSIA 210), Software Development Using C# (SDEV 240), Routing and Switching (NETI 115), and Mobile/Wireless Computing Support (ITSP 215).

When provided with the survey, students were reminded that they should not duplicate submissions if they had already taken this survey.

Appendix B: Interview Protocol I

Consent:

Introduction: Name, demographic information, etc.

What program are you currently enrolled in?

How sure are you of your program choice?

Thinking back to when you chose your current program…

Were you undecided about your educational path before you started your program (or are you still undecided)?

What were important influences on your enrollment in this program? Probe: advisors, faculty, other students?

Who or what would you say was the most important information source for your program decisions?

Why? What TYPES of information has most helped you make program decisions?

How much did you know about program/course requirements when you chose your program? How confident do you feel that you know your program's requirements? (if confident) What would you say helped you feel so confident? (if not confident) Why not? Are there any program requirements you are not confident about? Why?

How did you select your courses?

How important to you is the ability to transfer to a bachelor's degree program? What do you know about transfer options? How did you find out this information?

- How did this influence your decision about programs?

When you first enrolled in your program, did you have a good idea of what math you would be required to take? Where did you learn that information? If not, when did you learn about the math requirements?

- How did this influence your decision about your programs?
- How do you feel about your ability to complete your program's math requirements?

What impact would you say the pandemic had on your decision to attend school? On your program choice? (Probe: Did you think about program selection or pursuing education any differently because of the pandemic?)

Are your classes remote or in-person (given the pandemic)? If remote, how do you feel about taking remote classes? Would you have chosen online/remote courses if given the choice?

Explain how your advising experience took place (was it remote? In person?). How do you think advising may have been different because of the pandemic?

In your introduction course(s), have you learned anything about your strengths and weaknesses in IT that has helped you make career decisions? Have you learned anything about potential careers in IT that has informed your thinking? Did you re-think any of your decisions based on your introductory classes?

Thinking back to when you first enrolled in Ivy Tech…

When you first enrolled, did you enroll in the School of IT, or a different program (did you switch programs or return to Ivy Tech for this program)?

- If you switched programs, explain that experience and what helped you choose to change your program?

What were your interests? How clear do you think your program choice was when you first came to Ivy Tech? Did you know exactly what you wanted to do, or did you just have a "ballpark" idea?

Have you met with a general advisor? How helpful would you say this meeting was?

Have you met with a faculty advisor (instructor)? How helpful would you say this meeting was?

Thinking back to high school…

What did you want your career to be? How has that changed if at all? PROBE: IT-related?

What was your favorite participant? Your least favorite participant? Which did you do well in? Did you study IT in high school?

What were your interests outside of school? Did they change? Why/why not?

Was there any event, person, or time period during high school that helped form your career/program decisions? PROBE: teachers, friends, family

Were you dual enrolled or in the ASAP or other program? If yes, did this influence how you chose your Ivy Tech program/career?

Work experience & Hobbies…

Are you currently working?

- If you are currently working, how has the pandemic impacted your job responsibilities? Has your work schedule or job responsibilities changed at all because of the pandemic?

Have your job responsibilities impacted your ability to attend school? Has this changed at all because of the pandemic?

Have you been laid off because of the pandemic? If so, how did this impact your decision to return to school?

What (other) work experience have you had? PROBE: any in IT? Which did you like? Which did you not like?

- Did that position influence your current program/career choices? How so?

What hobbies have you had? PROBE: IT-related?

Career decisions…

What do you feel are important factors in selecting a career? PROBE: earnings potential; ability or desire to do the work; match of your personality to career; skills and abilities; support of family/friends

Did you have clear ideas about IT occupations before you came to Ivy Tech?

Who or what would you say was the most important information source for your career decisions? Why? Probe: What TYPES of information has most helped you make career decisions? Information from family and friends? From groups/clubs/social media? Available job opportunities or job openings?

- Other? How was that information different from information you received from the school website or from school advisors?

Have you chosen a career? Has your career choice changed over time? Why? What influenced you to change your mind? Were you undecided about your career path before you started your program (or are you still undecided)? Did it change after you met with an advisor? What about after meeting with a faculty advisor (instructor)?

Are you thinking about your career differently now than pre-pandemic? How so?

Have you had conversations with faculty or a general advisor about career options since the pandemic began? If so, how are you reaching them (email, Zoom, phone)? Is this during class time or outside of class time?

How do you think the pandemic has affected your career options overall? (probe: are there more or fewer employers hiring do you think? Do you think you can find work in your area? Are you thinking of looking outside your area now?)

General

What are your short-term and long-term educational goals? What are your short-term and long-term career goals?

What interests you most about IT programs and courses? Does or did anyone in your family work in IT?

Are you or have you been Pell eligible?

Did either of your parents graduate from college?

Overall, how would you say the pandemic has impacted your decision-making about education and careers?

Other

Is there anything else about your decision-making processes you would like to share with me?

Appendix C: Interview Protocol II: May 2021

Thank for participating in this interview as part of a larger study to evaluate how students make decisions about programs at Ivy Tech Community College and what career to enter as part of a National Science Foundation grant-funded research study. Your participation in this study is voluntary. You may refuse to answer any questions with which you are not comfortable, and you may withdraw from the study at any time (your decision to participate will not impact your access to college resources or services). There are no risks or harms. The interview should take 30-45 minutes. This study is confidential. All data collected will be securely stored, and only researchers conducting this study will have access to it. Your individual answers will not be shared or given to your instructor. Only the Rutgers' research team will be allowed to see the data, except as may be required by law. If a report of this study is published or the results are presented at a professional conference, only group results will be reported. No one at your college will ever know who answered the questions.

This interview is meant to be an update for anything that's changed over the past year, and to consider how the pandemic may have impacted your decision-making about your education or career.

GENERAL

The last time we talked, you _____ (were enrolled in xx program, had just completed xx program, had completed your program and started working at xx, etc.—review previous interview for information). Give me an update as to any changes over the last year.

EDUCATION

Are you enrolled in an education program at this time? At Ivy Tech, or elsewhere?

- If so, have you changed programs/majors? What is the new program and why did you change? What influences did you have on your new program choice? (Friends, family, advisors, faculty members, employer, etc.)

Did you go to other schools? If so, what were they and why did you change schools?

Have you completed any industry credentials over the last year? What were they?

What are your educational goals? If not in school currently, are you planning to return to school? If in school currently, are you planning to continue? Bachelor's/Masters/beyond?

WORK

Are you currently working? (If appropriate--Are you working at the same job you were working at last year? Review material)

- IF YES, in the IT industry?
- If yes—did you get the type of job you were hoping for? (If you didn't get the type of job you were looking for, why do you think you did not?)

How did you choose what type of job you wanted to go into (your career)? How did you choose what jobs you applied for? (local, salary, job type, remote, etc.?)

Do you see yourself in this job in 5 years? 10 years? Longer?

- IF the job is new from last year: What was your job search like? Did anyone help you?

Did you change your mind at all about your career from last year to now? If so, what were those changes? What do you think influenced those changes?

Is there anything about your job that is different than you thought it would be?

- IF NO, are you currently looking for work? In the IT industry? How long have you been looking?

Why do you think you haven't found anything yet?

Did you change your mind about what kind of job you wanted? If so, what were those changes?

SOCIAL STRUCTURE

When making decisions about your career, have your family or friends thoughts about careers influenced your decisions at all? If so, how?

- If job situation/career situation has changed: Did anyone help you in deciding what jobs to apply for or what career you wanted?

Did you use any personal contacts in securing your job?

Did you use any college services in searching for your job? If so, were these helpful or not? Were there services which could have been of help in job/career searching which were not offered or if offered, could have been of better help? If you received services which helped, what were they?

Have other responsibilities in your personal life influenced your career decision-making? (probe: do you have caregiving responsibilities that influence your decisions?)

When making decisions about your career, has considerations about how you might fit in to the social environment of the field been a factor in your decision-making?

INSTITUTIONAL STRUCTURE

(If new career/job since last year) Did anyone at Ivy Tech help you make career choices or decisions?

(If new career/job) How well do you think your program/classes prepared you for your career? What do you think helped you the most? The least? Did you receive any help from faculty, your department chair, the career services center, or advisors when looking for a career?

If you were to go back in time and change anything about your education path, what would it be? What knowledge did you not have that you wish you would have had?

Were there any moments in school that you feel helped shape your current career path? If so, what were those?

DECISION-MAKING

Do you think how you approach decisions has changed at all over the last year? (Do you wait to see what opportunities emerge, do you research all possible opportunities, do you think about your own personal enjoyment, etc.?)

Do you think you have changed your mind about what you feel are important factors in selecting a career? PROBE: earnings potential; ability or desire to do the work; match of your personality to career; skills and abilities; support of family/friends

Have your ideas about IT careers changed at all over the last year? If yes, how so?

PANDEMIC

Are you thinking about your career differently now than pre-pandemic? How so?

How do you think the pandemic has affected your career options overall? (probe: are there more or fewer employers hiring do you think? Do you think you can find work in your area? Are you thinking of looking outside your area now?)

Have you had conversations with faculty or a general advisor about career options since the pandemic began? If so, how are you reaching them (email, Zoom, phone)? How beneficial do you feel these discussions have been?

If you are currently working, how has the pandemic impacted your job responsibilities? Has your work schedule or job responsibilities changed at all because of the pandemic?

Have your job responsibilities impacted your ability to attend school? Has this changed at all because of the pandemic?

Have you been laid off because of the pandemic? If so, how did this impact your decision-making?

Have you considered/are you considering additional education because of the pandemic, or did you put on hold any further education because of the pandemic?

Has the pandemic affected other responsibilities in your life in ways that impact decision-making about education and careers? (probe: have your caregiving responsibilities changed or increased at all because of the pandemic?)

Overall, how would you say the pandemic has impacted your decision-making about education and careers?

OTHER

Is there anything else about your decision-making processes you would like to share with me?

Appendix D: Case Study Template

Coding framework

Student general characteristics

Timing of interview	
Major/Program	
Campus	
Gender	
Race/ethnicity	
Age	
SES	

Major/program & career decisions

Dependent variables

Decision scale	**Undecided (U)**	**Decided but changing or unsure (DC)**	**Decided and sure (DS)**
Interview #1 (Program)			
(Career)			
Interview #2 (Program)			
(Career)			
Interview #3 (Program)			
(Career)			

Key independent variables

Code each category throughout based on whether it pertains to program/major or career, or both depending on the respondent.

Influences

Distinguish between institutional and individual; distinguish between routine and nonroutine.

Influences	Influence	Institutional/Individual	Routine/Nonroutine
Key Information			
Key Experiences			
Key People/Encounters			

Weighting Factors

Factor	Comment
Earnings/Outcome expectations	
Skills, ability/Self-efficacy	
Enjoyment/Interest	
Credits	
Learning style	

Intervening Variables

Individual attributes

Attribute	Comment
Engagement (part of or emergent from habitus)	
Social context/social determinants	
Physical ability/disability & emotional or mental ability/disability	
Resources/opportunities	
Access to IT (computer, internet)	

Institutional Environment

	Comment
Policies & practices- high school and college / equity	
Resources/opportunities- high school and college: Capital	

Other

Key turning points

Turning Point	Time Period (Pre-high school, High school, College, Post-College, Workforce)	Self-Directed/External	Individual/Institutional

Hobby-to-career reckoning

About

The Education and Employment Research Center

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

EERC Areas of Focus

Community College Innovation

Student Choices and Pathways

STEM and Technician Education

Noncredit Education and Non-Degree Credentials

Education and Labor Market Connections

Rutgers' School of Management and Labor Relations

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

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

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