College Persistence: Sociocultural Factors and Early College Minority Students’ Pursuit of 4-Year STEM Degrees

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College access for racially minoritized students in the United States has improved since the 1970s; yet, significant gaps exist in college completion rates, namely, for students who identify as African American or Latino, when compared with White students (Snyder & Dillow, 2012). Moreover, U.S. policymakers and non-governmental organizations, such as the National Governors Association (2013) and the Bill and Melinda Gates Foundation (2009), have advocated for improved college readiness and persistence of racially minoritized students, particularly in the areas of Science, Technology, Engineering, and Math (STEM). Yet, college persistence to graduation remains a problem for both African American and Latino college students at four-year institutions (National Center for Education Statistics [NCES], 2015a).

For the past decade, U.S. policymakers have expressed an urgency to increase the number of U.S. students who study STEM (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2011; National Math and Science Initiative [NMSI], 2012; National Science Board, 2012; Schneider, Judy, & Mazuca, 2012). According to NMSI (2012) and the National Science Board ([NSB], 2012), although community colleges provide opportunities for STEM training, attainment of a four-year college degree guarantees greater preparation and employability to meet the U.S. STEM crisis. Educational attainment in STEM is a central focus in measures of college persistence and degree attainment (NCES, 2015b; NMSI, 2012; NSB, 2012). The STEM persistence gap between White college students and non-White college students also has been a growing con-
cern (NCES, 2015b). For African American and Latino students in pursuit of a STEM degree, college enrollment and persistence is another growing concern, with most students not persisting beyond their second or third year of college (Adelman, 2006). To equalize opportunities, African American and Latino college students must be exposed to and participate in programs that focus on both academic and social preparation (Hanley & Noblit, 2009).

Early College High Schools

As one way to address college preparedness and persistence in the areas of STEM, U.S. high schools are increasingly partnering with community colleges to create a pipeline of students who represent traditionally marginalized racial and ethnic minority groups and are highly academically prepared to persist to college graduation (Cellini, 2006; A. D. Greene, 2008). These partnerships often are called Early College High Schools (ECHSs) and are characterized by high school public collaboration with a local college or university, but most frequently a community college. Students enrolled in an ECHS program typically can earn both a high school diploma and an associate’s (two-year) degree, or up to two years of credit toward a bachelor’s degree (Webb, 2004). Enrollment in an ECHS rarely exceeds 400 students (i.e., 100 per grade level) and many programs focus on preparing students to study STEM in college (Webb, 2004).

The ECHS model also has been offered as a model that prepares students to navigate college in both cognitive and non-cognitive ways (A. Berger, Adelman, & Cole, 2010). Early College High Schools emphasize STEM curriculum, while also providing means to acquire college credit. African American and Latino students largely comprise ECHS student enrollment. It has been established that students who attend ECHS must satisfy certain academic pre-requisites (i.e., high state test scores, strong course grade averages, and teacher recommendations) in order to secure attendance at these high schools. With regard to college persistence of ECHS students to college, a 2014 study by the organization Jobs For the Future revealed that less than 50% of these students persist to four-year institutions (Webb & Gerwin, 2014). Conversely, in the same report, second-year college student persistence was 13 percentage points higher than the national average (Webb & Gerwin, 2014). Although this was a noteworthy finding in the report, there was no discussion of the particular factors that contributed to the college persistence of ECHS students. Some researchers suggest that students who attend ECHS often are first-generation, college-going students and might lack the social and cultural capital necessary to transition effectively from high school to college (Avilés-Reyes, 2007; Ramsey-White, 2012).

College Persistence

Racially minoritized college students face challenges to college access that are surmounted by barriers to degree completion (Adelman, 2006; Lloyd, Tienda, & Zajacova, 2001). Scholars who research college persistence emphasize one or more of the following four categories of individual barriers: (a) cognitive abilities (Murtaugh, Burns, & Shuster, 1999; Reason, 2009; Tross, Harper, Osher, & Kneidinger, 2000); (b) motivation and self-efficacy (Bandura, 1997; Davidson & Beck, 2006; Solberg et al., 1998); (c) student engagement (Alemán, 1997; Astin, 1993; Kuh, 1993; Tinto, 1975); and (d) student-faculty mentoring relationships (Allen & Ebb, 2007; Pascalella & Terenzini, 1980; Tinto, 1975).

The notion of what qualifies a student as college ready has shifted over the past 20 years, and now comprises both cognitive (academic) and non-cognitive (non-academic) factors (Byrd & Macdonald, 2005; Conley, 2007; 2012; Karp & Bork, 2012). Likewise, Mazzeo, Fleischman, Heppen, and Jahangir (2016) posited that postsecondary success was strongly influenced by factors beyond that of rigorous academic preparation alone. Increased academic ability has been identified as one of many factors that can contribute to a student persisting from high school to college (Dougherty & Kienzl, 2006; Tinto, 2012). As suggested by Bourdieu (1973) and Gordon (1999), culture-based factors and factors associated with an individual’s or family’s socioeconomic status (SES) are largely influential in determining a student’s academic and enduring future success. Reid and Moore (2008) urged K-12 and higher education professionals to attempt to understand students’ college-going knowledge and aspirations to identify students’ social and cultural capital developmental needs in supporting their college persistence and degree completion. Knowledge of a student’s first-generation college student status and socio-economic background often provide insights into the disadvantages that students might face (Reid & Moore, 2008). For many students, transcending disadvantages is difficult and relates to disconnections in academic/career expectations, college readiness and planning, family support, and the financial resources required to persist in college (Chen, 2005; Choy, 2001).
Although much of the focus on college persistence has been on academic or cognitive factors that impact persistence, researchers have suggested that non-cognitive factors impacting persistence are equally important (see Byrd & Macdonald, 2005; Conley, 2007; Karp & Bork, 2012; Mazzeo et al., 2016). Educational researchers who study college persistence suggest that non-cognitive factors such as a student’s social and cultural capital are equal to cognitive abilities for successful degree completion (Bush & Lawson Bush, 2010; Cejda & Hoover, 2010; Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012; Jett, 2013; Museus & Quaye, 2009; Schreiner, Noel, Anderson, & Cantwell, 2011). Furthermore, personal appropriation of sociocultural capital is as important as is the institutional accessibility and transference of this capital from institutional agents to the students that they serve (Bush & Lawson Bush, 2010; Cejda & Hoover, 2010; Gasiewski et al., 2012; Jett, 2013; Museus & Quaye, 2009; Schreiner et al., 2011). Ricks (2009), whose research built on the works of Bourdieu (1973) and Coleman (1988), suggested that sociocultural capital consists of non-cognitive factors that can either expand or contract a student’s ability to persist in college.

Limited research is available on the effectiveness of ECHS programs in preparing students who are African American and Latino to persist to graduation as STEM majors in college. Moreover, beyond persistence data, more studies are needed to identify sociocultural factors that might support the persistence of minoritized college students who attended ECHS high schools and study STEM in college. This was the motivation for the current study.

Conceptual Framework

Ricks’s (2009) sociocultural capital conceptual framework informed this study. Her framework combines the seminal work of Pierre Bourdieu (1973), who focuses on an individual’s social and cultural capital, and Edmund Gordon (1999), who extended Bourdieu’s theory to emphasize an individual’s human resource capital. In building on the work of these researchers, Ricks (2009) examined the impact of sociocultural capital on college student matriculation, and identified particular types of sociocultural capital used by college students that might affect college matriculation. Specifically, Ricks (2009) used a case study approach to explore the persistence of African American college students as impacted by social and cultural capital. Furthermore, in Ricks’s study, a particular emphasis was placed on class structure and social inequality and the reproduction of each by society. Moreover, also useful from Ricks’s study was the examination of the influence of differences in the possession of cultural capital of college students and the influence of habitus (i.e., the orientation to cultural resources) in the acquisition of capital. Related to this, the persistence of college students as a function of the role of cultural capital, or the cultural background, life knowledge, dispositions and abilities transferred from parents to their children, also was investigated. In particular, Ricks’s model illustrates: (a) the impact of sociocultural capital, (b) the influence of this capital on college student persistence, (c) the types of sociocultural capital used by college students, and (d) the effects of the use of this capital on college persistence. Additionally, Ricks (2009) proposed that the concept of sociocultural capital can be used to help students of color identify complex forms of capital, traverse and move beyond the auspice of social reproduction, avoid assumed deficiencies, and develop the kind of habitus necessary to persist in higher education. Figure 1 outlines the connection of seminal social and cultural capital research to that of Ricks’s (2009) sociocultural capital conceptual model. Figure 2 shows how Ricks’s sociocultural capital conceptual model was used to examine the persistence of former ECHS student STEM majors.

Methodological Framework

Collins, Onwuegbuzie, and Sutton’s (2006) mixed methods research process was used to guide the methodological decisions conducted in this study. As conceptualized by these authors and displayed in Figure 2, mixed methods research involves a three-stage, 13-step process that is both interactive and recursive. The utilization of the steps within these stages assists the researcher to formulate, to plan, and to implement a mixed methods research study that directs the researcher’s decisions toward a more rigorous research approach (Leech, Collins, Jiao, & Onwuegbuzie, 2011). Additionally, employing the 13-step process helped to ensure that quality inferences were drawn from both the quantitative and qualitative aspects of the research study and that these inferences established a foundation from which triangulation of the study resulted.
Step 1: Mixed Goal of the Study

As pointed out by Newman, Ridenour, Newman, and DeMarco (2003), thoughtful consideration must be given to the goals of the research that best assist researchers in identifying the most suitable methods by which to answer the research question(s). As such, the following eight goals were employed for this study: (a) predict, (b) add to the base of knowledge, (c) have multi-faceted impact, (d) understand complex phenomena, (e) test new ideas, (f) generate new ideas, (g) inform constituencies, and (h) examine the past. The goal of this research was to gain knowledge about sociocultural factors related to the successful persistence of African American and Latino STEM majors who attended ECHSs. However, a paucity of research remains available to K-12 and higher education leaders to improve the development and implementation of policy promoting persistence of these students. Consequently, the major goal of this study was to add to the scarcity of research and contribute to the present knowledge base.
Stage 1: Foundation
  Step 1: Determining the mixed goal of the study
  Step 2: Formulating the mixed research objective(s)
  Step 3: Determining the rationale of the study and the rationale(s) for mixing quantitative and qualitative approaches
  Step 4: Determining the purpose of the study and the purpose(s) for mixing quantitative and qualitative approaches
  Step 5: Determining the mixed research question(s)

Stage 2: Planning
  Step 6: Selecting the mixed sampling design
  Step 7: Selecting the mixed research design

Stage 3: Implementation
  Step 8: Collecting quantitative and/or qualitative data
  Step 9: Analyzing the quantitative and/or qualitative data using quantitative and/or qualitative analysis techniques
  Step 10: Validating/legitimating the mixed research findings
  Step 11: Interpreting the mixed research findings
  Step 12: Writing the mixed research report
  Step 13: Reforming the mixed research question.


Step 2: Mixed Research Objective

Because the application of Collins et al.’s (2006) 13-step process is fluid and recursive, more than one research paradigm can be utilized to determine the research objective(s) of a study. For this mixed methods research study, Johnson and Christensen’s (2012) typology of five major research objectives (i.e., exploration, description, explanation, prediction, and influence) was used to inform the selection of objectives for this study. Of these objectives, two were utilized to describe and to explain the phenomena under study: (a) description, which refers to describing the features, aspects, and nuances of the phenomenon being studied; and (b) explanation, which refers to illustrating the manner and reason(s) for which the phenomenon being studied exists as it does.

Step 3: Purpose of Study and Mixing Rationale

Although much work has been conducted in the area of college persistence, there is a scarcity of research regarding the influence of these factors on the college persistence of former ECHS students who pursue STEM degrees. In the beginning stages of conducting this research, few studies existed that examined the impact of social and/or cultural capital on the success of Early College students. Social and cultural factors such as the utilization of personal social and cultural capital amassed prior to college, and the acquisition of institutional capital, polity capital, and personal capital, once in college, have been identified to influence the persistence of African American and Latino students (Bush & Lawson Bush, 2010; Cejda & Hoover, 2010; Gasiewski et al., 2012; Jett, 2013; Museus & Quaye, 2009; Schreiner et al., 2011). Of these researchers who conducted studies examining the impact of social and/or cultural capital on the success of ECHS students, findings from Avilés-Reyes’s (2007) qualitative case study highlighted the importance of teacher training focused on improving Early College students’ funds of knowledge (i.e., social capital, cultural capital, and support systems). Connectedly, Brooks’s (2011) qualitative case study revealed that strong student-teacher relationships are essential in the transmission of college-going capital and in the growth of Early College student habitus.

With regard to the research preceding this study, although social and cultural capital was identified as being strongly influential in the preparation of Early College students for the four-year college setting, particular concern was expressed with the limited alignment between high school course experiences and the academic demands of college courses (Ramsey-White, 2012). Moreover, teacher and peer networks were revealed strongly to influence college choice (Núñez & Bowers, 2011) and increased student social capital was revealed to strengthen ECHS student intent to major in the STEM areas (St. Pierre, 2014).

Moreover, much of what researchers have used to define persistence has rested on some of the more familiar sociocultural concepts noted to impact persistence such as student engagement, academic mentorship, rapport with institutional and departmental agents, the support of friends and family, parents’ education, and
high school background. Furthermore, Pascarella, Smart, and Ethington (1986) pointed out that it is this “preponderance of research” (p. 47) that creates a lack of cohesion in the support for or development of any definition that might offer to explain this widely studied concept. However, with regard to STEM student persistence, a number of researchers have found that there is a substantial outflow of STEM majors from STEM fields by the end of the first year of college (Alting & Walser, 2007; Eagan, Hurtado, & Chang, 2010; Seymour & Hewitt, 2000).

Given the vastness of the literature and absence of a generally accepted definition of persistence, it was determined for the purpose of this study that college persistence would be defined as a college student moving toward degree completion with two or more years of continued enrollment as a STEM major. Thus, the purpose of this sequential mixed methods research study was to examine sociocultural factors related to the successful persistence of African American and Latino students who attended ECHS and were STEM majors in four-year institutions. A mixed methods research approach was deemed the most appropriate way quantitatively to examine college persistence, while also eliciting student perceptions of sociocultural factors that supported their college success in STEM at four-year universities. It was hoped that findings from this study would be useful to ECHS educators, policymakers, higher education leaders and advisors, and STEM majors.

The rationale for conducting this mixed methods research study was participant enrichment (i.e., optimizing the sample) and significance enhancement (i.e., enhancing data interpretation) (Collins et al., 2006). Participant enrichment occurred by selecting for the qualitative phase nine members from the quantitative phase. Further, significance enhancement occurred by collecting, analyzing, and interpreting both quantitative data and qualitative data, which yielded thick and rich data (Geertz, 1973).

**Step 4: Mixing Purpose**

According to J. C. Greene, Caracelli, and Graham (1989), in light of the ever expanding repertoire of evaluation methods and tools, it is important to identify the purpose of employing a mixed methods research approach. J. C. Greene et al. (1989) identified five purposes for mixing quantitative and qualitative data: triangulation (i.e., compare findings from the quantitative data with the qualitative findings), complementarity (i.e., seek elaboration, enhancement, explanation, and clarification of the findings from one analytical components [e.g., quantitative] with results from the other analytical components [e.g., qualitative]), development (i.e., use the results from one analytical phase to help inform the other analytical phase), initiation (i.e., identify paradoxes and contradictions that emerge when findings from the two analytical components are compared that might lead to a re-framing of the research question), and expansion (i.e., expand breadth and range of a study by using multiple analytical components for different study phases). The purpose of utilizing a mixed methods research approach for the current study was two-fold: (a) to increase understanding of the phenomena being studied by detecting its existence and gathering further details (i.e., complementarity; J. C. Greene et al., 1989), and (b) to expand the range of inquiry, so as appropriately to answer the research questions (i.e., expansion; J. C. Greene et al., 1989).

**Step 5: Mixed Research Questions**

Using Plano Clark and Badiee’s (2010) typology, the research question in this study represented combination research questions, which involves at least one mixed methods question combined with separate quantitative and qualitative questions. Specifically, the following research questions were addressed:

**Quantitative research question.** The following qualitative research question was addressed:

1) What college persistence factors are related to the level of persistence of African American and Latino STEM majors who attended ECHS and who have continued in college for two or more years?

**Qualitative research questions.** The following qualitative research questions were addressed:

2) What are the perceptions of African American and Latino students who attended ECHS and are STEM majors regarding the sociocultural factors that contributed to their persistence in a four-year institution?
3) To what extent do these students believe that their experiences attending Early College High Schools contributed to their social and cultural capital?

**Mixed methods research questions.** The following qualitative research questions were addressed:

4) What is the prevalence of perceived social and cultural capital factors that influence college persistence of students who formerly attended ECHS and are currently STEM majors?
5) How do select student perceptions relate to the resultant predictors on the College Persistence Questionnaire?
Method

Context of the Study

The general setting for this study was four-year state universities in Texas. Specifically, the study context comprised 13 four-year institutions of higher education that ranged in size from medium (i.e., 3,711 students) to large (i.e., 50,950 students). Additionally, the characteristics for the collective case of postsecondary schools included both urban (i.e., highly residential) and rural (i.e., primarily nonresidential) institutions, and schools ranged in basic classification from RI—Doctoral Universities of Highest Research to M3—Small Master’s Colleges and Universities (The Carnegie Classification of Institutions of Higher Education, 2016).

Step 6: Mixed Sampling Design

For the purposes of the study, a purposive sampling scheme was used (Patton, 1990). In particular, a criterion sampling scheme and extreme case sampling scheme (Miles & Huberman, 1994) were used to select the four-year universities: large, medium, and small public and private institutions from which participants were identified to participate in the sample. Overall, the mixed methods sampling design involved a sequential design using nested samples for the qualitative and quantitative components of the study (Onwuegbuzie & Collins, 2007). The quantitative and qualitative data were collected sequentially, with the quantitative data collected before the qualitative data, and the participants for the qualitative phase were a subset of the participants from the quantitative phase. For the quantitative phase of the study, criterion sampling was used to identify participants. Specifically, participants were selected using the following criteria: (a) self-identified as African American or Latino, (b) had matriculated to a four-year college setting, (c) were formerly enrolled in an Early College High School, and (d) were declared Mathematics and Science majors. The qualitative phase of the study involved the use of extreme case sampling to determine participants from the quantitative phase for two rounds of focus group interviews. Figure 3 illustrates the nested sampling design utilized.

Participants

A total of 83 students completed the survey for the quantitative phase. Of these 83 students, 59 met the participation criteria, from which 50 sets of survey responses were used because nine of the participants had missing or incomplete survey data for the particular scale factors being analyzed. A figure outlining the demographics of the 50 survey participants are included in Figure 4.

Utilizing GPower 3.1, and taking into consideration the number of variables/factors (i.e., 3) utilized for the multiple linear regression analysis, it was determined that a sample size of 55 participants was needed to detect a moderate $R^2$ (i.e., $f^2 = .20$) using a two-tailed test with .80 power at a 5% level of statistical significance (cf. Faul, Erdfelder, Lang, & Buchner, 2007). Thus, the final sample size of 50 for the quantitative phase yielded an a priori power of .72. The participants’ ages ranged from 18 years (15.3%) to 23 years (3.4%), with most students’ ages falling in the range of 20 to 22 years (42.5%). The majority of participants were women (59.3%).

The ethnic composition was as follows: Latino participants (84.7%) and African American participants (15.3%). In addition, approximately two thirds (67.8%) of participants were STEM majors. Those categorized as non-STEM majors (32.2%) had entered college as STEM majors, but, subsequent to the study being conducted, they had elected during the semester to change major to a non-STEM area. The overwhelming majority of participants (91.5%) attended public four-year postsecondary institutions, and more than 86% of participants received financial aid.

The qualitative phase of the study, as noted previously, extreme case sampling was utilized (Miles & Huberman, 1994). More specifically, participants were selected for the second phase of the study based on their questionnaire scores in one factor area, Institutional Commitment. Only those students with scores placing them in the upper and lower quartiles were invited to participate in focus group interviews in order to solicit more in-depth perspectives on their college experiences. A total of nine students participated in two rounds of two focus groups, yielding a total of four focus groups. Guest, Namey, and McKenna (2017) recently provided empirical evidence that more than 80% of all themes can be extracted within two to three focus groups and 90% can be extracted within three to six focus groups, thereby supporting the decision to conduct four focus groups. The name, Group Illuminate, represented those participants ($n = 6$) who were selected for their upper quartile survey scores, whereas the name Group Resilience represented those participants ($n = 3$) who were selected for their scores in the lower quartile of survey participants. As such, Group Illuminate represented a
traditional focus group because the number of participants ranged between the recommended six and 12 members (Baumgartner, Strong, & Hensley, 2002; Bernard, 1995; Johnson & Christensen, 2014; Krueger & Casey, 2000; Langford, Schoenfeld, & Izzo, 2002; Morgan, 1997; Onwuegbuzie, Dickinson, Leech, & Zoran, 2009, 2010; Onwuegbuzie, McAlister-Shields, Dickerson, & Denham, in press), whereas Group Resilience represented what is called a “mini-focus group” (Krueger, 1994, p. 17) because the number of participants ranged between three (Morgan, 1997) and four (Krueger, 1994).

Figure 3. Illustration of sequential nested sampling design being utilized.

Step 7: Mixed Research Design

A fully mixed sequential equal-status mixed methods research design was employed (Leech & Onwuegbuzie, 2009). As pointed out by Leech and Onwuegbuzie (2009), a fully mixed methods research design is the most robust of the mixed methods research approaches. This design involves conducting a study that mixes or combines qualitative and quantitative research within one or more of, or across the stages of the research process. In this study, the quantitative and qualitative phases occur sequentially, with both elements being given approximately equal weight (Leech & Onwuegbuzie, 2009). The quantitative phase involved the use of a correlation research design (Johnson & Christensen, 2012) to address Research Question 1. Further, because the qual-
itative phase attempted to shed light on the impact of social and cultural capital on STEM major persistence, a collective case study design was utilized (Stake, 2005). With respect to research philosophy, we adopted a dialectical pluralist stance (Johnson, 2012, 2017), wherein we incorporated multiple epistemological perspectives (i.e., postpositivism [Phillips & Burbules, 2000] and social constructionism [P. L. Berger & Luckmann, 1967]) within the same inquiry.

<table>
<thead>
<tr>
<th>Participant Demographics</th>
<th>Percentage</th>
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<tr>
<td><strong>Age</strong></td>
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<tr>
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<tr>
<td>19</td>
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<td>Male</td>
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<tr>
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Figure 4. Demographics of survey participants.

Step 8: Mixed Data Collection

Davidson, Beck, and Grisaffe’s (2015) College Persistence Questionnaire (CPQ-V2) is a 32-item questionnaire that was administered to student participants in the quantitative phase of this mixed methods research study. This scale was selected based on Davidson et al.’s (2015) focus on the importance and influence of non-cognitive factors in contributing to a student’s ability to persist through college. The College Persistence Questionnaire consists of the following 10 subscales: (a) institutional commitment, (b) academic integration, (c) financial strain, (d) social integration, (e) scholastic conscientiousness, (f) motivation to learn, (g) degree commitment, (h) collegiate stress, (i) advising effectiveness, and (j) academic efficacy. Furthermore, three additional variables (i.e., financial strain, scholastic conscientiousness, and motivation to learn) served as control variables. The response options for the remaining eight subscales range from -6 to 6. Of the 32 items, 20 are regularly scored, whereas 12 represent reverse-scored items. Davidson et al. (2015) identified scores from three subscales (i.e., academic integration, social integration, and degree commitment) as having a direct effect on intuitional commitment, and three additional variables (i.e., advising effectiveness, academic efficacy, and collegiate stress) to have an indirect effect on institutional commitment. Thus, for the purposes of the present study, only the subscales that have a direct effect on intuitional commitment were analyzed, namely, academic integration, social integration, and degree commitment, alongside the institutional commitment subscale.

After completing the College Persistence Scale (Quantitative Phase), participants who scored in the upper and lower quartiles were asked to participate in semi-structured focus group interviews (Morgan, 2002) (Qual-
Itative Phase). In addition to the focus group interviews, member checking (Manning, 1997), debriefing inter-
views (Onwuegbuzie, Leech, & Collins, 2008), and a subjectivity journal (Lincoln & Guba, 1985) were utilized to
enhance trustworthiness and credibility.

With regard to the mixed methods research phase of the study, the software, QDA Miner 4.4.21 was utilized
to quantitize (cf. Miles & Huberman, 1994; Onwuegbuzie & Teddlie, 2003; Sandelowski, Voils, & Knafl, 2009;
Tashakkori & Teddlie, 1998) the focus group data. A mixed research matrix was used to triangulate study data. Throughout the study, several strategies were taken by the researchers to minimize threats to internal validity and external validity of the quantitative findings (Onwuegbuzie, 2003), threats to internal credibility and ex-
ternal credibility of the qualitative findings (Onwuegbuzie & Leech, 2007), and threats to legitimation of the mixed methods findings (Onwuegbuzie & Johnson, 2006).

Step 9: Mixed Data Analysis

Figure 5 delineates the data analysis approaches used in this study. It can be seen from this figure that the data
analysis comprised a quantitative data analysis phase, a qualitative data analysis phase, and a mixed data
analysis phase. Furthermore, the overall data analysis was guided by Onwuegbuzie and Teddlie’s (2003) seven-
stage process of mixed methods data analysis. For the purposes of this study, the following five steps were
used: (a) data reduction (e.g., exploratory analysis for qualitative data and the use of descriptive statistics for
quantitative data), (b) data display (e.g., matrices, charts and Venn diagrams for qualitative data; tables and
graphs for quantitative data), (c) data transformation (e.g., quantitizing qualitative data and qualitizing quanti-
tative data), (d) data correlation (e.g., relating quantitative data to qualitative data and vice versa), and
(e) data comparison (e.g., evaluating and relating data from different data sources).

Figure 5. Description of collection and analysis methods used.

**Quantitative data analysis phase.** Descriptive statistics (i.e., central tendency, measures of variability, skew-
ness and kurtosis) were obtained from the following students’ demographic information: (a) gender,
(b) race/ethnicity, (c) major, (d) classification, (e) parents’ educational attainment, and (f) persistence scale
data. Scores from the three selected College Persistence Questionnaire subscales (i.e., academic integration,
degree commitment, and social integration) served as independent variables, representing sociocultural capi-
tal. In addition, scores from the institutional commitment subscale of the College Persistence Questionnaire
served as the dependent variable and was operationalized as college persistence. As such, a multiple linear
regression analysis (Thompson, 2004) was conducted to assess the degree to which the independent variables
(i.e., academic integration, degree commitment, and social integration) were related to the dependent variable institutional commitment. Specifically, an all possible subsets (APS) multiple linear regression analysis (Onwuegbuzie & Daniel, 2003) was used to identify an optimal combination of factors related to persistence. This technique involves examining all possible models involving some or all of the independent variables; that is, separate regressions are computed for all independent variables singly, all possible pairs of independent variables, all possible trios of independent variables, and so forth, until the best subset of independent variables is identified according to some criterion such as the maximum proportion of variance explained ($R^2$), which represents a measure of effect size (Cohen, 1988). SPSS 23 was used to conduct the multiple linear regression analysis.

**Qualitative data analysis phase.** For the qualitative phase, the researchers served as an instrument of data collection and analysis (Denzin & Lincoln, 2000). To increase triangulation of data, several data analysis techniques were utilized, as recommended by Onwuegbuzie and Leech (2007). To minimize the threat to trustworthiness in research and to maximize the truth value of the qualitative data analysis, researcher interpretations were captured and reported using a subjectivity journal (Lincoln & Guba, 1985). The researcher documented thoughts using voice recordings and written notes. Transcriptions of voice recordings were analyzed using constant comparative analysis to identify themes and to draw conclusions about the inquiry process (Glaser, 1965; Onwuegbuzie & Leech, 2007).

Following interview transcription, member checking was employed to verify the participants’ responses, as well as to safeguard the integrity of these voices. Participants were allotted one week to read through their portion of the transcription and to submit revisions or clarifications. Once member checking had been completed, transcriptions from the focus group interviews were imported into QDA Miner 4.1.21 and coded.

Data coding occurred in two cycles, from first cycle to second cycle coding. Both structural coding and simultaneous coding (Saldaña, 2013) were used. Initial coding was determined a priori, based on (a) the qualitative research questions to be answered, and (b) a prediction of what would be found as informed by the literature. As put forth by Saldaña (2013), researchers should be flexible about the initial decision-making about codes and with regard to the coding process. Therefore, the second cycle of coding involved reorganizing and reanalyzing data. The first and second cycle of coding involved assigning conceptual phrases to the data as they related to each research question (Saldaña, 2013). Moreover, a third and final review of codes followed. Once links between the collected data and the explanation of data had been made, then the constant comparative was used to identify themes and subthemes (Glaser, 1965).

In addition to the employment of the subjectivity journal, further attempts to reduce researcher bias included a debriefing interview, as conceptualized by Onwuegbuzie et al. (2008). The assistant moderator conducted the debriefing interview and the moderator (i.e., lead author) shared thoughts and insights with the assistant moderator about the moderator’s experience during both the initial and final round of focus group interviews. The audio recording of the debriefing interview was transcribed, and this transcription was subjected to a constant comparison analysis to enhance reflexivity (Onwuegbuzie et al., 2008).

**Mixed data analysis phase.** Using QDA Miner 4.1.21, data yielded from the focus group interviews were quantititized using Word Count to assess the frequency of words used throughout the focus group interviews. Code Frequency also was used to count the total number of codes that were utilized across cases. To conduct code frequencies, the Content Analysis function of WordStat software program (Provalis Research, 2016) was used. Additionally, a mixed research matrix was used to triangulate study data, by assessing the convergence and departure of data results from the quantitative and the qualitative phases of the study.

Figure 6 displays the phases of research, data collection methods, and associated data analyses performed to answer the research questions. In summary, data were collected from the College Persistence Questionnaire, demographic questionnaire, four focus group interviews, one debriefing interview, and a subjectivity journal.

**Results**

**Quantitative Phase**

Table 1 presents the descriptive statistics, namely, means and standard deviations, relating to the three independent variables (i.e., academic integration [AI], social integration [SI], and degree commitment [DC]) and the dependent variable (i.e., institutional commitment [IC], which served as a proxy for persistence). The APS multiple linear regression indicated that the two-variable model consisting of Academic Integration and Degree Commitment was the best model ($R^2 = .499$) out of the seven possible models that three independent variables can generate. Table 2 shows the values for each of the seven regression models.
Based on their structure coefficients, both Academic Integration and Degree Commitment were highly important contributors to the model, indicating that the more academically integrated a student is along with the more commitment a student has to the completion of her/his degree, the greater the indication of persistence. Moreover, a 1-point increase in a student’s Academic Integration score was associated with a 0.51 increase in their persistence score. Similarly, a 1-point increase in a student’s Degree Commitment score was associated with a 0.41 increase in their overall persistence score. Taken together, these findings suggest that it is important that African American and Latino former ECHS students who pursue STEM degrees have opportunities to be fully integrated academically, to receive quality instruction, and to receive support from faculty and institutional agents, alongside obtaining strengthened commitment to earn their degrees by accessing resources and increasing their capital that will better enable them to overcome degree obstacles. Furthermore, although models that included the student experience variable, Social Integration, were not identified as being a part of the optimal subset of factors related to persistence (i.e., Institutional Commitment), the developers of the scale acknowledged that this variable is a robust associate of Institutional Commitment (Davidson et al., 2015). Moreover, unlike other correlates of Institutional Commitment, student experience variables like Social Integration are adaptable and are subject to interventions by higher education leaders and frontline practitioners (Davidson et al., 2015).

Figure 6. Description of analysis methods used.
### Table 1. Means and Standard Deviations for Predicting and Dependent Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Integration (IV)</td>
<td>0.95</td>
<td>.69</td>
</tr>
<tr>
<td>Social Integration (IV)</td>
<td>0.67</td>
<td>.84</td>
</tr>
<tr>
<td>Degree Commitment (IV)</td>
<td>1.61</td>
<td>.61</td>
</tr>
<tr>
<td>Institutional Commitment</td>
<td>1.11</td>
<td>.72</td>
</tr>
</tbody>
</table>

### Table 2. $R^2$ Values for the Seven Multiple Linear Regression Models

<table>
<thead>
<tr>
<th>Multiple Linear Regression Models</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Variable Model:</td>
<td></td>
</tr>
<tr>
<td>Academic Integration, Social Integration &amp; Degree Commitment</td>
<td>.492</td>
</tr>
<tr>
<td>Two-Variable Models:</td>
<td></td>
</tr>
<tr>
<td>Academic Integration, Social Integration</td>
<td>.399</td>
</tr>
<tr>
<td>Academic Integration, Degree Commitment</td>
<td>.499</td>
</tr>
<tr>
<td>Social Integration, Degree Commitment</td>
<td>.278</td>
</tr>
<tr>
<td>One-Variable Models:</td>
<td></td>
</tr>
<tr>
<td>Academic Integration</td>
<td>.404</td>
</tr>
<tr>
<td>Social Integration</td>
<td>.043</td>
</tr>
<tr>
<td>Degree Commitment</td>
<td>.292</td>
</tr>
</tbody>
</table>

Note: Six models were statistically significant ($p < .05$). “Social Integration was not indicated as being statistically significantly related to Institutional Commitment ($p = .152$).

### Qualitative Phase

The qualitative phase of the study revealed salient findings about the contributions to sociocultural capital and the impact of such capital on African American and Latino STEM major persistence. In particular, most focus group participants indicated varied outcomes about the impact of sociocultural capital on their degree attainment. They indicated strong cultural capital, but also a need for furthered development of social capital. Furthermore, data from focus group interviews yielded five emergent themes related to sociocultural factors that impact persistence. The five themes (with their corresponding subthemes in parentheses) were **Transitioning to College** (i.e., Fitting In, Navigating College), **College Persistence** (i.e., Individual Factors, Institutional Factors), **College Readiness** (i.e., College Knowledge, Academic Readiness, Social Readiness), **Impact of Support Systems** (i.e., School Life Balance, Close-Knit Support, Academic Support), and **Practical Constraints** (i.e., Financial Constraints, Societal Constraints, Familial Constraints). Table 3 presents these themes and subthemes. Each of these themes is discussed in the following sections.

**Transitioning to College.** A major finding from this phase of the study suggested that former ECHS students experienced difficulties due to their limited social capital with making the transition from high school to college. After further inquiry, participants shared that they felt lost and alone in their transition from ECHS to the four-year college setting and that there was a great difference in the types of relationships that they had with faculty and administrators at their ECHS as compared to faculty and administrators at their colleges/universities. For example, as Marisol from Group Illuminate stated:

> Early college is very different than a university. Socially, for me, my other high school was on a community college campus; so, I did have my class and it was very small. It was like 50 people, but I did get to communicate with the college students and faculty; so, I feel like socially, it was different.

A review of the combined mean frequencies ($M = 16$) for both sets of focus group members confirmed that the transition to college was of principal concern for both groups.

Additionally, although many of the students attended community colleges while in high school, there was an overwhelming agreement from study participants that their experience at the community colleges did not prepare them for the transition to the college setting. For many of the participants, the ECHS offered small classes and a feeling of community. These factors allowed for the development and growth of sociocultural capital as students heavily interacted, relied, and supported one another and, in similar fashion, developed strong bonds with faculty and school administrators, which translated into substantial sources of capital. The lack of substantial sources of sociocultural capital was a drastic change from what participants experienced prior to transitioning to the four-year college setting. Many of the participants, when reflecting on their transition to college, expressed their struggle to build social capital. More specifically, Michael from Group Illumi-
nate declared, “When I got to college, there were just a big amount of diversity there. There are some Asians, some African Americans, some Hispanics, some Middle Easterners, some Europeans. It felt weird because I had never thought about diversity,” and Jonathan from Group Resilience admitted, “Socially, just not being used to so many people at once, that was what maybe got to me.” Both participants expressed their struggle to find their place and to fit in or to adapt to their surroundings, which were socially and culturally different from their ECHS experience. Because the students in this study were African American and Latino STEM majors, the need for substantial sources of capital was an especially important finding because, often, racially minoritized college students do not persist as STEM majors beyond the second or third year of college (Adelman, 2006), and often these students lack the kinds of sociocultural capital necessary to persist during this tenuous time (Stephan, 2013).

**Table 3. Focus Group Perceptions of Sociocultural Factors and Persistence Emergent Themes**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Themes</th>
<th>Constructed Meaning</th>
<th>Examples of Significant Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitioning to</td>
<td>1. Fitting In</td>
<td>Articulation of experiences and characterization of challenges associated with</td>
<td>“Whenever you’re coming from community college your class size is like 20 to 30 people and then you go to a chemistry class, it’s like 500, 600 people and you’re a little more scared to ask a question or interact with other people.”</td>
</tr>
<tr>
<td>College</td>
<td>2. Navigating College</td>
<td>matriculating from high school to college (Huynh &amp; Fuligni, 2012).</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>College Persistence</td>
<td>1. Individual Factors</td>
<td>Identification of the individual and institutional factors that both contribute</td>
<td>“One of the things that made me question to stay in STEM was, I don’t know if you guys ever feel this, but every once in a while I feel like this distance, isolation, not only from myself but from the students around me.”</td>
</tr>
<tr>
<td></td>
<td>2. Institutional Factors</td>
<td>and diminish an individual’s ability to persist (Palmer, Maramba, &amp; Dancy, 2011; Wang, 2009).</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>College Readiness</td>
<td>1. College Knowledge</td>
<td>Knowledge of the college process, degree of academic preparedness, and level of</td>
<td>“We had a class every Friday, it was a college readiness sort of class. Every Friday we had to do some sort of scholarship. They had a list, and we had to do one. Every Friday. We had to do this, we had to apply for a scholarship every Friday.”</td>
</tr>
<tr>
<td></td>
<td>2. Academic Readiness</td>
<td>social keenness prior to entering college (Conley, 2007).</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>3. Social Readiness</td>
<td></td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impact of Support</td>
<td>1. School Life Balance</td>
<td>Description of academic and non-academic support and the impact of these systems on</td>
<td>“Then outside of school, I participated in mentor programs like Houston Area Urban League. Another one is for black males, to encourage them to see and do better at school.”</td>
</tr>
<tr>
<td>Systems</td>
<td>2. Close-Knit Support</td>
<td>college persistence (Ellington &amp; Frederick, 2010; Gloria, Castellanos, Lopez, &amp; Rosales, 2005; Museus &amp; Neville, 2012; Palmer et al., 2011).</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>3. Academic Support</td>
<td></td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Practical Constraints</td>
<td>1. Financial Constraints</td>
<td>Social, financial and familial challenges faced by students (Berrios-Allison, 2011; Choy, 2001; Portes, 1998).</td>
<td>“I wish I could do a lot more things. My main restriction is work. I work between 25 to 27 hours per week, plus a 12-hour schedule on the weekends.”</td>
</tr>
<tr>
<td></td>
<td>2. Societal Constraints</td>
<td></td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>3. Familial Constraints</td>
<td></td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

**College Persistence.** A review of the combined mean frequencies for both sets of focus group members ($M = 18.5$) confirmed that the transition to college was of paramount concern for both groups. As confirmed throughout the interview responses, focus group members’ sentiments regarding institutional factors under-
scored the importance of being knowledgeable about on-campus resources as well as accessing student support services. As an example, David from Group Illuminate shared the following experience:

One of the things that made me question to stay in STEM was every once in a while, I feel like this distance, isolation, not only from myself but from the students and faculty around me. It was just kind of like, am I alone having this tough time?

Although all participants did indicate having accessed some aspect of available resources, when probed further about this topic, six of the nine participants contended that they were unaware of the range of resources available to them.

Concerning individual factors, participants highlighted the importance of mentorship or meaningful connections with faculty as being impactful to their persistence as STEM majors. Such sentiments are important because these connections to faculty allow for transference of sociocultural capital that translates into academic opportunities that, in turn, strengthen a students’ STEM knowledge and conveys a belief in students’ ability to succeed in their chosen major. Connectedly, much of the participants’ discussion highlighted the importance of student self-efficacy, because it is a student’s belief in her/his ability to accomplish tasks and to overcome obstacles that can influence persistence. With regard to self-efficacy, a range of responses resulted; however, when probed, all six members of Group Illuminate (i.e., participants selected for their upper quartile survey scores) indicated a heightened self-efficacy and two of the three members of Group Resilience (i.e., participants selected for their lower quartile survey scores) indicated a lower sense of self-efficacy. The remaining member of Group Resilience indicated a stronger sense of self-efficacy and, through further discussion, shared that routine access to student support services and the reliance on faculty mentors had been instrumental in influencing his personal beliefs to succeed academically.

**College Readiness.** A review of the combined mean frequencies for both focus groups (M = 9.5) confirmed that college readiness was an important topic for both groups. A finding from this phase of the study suggested that former ECHS students generally did not feel ready for the four-year college setting. Participants expressed difficulty with their major coursework and, particularly, with the pace of work. Moreover, much of their concern about the pace of work was attributed to the lack of core classes to offer a balanced course load. Participants shared that due to their completion of the Associate’s Degree, their status as Core Complete limited their enrollment to upper level major courses.

Additionally, participants shared challenges with building a rapport with course instructors. Also, although participants did indicate having prior knowledge of the college-going process, they did not possess a strong knowledge of the particular aspects of navigating the four-year college setting once matriculated. Likewise, after further inquiry, participants shared that they lacked the social keenness to grow their personal network once matriculated. Further, participants in both focus groups often felt socially unprepared for the four-year college setting and socially mismatched with their peers because many entered college as a second-semester sophomore or administrators at their ECHS as compared to faculty members and administrators at their colleges/universities. Justin from Group Illuminate shared, “Socially, it was kind of weird for me going to a new place and meeting all these people.” Similarly, Juan from Group Resilience shared, “Socially however, it was a different story. You have those people that are shy. They come to college freshmen year and don’t know anybody. That was me.”

**Impact of Support Systems.** A review of the combined mean frequencies for both focus groups (M = 10.5) confirmed that college readiness was an additionally important topic for both groups. Moreover, the participants suggested that both close-knit and academic support systems were impactful to their persistence. In particular, the focus group members cited the influence of familial support and the support of friends as being extremely important. Here, the participants indicated a strong degree of cultural capital and transference of this capital from family and friends. Interestingly, there were continuous references to difficulties with school/life balance with the demands of family, as well as the challenge of addressing the concerns of family and friends who perceived participants as changing or disconnected due to their educational attainment. Jonathan from Group Resilience shared the following experience:

Pretty much the weekend is full for me and out of the five days of the week, I work three, so I have two days to do other things, something else. One day I do family things. That leaves me one day for things, for school or for homework or for anything. If they say, “Oh, we have a social event or we have this,” and I have to study for a test or I have to do homework. I have to do this. I’m going to do the thing that helps me pass a class for me.

Concerning academic support systems, the participants were involved in much discussion pertaining to the value of study groups both as a form of academic and social support. Moreover, the participants discussed the
helpfulness of academic advisors in both access to academic and student services as well as course selection. Faculty advisors were mentioned by some focus group members as representing a source of help with regards to scholarship and experiential learning opportunities as well as providing encouragement to become involved with professional organizations associated with their major areas.

**Practical Constraints.** When probed on this topic, participants indicated that financial obligations associated with school and family caused great concern and resulted in some participants seeking on- and off-campus employment to generate the money needed to meet financial obligations. Moreover, the participants cited personal experiences with cultural stereotypes and racial biases both occurring at school and outside of the college setting that pertained to English speaking abilities and skepticism regarding educational attainment. Further, the participants discussed difficulties with managing parental expectations to prioritize family over college obligations. They shared examples of disagreements with their parents regarding the need to dedicate time to homework, or to stay at school to undertake laboratory work or to participate in group projects. The participants expressed that as the first in their family to attend school, they experienced heightened tensions when discussing the demands of school and course requirements. One participant shared her frustration with having limited transportation, and the burdensome feeling that she believed her parents had with regard to providing transportation to school-related activities.

**Mixed Phase**

The mixed data analysis phase of the study allowed for a triangulation of study findings and an examination of the intersection of quantitative and qualitative data results. The quantizing of qualitative data and the comparison of frequency means across focus groups revealed that both College Persistence and Transitioning to College were the two areas of sociocultural capital that participants perceived as being largely important to their persistence, accounting for nearly one half (46.9%) of the total frequency of factors discussed. This undergirds the findings from the qualitative phase of the study where mean frequencies for both areas (i.e., College Persistence = 18.5; Transitioning to College = 16) indicated that these sociocultural factors were the most paramount to college persistence. As seen in Figure 7, the use of the matrix indicated areas of convergence and corroboration of findings.

Results from the mixed data matrix were used to examine the convergence of both the quantitative and qualitative findings. A major finding was the convergence of data relating to the academic integration of participants and the challenges that participants faced when matriculating from high school to college, as well as a lack of institutional knowledge and underdeveloped social networks to assist participants with acclimating to the four-year college setting. This was a significant finding because the mixed research matrix helped to uncover a relationship between the quantitative variable, Academic Integration, which pertains to a student’s integration into the college academic setting, and the qualitative factors related to a student’s social integration that impact persistence.

<table>
<thead>
<tr>
<th>Focus Group Themes</th>
<th>Academic Integration</th>
<th>Degree Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions of Sociocultural Factors and Persistence</td>
<td>Transitioning to College</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>College Persistence</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>College Readiness</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Impact of Support Systems</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Practical Constraints</td>
<td>X</td>
</tr>
<tr>
<td>Beliefs about ECHS Contributions to Sociocultural Capital</td>
<td>Expectation vs. Reality</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>College-Going Culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intersection of Race/Ethnic Identity and Culture</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 7.** Comparison of emergent themes with findings of multiple linear regression.

Further examination of the findings also revealed a convergence of data relating to the commitment to pursue a STEM degree and the ability to overcome degree obstacles, with the ability to navigate the college setting, personal knowledge of the institutional and individual factors, and the practical constraints that impact persistence. This finding also was important because it highlighted a relationship between the quantitative variable, Degree Integration, and the qualitative factors related to institutional cultural knowledge and the real-world obstacles that impact persistence. The intersection of the quantitative and qualitative findings indicated a tri-
Discussion

Implications and Recommendations

Results of this mixed methods research study have several important implications. In particular, the findings undergird the extant literature that outlines the importance of sociocultural capital on college student persistence (Bergerson, 2007; Bourdieu, 1973; Heckman & Lochner, 2000; Jehangir, 2009; Midkoff & Grinage, 2017). Although the persistence literature places a strong focus on individual factors that impact persistence, these findings indicate that both institutional and individual contributions of sociocultural capital are important to college student persistence, highlighting a need to develop and to strengthen non-cognitive factors that impact student persistence as well as cognitive or academic factors. Overall, the present findings begin to address the paucity of research on the experiences of former ECHS students, who identified as African American or Latino, and were STEM majors. The potential for gains in persistence and college student degree attainment might be more contingent on institutional efforts to develop students’ sociocultural capital.

In line with institutional efforts, the persistence of African American and Latino college students—at least those students who participated in this study—depends on many stakeholders, as consistent disparities in general college degree and STEM attainment continue. Stakeholders include industry advocates and policymakers for STEM education, ECHS educators, and frontline practitioners, or the numerous higher education educators (e.g., academic advisors, faculty, student services) who work with racially minoritized students in college settings. Business and industry, in the form of public/private partnerships with community colleges, have been drivers in support of ECHS as corporations demand a skilled STEM workforce (Business Higher Education Forum, 2012; Matthews, 2014; NCES, 2015a, 2015b).

Based on the present findings, recommendations for policymakers include the consideration of articulation agreements that reduce the number of college credit hours that early college students acquire to allow for a portion of college core credits to be completed after their transition to college. This consideration likely would reduce the difficulty that (some) students face once they have transitioned to a four-year college setting and enroll strictly in their major courses. Moreover, this option would offer ECHS students the ability to remain on the path to graduation while they complete major course pre-requisites (Friedman et al., 2011). Such an option also allows ECHS students to remain engaged in the community college while offering a bridge to improve ECHS student transition from high school to college. Furthermore, acceptance of the associate’s degree requirements at four-year institutions would allow for a more balanced course load once students reach the university.

The role of ECHS educators was deemed to be important by the student participants, but insufficient to college adaptation and persistence. They reported that ECHSs assisted them tremendously in the college planning and selection process, which increased their sociocultural capital in ways that prepared them for the college-going process. However, once matriculated, the participants experienced a severe inability to navigate the initial college experience. Additionally, the participants recommended that ECHS leadership acquire a deeper understanding of the implications of the Texas Core Complete status, obtained from completion of community college course work, on their four-year college course selection and course load. These participants emphasized their poor understanding of the impact of an Associate of Science or an Associate of Arts on transfer credit and college degree attainment. Overall, the preparation, knowledge, and transference of sociocultural capital from the frontline practitioners was deemed important to the students. Initiatives that remove college-going myths for racially minoritized college students, once they enroll in a four-year university, were viewed by the participants as being imperative to their STEM persistence.

Frontline practitioners deal with the day-to-day academic and non-academic needs of college students. As such, frontline practitioners’ knowledge of the college-going process potentially influence greatly students’ ultimate college persistence. Frontline practitioners often are the only institutional agents outside of faculty from whom students routinely seek assistance. Additionally, for racially minoritized students to have the best chance at persistence, frontline practitioners must possess the skills necessary (i.e., highly proficient in college student development, achievement and empowerment theories, and culturally responsive to the needs of their students) to support student degree attainment.
Opportunities to develop student sociocultural capital, such as involving students in the selection of community college courses rather than prescribing course enrollment, might contribute to the development of student agency and encourage student independence. To grow student sociocultural capital further, ECHS students should meet with a community college advisor as they near the completion of their ECHS program. The interaction with community college advisors not only would allow students to gain experience meeting a college advisor, but also would allow students to develop a better understanding of the expectations and realities of college prior to transferring to a four-year college setting.

Several recommendations for the practice of educational leaders and frontline practitioners were identified. The first of these recommendations is that early college educational leaders create programming that goes beyond helping their students to acquire college knowledge, by ensuring that the attainment of sociocultural capital extends to the four-year college setting. College induction programs should help college students both acquire capital and encourage student agency in the use of this capital. For instance, former students need an avenue to “check-in” regarding their newfound college experience and need helpful information about important sources of capital and ongoing encouragement to persist. Additionally, these types of programs would allow students to ask questions and to seek advice in a non-threatening environment, because they would be able to reach back to their foundational sources of capital that would help to grow sociocultural capital necessary to succeed in a post-secondary setting. Programs such as Freshmen Interest Groups (FIGs), which connect former ECHS students to faculty and advisors via weekly cohort meetings, not only would allow college students to grow their sociocultural capital, but also would assist in developing student agency through creating opportunities that encourage institutional agent/student outreach. In addition to building student/parent sociocultural capital, parent orientation or visits to campus should include the offer of workshops and information sessions that are culturally responsive and that address topics such as college-going myths. Such meetings would help to educate parents, whose children often are first-generation college students, about the demands of college, and provide parents with a better understanding of what to expect of their children’s college experience.

Connectedly, another recommendation is that faculty and administrators of ECHS, community colleges, and universities must work to improve the avenues of knowledge that students can access when planning for their matriculation to the four-year college setting. P-16 partnerships, typically defined by the joint initiatives of ECHS and community colleges, should expand to include four-year institutions. The inclusion of leadership at all levels of college planning might improve the development of transfer policies that enhance students’ knowledge of the college-going process and strengthen their persistence. Particular areas of college planning should include associate degree selection and major fit, the subsequent impact on transfer credit and the implications of transfer credit on course selection, difficulty of course load, and duration of degree completion. Regarding STEM preparation, consortia to include ECHS, community colleges, and four-year institutions focused on the successful matriculation and subsequent degree completion of racially minoritized students would provide a wealth of knowledge that inform institutional policies to improve the STEM persistence of racially minoritized college students.

A third and final recommendation is to provide opportunities for the professional development of educational leaders, faculty members, and institutional agents, regarding the particular needs of racially minoritized students. A significant aspect of the ECHS experience consists of students interfacing with high school faculty and staff, as well as with faculty and staff at the four-year college setting. As suggested by Bensimon (2007), practitioner knowledge or the transference of academic, cultural, and informational knowledge from frontline practitioners and institutional agents to college students is imperative to their success. Practitioners and instructors can play a significant role in the lessening of challenges faced by racially minoritized students in the pursuit of a STEM degree. Such success depends upon the knowledge, predisposition, education, and self-efficacy of institutional agents, as well as how these characteristics influence the educational experience of college students (Bensimon, 2007). For advisors, although knowledge and proficiency in the areas of student development, student achievement, and empowerment theories are essential to one’s practice, also important are the attitudes that they impart and the expectations that they have with students in their day-to-day meetings and interactions. Moreover, recognizing how to become more culturally responsive should cultivate improved practices that do not marginalize racially minoritized students, but rather places an emphasis on meeting the needs of these students. Most importantly, it is incumbent upon all institutional agents—leadership, faculty, and frontline practitioners—to recognize that the focus on the growth of sociocultural capital is not to focus on the assimilation of students, but on the utilization of a student’s existing sociocultural capital, personal resilience, and own talents, to grow capital and to improve the persistence of students.
Additionally, higher education leaders must recognize the impact that faculty members have when working with racially minoritized students, and to provide opportunities for improved instructional knowledge, which includes culturally responsive instructional practices. As suggested by the findings of this study, the academic integration of college students is essential to college student persistence and degree attainment. In particular, faculty members’ praise of students’ abilities to undertake coursework is of central importance to a student’s academic integration. As further suggested by Bensimon (2007), it is important that frontline practitioners have adequate funds of knowledge (i.e., intellectual and social knowledge of an individual or community) to help build student self-efficacy and to affirm their scholarly identity.

As suggested by Ricks (2009), although support is made available to students who experience disadvantages, often, the support is focused on access to academic services and not on the building of a student’s social capital. Such a narrow focus not only neglects the development of important building blocks necessary for success, but also prolongs students’ existing academic challenges (Gordon, 1999). Therefore, focus also must be given to the growth and utilization of sociocultural capital of racially minoritized students in addition to access to support services.

**Recommendations for Future Research**

Future research is suggested to build upon the findings of this study and to replicate and to extend the study in other settings. Findings from this study indicated a need to examine institutional rather than individual development of sociocultural capital and the impact of such development on college student persistence. A recommended area of future research is to examine expanded district/college partnerships involving four-year institutions by measuring college student perceptions of sociocultural capital on college persistence. As district/college partnerships become more prevalent, such research would allow policymakers and educational leaders to develop a better understanding of how non-cognitive factors might influence college student persistence. Another area of suggested study might include college induction programs on the development of sociocultural capital on STEM college students and persistence. Lastly, another suggested area for future research would be to assess the influence of attitudes and beliefs of frontline practitioners and STEM faculty on college student perceptions of sociocultural factors that impact persistence.

**Conclusion**

The findings of this mixed methods research study undergird the findings of the persistence literature that outline the importance of sociocultural capital on college student persistence. These findings further highlight the need to develop and to strengthen the non-cognitive factors that impact African American and Latino college student persistence. Additionally, this study helped to address the paucity of research regarding former ECHS African American and Latino STEM majors’ perceptions of sociocultural capital, which impact persistence. Although the persistence literature places a strong focus on individual factors that influence persistence, study findings indicated that an accumulation of institutional and individual sociocultural capital is important to college student persistence. This finding is particularly important because the potential for gains in persistence and college student degree attainment might lie in the institutional contributions to a student’s sociocultural capital.

Furthermore, because the pathway to STEM degree attainment can be difficult for former ECHS students as they traverse their newfound college experience, frontline practitioner faculty, along with educational leaders, play a crucial role in the growth of college student capital and in the persistence of racially minoritized STEM majors. Equally as important is how educational leaders, frontline practitioners, and educational researchers view persistence and how they utilize their funds of knowledge to assist students to degree completion. Because persistence has been shown to be strongly impacted by institutions and more specifically institutional actors, we should consider definitions of persistence that no longer singularly focus on individual factors that impact persistence, but, rather, include notions of persistence that highlight the role and influence of institutional leaders, faculty members, and frontline practitioners.
References


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