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Exploring How Chemistry and English Majors Understand and Construct Disciplinary Identities in Relation to Life, Departmental, and Writing Experiences: Implications for WAC and Retention

Justin Nicholes

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EXPLORING HOW CHEMISTRY AND ENGLISH MAJORS UNDERSTAND
AND CONSTRUCT DISCIPLINARY IDENTITIES IN RELATION TO
LIFE, DEPARTMENTAL, AND WRITING EXPERIENCES:
IMPLICATIONS FOR WAC AND RETENTION

A Dissertation

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in Partial Fulfillment of the

Requirements for the Degree

Doctor of Philosophy

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To suggest how U.S. colleges and departmental programs can further engage and retain undergraduates and how writing-across-the-curriculum (WAC) programs can support student engagement and retention, this study explored how chemistry and English majors at one northeastern U.S. state public university understood and performed identities in relation to their life, departmental, and disciplinary writing experiences. Data gathered to answer the study's research questions came from co-written academic life narratives, participant-authored autobiographical writing, and disciplinary-writing interviews. Participants were undergraduates in chemistry ($n = 7$) and English ($n = 10$). Data was categorized to explore how participants understood their experiences, and it was analyzed for disciplinary identity performance.

Results indicate that chemistry and English majors understood becoming and remaining in their majors in terms of (a) *mental orientations* that predisposed them to be interested in and have aptitude for their majors; (b) *influential people*, such as teachers or family members, who inspired or validated them; (c) *influential environments* that awakened them to aspects of their majors; and (d) *influential experiences*, such as engaging classrooms, research, and reading and/or writing literature. Participants drew on these categories also in constructing academic life narratives that presented them as continuously and richly engaged with their majors.

Results also indicate that chemistry and English majors understood their disciplinary writing experiences as unique and comprising discipline-specific genres. Whereas chemistry

majors explained their writing experiences as constituting more writing-in-the-disciplines (WID) experiences, English majors explained their writing experiences as constituting more writing-to-learn (WTL) experiences. This reported orientation of writing experiences in their majors provides context for understanding how participants constructed themselves as being involved in their majors in the future.

While these findings offer direction for helping chemistry and English departments in U.S. colleges create learning environments and experiences to support students' persistence, these findings also offer direction for research and retention initiatives involving first-year composition and WAC programs.

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CHAPTER 1

INTRODUCTION

When U.S. policymakers, college administrators, and faculty members express concern about college-student retention, defined as a college's ability to keep students continuously enrolled (Berger, Blanco Ramírez, & Lyons, 2012), they do so uniquely.

U.S. national policymakers explain higher education as vital for a competitive national workforce and economy. The imperative to prepare graduates to join an internationally competitive workforce is visible, for instance, in President Obama's (2009) American Graduation Initiative, a plan that aimed "to help an additional five million Americans earn degrees and certificates" over a ten-year period so that the U.S. could "once again have the highest proportion of college graduates in the world." Like the more recent Every Student Succeeds Act (2015) signed by President Obama in December of 2015 to revamp the earlier No Child Left Behind Act, the American Graduation Initiative reflected the mission of the U.S. Department of Education, which at the time of this writing was "to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access" (U.S. Department of Education, n.d.). At the national-policy level, then, higher education and retention are seen as important for safeguarding national interests and a competitive status.

For decades, talk of retention likewise has circulated at the administrative levels of U.S. colleges (Berger et al., 2012). An urgency for administration to retain students until they graduate (Palmer & Davis, 2012) may partially result from students and their parents being able to compare schools' graduation rates, which have been public through the Integrated Postsecondary Education Data System (IPEDS) since the U.S. Congress passed the Student

Right-to-Know Act in 1990. At the administrative level, the number of students retained until graduation may reflect on the perceived value of that college, and, as is the case for national policymakers, a primary concern for administrators entails the need to remain solvent in the face of fewer enrolling and graduating students. At administrative levels, then, increasing retention rates contributes to more students and necessary tuition dollars.

While the talk of policymakers and administrators may reflect variants of economic concerns about retaining and graduating college students, the concerns of college teachers seem to have a different quality. I write from the perspective of a college writing instructor who teaches and designs first-year composition courses and who holds a professional interest in the writing-across-the-curriculum (WAC) research and pedagogical movement. Developed in the 1970s as a way to support an increasingly diverse body of students entering what had previously been institutions mainly restricted to upper-class white males (Russell, 2002), WAC is an established focus associated with composition and refers to “the pedagogical and curricular attention to writing occurring in university subject matter classes other than those offered by composition or writing programs” (Bazerman et al., 2005, p. 9). To suggest how English teachers, including WAC practitioners, often have a different focus from national policymakers and college administrators when it comes to retention and the role of higher education in the U.S., I find it relevant to point toward the mission statement of the National Council of Teachers of English (n.d.): “The Council promotes the development of literacy, the use of language to construct personal and public worlds and to achieve full participation in society, through the learning and teaching of English and the related arts and sciences of language.” Absent from this mission statement is explicit concern with worldwide economic competition. The language instead shows interest in the intellectual and imaginative experiences students have in college

(“construct personal and public worlds”) and tools that may encourage students’ self-empowerment (“development of literacy”).

In exploring the issue of what keeps students enrolled in college with special attention being paid to informing composition teachers and WAC practitioners, it is at the level of individual students and their disciplinary experiences in college where I will be focusing in this dissertation. My focus is specifically on how undergraduates understand and construct disciplinary identities in relation to life, departmental, and disciplinary writing experiences, and how my participants’ stories and perceptions can offer insight into the issue of college-student *persistence*, defined as the desire and action of staying enrolled in college from semester to semester (Berger et al., 2012). Again, I come at the issue of retention and persistence from the point of view of a teacher and designer of first-year composition courses, which is an advantageous position to be writing from: While the role of national policy and administrative work may involve gatekeeping and access-ensuring, the role of first-year teachers is engaging and thus possibly *retaining* students. Composition teachers and researchers are in advantageous positions to work in service of retaining students whose goal is to persist in college, just as WAC practitioners are in advantageous positions to sustain retention efforts throughout a student’s college experience and otherwise support institutional priorities (Boquet & Lerner, 2016; Melzer, 2014).

To clarify usage of terms, *persistence* and *retention* differ in their implied points of view. Persistence may be defined “through the eyes of students” (Tinto, 2015, p. 2) as “the desire and action of a student to stay within the system of higher education from beginning year to degree completion” (Berger et al., 2012, p. 12). Meanwhile, retention may be defined from an institutional point of view (Tinto, 2015) as “the ability of an institution to retain a student from

admission through graduation” (Berger et al., 2012, p. 12). Throughout this dissertation, I use the term *retention studies* to refer to the field of study that produces research on both focuses: retention from institutional viewpoints and persistence from students’ viewpoints. This is how people in retention studies refer to their own field (see the field’s flagship publication, the *Journal of College Student Retention*). Otherwise, I will use the terms persistence and retention purposefully to indicate whose point of view is under discussion. In the present dissertation, I am interested in exploring persistence from students’ points of view, but I expect the insight derived will be useful for college-student retention initiatives.

Exploring persistence and retention from the viewpoint of a compositionist, Reichert Powell (2014) has expressed dissatisfaction with retention studies’ reliance on quantitative analysis to describe factors that impact persistence and retention, which she has described as too often reducing “student success and failure, the value of higher education, or the purpose of our courses, to a set of numbers” (p. 5). Importantly, part of Reichert Powell’s point is that college administrators may expect unrealistic outcomes from faculty taxed with operationalizing retention initiatives in their teaching and programs. Still, I wish to push back on Reichert Powell’s hint of undervaluing the body of quantitative evidence collected by retention-studies scholars over more than forty years. Quantification of persistence and retention trends has proven to be pragmatic for unifying findings across multiple samples and for advancing a descriptive understanding of the issue in relation to a college-student population. What is known because of quantitative studies is that, while full-time year-round workers aged 25-34 have been shown to have higher median salaries when they had a bachelor’s degree (women, \$42,400; men, \$51,800) than when they had only a high-school diploma (women, \$26,300; men, \$34,000) (Baum, Ma, & Payea, 2013, p. 14) and while U.S. citizens between ages 25-64 working with a bachelor’s

degree also were shown to have an employment rate of 82% in 2012 compared to 67% for people with only high-school diplomas (Baum et al., 2013, p. 18), the overall college retention rate in the U.S. stands today at 45% (ACT, 2015). It is also known that, in addition to pre-college factors such as (a) having a higher high school grade point average (GPA) (Farmer & Hope, 2015; Ma & Cragg, 2013; Raju & Schumacker, 2015); (b) having a higher high-school percentile rank (Bingham & Solverson, 2016; Pike, Hansen, & Childress, 2014); and (c) having parents who obtained a degree from a four-year college (Jenkins-Guarnieri, Horne, Wallis, Rings, & Vaughan, 2015; I. Johnson, 2008; Martin Lohfink & Paulsen, 2005; Pike et al., 2014; Porchea, Allen, Robbins, & Phelps, 2010; Soria & Stebleton, 2012) being linked to a student's statistical likelihood of graduating from college, students' experiences once they begin college matter tremendously as well (Hanauer, Graham, & Hatfull, 2016; Tinto, 2015). Among those experiences that especially matter to college undergraduates are those that relate to students' feelings of and actions that enact *belonging* in a college community.

My entry point into an investigation of belonging in college is through the concept of a student's *disciplinary identity*. Identity has been conceptualized in various ways (Bucholtz & Hall, 2008). Importantly, I do not draw on definitions that see identity as relating to static characteristics attributed to people. As defined here, identity is a fluid, locally situated, multifaceted co-construction (Jacoby & Ochs, 1995) that might be partly but might not necessarily be completely representative of a person's self-concept (Niedenthal & Beike, 1997). Defining identity as a "co-construction" acknowledges the "fundamentally interactional basis of the human construction of meaning, context, activity, and identity" (Jacoby & Ochs, 1995, p. 175). Thus people's self-concepts, which Niedenthal and Beike (1997) defined as "mental representations of those personal qualities used by individuals for the purpose of defining

themselves and regulating their behavior,” may not match how people’s identities are co-constructed in social engagement (p. 106). This is because co-construction does not mean cooperation: It does not “necessarily entail affiliative or supportive interactions” (Jacoby & Ochs, 1995, p. 171).

In talking about disciplinary identity as a way of thinking about belonging and persistence in college, it is useful to draw on conceptions of identity that have been developed in relation to conditions and settings of learning. Referring to Anderson’s (1983/1991) concept of imagined communities and coming from the point of view of a language teacher, Norton (2001) wrote that “different learners have different imagined communities, and that these imagined communities are best understood in the context of a learner’s unique investment in the target language and the conditions under which he or she speaks or practices it” (p. 165). For Norton (2001), “a learner’s imagined community invited an imagined identity” (p. 166). Imagined communities and identities refer “to groups of people—not immediately tangible and accessible—with whom we connect through the power of the imagination” (Norton, 2010, p. 3). Regarding investment, Norton (Norton Peirce, 1995) drew on notions from Bourdieu (1977) in explaining that “if learners invest in a second language, they do so with the understanding that they will acquire a wider range of symbolic and material resources, which will in turn increase the value of their cultural capital” (p. 17). Investing in an additional language for Norton was done with anticipation of benefits that could take the form, for instance, of friendships, connections, and money (Norton Peirce, 1995). Importantly, Norton linked investment and identity. In Norton’s (Norton Peirce, 1995) words, “an investment in the target language is also an investment in a learner’s own social identity” (p. 18). It is also important to note the distinction that Norton made between investment and motivation: For Norton, language learners

could be motivated (meaning they had and showed a stable characteristic of desiring to do or achieve something) to learn a particular language but nonetheless not invested in the specific classroom practices and exchanges meant to enable access to practicing and learning that language (Norton Peirce, 1995). In Norton's (2013) words, "The construct of investment provides for a particular set of questions associated with a learner's commitment to learning" a target subject; it also allows that "A learner may be a highly motivated language learner but may nevertheless have little investment in the language practices of a given classroom or community, which may, for example, be racist, sexist, elitist or homophobic" (p. 7). In applying Norton's discussion to the study to be reported in the present dissertation, it can be said that a chemistry or English¹ major may be highly motivated to obtain, for example, a chemistry or English degree but may not be invested in the specific institutional or departmental practices that shape contact with actions and experiences associated with a discipline. Noting Norton's concept of identity as it pertains to imagined communities and investment, I define disciplinary identity as a fluid, locally situated, multifaceted co-construction that is related to a target discipline and to the departmental conditions and practices in which students may invest.

Sites where I explore disciplinary identity construction include co-written academic life narratives, participant-authored autobiographical life narratives, and interview responses pertaining to my participants' life, departmental, and disciplinary writing experiences. In

¹ English departments differ from context to context in their relative emphasis on literary, liberal-arts focuses versus writing studies, rhetoric-and-composition focuses (W. M. Anderson, 2010; Balzhiser & McLeod, 2010; Leverenz, Lucas, George, Hogg, & Murray, 2015; Miller & Jackson, 2007). Chapter 4 describes the more literary-studies, creative-writing orientation of the English department where participants interviewed for this dissertation were studying.

defining *narrative*, I draw on Ochs (1997), who explained that *narrative* refers to “a vast range of genres” that all commonly “*depict a temporal transition from one state of affairs to another*” (p. 189). Schiffrin (1996) demonstrated that “The form of our stories (their textual structure), the content of our stories (what we tell about), and our story-telling behavior (how we tell our stories) are all sensitive indices not just of our personal selves, but also of our social and cultural identities” (p. 170). Identity construction can therefore be explored in the narratives people tell and write about their lives. Exploring the content of students’ narratives and the way these narratives index “stances, social acts, social activities, and other social constructs” (Ochs, 1992, p. 337) offers insight into performed aspects of a student’s disciplinary identity, conceptualized here as a way to understand investment (Norton Peirce, 1995) in the institutional and departmental conditions students encounter in their majors as well as a mechanism that may be seen as facilitating belonging and thus persisting in college. Exploring students’ understanding of—as well as performed identities in relation to—life, departmental, and disciplinary writing experiences also promises to suggest what kinds of institutional and departmental conditions and experiences may promote the possible engagement and retention of these students.

Now that I have discussed the importance of persistence and retention and suggested the advantageous position where composition teachers and researchers and WAC practitioners stand to work in support of retention efforts, now in the remainder of this chapter I present my study’s problem statement, purpose statement, research questions, and overview of the research approach. I then provide an overview of the dissertation.

Problem Statement

In addition to addressing the issue of belonging, persistence, and writing experiences generally, the present dissertation explores perceptions and constructed disciplinary identities of

chemistry and English majors—two groups who deserve attention for different, important reasons.

Currently, retaining STEM majors is an urgent challenge in U.S. higher education, in part because U.S. economic projections estimate a need for “approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade” (President’s Council of Advisors on Science and Technology [PCAST], 2012, p. i). According to the National Center for Education Statistics (2014), 14,442 chemistry bachelor’s degrees were awarded in the 2013-2014 academic year, up 21.9% from 2008-2009’s number of 11,852. Meanwhile, the 11,852 chemistry bachelor’s degrees awarded in 2008-2009 represented a 31.5% increase from 2003-2004’s number of 9,016. As shown here, the number of chemistry bachelor’s degrees has experienced jumps over the last decade. In addition to STEM graduates possibly contributing to a robust economy, STEM-field jobs tend to offer graduates relatively higher salaries, with the median salary for full-time STEM jobs being \$60,000 versus full-time non-STEM jobs’ median salary of \$44,000 (Forrest Cataldi, Siegel, Shepherd, & Cooney, 2014). STEM-major persistence has been robustly researched. STEM-major disciplinary identity has also been explored in relation to life stories, for instance in Avraamidou’s (2016) work on intersections of preservice science teachers’ identities and life histories. What have been less investigated, however, are chemistry students’ disciplinary identities and the experiences—possibly including writing experiences—that may figure into disciplinary identity construction. Regarding writing, while Emerson (2016) recently explored the literacy narratives of scientists at various stages of their careers, this exploration started at the level of the literacy narrative, disallowing an exploration of whether writing experiences were perceived as important in scientists’ academic life narratives, which is a broader narrative structure that may absorb a person’s literacy experiences.

In contrast to chemistry bachelor's degrees, English language and literature bachelor's degrees conferred by postsecondary institutions have been in marked decline: According to the National Center for Education Statistics (2014), 50,404 English bachelor's degrees were awarded in the 2013-2014 academic year, down 9.1% from 2008-2009's number of 55,465. This is despite the English major's relative, perhaps underestimated, value. Wage-earning statistics show that English majors make lifetime earnings equal, for instance, to business majors (The Hamilton Project, 2014) and that English majors qualify for diverse and plentiful fields of employment (Matz, 2016). The English major may also be the major that best develops writing skills and creativity, which employers and entrepreneurs may especially prize (Strauss, 2016). Aside from conferring potentially marketable job skills, the English major may also include activities, such as poetry and fiction reading, linked in writing-studies literature to the ability to understand human diversity (Hanauer, 2003) and to exercise empathy (Johnson, 2013). Overall, the English major may offer students marketable skills and personal enrichment. Still, aside from personal-experience articles that signal alarm at the dipping number of English majors in U.S. English departments (Flaherty, 2015; Jaschik, 2016) and empirical studies that talk about humanities-student persistence generally (Harvey & Luckman, 2014; Mestan, 2016), no published peer-reviewed empirical studies seem to have explored English-major persistence. Additionally, aside from my study (Nicholes, 2017) that indicated English major undergraduates claimed statistically significantly greater ownership for their poetry and fiction writing than for their argument and research writing, writing-studies literature to the best of my knowledge lacks empirical studies about the writing experiences that English majors most prize and that, as a result, may keep English majors engaged in their major.

To summarize, the present dissertation addresses a need for further exploration of college students' perceptions and identities pertinent to an understanding of belonging and persistence in college. The present dissertation also addresses a need in composition and WAC studies for further understanding of whether literacy experiences in college, particularly disciplinary writing experiences, relate to students' disciplinary identities and their reconstructed past, perceived present, and imagined future experiences.

Purpose Statement

The purpose of this study is to explore how undergraduate chemistry and English majors understand and construct their disciplinary identities in relation to (a) their past and present life and disciplinary experiences as well as their imagined futures, and (b) their past and present disciplinary writing experiences.

Research Questions

To guide this exploration, I pose the following research questions:

1. How do chemistry and English majors understand their becoming and remaining students in their majors?
2. How do chemistry and English majors understand their disciplinary writing experiences?
3. How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?

Research Approach

This study draws on the qualitative tradition of the case study. I refer to the case study qualitative tradition after Stake (2000), who described it as “not a methodological choice but a

choice of what is to be studied” (p. 435). Individual cases define the case study form of research rather than the methods of data-collection and analysis (Stake, 2000). In any case study, it is vital to define what specifically is meant by *case* (Yin, 2003). In the present study, individual undergraduate chemistry and English majors make up individual cases of interest. The specific design, then, of this study most closely resembles the “collective case study,” which Stake (2000) referred to as “an instrumental study extended to several cases” (p. 437). As an instrumental case study, meaning the kind of case study meant to extrapolate from cases to a broader issue (Stake, 2000), this study focuses on how individual students use language to indirectly index aspects of their disciplinary identities. This focus on disciplinary identity construction meanwhile aims to provide insight into belonging and persisting in college. In this study, I recruited seven chemistry majors ($n = 7$) and ten English majors ($n = 10$) who were studying in a northeastern U.S. state public university. Participants who gave informed consent participated in two interviews and took part in autobiographical narrative writing.

Organizational Overview

I have organized this dissertation into seven chapters: Introduction; Review of Literature; Analytical Approach; Methodology; Presentation of Findings; Interpretation and Discussion; and Conclusions and Recommendations. While the present chapter contextualizes an exploration of disciplinary identity and persistence in relation to college students’ reconstruction of life narratives and disciplinary and university experiences, what follows in Chapter 2 is a literature review that explains where among existing literature my study looks to build. In Chapter 3, I argue for a proposed analytical approach for analyzing how identity, writing, and discipline can be seen as linked and related to persistence. In Chapter 4, I present my methodology, detailing how I attempted to suggest answers to research questions posed and how I safeguarded against

limitations of my study's research methods. In Chapter 5, I present findings and participants' voices without subjecting them to explicit interpretation while, in Chapter 6, I discuss findings in relation to the concept of investment (Norton, 2000), existing literature, and existing WAC and retention viewpoints. In Chapter 7, I explain how to use my theoretical frame and concrete results to promote persistence through writing.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this study is to explore how undergraduate chemistry and English majors understand and construct their disciplinary identities in relation to (a) their past and present life and disciplinary experiences as well as their imagined futures, and (b) their past and present disciplinary writing experiences. In addition to fully defining key concepts, the following review of literature advances the argument that explorations of disciplinary identity construction in academic life narratives and interviewing can complement quantitative correlational studies linking measurements of senses of belonging with variables impacting persistence. Such an exploration can catalog what specific experiences interacted with the ways participants in the present study constructed disciplinary identities, which may prove useful for further research and creation of retention initiatives. In explaining the methods of data collection used in this study and how they fit the study's purpose, this chapter also argues that the academic life narrative represents a broader unit of analysis that may encompass the literacy narrative, making my present study complementary to studies on college students' literacy experiences. Writing-across-the-curriculum (WAC) studies that, for instance, have explored scientists' literacy narratives have directed interview conversations to the topic of disciplinary writing experiences (e.g., Emerson, 2016), which seems to risk immediately narrowing the discussion to writing without allowing writing to emerge, or not, in relation to other life and disciplinary experiences.

Writing Across the Curriculum (WAC) and Student Support

Developed in the 1970s at a time when open admissions and integration prompted revamping of educational structures and programs in the U.S., and currently an international movement (Russell, 2002), WAC is an established focus associated with composition (Bazerman

et al., 2005; Palmquist, 2011). Bazerman et al. (2005) defined WAC as referring to “the pedagogical and curricular attention to writing occurring in university subject matter classes other than those offered by composition or writing programs” (p. 9). WAC is often defined in relation to a closely related term, writing in the disciplines (WID) (Russell, 2002). Bazerman et al. (2005) defined WID as “distinct from WAC,” as “both a research movement to understand what writing actually occurs in the different disciplinary areas and a curricular reform movement to offer disciplinary-related writing instruction” (pp. 9-10). McLeod (1992/2000), on the other hand, assists in thinking of WID as an aspect of a broader WAC concern: She defines WAC as comprising a continuum of approaches, with more “expressive” or “cognitive” approaches on one end of the continuum and “rhetorical” approaches on the other (pp. 2-3). The “cognitive” approaches can be defined as writing-to-learn (WTL) approaches, whose aim is “helping students build and change their knowledge structures” by having them “write for themselves as audience—to explain things to themselves before they have to explain them to someone else” (McLeod, 1992/2000, p. 3). WTL approaches see writing as a mode of thought (Arnold et al., 2017; Emig, 1977; Estrem, 2015), and they include assignments such as journal writing, class-note summaries, and imaginary dialogues (Fulwiler, 1982; Young, 1984/2011) and other ungraded writing assignments aimed at promoting “learning” defined not simply as memorization but rather as “*discovery*, as a way of objectifying thought, of helping separate the knower from the known” (McLeod, 1992/2000, p. 3).

At the other end of the WAC-approach continuum are “rhetorical” approaches, often referred to as learning-to-write (LTW) or writing-in-the-disciplines (WID) approaches (Russell, 2002), which involve “learning to write in particular disciplines” and, while not necessarily excluding WTL assignments, emphasize “more formal assignments, teaching writing as a form

of social behavior in the academic community” (McLeod, 1992/2000, p. 3). Recently, acknowledging the existence of the distinction between WTL and LTW was identified as a writing-studies threshold concept (Anson, 2015).

Traditionally concerned more with changing pedagogy than with changing curriculums, WAC programs have taken multiple forms, including faculty-development workshops, writing-intensive courses, first-year seminars, and writing centers (Russell, 2002). More recently, Condon and Rutz (2012) developed a taxonomy of WAC programs, noting that, at their most integrated, WAC programs represent “institutional change agents” in which “WAC [becomes the] signature program for the institution” (Condon & Rutz, 2012, p. 363). When embraced, WAC programs can be recognized for their original and intended purpose: supporting newcomers entering specialized communities with the expectation that doing so increases the chances that these newcomers secure stable economic and social lives.

In his history of the WAC movement, Russell (2002) points to the 1870s as the period of time when U.S. academic communities became departmentalized to such a degree that writing could no longer be considered a skill that students mastered at a young age; rather, writing became “a complex and continuously developing response to specialized text-based discourse communities, highly embedded in the differentiated practices of those communities” (p. 5). Still, while the adage that all teachers across the curriculum should teach writing existed long before the 1970s, this most recent attempt known as the modern WAC movement has had lasting impact (Russell, 2002). Importantly, WAC has always been about supporting a diverse group of students as they entered academic communities previously restricted to upper-class white men, and for Russell (2002), WAC is a way of addressing questions concerning equity and access:

WAC is not a single trend or movement; it is, like its predecessors, a collection of often-conflicting approaches to the problem of linguistic differentiation in the modern world. It offers no panacea, but it need not support the myth of transience either. Seen in its full dimensions, WAC can become a convenient tool for focusing our attention in a very practical way on the contradictions of American secondary and higher education, a means of examining rather than skirting the deepest problems. With WAC, the old battles between access and exclusion, excellence and equity, scientific and humanist worldviews, liberal and professional education, all come down to very specific questions of responsibility for curriculum and teaching. (p. 307)

Importantly, it has been argued that WAC practitioners are in advantageous positions to support institutional priorities (Boquet & Lerner, 2016; Melzer, 2014). With cross-curricular and cross-disciplinary reach, WAC programs have potential to support specifically college-student retention.

In the following sections, I review findings in retention studies related to the variable of belonging. In so doing, I point out where qualitative research designs can enrich what retention studies has already established through a wealth of quantitative research. I also argue that WAC theory and practice, which aim to foster understanding of and guidance for cross-departmental and disciplinary communication, can help to support college students' persistence.

Retention Studies and Belonging

As mentioned in Chapter 1, the terms *persistence* and *retention* differ in their implied points of view. Persistence may be defined “through the eyes of students” (Tinto, 2015, p. 2) as “the desire and action of a student to stay within the system of higher education from beginning year to degree completion” (Berger et al., 2012, p. 12). Meanwhile, retention may be defined

from an institutional point of view (Tinto, 2015) as “the ability of an institution to retain a student from admission through graduation” (Berger et al., 2012, p. 12). To recap, throughout this dissertation, I use the term *retention studies* to refer to the field of study that produces research on both focuses: retention from institutional viewpoints and persistence from students’ viewpoints.

Retention studies, at its heart, has always been about how people *belong* in increasingly accessible and diverse college communities. A brief history of the field of retention studies and its guiding theories illustrates this point. Work that influenced early and still influential theories of college-student persistence stressed the importance of belonging in society. Durkheim’s (1952/2005) seminal work in sociology theorized that social institutions, for instance religious institutions, that most thoroughly integrated individuals into themselves created societies with greatest cohesion. For Durkheim, individuals in cohesive, integrating communities did not seek to exit those communities.

Early theories from the 1970s, referred to as the “Building Theory Era” of retention studies (Berger et al., 2012, p. 22), referred to Durkheim’s (1952/2005) theory. Spady (1971) drew on Durkheim in generating a multivariate model that conceived of “successful assimilation of entering college students into the full life of their institution” (p. 38). For Spady (1971), successful assimilation resulted from numerous interrelated factors, including “institutional commitment,” itself involving “satisfaction” resulting partly from “social integration” (p. 39). Analyzing admissions data, closed-answer survey data, and interview data from the 1965 entering first-year student² class of 683 students at University of Chicago, Spady (1971) found, among other results, that frequency of contact with faculty members significantly impacted a

² For gender inclusivity, the term *first-year student* replaces *freshman* throughout (Darcy, 2012).

student's reported intellectual development. "Intellectual development," in turn, impacted "social integration," which played a significant role in the process of undergraduate persistence (Spady, 1971, p. 58). As an early attempt, Spady's (1971) model demarcated many of the factors related to college-student persistence in use today, such as constructs of *satisfaction*, *institutional commitment*, and *social integration*. Spady's model, however, paid less attention to perceptions existing or undergoing change within individuals. Though the model's constructs, such as social integration, referred to a campus environment as a factor in persistence, nearly exclusive emphasis was placed on the individual as already having been shaped by pre-college factors, with little attention to processes or interplay among people in communities.

After Spady (1971), Tinto (1975) proposed an "institutionally oriented" theory of student departure that, like Spady's (1971) model, drew on Durkheim (1952/2005). Tinto (1975) drew on an economics-of-education concept of "investment" to refer to a "cost-benefit analysis of individual decisions" related to alternative educational experiences (p. 91). Tinto attempted to conceptualize how students decided to persist based on their perceptions of whether it was worth it to stay, with these perceptions resulting partly from interactions with administrators, teachers, and clerical staff who created the institutional environment. Integration for Tinto (1975) served as a necessary condition for persistence, though what integration meant and what forms it could take for individual students remained under-researched.

With student enrollment leveling out in the 1980s, administrators of U.S. institutions of higher education fretted over how to keep students enrolled; thus started the 1980s "Managing Enrollments Era" of retention studies (Berger et al., 2012, p. 24). Responding to Tinto's (1975) model, Bean (1985) proposed a model based on socialization rather than Durkheim's (1952/2005) theory, focusing on environmental factors possibly impacting student departure. For

Bean (1985), working at a time when higher education sought ways to keep its students, the organizational character of an institution impacted a student's level of satisfaction, which then impacted dropout. One mechanism Bean proposed as socializing students was peer interaction and support. In his study of "517 freshmen, 466 sophomores, and 423 juniors, of whom 135 (10%) dropped out" who completed a mailed survey, peer socialization leading to persistence significantly outweighed faculty-member effects (Bean, 1985, p. 41). While both Tinto (1975) and Bean (1985) provided models that theorized student dropout as a linear process, Bean's model placed greater emphasis on environmental cues signaling socialization into university communities.

The 1990s has been referred to as the "Broadening Horizons Era" in retention studies, in which retention had become a permanent concern in higher education and in which the field, by then well established, could begin to inventory the "vast amounts of knowledge that had been amassed through thousands of published and unpublished studies" (Berger et al., 2012, p. 26). It was during these years that Tinto (1993, 1997, 1998, 2000) revised his earlier model of student departure. In a revision of his seminal work *Leaving College: Rethinking the Causes and Cures of Student Attrition*, Tinto (1993) expressed some dismay that existing theories of retention attempting to account for environmental factors at play in student dropout, such as Bean's (1985), in the end "rarely explicated the mechanisms by which those environments affect student departure" (p. 91). In addition to drawing on Durkheim (1952/2005), Tinto (1993) drew on van Genep's (1960) conceptualization of rites of passage. For van Genep (1960), "life itself means to separate and to be reunited, to change form and condition" (p. 189). Tinto (1993) drew on van Genep in likening the transition to college as a rite of passage that necessitated some degree of cutting of ties with past communities to thrive in new ones.

Tinto continued to explore the concept of college-as-community in his work in the 1990s.

Tinto (1993) wrote,

Colleges, like other human communities, are highly interdependent, interactive systems in which events in any one part may be felt in other parts of the system. Experiences in the formal social system, for instance via the well-documented effect of work-study, may have important effects upon one's success in the academic system of college. At the same time, social isolation may undermine one's academic performance. In some instances, academic failure may arise not from the absence of skills but from the debilitating impact of social isolation upon a person's ability to carry out academic work. (pp. 108-109)

Tinto (1993, 1997, 2000) considered the classroom as an especially important place in college where social and academic communal dimensions could meet. In addition to conceiving of the college itself as a community (Tinto, 1998), Tinto (2000) referred to classrooms as "smaller communities located at the very heart of the college's broader academic and social communities" (p. 82). The more students participated in these communities, the more they were socially and academically integrated, and the more they persisted (Tinto, 1997, 1998, 2000).

In the present era of retention studies referred to as the "Current and Future Trends Era," "with retention fully entrenched as a major policy issue in higher education as well as a well-established professional realm," researchers have continued to develop theories explaining a changing student body as well as changing forms of literacy and access to higher education (Berger et al., 2012, p. 28). Among those updates of previous theories for new students, Kerby (2015) proposed a revision of Spady's (1971), Tinto's (1975), and Bean's (1985) efforts by arguing for a model in which "the national and educational climate (political, economic, and social) directly influences the environmental factors, sociocultural factors, and individual

educational/career goals” at work in the model of voluntary student departure (pp. 154-155). Kerby gave an example of how the U.S. invasion of Afghanistan after attacks associated with September 11, 2001, impacted the educational climate in relation to less state and federal educational funding as well as stricter screening policies for study-abroad students. Explaining the model from the student’s point of view, Kerby (2015) held that a student’s “sense of place” or sense of belonging in a particular college directly impacted that student’s decision to persist, and that sense of self or place was impacted by an educational environment itself impacted by political, economic, and social variables (p. 155). Kerby’s model represents one recent, initial step in broadening the scope of theories beyond traditional pre-college and in-college factors possibly interacting with students’ persistence.

Further illustrating the importance of belonging in retention studies, Tinto (2015) recently proposed a model of student persistence to balance a progression of retention theory presented from an institutional viewpoint. Considering persistence “through the eyes of students,” Tinto (2015) theorized that persistence importantly entails a student’s sense of belonging (p. 2). For Tinto, a student’s sense of belonging impacts and is impacted by a student’s perception of how personally relevant the curriculum is. A student’s sense of belonging for Tinto also impacts a student’s motivation, which in turn directly impacts persistence.

Belonging as a Variable in Empirical Retention Studies

Retention-studies literature related to conceptualizations of belonging have offered convincing insight into factors related to belonging in college. The literature in this area, however, leaves room for work to be done. Studies that have explored belonging in relation to college-student persistence reveal a need for study of how students express or construct identities that signal belonging. In other words, what does belonging look like and mean to students?

For instance, in a study that investigated how first-generation college students, meaning students whose parents did not earn a bachelor's degree from a four-year university, and non-first-generation college students differed regarding academic engagement and persistence, Soria and Stebleton (2012) administered the Student Experience in the Research University survey to first-year students ($N = 1,864$) at what the researchers described as a large public U.S. research university. Results of statistical analyses of difference conducted on survey data indicated that first-generation students reported statistically significantly lower academic engagement—operationalized in the survey by self-reported frequency of (a) interacting with faculty, (b) contributing to class discussions, (c) raising ideas from different classes in class discussions, and (d) asking insightful questions in class. As Soria and Stebleton (2012) reported, “students’ sense of belonging on campus is consistently and positively predictive of academic engagement, although no other demographic or academic factors are consistently negatively or positively predictive of academic engagement” (p. 680). Here, while students’ reporting of a sense of belonging is powerfully described as impacting academic engagement, itself related to persistence, a need remains to understand how belonging is understood and expressed by students in association with such experiences as interacting with faculty members.

Already, research suggests other aspects of students’ identities, such as those related to socioeconomics, can impact belonging. In one study, “class identity” was concluded as being linked to belonging in college. Soria, Stebleton, and Huesman (2013) asked in their study if self-identified middle-class and working-class students differed regarding persistence at large U.S. public research universities. The researchers compared students ($N = 58,017$) from 6 universities along Tinto’s (1975) lines of academic and social integration using the Student Experience in the Research University survey. Results included that working-class students reported statistically

significantly lower satisfaction with the educational experience and a lower sense of belonging and satisfaction on campus (Soria et al., 2013). Soria et al. (2013) pointed to a kind of “class identity” negotiation and struggle as a potential mechanism at play in explaining why working-class students sensed the university as relatively less welcoming, but those conclusions were only speculative. Their quantitative-design study did not include student voices or perceptions to support more than calls for future research into this issue.

Conceptions of gender identity have also been discussed in retention studies as related to college-student persistence. For example, in a study that investigated how stereotypes impacted attribution bias regarding men and women STEM majors, LaCosse, Sekaquaptewa, and Bennett (2016) invited undergraduates ($N = 85$) (women, $n = 46$) enrolled in math, engineering, physics, informatics, and chemistry courses to finish a sentence-fragment completion task meant to measure stereotypic attribution bias. Students who self-identified as male or female both equally demonstrated the attribution bias in which women’s setbacks in STEM were attributed to women’s internal shortcomings, such as low ability, while men’s setbacks in STEM were attributed to external factors beyond men’s control. The researchers concluded that the stereotype attribution bias also “was associated with less perceived belonging and weaker postgraduate intentions to stay in STEM” for women (LaCosse et al., 2016, p. 16). Though not explicitly discussing a notion of co-constructed gender identity in which women are constructed as less able than men, this study implies a need for further work on co-constructions of disciplinary identities unique for individuals.

Related research has explored whether involvement in different academic communities, experienced in different classes and disciplines, can impact a student’s feeling of belonging in a STEM major. Thoman, Arizaga, Smith, Story, and Soncuya (2014) asked participants ($N = 62$)

who were undergraduate women STEM majors to report feelings of belonging and interest in each of two courses (one STEM and one humanities or liberal arts class) every two weeks, or eight times total, over the course of a semester. Results of statistical analyses of difference between reported senses of belonging in the two kinds of class over the course of the semester indicated that a sense of belonging in STEM correlated statistically significantly and positively with interest in STEM, and for students who had scored highly in measures of self-liking and low in measures self-competence, feelings of belonging in the humanities/liberal arts class correlated statistically significantly and negatively with STEM-class interest (Thoman et al., 2014). Therefore, while the researchers concluded that “greater class belonging in one domain does not always affect interest in another,” a diminished sense of belonging in STEM may signal a diminished interest in the STEM class for women students in this study (Thoman et al., 2014, p. 253). The big-picture pattern suggested here, however, leaves students’ voices to be explored.

In addition to conceptualizations of class and gender identity, race identity is another construct that has appeared in retention-studies literature in relation to a student’s sense of belonging in college. Carrant (2015) asked students of color what challenges they faced in belonging to a predominantly white university. Through face-to-face interviews ($N = 12$), Carrant (2015) located three categories of engagement and belonging strategies that the students employed: (a) a “post racial engagement and belonging strategy,” which entailed students’ engagement with what were perceived as wider problems or issues at the university not necessarily perceived as having a clearly racial dimension, in order to interact with a wide range of people academically and socially; (b) an “academic engagement and belonging strategy,” which entailed performing well academically to overcome racial and ethnic disadvantages; and, (c) an “advocacy engagement and belonging strategy,” which entailed feeling obligated to

educate others on racial issues. Carrant's study suggests the possibility here that an academic identity may have seemed to help students navigate perceived disadvantages conferred by a racial identity as a person of color. The notion that a person's co-constructed disciplinary identity can seem to students to be a more central identity in college than other identities seems further supported in a study by Sriram and Diaz (2016), who interviewed sophomores of color majoring in STEM who had chosen to live in living-learning communities. Analysis of interview data led the researchers to conclude that being a STEM major was reported as an experience of belonging to a minority group in the university—a minority group that, according to Sriram and Diaz (2016), participants self-identified with more vocally than with categories of race. This study suggests the possibility that constructing a disciplinary identity among fellow students in the same major, in the high-impact educational practice or those practices that “educational research suggests increase rates of student retention and student engagement” (Kuh, 2008, p. 9) of the living-learning community experience, facilitates belonging in college—though more work that specifically aims to understand disciplinary identity construction remains to be done here.

As my review of the above studies indicates, my study promises to offer further understanding of how students understand their departmental and disciplinary lives, and how they construct themselves as belonging in college. Such an exploration can also catalog what specific experiences interacted with disciplinary identity construction and belonging, something useful for future research and retention initiatives.

Retention Initiatives and Belonging

Numerous retention initiatives, meaning strategies colleges employ to keep students enrolled, have been linked in empirical studies to fostering students' senses of belonging. Often these initiatives entail forms of student-student or faculty-student community building. A review

of such studies reveals a need for further investigation of how students understand these experiences.

In a study of one such retention effort, Tomasko, Ridgway, Waller, and Olesik (2016) asked if participation in a bridge program, or a summer program meant to facilitate students' transition into their first years, related to retention in a STEM-field major. In the study, participants ($N = 7,823$) completed surveys with closed- and open-answer items about perceptions of academic preparation and belonging. Survey results indicated that students reported (a) feeling prepared for college and (b) developing a sense of belonging by making friends and forging relationships with STEM faculty. The researchers also found that participants also were retained at rates higher than those who had not experienced the program (Tomasko et al., 2016). While student-faculty interaction has long been established as supporting retention of college students (e.g., Spady, 1971), it is not the case that student-faculty interaction alone is perceived by students as beneficial, since negative experiences with faculty may be reported by students as making them lose interest in their majors (Seymour & Hewitt, 1997). Further investigation is still needed here into what kinds of interactions specifically may be perceived as leading to students reporting belonging.

Other intervention studies aiming to help students transition to college and support belonging have explored ways of creating “multicultural learning communities” (MLCs) (Jehangir, 2010, p. 98). Jehangir (2010), for instance, investigated whether MLCs impacted first-generation college students' educational experiences. A kind of experience that melds learning communities and diversity learning, which are two high-impact educational practices (Kuh, 2008), Jehangir (2010) defined MLCs as consisting of a cohort of students enrolled together in three courses in their first semester of college: “The MLC included three college courses: a first-

year writing composition course, a creativity art lab humanities course, and a multicultural relations social science course or an international literature course” (p. 98). In the study, the researcher interviewed students ($N = 24$) who had experienced the MLC, with results suggesting that belonging/finding a place as well as developing academic- and self-identity were self-reported outcomes of experiencing the learning community (Jehangir, 2010). Here belonging and identity, conceptualized as psychological constructs, are linked as possible outcomes of the multicultural learning community experience. Further work on what specific experiences and how students perceive those experiences could complement and give illustrative examples of communal belonging.

To summarize, intervention studies to retain students, often in an attempt to support belonging, indicate that students’ working together in academic cohorts and communities supports belonging and may, according to persistence theory (Tinto, 2015), play a role in college-student persistence. In exploring how students construct disciplinary identities and what experiences they report as being meaningful for their disciplinary lives, my study aims to build on such studies to inform and support retention initiatives.

STEM- and Humanities-Student Persistence

In a dissertation that focuses on chemistry and English students, there is a need to recap relevant knowledge about STEM-student and humanities-student persistence.

STEM-Student Entry Characteristics and Persistence

What we know about student-entry characteristics, first, is that high school academic achievement and experiences matter; for instance, students’ exposure to STEM-field courses has been associated with students choosing a STEM-field major (Wang, 2013). In addition to overall high school GPA (Wao et al., 2015), grades specifically in high school math are linked to

becoming a STEM student (Wang, 2013). Race and gender also appear in STEM-student persistence literature, as well as student-entry characteristics that play important parts in retention studies literature (Braxton et al., 2014). Gender bias may impact women students' interest in STEM classes and belonging in STEM (Grunspan et al., 2016; LaCosse et al., 2016; Thoman et al., 2014). Gender may also play a role in what majors women choose within STEM fields: Women may be significantly less likely to enter into and graduate from an engineering STEM program than men but may be more likely than men to enter into and graduate from a biology/life sciences program (Wao et al., 2015).

Conceptions of race have been discussed as STEM-student entry characteristics impacting persistence (e.g., Braxton et al., 2014). In retention studies, researchers often refer to African Americans and Latina/os as “underrepresented racial minorities” (URMs) in STEM fields and have reported that Asian Americans have persisted in STEM fields at a rate of 73.5%, white students at a rate of 63.5%, and URM students at a rate of 58.4%—with Native Americans at 62.8%, Latinos/as at 58.9%, and African Americans at 56.5% (Chang, Sharkness, Hurtado, & Newman, 2014, p. 564). Other research has suggested that African Americans and Latina/os may report feeling less comfortable as STEM majors in college, which may lead to comparing themselves socially with others (Micari & Drane, 2011). To summarize, high school course exposure, high school GPA, high school math achievement, gender, and race have appeared in literature on retention studies that explores what pre-college, student-entry characteristics may be at play to explain STEM-student persistence.

STEM Students' Experiences in College and Persistence

Most of what we know about STEM-student persistence comes from studies that have explored STEM students' experiences upon entering college. In their seminal study of highly

qualified science, mathematics, and engineering (SME) undergraduates, Seymour and Hewitt (1997) found that, regardless of the size, mission, reputation, and selectivity of the college, factors influencing departure were the following: (a) lacking or losing interest in the SME major; (b) perceiving a non-SME major as offering better education or being more interesting; (c) experiencing poor teaching by SME faculty; and (d) feeling overwhelmed by curriculum load and pace (pp. 46-47). Additional concerns for SME students who stayed in their major and who switched to another major included finding conceptual material in a SME course difficult and feeling discouraged by a competitive atmosphere, a factor the researchers reported as being possibly especially felt among women in SME majors (Seymour & Hewitt, 1997). Indeed, recent studies have shown academic performance in college courses in life and physical science (i.e., grades received) impacted persistence, with women reported as being more affected by grades than men (Ost, 2010). A recent study that measured if engineering students graded with an alternative satisfactory/unsatisfactory grading method (SUG) persisted in engineering more so than students receiving traditional A, B, C, D, or F grades found that SUG may be a more effective way to give students' feedback on performance when the goal is retention (Novak, Paguyo, & Siller, 2016).

Aside from grades, having friends who persist in STEM may help an individual persist (Ost, 2010). Intervention studies that have investigated ways of helping STEM students transition into college and remain in STEM programs have indicated the effectiveness of summer bridge programs (Murphy, Gaughan, Hume, & Moore, 2010; Tomasko et al., 2016) as well as the effectiveness of individual courses aiming to retain STEM students (Rivera & Murray, 2014; Schultz et al., 2011). Other studies have likewise indicated that community building through such interventions can be achieved through learning communities specifically populated with

STEM majors (Carlson, Turvold Celotta, Curran, Marcus, & Loe, 2016; Goonewardene, Offutt, Whitling, & Woodhouse, 2016; Sriram & Diaz, 2016).

Described elsewhere as a high-impact educational practice (Kuh, 2008), one of the most promising ways of engaging STEM students in academic practices related to STEM communities is course-based research experiences (Hanauer & Bauerle, 2012; Hanauer et al., 2016; Hanauer, Hatfull, & Jacobs-Sera, 2009; Hanauer et al., 2006). Undergraduate research experiences generally have been linked to STEM-student persistence (Gardner & Willey, 2016; Goonewardene et al., 2016; Jones, Barlow, & Villarejo, 2010; Schultz et al., 2011) and intent to become research scientists (Hanauer et al., 2016). As Seymour and Hewitt (1997) established twenty years ago, “We met very few students who had been given the chance to work with S.M.E. faculty in a research capacity or to observe them in a hands-on relationship with their discipline. However, students (largely non-switchers) who reported such experiences pointed to the pleasant and open way in which faculty treated undergraduates in a research relationship, compared with their apparent indifference in a teaching context” (p. 147). In addition to research experiences with faculty being positive experiences, undergraduate research in STEM has also been linked to students’ desiring to themselves become professors in STEM, for instance in computer science (Tamer & Stout, 2016), or to students’ identifying with scientific thinking, identifying with scientists, and self-identifying as scientists (Kortz & van der Hoeven Kraft, 2016). The importance of identifying with science as a field and scientists within the field has also been discussed as an especially powerful predictor of persisting to STEM-degree completion (Chang, Eagan, Lin, & Hurtado, 2011; Hernandez, Schultz, Estrada, Woodcock, & Chance, 2013). Importantly, constructs of identification and science identity have special importance in

literature in retention studies specifically concerned with STEM-student persistence (Hanauer et al., 2016).

Humanities-Student Experiences and Persistence

In a six-year longitudinal study of first-year college students enrolled in U.S. colleges in all 50 U.S. states including the District of Columbia and Puerto Rico ($N = 7,800$), student persistence in STEM fields was 52%, with persistence in physical sciences (including chemistry) being 54%; meanwhile, student persistence in humanities (including English) was 44% (Chen & Soldner, 2013). Yet trustworthy empirical data remains scarce and not clearly indicative of college experiences unique to students majoring in the humanities or in English. Among studies into what factors may relate to humanities-student persistence is Mestan's (2016) investigation. After conducting semi-structured phone interviews with 17 former bachelor of arts students at an Australian university, Mestan (2016) reported that students' explanations for leaving college before graduating could be categorized as course-related and personal reasons. The most important course-related reason was coursework that "did not provide career direction and lacked purpose" (Mestan, 2016, p. 4). Meanwhile, the most important personal reasons were experiencing physical or mental illness and financial troubles (Mestan, 2016, p. 9). While the first finding may perhaps be unique to students in humanities in the U.S., research is needed to corroborate it. What we do have are personal-experience pieces, such as Flaherty's (2015) piece on the steep decline of English majors at University of Maryland at College Park, a decline perceived to resemble those being experienced across a number of U.S. English departments. Flaherty (2015) discussed English faculty members' common assumption that undergraduates and their families may be avoiding the English major because of "anxieties about studying the humanities in a still-uncertain job market" (para. 4). Mestan's (2016) second finding, related to

illness and financial trouble, matches others' findings related to uncontrollable personal issues or simple bad luck (Reichert Powell & Aquiline, 2009) as well as financial issues (Letkiewicz et al., 2014; Robb, Moody, & Abdel-Ghany, 2012; Xu, 2016). Thus Mestan's (2016) study may not offer any clearly humanities-specific data on persistence.

In another study, Harvey and Luckman (2014) found first-year academic performance and course preference in the bachelor of arts program at an Australian university positively and statistically significantly correlated with persistence. Again, Harvey and Luckman's (2014) study, while shedding further light on persistence in general, does not clearly reveal any humanities-specific understanding of persistence. Earlier studies have already noted how vital the grades students earn in their first semester (Dika & D'Amico, 2016; Farmer & Hope, 2015; McGrath & Braunstein, 1997) and first academic year (Allen & Robbins, 2008; Arbona & Nora, 2007; Ma & Cragg, 2013) prove to be for first-to-second-year persistence and persistence to graduation. Additionally, Harvey and Luckman's (2014) finding that course preference mattered, while possibly useful for directing qualitative inquiry to complement this quantitative-design study, matches earlier findings on the importance of course and major preference and sense of individual-major fit (Allen & Robins, 2008, 2010). In summary, while useful as starting points, these two studies leave much work to be done in exploring humanities-student and English major-specific persistence in U.S. colleges as well as how these students understand their experiences, in and out of class.

STEM- and Humanities-Student Writing and How WAC Theory and Practice Can Guide Retention Initiatives

In addition to providing an overview of what is known about STEM- and humanities-student persistence, it is important to detail what is known about how writing relates to STEM

and humanities students' college experiences. This overview helps to situate my investigation into students' academic life narratives and disciplinary writing experiences and locate where I have aimed to build knowledge in this dissertation.

To begin by taking a broad view of the issue, empirical studies have established college writing as related to college-student persistence generally. In a study that ran correlational analysis on the academic records of 500 community college students, Volpe (2011) concluded that students' grades in Composition 1 positively and statistically significantly correlated with persistence even two semesters after completion of the course, with students earning a C or below being significantly less likely to persist than those who earned an A or a B. Garrett, Bridgewater, and Feinstein (2017) have corroborated this finding, concluding through quantitative analysis of students' records at one small, metropolitan U.S. university that students who earned a C or below in first-year composition had a 17% likelihood of graduating compared to the 53% likelihood that students who earned an A or a B had.

Other studies have helped to build an understanding of what such findings mean. Robbins, Allen, Casillas, Peterson, and Le (2006) investigated how psychosocial factors impacted first-year college outcomes, including how such factors impacted first-year composition grades. Incoming first-year students ($N = 14,642$) from 48 institutions took the Student Readiness Inventory, and "The strongest predictor of success in English Composition was high school GPA" while "Social Activity was inversely related to success in English composition" (Robbins et al., 2006, p. 610). This result suggests that, if high school GPA reflects some level of preparedness for college, then pre-college preparation may relate to how students do in Composition 1. Meanwhile, this result also suggests that the variable of social activity, defined as reflecting "how comfortable a student feels meeting and interacting with other

people,” plays a role—with being less comfortable linked to doing better in Composition 1 (Robbins et al., 2006, p. 600). For the researchers, participants who self-reported high scores in social activity were potentially socializing more than studying (Robbins et al., 2006)—though more work and qualitative inquiry would be needed to find out what exactly social activity and being comfortable doing social activity mean for college students. It seems more accurate to say that the kind of social activity a person engages in matters. Other studies have found that social networking sites, when they result in more student-faculty interaction, may relate to students seeking more writing advice, which is linked to overall academic success and persistence in college (Nalbone et al., 2016).

Writing is considered central to the working of various high-impact educational practices (Kuh, 2008). Defined by Kuh (2008), high-impact educational practices are teaching and learning practices that “educational research suggests increase rates of student retention and student engagement” (p. 9). There are currently eleven high-impact educational practices:

1. first-year seminars and experiences
2. common intellectual experiences
3. learning communities
4. writing-intensive courses
5. collaborative assignments and projects
6. undergraduate inquiry and creative activity
7. diversity/global learning
8. service/community-based learning
9. internships and field placements
10. capstone courses and projects

11. ePortfolios (Kuh, 2008; Moore, 2016; Watson, Kuh, Rhodes, Light, & Chen, 2016)

Writing-across-the-curriculum (WAC) theory and practice have long reflected the importance of writing as a way of supporting content learning (Bazerman et al., 2005; Emig, 1977) and of becoming socialized into ways of thinking and communicating in disciplinary communities (Russell, 2002). Yet as the recent special issue linking WAC and writing in the disciplines (WID) to high-impact educational practices in *Across the Disciplines* (Boquet & Lerner, 2016) illustrates, WAC practitioners are increasingly aware that they and composition teachers are in advantageous positions to support high-impact educational practices across the curriculum and, consequently, to support retention initiatives. Indeed, Kuh (2008) has made clear that many of these practices are most successful when they include significant writing components. For instance, according to Kuh (2008), “the highest quality first-year experiences place a strong emphasis on critical inquiry, frequent writing, information literacy, [and] collaborative learning” (p. 9). Meanwhile, some high-impact practices are writing experiences themselves, such as those that happen through writing-intensive courses (Kuh, 2008). Other high-impact educational practices are importantly mediated or complemented by writing, such as undergraduate inquiry and creative activity, as well as ePortfolios (Kuh, 2008; Moore, 2016; Watson et al., 2016). In summary, writing classes such as Composition 1 as well as writing experiences generally, such as writing-intensive courses and writing involved with undergraduate inquiry and creative activity, have been established as important for understanding student engagement and college-student persistence generally.

What we know about STEM writing and STEM student college experiences reflects what is known generally about writing’s importance to college-student performance, engagement, and persistence. I have already discussed the importance of undergraduate course-based research

experiences (Hanauer & Bauerle, 2012; Hanauer et al., 2016; Hanauer et al., 2009; Hanauer et al., 2006), a learning experience usually mediated by writing. As noted earlier, undergraduate research experiences generally have been linked to STEM-student persistence (Gardner & Willey, 2016; Goonewardene et al., 2016; Jones et al., 2010; Schultz et al., 2011) and intent to become research scientists (Hanauer et al., 2016). In addition to research experiences with faculty being positive experiences, undergraduate research in STEM has also been linked to students' desiring to themselves become professors in STEM, for instance in computer science (Tamer & Stout, 2016), or to students' identifying with scientific thinking, identifying with scientists, and self-identifying as scientists (Kortz & van der Hoeven Kraft, 2016).

It is also argued, however, that U.S. students' entire educational experiences from Kindergarten onward create perceived divisions between science and literature/writing: According to Martin (2012), "Our academic system, from pre-K through graduate school, contrasts science and literature—objectivism and subjectivism, reductionism and holism" (para. 9). It is also argued that the divisions perceived between writing and science represent obstacles that may prevent future scientists from becoming expert science writers (Shanahan, 2004), especially since writing represents a central activity for college students and professors (Emerson, 2016). As Emerson (2016) recently wrote in her study of scientists' literacy narratives, "Over and over, I noted this odd discrepancy: scientists were concerned about their students' writing, the majority saw themselves as (sometimes reluctant) teachers of writing, but many hadn't recognized the extent to which their professional identity revolved around their writing, until they began to talk about it" (p. 180). It may be that, when asked, science students and professors dismiss writing as part of their professions because, unlike fields like composition, scientists may not have developed a vocabulary that facilitates talking about

writing (Emerson, 2016). In summary, what we know about STEM students and writing is that writing mediates high-impact educational practices, such as research, but that writing may not be perceived as integral to a scientist's disciplinary life because how to do science writing is not always an explicit focus in college disciplinary experiences.

College chemistry-student writing, in particular, has received special attention in empirical studies. Stewart et al. (2016) reported on a departmental effort to incorporate writing instruction for chemistry students in laboratory courses, finding that both undergraduates and graduates reported positive views toward the initiative. In a study looking at the impact of writing-intensive experiences for first-year undergraduate chemistry majors, Waratuke and Kling (2016) reported on an summer bridge program that employed writing as a way to nurture engagement with chemistry concepts as well as a way to reflect on disciplinary identities as chemistry students. The researchers reported that students who experienced the writing-intensive program also persisted from semester to semester, as well as to graduation, more so than did their peers who had not experienced the seminar (Waratuke & Kling, 2016). Indeed, writing and reflection have been reported as boosting critical thinking as evidenced in chemistry students' written laboratory reports (Gupta, Burke, Mehta, & Greenbowe, 2015). Overall, these studies suggest that chemistry students may view chemistry department-directed writing instruction as meaningful and valuable for their disciplinary lives. These studies also suggest that writing may be used successfully in chemistry departments to support a number of learning outcomes, including critical thinking, content understanding, self-reflection, and chemistry-major persistence. What remains, however, is an understanding of what kinds of writing chemistry majors find most meaningful, beyond the usual laboratory report. It has already been suggested that, among chemistry non-majors, creative writing components added into the usual scientific

laboratory report have been engaging (Henary, Owens, & Tawney, 2015). It remains to be seen what other genres of writing aside from the informative/persuasive laboratory report may be indicated as important for chemistry majors. Overall, I aim to add to what is known here by exploring what academic experiences, possibly literacy or writing experiences, are drawn upon as chemistry majors talk about those disciplinary experiences that were and are meaningful to them.

What we know about humanities writing, and specifically English-major writing, is surprisingly little. The arguments above that U.S. students may encounter messages in school that science is distinct from literature/writing apply here (Martin, 2012). If this distinction was encountered, it may be that humanities students, including English majors, will consider their disciplinary identities as excluding science and/or mathematics knowledge. A study I carried out explored how much ownership English majors felt for four different kinds of writing: poetry, short stories, argument papers, and research papers (Nicholes, 2017). Statistical analyses of difference revealed a hierarchy of ownership, with undergraduate English majors reporting statistically significantly more ownership over their poetry and short stories than over their argument and research writing (Nicholes, 2017). Undergraduate English majors also reported feeling statistically significantly more ownership over their argument writing than over their research writing; however, in comparing undergraduate and postgraduate English majors' ownership, I found postgraduates felt statistically significantly more ownership over their research writing than undergraduates did (Nicholes, 2017). What this study suggests is that creative writing may be a common experience for some English majors and may be among the more meaningful writing experiences English majors have while undergraduates. It is possible that creative writing qualifies as part of Kuh's (2008) sixth high-impact educational practice,

undergraduate inquiry and creative activity. Still, qualitative inquiry is needed to flesh out the issue. My earlier study (Nicholes, 2017) limited English majors' choices of kinds of writing experience; academic life narrative interviewing and writing promise to contextualize writing experiences that English majors report as meaningful in other life and disciplinary experiences to see the perceived relative importance of writing experiences.

WAC can add to the question of how to foster belonging in college, and thus support disciplinary identity construction and enacted disciplinary belonging, by further exploring how to use its programmatic features strategically. That is, WAC may draw on its practice of coordinating with faculty across campus and with resources such as writing-intensive courses, writing centers, and peer tutors (Bazerman et al., 2005) not only to help students learn to write in the disciplines but also to support students as they reflect upon themselves in, and perform disciplinary identities through, writing-to-learn and learning-to-writing activities—while inflecting WAC practice with identity and retention theory.

Chapter Summary

In this chapter, I have argued that the existing literature on college-student persistence has explained that belonging relates significantly to persistence; however, studies on how students understand their college department and disciplinary lives are lacking, as well as how students construct their disciplinary identities. My study seeks to build on what is known about college-student persistence by exploring disciplinary identity construction in the academic life narratives of undergraduate chemistry and English majors. Additionally, the academic life narrative is a broad enough narrative structure to absorb the literacy narrative. Thus my study may complement literacy-narrative studies, such as Emerson's (2016), by enacting a methodological approach that does not assume that disciplinary writing is important to my

participants in relation to other life and disciplinary experiences. My methodology first involves understanding students' academic life narratives before specifically following up about literacy and specifically writing experiences. In these two ways, then, my study may add knowledge to composition, the WAC movement, and higher education in general.

In the next chapter, I detail the proposed analytical approach to investigate how identity, writing, and discipline are linked, and their relationship to college-student persistence.

CHAPTER 3

ANALYTICAL APPROACH

Disciplinary Identity

My entry point into an investigation of belonging and persistence in college is through the concept of a student's *disciplinary identity*.

As defined here, identity is a fluid, locally situated, multifaceted co-construction (Jacoby & Ochs, 1995) that might be partly but might not necessarily be completely representative of a person's self-concept (Niedenthal & Beike, 1997). Defining identity as a "co-construction" acknowledges the "fundamentally interactional basis of the human construction of meaning, context, activity, and identity" (Jacoby & Ochs, 1995, p. 175). Thus people's self-concepts, which Niedenthal and Beike (1997) defined as "mental representations of those personal qualities used by individuals for the purpose of defining themselves and regulating their behavior," may not match how their identities are co-constructed in social engagement (p. 106). This is because co-construction does not mean cooperation: It does not "necessarily entail affiliative or supportive interactions" (Jacoby & Ochs, 1995, p. 171). We are partly but not necessarily completely in control of how our identities are co-constructed in social interactions.

In talking about disciplinary identity as a way of exploring belonging and persistence in college, it is useful to draw on conceptions of identity that have been developed in relation to learning. Referring to Anderson's (1983/1991) concept of imagined communities and coming from the point of view of a language teacher, Norton (2001) wrote that "different learners have different imagined communities, and that these imagined communities are best understood in the context of a learner's unique investment in the target language and the conditions under which he or she speaks or practices it" (p. 165). For Norton (2001), "a learner's imagined community

invited an imagined identity” (p. 166). Imagined communities and identities refer “to groups of people—not immediately tangible and accessible—with whom we connect through the power of the imagination” (Norton, 2010, p. 3). Regarding investment, Norton (Norton Peirce, 1995) drew on notions from Bourdieu (1977) in explaining that “if learners invest in a second language, they do so with the understanding that they will acquire a wider range of symbolic and material resources, which will in turn increase the value of their cultural capital” (p. 17). Investing in an additional language, according to Norton, was done with anticipation of benefits in terms, for instance, of friendships, connections, and money (Norton Peirce, 1995). Importantly, Norton linked investment and identity by arguing that “an investment in the target language [was] also an investment in a learner’s own social identity” (Norton Peirce, 1995, p. 18). What can be argued here, then, for chemistry and English majors is that an investment in a target discipline is also an investment in a student’s disciplinary identity.

Norton importantly distinguished investment from motivation: For Norton, language learners could be motivated (meaning they had and showed a stable characteristic of desiring to do or achieve something) to learn a particular language but not invested in the specific classroom practices and exchanges meant to enable access to practicing and learning that language (Norton Peirce, 1995). According to Norton (2013), “The construct of investment provides for a particular set of questions associated with a learner’s commitment to learning” a target subject; it also allows that “A learner may be a highly motivated language learner but may nevertheless have little investment in the language practices of a given classroom or community, which may, for example, be racist, sexist, elitist or homophobic” (p. 7). Norton’s definition of the concept of investment may be applied in the present dissertation by arguing that chemistry or English

majors may be highly motivated but may not be invested in the specific institutional or departmental practices that shape contact with their discipline.

Noting Norton's (2001) concept of identity as it pertains to imagined communities and investment, I define disciplinary identity as a fluid, locally situated, multifaceted co-construction that is related to a target discipline and to the departmental conditions and practices in which students may invest. A person's disciplinary identity might be partly but might not necessarily be completely representative of that person's self-concept. Understanding the imagined communities of college undergraduates and analyzing to what degree these imagined communities refer to meaningful participation in department-specific disciplinary communities of practice (Wenger, 1998) offers insight, then, into the investment students have placed in engaging with a target discipline in specific departmental settings—with that investment signaling also an investment in students' disciplinary identities.

Persistence as Disciplinary Identity Investment and Performance

As noted earlier, persistence traditionally has been defined “through the eyes of students” (Tinto, 2015, p. 2) as “the desire and action of a student to stay within the system of higher education from beginning year to degree completion” (Berger et al., 2012, p. 12). Retention studies scholars developed this definition mainly for correlation studies to provide overviews of college-student persistence. Such studies have developed convincing and generalizable descriptions, but additional ways of exploring persistence are needed to complement correlational studies to understand students' perceptions and constructed narratives of why they chose and stay in their majors. The co-written and autobiographical academic life narratives collected from participants in this study represent fruitful ground for exploring how students chose to express themselves at the moment of writing or speaking but in a context where they

were prompted to select and negotiate the personal significance of episodes from their lives. For each participant in this study, this process spanned a week's time, and the stories that resulted give a rich expression touching on how students chose to enter and perhaps to remain in their majors.

In this study, I suggest viewing persistence not as a state of mind or stable desire. Instead, persistence can be fruitfully understood as an investment (Norton, 2000) in and performance (Austin, 1962; Butler, 1997) of disciplinary identity.

One productive way of exploring students' investments in their disciplinary identities is by considering their academic life narratives as performances of aspects of disciplinary identity. Austin (1962) illustrated how linguistic behavior constituted performance. Austin (1962), in explaining the term "performative," wrote that "The name is derived, of course, from 'perform', the usual verb with the noun 'action': it indicates that the issuing of the utterance is the performing of an action—it is not normally thought of as just saying something" (pp. 6-7). For Austin (1962), the speaker of a performance makes choices about how to perform based on intentions and on how the speaker may want others to respond to the performance (p. 110). Meanwhile, Butler (1997) suggested that cultural context and conditions are important for understanding identity performance in addition to speaker agency and choice. For Butler (1997), a performative's success happens "only because that action echoes prior actions, and *accumulates the force of authority through the repetition or citation of a prior and authoritative set of practices*. It is not simply that the speech act takes place *within* a practice, but that the act is itself a ritualized practice" (p. 51, emphasis in original). Narratives represent modes of communication capable of capturing what Butler referred to as ritualized practice echoing prior actions, as explained below.

In defining *narrative*, I draw on Ochs (1997), who explained that narrative refers to “a vast range of genres” that all commonly “*depict a temporal transition from one state of affairs to another*” (p. 189). Schiffrin (1996) demonstrated that “The form of our stories (their textual structure), the content of our stories (what we tell about), and our story-telling behavior (how we tell our stories) are all sensitive indices not just of our personal selves, but also of our social and cultural identities” (p. 170). Identity construction can therefore be explored in the narratives people tell and write about their lives. Exploring the content of students’ narratives and the way these narratives index “stances, social acts, social activities, and other social constructs” (Ochs, 1992, p. 337) offers insight into performed aspects of a student’s disciplinary identities.

Understanding identity construction in narratives requires a framework for explaining narrative structure and the devices that make life narratives coherent. In describing the general features of narrative, Labov (1972) noted that some narratives “contain only narrative clauses,” meaning “they are complete in the sense that they have a beginning, a middle, and an end” (p. 362). More fully developed narratives for Labov (1972), however, contained the following:

1. *Abstract*: opening clauses that summarize the story to come.
2. *Orientation*: sections at the beginning of a narrative that describe the who, what, and where of the events to be narrated.
3. *Complicating action*: elaboration of unfolding actions and circumstances surrounding them.
4. *Evaluation*: clauses embedded in the narrative or concentrated after complicating action that express the point or significance of the story for the narrator.
5. *Result or resolution*: sections that conclude the events narrated.

6. *Coda*: clauses at the endings of narratives by which authors signal their narratives' conclusions.

Narratives have been conceptualized as providing coherence to our lives partly because, in one sense, narratives represent how we experience life; as Clandinin and Connelly (2000) have argued, “life—as we come to it and as it comes to others—is filled with narrative fragments, enacted in storied moments of time and space, and reflected upon and understood in terms of narrative unities and discontinuities” (p. 17). Linde (1993) assisted in explaining mechanisms in narratives that create such unities and repair discontinuities. Linde (1993) pointed out how life stories achieved coherence through two “coherence principles,” namely “causality and continuity” (p. 127), which may be achievable through various strategies (Table 1).

Table 1

Coherence Principles for Narrative Order in Life Stories (Linde, 1993)

Principles	Strategies	Description
Causality	1. Character as Adequate Causality	Presenting character traits as obvious causes for a decision; no explanation of how those character traits developed is needed.
	2. Richness of Account as Adequate Causality	Covering a long period of time, perhaps with some activity being described as having started in a person's youth; also combining various but not contradictory accounts for a decision.
Continuity	1. Apparent Break	Rejecting the presence of a break by describing a decision or life event as only seemingly discontinuous.
	2. Temporary Discontinuity	Rejecting the presence of a break by describing a decision or life event as merely temporarily discontinuous.
	3. Discontinuity as Sequence	Rejecting the presence of a break by describing two life events that seem discontinuous to actually be logically or naturally linked by cause and effect.
	4. Self-Distancing	Acknowledging the presence of a break but managing it by describing yourself as not being the same person as then.
	5. Discontinuity as Meta-Continuity	Acknowledging the presence of a break but managing it by presenting your character as desiring such multiplicity, so that discontinuity is your continuity.

In addition to coherence strategies, Linde (1993) referenced “coherence systems,” or “a system of beliefs that occupies a position midway between common sense [and] expert systems, which are beliefs and relations between beliefs held, understood, and properly used by experts in a particular domain” (p. 163). For Linde, common sense also represented a coherence system.

To summarize, the oral life story and the written autobiographical narrative represent logical units of analysis of choice for exploring disciplinary identity conceptualized as coming about through negotiation of what students’ experiences of department-specific social membership mean. Not only do narratives organize how we perceive life events; they also reflect “the prevailing theories about ‘possible lives’” (Bruner, 2004, p. 694) that are part of communities of practice. As Wenger (1998) explained, our identities comprise a “complex interweaving of participative experience and reificative projections” (p. 151), with Wenger’s concepts of reificative projections covering such formal social interpretations of experience as Bruner’s (2004) “prevailing theories of ‘possible lives’” (p. 694). Narratives are made up of storylines available for meaning making in any given community—immediate (Wenger, 1998) or imagined (B. Anderson, 1983/1991).

To assist in investigating identity performance systematically, the concept of indexicality is useful. As a social act, identity performance is ultimately observable in linguistic units that index stances, which in turn index aspects of identity (Du Bois, 2007; Ochs, 1993). Identity, then, is presented in the ways people construct and perform identity in social moments. In the present study, exploring how participants talk about their disciplinary experiences, their writing experiences, and their imagined futures is expected to assist in understanding from what self-positioning participants are performing aspects of their disciplinary identities in their academic life narratives. Additionally, richness of account (Linde, 1993) in narratives could be expected to

be achieved by authors presenting continuous narrated selves who engage with their majors at points deep in their personal histories. Richness of account can also be emphasized by placing an implied ending point of the narrative at some future time beyond the storytelling moment.

Understanding how participants align with learning experiences and learning environments is also important. In evaluating experiences and environments, students are taking stances (Du Bois, 2007). Stancetaking, for Du Bois (2007), always entails evaluation: “The act of taking a stance necessarily invokes an evaluation at one level or another, whether by assertion or inference” (p. 141). Stancetaking is also a “triune act” that at once evaluates objects, positions speakers, and aligns (converging with or diverging from) speakers in relation to objects of evaluation (Du Bois, 2007, p. 169). Taking a stance, then, positions a speaker in a way that indexes aspects of that speaker’s performed identity.

As a more specific learning experience and literacy practice, writing represents a way of constructing and performing identity (Ivanič, 1998; Scott, 2015). In explaining the relationship between literacy and identity according to her own literacy research, Norton (2010) explained that literacy practices that involve producing various kinds of texts (“oral, written, drawn, or performed”) that students are invested in “provide students with the opportunity to explore a range of identities, including those of the imagination” (p. 10). Norton (2010) described literacy as comprising relationships, saying,

literacy is not only about reading and writing, but also about relationships between text and reader, student and teacher, classroom and community, in local, regional, and transnational sites. As such, when learners engage in literacy practices, they are also engaged in acts of identity. (p. 10)

Important for Norton, however, was that educators should understand that some literacy experiences prove more engaging than others. For Norton (2010), students should have a feeling of “ownership over meaning-making” because, lacking ownership, that meaning-making becomes “meaningless and ritualized”; further, meaning-making is facilitated when learners are “in a position of relative power in a given literacy event” (p. 10). It might also be assumed, then, that students’ choices over content and form of writing, as well as whether they write inside as well as outside of class in ways they see as connected to their discipline, could shed light on how much ownership students report in relation to disciplinary literacy experiences. What should be considered is what Norton (2010) may refer to as “a position of relative power in a given literacy event” (p. 10). Given choice of what to write about and what forms that writing could possibly take may be expected to keep disciplinary writing from becoming “meaningless and ritualized” (Norton, 2010, p. 10).

Chapter Summary

Persistence traditionally has been defined “through the eyes of students” (Tinto, 2015, p. 2) as “the desire and action of a student to stay within the system of higher education from beginning year to degree completion” (Berger et al., 2012, p. 12). Here I suggest that persistence can be fruitfully understood, not as a state of mind or stable desire, but as an investment in and performance of identity. That is because, following Norton (2001), an investment in a target major implies investment both in the learning conditions of that major and investment in a student’s own disciplinary identity.

One productive way of exploring students’ investments in their disciplinary identities is by considering their academic life narratives as performances of aspects of disciplinary identity. As a social act, identity performance is ultimately observable in linguistic units that index

stances, which in turn index aspects of identity (Du Bois, 2007; Ochs, 1993). Since the life narratives that people tell must satisfy personal and audience members' requirements for coherence to be socially functional, what synthesis and analysis of narratives would be expected to reflect is how authors construct themselves in their life narratives using strategies that create coherence for narrative order (Linde, 1993).

Having presented my analytical approach, now I turn in the next chapter to presenting the methodology followed to explore disciplinary identity construction, department-specific (literacy) experiences, and persistence.

CHAPTER 4

METHODOLOGY

The purpose of this study is to explore how undergraduate chemistry and English majors understand and construct their disciplinary identities in relation to (a) their past and present life and disciplinary experiences as well as their imagined futures, and (b) their past and present disciplinary writing experiences.

To guide this exploration, I posed the following research questions:

1. How do chemistry and English majors understand their becoming and remaining students in their majors?
2. How do chemistry and English majors understand their disciplinary writing experiences?
3. How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?

In this chapter, I put forward the methodology followed to collect and analyze data that can answer the above questions. This chapter is organized to describe my research sample, the information needed to answer my research questions, my research design, and methods of data collection. Afterward, I explain data analysis and synthesis procedures, ethical considerations, issues of trustworthiness, and finally delimitations and limitations of the study.

Research Site and Sample

This study took place at a northeastern U.S. state public university. The university describes itself as a comprehensive, doctoral/research university, with approximately 130 undergraduate programs, 55 master's programs, and 10 doctorate programs. The university

enrolls approximately 14,000 students (approximately 2,250 of them graduate students, 80% identified as White, and 56% identified as female). The university reports having a 75% second-year undergraduate retention rate (students who stayed enrolled from their first to second academic years), 39% four-year undergraduate retention rate, and 55% six-year graduation rate.

While excluding minors, this study included 7 students majoring in chemistry and 10 students majoring in English. Participants who were recruited met the following inclusion criteria: (a) were students at the northeastern U.S. state public university of interest and (b) were full-time undergraduate college students majoring in either chemistry or English.

In the remainder of this section, I describe the chemistry and English departments, followed by a contextualizing profile of each participant.

Chemistry Department

The department of chemistry involved in this study employs approximately 20 full-time faculty members and offers more than half a dozen undergraduate degrees. The department describes its chemistry-degree curriculums as having been certified by the American Chemical Society. Pathways to a degree include a Bachelor of Arts (BA) track described as a technical degree, a Bachelor of Science (BS) track described as a professional degree, and BS pre-medical, pre-pharmacy, and interdisciplinary tracks. The department also offers a chemistry Bachelor of Science in Education, a chemistry minor, and a biochemistry BS or minor. The department has one graduate degree, described as a professional science master's (PSM) degree. The area of study for this degree is described as applied and industrial chemistry. Undergraduate students can apply to be enrolled in the master's program in their junior year, on a 4 + 1 basis, meaning that one of the five classes students take earns both undergraduate- and graduate-level credit.

From this chemistry department, 7 enrolled undergraduates volunteered to participate in the study. Table 2 describes student characteristics (pseudonyms are used).

Table 2

Chemistry Participant Student Characteristics

	Name	Gender	Year	Department	Focus
1	Ada*	Female	First-Year	Chemistry	Biochemistry
2	Arykaj*	Female	Junior	Chemistry	Pre-Pharmacy
3	Kiki	Female	Senior	Chemistry	Biochemistry
4	Linus	Male	First-Year	Chemistry	Pre-Medical
5	Ramsay	Male	Junior	Chemistry	Chemistry
6	Reatha	Female	Junior	Chemistry	Chemistry
7	Rosalind	Male	First-Year	Chemistry	Biochemistry

Note. * = self-selected pseudonym.

Below are brief profiles of the chemistry participants at the time they were interviewed.

Ada. A first-year student, Ada joined the Chemistry Department directly after graduating from high school. She is a student in the university's honors college.

Arykaj. A junior, Arykaj conducts X-ray diffraction and crystallography research. She is a member of the American Chemical Society (ACS) and Alpha Chi Sigma (AXE) (co-ed chemistry fraternity). She is a McNair Scholar, participating in The McNair Scholars Program.

Kiki. A senior, Kiki is a paid supplemental instruction leader for organic chemistry classes. She is a member of ACS and is the "Master Alchemist" of AXE.

Linus. A first-year student, Linus double majors in chemistry and mathematics. Linus works in a professor's lab, working on a protein structure and looking at how certain proteins function within *saccharomyces cerevisiae*, or baker's yeast. He is a student of the university's honors college.

Ramsay. A junior, Ramsay has experienced not one but two chemistry-lab explosions. He is working on a computational experiment involving reactions and quantum tunneling.

Reatha. A junior, Reatha researches inorganic photodynamic therapy agents. She has won multiple awards for her research, including first prize for a poster at the National Organization for Professional Development of Black Chemists and Chemical Engineers conference. She is a member of AXE and is a McNair Scholar.

Rosalind. A first-year student, Rosalind has a work-study job in the chemistry-department stock room. She enrolled in the biochemistry track directly out of high school and is taking steps to become a member of AXE.

English Department

The department of English involved in this study employs approximately 50 full-time faculty members and offers more than half a dozen undergraduate options. These options include BA degrees in a films-study track; a literary, textual, and cultural studies track; a pre-law track; and a writing-studies track. The department also offers an English Bachelor of Science in Education degree as well as an English minor. The department has multiple graduate-degree programs, including Master of Arts (MA) degrees in composition and literature, literature, teaching English, and TESOL. It also offers Doctor of Philosophy (PhD) degrees centering on composition, TESOL/applied linguistics, and literary studies.

English departments differ from context to context in their relative emphasis on literary, liberal-arts focuses versus writing studies, rhetoric-and-composition focuses (W. M. Anderson, 2010; Balzhiser & McLeod, 2010; Leverenz et al., 2015; Miller & Jackson, 2007). The present context can be described as having more of a literary-studies, creative-writing orientation, especially in contrast to departments where rhetoric and composition exist outside of the English departments (W. M. Anderson, 2010). The findings that are presented in Chapter 5 and synthesized in Chapter 6 must be understood in this context.

From this English department, 10 enrolled undergraduates volunteered to participate in the study. Table 3 describes their student characteristics (pseudonyms are used).

Table 3

English Participant Student Characteristics

	Name	Gender	Year	Department	Focus
1	Anna*	Female	First-Year	English	Writing
2	Astrid*	Female	Sophomore	English	Writing
3	Evelyn*	Female	First-Year	English	Writing
4	Joanne	Female	Senior	English	Writing
5	King	Male	First-Year	English	English Ed.
6	Nick	Male	First-Year	English	English Ed.
7	Rudy*	Male	Senior	English	English Ed.
8	Sylvester*	Male	Senior	English	Pre-Law
9	Warlock*	Male	First-Year	English	English Ed.
10	Zaphod*	Male	Sophomore	English	Writing

Note. * = self-selected pseudonym.

Anna. A first-year student, Anna attends and has read her poetry at a monthly poetry- and fiction-reading event organized by English PhD students and hosted at a local art gallery and espresso bar.

Astrid. A sophomore, Astrid took two years off after high school before deciding to become a college student. Though originally enrolled as “undecided,” she now double majors in English and theater.

Evelyn. A first-year student, Evelyn switched majors her first year from nutrition and dietetics to English. She is still deciding whether English is what she really wants to do.

Joanne. A senior, Joanne edits the university’s student-run literary magazine. She entered the English major straight from high school.

King. A first-year student, King has also attended, and considered reading at, the department-associated monthly poetry- and fiction-reading event off campus.

Nick. A first-year student, Nick came into the English major directly from high school although he had originally thought of being a journalism major.

Rudy. A senior, Rudy describes himself as a nontraditional student. He had a career in the military and then worked in the private sector fracking wells and driving truck. He transferred to the university from a nearby community college.

Sylvester. A senior, Sylvester switched majors his sophomore year from business to English pre-law. He is a member and leader of numerous associations on campus and works with the Salvation Army as a financial literacy tutor in town.

Warlock. A first-year student, Warlock nearly majored in archeology, then flirted with the idea of joining the Air Force, but finally settled on being an English major.

Zaphod. A sophomore, Zaphod originally majored in computer science with a minor in math. He switched to English and is considering adding a computer-science minor.

Research Design

This study draws on the qualitative tradition of the case study. I refer to the case study qualitative tradition after Stake (2000), who described it as “not a methodological choice but a choice of what is to be studied” (p. 435). Individual cases define the case study form of research rather than the methods of data-collection and analysis (Stake, 2000). In any case study, it is vital to define what specifically is meant by *case* (Yin, 2003). In the present study, individual undergraduate chemistry and English majors make up individual cases of interest. The specific design, then, of this study most closely resembles the “collective case study,” which Stake (2000) referred to as “an instrumental study extended to several cases” (p. 437). As an instrumental case study, meaning the kind of case study meant to extrapolate from cases to a broader issue (Stake, 2000), this study focuses on how individual students use language to

indirectly index aspects of their disciplinary identities. This focus on disciplinary identity construction meanwhile aims to provide insight into belonging and persisting in college.

Life-Narrative Interviewing

In the present study, I used interviewing to understand how chemistry and English undergraduates perceived their disciplinary experiences and how they constructed disciplinary identities through academic life storytelling. Interviewing has been described as especially useful in investigations of individuals' lived experiences (Brinkmann, 2013). Seidman (1998) has described in-depth interviewing as “a powerful way to gain insight into educational issues through understanding the experience of the individuals whose lives constitute education” (p. 7). Since the interviewing and the autobiographical narrative writing that participants were asked to take part in during this study concerned their life narratives, with disciplinary identities conveyed as a result of negotiation of meaning of what their human experience means in social practice in department-specific communities, other forms of interviewing, such as focus-group interviewing useful for investigating how groups of people feel or think about an issue (Myers, 1998), was not as suitable here.

Life-Narrative Writing

In the present study, I also asked participants to complete autobiographical writing to allow me to understand how chemistry and English undergraduates perceived their disciplinary experiences and how they constructed disciplinary identities through academic life narrative writing. As mentioned above, that writing “enacts and creates identities” has become a threshold concept, or established knowledge, in composition and writing studies (Scott, 2015, p. 48). Inherent in this tenet are decades of identity and writing theory and research that have conceptualized writing as something more than simply the inscribing of a person's thoughts in

material form (Austin, 1962; Butler, 1997). As Figure 1 depicts, the flow of steps in the research design included safeguards for trustworthiness, meaning how my findings seemed true for the participants involved in my study at the particular research site (Guba & Lincoln, 1981, p. 103). These safeguards included member checking and peer debriefing, all of which contributed to my dissertation’s final presentation of findings.

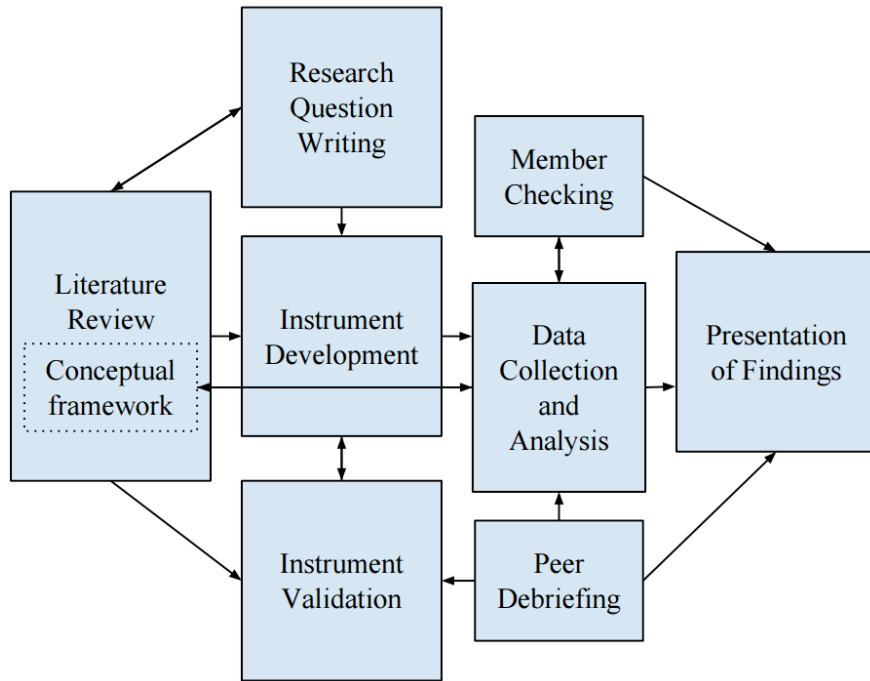


Figure 1. Flowchart of steps involved in the research design.

Procedures for Data Collection

What follows is a description of how I invited and engaged with participants for this study. All interactions with participants were approved and overseen by Indiana University of Pennsylvania’s Internal Review Board (Log No. 16-304).

Advertisement

I posted invitational posters on public bulletin boards inside classroom buildings where such postings were allowed and, when permission was granted, I asked the department chairs in each department as well as individual instructors in each department to email the invitational

posters in electronic form to undergraduates in their programs. The invitational posters in email form had direct links to the informed-consent form for anyone interested (Appendix A). Additionally, I asked interested participants to recommend to a classmate that the classmate consider participating.

Interview 1

At the interview site (a quiet location in the university library), I again discussed the study with each participant and made sure she or he had completed an informed-consent form. If not, I offered a consent form via Qualtrics which the participant could complete using a computer or another electronic device. Participants were informed that steps would be taken to ensure confidentiality.

I then began the data-collection stage of the study, which involved an interview/autobiographical writing protocol (Appendix B). I recorded the interview with a digital audio recording device that was laid clearly visibly at the center of the table. I made sure that participants understood that recording would happen and that they agreed with me audio-recording the interview. Before and after the interview, I reminded participants of their rights to withdraw without any negative consequences whatsoever. I then informed participants of the next step in the methodology.

Interview 2

Generally one week after the first meeting, I invited participants to return for a second interview. The purpose of the second meeting was for member checking of the academic life narrative I created based on the words, phrases, and sentences uttered and recorded in the first interview. I then continued the data-collection phase by asking interview questions specifically related to disciplinary writing (Appendix B). I recorded the interview with a digital audio

recording device that was laid clearly visibly at the center of the table. I made sure that participants understood that recording would happen and that they agreed with me audio-recording the interview.

Finally, I asked students to complete a writing prompt (Appendix C) related to their academic life narratives. This writing offered possibly valuable insight into how students selected in writing those experiences that shaped their academic life narratives. Participants did not write their real names on the writing prompt sheet, nor did they provide any identifying information in writing outside of the informed-consent form. Participants could choose to write by hand or to write by computer. In either case, the writing prompt looked identical except that the online version enabled spacing to change between prompt items as participants were writing. If participants chose to write on the computer, I provided them with my work laptop, and their writing was safely stored in a password-protected folder.

After participants had finished writing the three paragraphs in Appendix C, the interview concluded. At that time, I asked participants to select a pseudonym for themselves to be used in the records of their data (interview transcripts as well as autobiographical narrative writing), and I offered to select one for them. At the conclusion of the second meeting, I thanked participants for sharing their time and invited them to contact me about any follow-up questions or concerns.

After this second meeting, no additional correspondence by email, or any other form of final contact related to this research, was expected to take place.

Limitations of Methods Used

While I have already argued for the strengths of using interviewing and autobiographical narrative writing to explore life, departmental, and disciplinary writing experiences in relation to disciplinary identity in this particular study, limitations remain. One potential weakness of life

narratives as data concerns the possible pitfall of collapsing chronology and causality, or falling victim to what Crites (1986) referred to as “the illusion of causality” (p. 168). No one can conclude simple cause and effect from narrative structure alone. In cautioning those reading narratives, as well as narrative inquirers writing narratives, Connelly and Clandinin (1990) noted, “Narratives are not adequately written according to a model of cause and effect but according to the explanations gleaned from the overall narrative” (p. 7). In other words, for Connelly and Clandinin (1990), “Stories function as arguments in which we learn something essentially human by understanding an actual life or community as lived” (p. 8). Rather than getting absorbed into individual events in a narrative, then, readers and writers of narrative should keep this greater whole in mind (Connelly & Clandinin, 1990) and avoid assuming that narratives present cause-and-effect linkages.

Interviewing also has limitations, some of which may be avoided but some of which may be inherent in the method (Potter & Hepburn, 2005). Potter and Hepburn (2005) identified “contingent” problems with interviews, meaning those problems that could be remedied (p. 285); those avoidable limitations included the following:

1. *The deletion of the interviewer*, meaning that transcribed interview data may be presented in reports out of interactional context, for instance by having the interviewer’s question or responses removed (pp. 285-286);
2. *The conventions of representation of interaction*, including transcriptions that miss hearable and therefore possibly conversationally vital details of speech (pp. 286-289);
3. *The specificity of observations*, referring to the making of conclusions based on transcribed data that lacks line numbers and detailed transcription, thereby making it difficult to know what elements in excerpts support conclusions (p. 289); and,

4. *The unavailability of the interview set-up*, referring to research reports that do not clarify under what construct (e.g., first-year undergraduate science major) participants were recruited and how that construct was arrived at or conceptualized, as well as what participants were told to expect from the interview before taking part in it. (p. 290)

Limitations of interviewing that Potter and Hepburn (2005) have contended cannot be remedied involve the difficulty in accurately analyzing “the precise category that the interviewee is speaking from” (p. 294), which may happen when a participant recruited under the category of teacher, for instance, is asked questions that draw on her personal feelings as a former army sergeant. Additionally, Potter and Hepburn (2005) have argued that, although participants tend to be recruited because they represent some social category, participants tend to be treated in interviews as neutral parties with nothing necessarily at stake. In other words, what both interviewers and interviewees have at stake will necessarily impact interview data and complicate analysis, though what participants have at stake may remain impossible to know (Potter & Hepburn, 2005).

Instrument Development and Field Testing

Instruments used in this study underwent a development plan. In the first stage, the prompts that I constructed based on my understanding of the relevant persistence and identity literature were workshopped with my dissertation advisor. The prompts were discussed and critiqued in terms of whether they adequately reflected existing literature, were comprehensible, and seemed to gather what I hoped they would gather. Additionally, another researcher in composition/applied linguistics assisted in experiencing the treatment, of being interviewed and

given the autobiographical writing prompt. That researcher offered feedback on the experience to guide instrument revision.

Recording and Safeguarding of Data

All research-related materials were kept on a password-protected computer in my possession. Although participants gave me their names and email addresses on consent forms, I used pseudonyms for participants on anything that was used outside of the password-protected computer files, such as in this present dissertation and any conference presentations or journal articles derived from this dissertation.

Data Analysis and Synthesis

I carried out thematic analysis of autobiographical narrative and interview data. In defining thematic analysis, I drew on Joffe and Yardley (2004), who described content analysis as “a partially quantitative method” involving “establishing categories and then counting the number of instances in which they are used in a text” and thematic analysis as “similar to content analysis” except that it “pays greater attention to the qualitative aspects of the material analyzed” (p. 57). The quantitative dimension of the thematic-analysis approach began with NVivo analysis to understand word frequency and frequent collocation of frequently used words.

In carrying out thematic analysis, I defined *theme* after Braun and Clarke (2006), who wrote that “A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set” (p. 82). Importantly, I took steps in my thematic analyses to avoid limitations of these methods. Pavlenko (2007) specified numerous weaknesses of content and thematic analysis procedures; these weaknesses can arise when researchers carry out thematic analysis with “the lack of a theoretical premise,” the “overreliance on repeated instances,” an “exclusive focus on what is in the text,”

and “lack of attention to ways in which storytellers use language to interpret experiences and position themselves as particular kinds of people” (pp. 166-167). I took steps to avoid these limitations by allowing my conceptual framework to guide the exploration of themes, specifically in focusing on how participants’ language in interviews and writing indexed “stances, social acts, social activities, and other social constructs” (Ochs, 1992, p. 337), which themselves indexed aspects of identity. I also drew on explanatory theories of narrative structure (Labov, 1972) as well as theories of strategies life-storytellers use to build coherent life stories (Linde, 1993). What follows here are my specific procedural steps taken to code and develop themes from my study’s data.

Co-Written Academic Life Narrative Analysis Procedure

I followed these steps in analyzing co-written academic life narrative data.

1. While listening to digital recordings from the academic life-narrative interviews, I organized participants’ utterances into a cohesive narrative comprising past, present, and future experiences and imaginings.
2. In a second meeting with each participant, I engaged in member checking (Guba & Lincoln, 1981). I opened each participants’ narratives on a laptop and invited them to read the narrative and to make any changes to the text directly. This was done to be sure the narratives accurately reflected participants’ perceptions. All participants stated that the academic life narratives accurately reflected their stories as they had explained them during the academic life narrative interview. While participants were invited to make changes and alterations to the narrative while reading it, no participant made more than a brief clarification or correction of something I might

- have misheard. Generally, this happened when I misspelled or misunderstood a chemistry student's scientific terminology.
3. I read over academic life narratives numerous times, making reflective marginal comments on what each line seemed to mean with the help of NVivo.
 4. I looked at word frequencies using NVivo.
 5. With word frequencies established, I read over the data several more times, making additional marginal comments on what each line seemed to mean with the use of NVivo.
 6. I worked with a team of researchers to carry out cooperative coding (Smagorinsky, 2008). This process involved me and two other researchers meeting in a conference room to negotiate how to determine units of analysis in the narratives and which codes might be given to a particular unit. We decided that units of analysis began and ended whenever a participant's narrative focused on a new theme. This meant units could be as small as one word or phrase and as long as individual clauses or entire paragraphs. After a session for developing codes and negotiating the transcription of 2 of 7 chemistry and 2 of 10 English academic life narratives (4/17, or 24% of this data set), I created a coding test for my coding team using units not cooperatively coded. The result of our process was a very high degree of reliability, with an average measures intraclass correlation coefficient (ICC) of .99.
 7. Given an interrater reliability score above the lower threshold of .80, I continued by myself in coding the remainder of my data in order to create descriptions and explanations in relation to my conceptual framework.

8. I engaged in peer debriefing, defined as a “process of exposing oneself to a disinterested peer in a manner paralleling an analytical session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer’s mind” (Lincoln & Guba, 1985, p. 308). As a final stage of research evaluation, peer debriefing helps a researcher in “clarifying issues” as well as providing chances for “catharsis” (Cooper, Brandon, & Lindberg, 1997, p. 24).

Participant-Authored Academic Life Narrative Writing Analysis Procedure

1. In the second meeting with each participant, I invited them to enrich the information I already had gathered from co-written academic life narratives. They enriched co-written data with individually authored autobiographical writing following a writing prompt (Appendix C). The prompt asked participants to select three scenes we had already talked about or had not talked about and bring each scene to life in a narrative paragraph.
2. I applied the codes established for the co-written narratives to these stories, but in negotiation with my coding team, we decided that each story itself could be look at as individual units of analysis encompassing other codes. In other words, we worked to label each individual story as communicating an overall “theme” in the more literary, narrative sense as being the overall topic of each story. After a session for developing codes and negotiating the transcription of 2 of 7 chemistry and 2 of 10 English participant-authored academic life narratives (4/17, or 24% of this data set), I created a coding test for my coding team using units not cooperatively coded. The result of our process was a high degree of reliability, with an average measures ICC of .85.

3. Given an interrater reliability score above the lower threshold of .80, I continued by myself in coding the remainder of my data in order to create descriptions and explanations in relation to my conceptual framework.
4. I engaged in peer debriefing (Lincoln & Guba, 1985).

Disciplinary Writing Experience Interview Analysis Procedure

I followed these steps in analyzing interview data.

1. I transcribed the interview data at the interaction level (Du Bois, Scheuette-Coburn, Cumming, & Paolino, 1993) to capture interaction between myself and participants and adopted transcription symbols mainly as described in Bucholtz (2000).
2. I read the interview transcriptions numerous times, making reflective marginal comments on what each line seemed to mean.
3. After making a copy of interview data, I ran a preliminary word-frequency analysis through NVivo.
4. With word frequencies established, I read transcriptions several more times, making additional marginal comments on what each line seemed to mean.
5. I worked with a team of researchers to carry out cooperative coding (Smagorinsky, 2008). This process involved me and one other researcher meeting in a conference room to negotiate how to determine units of analysis in the interview transcriptions and which codes might be given to a particular unit. We decided that units of analysis began and ended whenever a participant's interview response focused on a new theme. This meant units could be as small as one word or phrase and as long as a grouping of numerous back-to-back clauses. After a session for developing codes and negotiating the transcription of 2 of 7 chemistry and 2 of 10 English interviews (4/17,

- or 24% of this data set), I created a coding test for my coding partner using units not cooperatively coded. The result of our process was a very high degree of reliability, with an average measures ICC of .99.
6. Given an interrater reliability score above the lower threshold of .80, I continued by myself in coding the remainder of my data in order to create descriptions and explanations in relation to my conceptual framework.
 7. I engaged in peer debriefing (Lincoln & Guba, 1985).

Ethical Considerations

In designing this study, I took steps to produce and to carry out an ethical research project. I designed my study bearing in mind basic ethical principles outlined by “The Belmont Report” (1979), with specific concern for Respect for Persons, Beneficence, and Justice. Always informed by these basic ethical principles as well as by methods of applying these principles through informed consent, assessment of risks and benefits, and subject selection (“The Belmont Report,” 1979), further consideration of ethical issues related to my trying to remain reflective during the study about, and to clarify the intentions of, how knowledge I derived could impact the world (Gillies & Alldred, 2002): To be clear, I hope my research informs higher-education retention efforts, writing-across-the-curriculum (WAC) pedagogy, and writing-in-the-discipline (WID) research; that is, I hope to support arguments for mindfully empathetic and supportive practice in higher education to explore conditions conducive to practices of belonging that retain and inspire students. My personal aim, I hope, resembles what Christians (2000) referred to as “the mission of social science research,” which specifically involves “enabling community life to prosper—enabling people to come to mutually held conclusions” and, ultimately, the aim of “community transformation” (p. 145). Relatedly, I considered ethical questions related to

practices in encouraging participation, being mindful and reflective while I wrote “ethical narratives” by which I reflected and found ways of bringing participants into the co-creation of both data and reports (Birch & Miller, 2002, p. 97); in this study, member checking involved participants reading over and altering narrative data.

Further ethical considerations in relation to my study entailed awareness of what has been referred to as “faking” or “doing rapport” with, and even *to*, participants (Duncombe & Jessop, 2002, p. 107). Duncombe and Jessop (2002) described how even the most well-intentioned of theoretical and methodological stances could happen in conjunction with interviewing that may, without caution and awareness, come dangerously close to resembling “a kind of *job* where, at the heart of our outwardly friendly interviews, lay the instrumental purpose of persuading interviewees to provide us with data for our research, and also (hopefully) for our future careers” (p. 107). Duncombe and Jessop (2002) have recommended that researchers “continue to worry” about such issues in order to be alert to resulting ethical concerns. Finally, my ethical considerations also extended to issues of eliciting and reproducing participants’ voices and stories. Alldred and Gillies (2002) have cautioned that the expectations that interviewers and interviewees bring to interview situations may imply a limited range of ways of responding for all involved. Remaining aware that “interview interactions can function to constrain as they invite particular modes of being” for both researchers and interviewees (Alldred & Gillies, 2002, p. 157), I cautiously considered the context from which I finally collected data.

Issues of Trustworthiness

For Guba and Lincoln (1981), determining the “Truth Value” of research means answering how a researcher can “establish confidence in the ‘truth’ of the findings of a particular inquiry for the subjects with which—and the context within which—the inquiry was carried out”

(p. 103). Trustworthiness thus replaces traditional criteria such as “internal validity, external validity, reliability, and objectivity” (Lincoln & Guba, 1985, p. 218) used to evaluate research. Trustworthiness may be achieved, for example, by “maintaining field journals,” “triangulating data,” and “developing and maintaining an audit trail” (Lincoln & Guba, 1985, p. 287). I tried to account for trustworthiness in this study by keeping notes about how I and my co-researchers created codes and applied them, also making these processes clear in the presentation and discussion of findings.

The use of narratives as data illustrates the inability to apply traditional criteria to data arrived at through qualitative designs. For Ellis and Bochner (2000), the “truth” of a narrative has no parallel preexisting meaning; instead, the act of narrating absorbs prenarrative meaning. To achieve a sense of trustworthiness, I nonetheless kept in mind related concepts of credibility, dependability, and transferability

Credibility

The concept of *credibility* replaces the traditional concept of *internal validity*; I draw on Guba and Lincoln (1981) to conceptualize credibility as a notion related to how sound participants in a study would find the researcher’s conclusions (pp. 104). In other words, a question to ask is whether participants’ experiences match how I portray them in my synthesis and report of findings. Triangulation of methods of data collection and analysis, member checking, and peer debriefing are ways of achieving credibility (Guba & Lincoln, 1981), all of which I made use of.

Dependability

The concept of *dependability*, referred to by Guba and Lincoln (1981) also as “auditability,” replaces the traditional concept of *reliability* (p. 104). I attempted to establish

dependability by keeping detailed records of my coding process, including how codes were created and applied, available for others to review. I also aimed for interrater reliability in my coding through the recruiting of at least one additional assisting researcher, who coded at least 20% of my data.

Transferability

The concept of *transferability* replaces the traditional concept of *external validity* or *generalizability*; in talking about transferability, I am seeking to answer how “the findings of a particular inquiry may have applicability in other contexts or with others subjects” (Guba & Lincoln, 1981, p. 104). I attempted to address transferability by presenting participants’ voices in depth, thereby making it possible for readers to determine to what extent my presentation of findings possibly resembles the experiences of other first-year college students majoring in chemistry or English in diverse college settings.

Delimitations and Limitations

Certain delimitations narrowed the scope of my inquiry. To begin with, I chose to zero in on a construct related to *belonging* but not a *sense of belonging* in the solely psychological sense. I conceptualized belonging as constituting practice. Still, I was not looking to observe how or if students *belonged* exactly, but rather to understand identity performance in life storytelling and in autobiographical narrative writing that was theoretically expected to create coherent presentations that may index modes of belonging in academic communities. In addition to narrowing constructs of interest, I narrowed the research site to one northeastern U.S. state public university. Relatedly, I narrowed the scope of inquiry to undergraduate chemistry and English majors, with special interest in inviting first-year students to participate. This was in order to focus on a particular area of concern in higher education, with half of all departures

happening between the first and sophomore year: According to recent data, the overall first-to-second-year persistence rate in any kind of U.S higher-education institution stands at 68%, and the overall persistence-to-degree rate stands at 45% (ACT, 2015). These numbers illustrate that the first year of college, in particular the first half of the first semester (Tinto, 2015), remains a critical period as students adjust to a new, demanding, and unfamiliar community.

In addition to delimitations, it is important to also specify limitations of this study and how I safeguarded against them. I took safeguarding measures particularly in light of the possible limitations facing transcribing and interviewing. In my approach to transcription, I aimed to carry out what Bucholtz (2000) referred to as “reflexive transcription practice” in which I strove to remain conscious and to make clear my understanding of my “effect on the unfolding transcript, and the effect of the transcript on the representation of speakers whose discourse is transcribed” (p. 1462). I attempted to clarify my relation to my transcripts upon their completion, during analysis, and after synthesis and reporting. In my borrowing of many of Bucholtz’s (2000) transcription symbols, I aimed to avoid possibly destroying or omitting data that could, though also perhaps might not, be of use in understanding this study’s central issues.

Relatedly, the way I present transcribed excerpts in upcoming chapters presents interview data in context—for instance, by including my contribution to the interaction in excerpts, by using line numbers (e.g., Jenks, 2011) to show where in the interaction language happened, by indicating when and if I chose to omit lines for expediency of presentation (Du Bois et al., 1993), and by providing time stamps to illustrate how long into an interview language in question happened.

Chapter Summary

This chapter has laid out methodological choices I made in carrying out this exploration of undergraduate chemistry and English majors' department-specific disciplinary identities. Here I have explained my research sample; information needed to answer research questions; the research design; and research methods, which can be answered after analysis of interview transcriptions and autobiographical narrative writing. Additionally, I have detailed the data analysis and synthesis procedures I took; ethical considerations in relation to Respect for Persons, Beneficence, and Justice ("The Belmont Report," 1979); issues of trustworthiness in terms of credibility, dependability, and transferability (Guba & Lincoln, 1981); and delimitations and limitations of the study. In the next chapter, Chapter 5, I present findings from the study. Afterward, in Chapter 6, I discuss findings in relation to the concept of investment (Norton, 2000), existing literature, and existing WAC and retention viewpoints. I close the dissertation thereafter in Chapter 7 with conclusions and recommendations.

CHAPTER 5

PRESENTATION OF FINDINGS

The purpose of this study is to explore how undergraduate chemistry and English majors understand and construct their disciplinary identities in relation to (a) their past and present life and disciplinary experiences as well as their imagined futures, and (b) their past and present disciplinary writing experiences. Three research questions guided the present study, which follow here:

1. How do chemistry and English majors understand their becoming and remaining students in their majors?
2. How do chemistry and English majors understand their disciplinary writing experiences?
3. How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?

In this chapter, findings appear in relation to each research question, following a sequence of (a) chemistry major-specific findings, (b) English major-specific findings, and (c) shared findings between groups. Seventeen ($N = 17$) total participants (7 chemistry majors, 10 English majors) were interviewed two times each, one time to be interviewed to co-write academic life narratives with me and a second time to discuss disciplinary writing experiences and to themselves write about key moments in their academic life narratives.

Research Question 1: How Participants Understand Becoming and Remaining Chemistry and English Majors

In this section, I present findings related to the first research question: *How do chemistry and English majors understand their becoming and remaining students in their majors?* Data in the form of co-written academic life narratives and participant-authored autobiographical writing was analyzed. After 4/17 sets of data (24%) were cooperatively coded, codebooks for this data were validated with high degrees of reliability, with an ICC of .99 for the Academic Life Narrative codebook and an ICC of .85 for the Writing Theme codebook.

Chemistry Major-Specific Findings

Five major chemistry major-specific findings are summarized here:

1. All seven participants (100%) indicated they bore *mental orientations* that led them logically toward the chemistry major.
2. All seven participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being chemistry majors.
3. All seven participants (100%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being chemistry majors.
4. All seven participants (100%) specified *influential experiences*, including *research experiences* and *engaging classroom experiences*, that supported or inspired their becoming and being chemistry majors.
5. All seven participants (100%) expressed specific *motivators* that moved them to choose to become and to remain a chemistry major as a reasonable decision.

The Academic Live Narrative codebook for chemistry with illustrating examples appears as Table 4 below.

Table 4

Chemistry Major Findings for Research Question 1: Codebook Labels and Definitions

Category	Code	Definition	Examples
1. Mental Orientations of a Chem Major	1a. Interest in Science	Statements of being specially or exclusively interested in science, of it being something participants liked, and it relating to the classes they tried to take the most—maybe leading to such actions as changing majors to get into science after realizing where their strengths lay.	“[A]nd I wasn’t that interested in anything else. I didn’t want to go into something that was intensely writing heavy because, while I had been good at writing, I didn’t always feel confident with what I had put forward. And I suck at art” (Linus, first-year student, pre-medical).
	1b. Aptitude for Science	References to being good at science/math and/or realizing science simply clicked with or fit a person—as well as being recognized by teachers or established science-field figures as having an aptitude for science.	“These kinds of interactive things were just cool to me. It wasn’t until I got into high school, when I did really well on my chemistry class, that I thought, I really like this. It’s starting to make sense. <i>I realized it was something that just clicks with me</i> ” (emphasis added) (Arykaj, junior, pre-pharmacy).
	1c. Science Mindset	References to simply having curiosity, or a mindset or scientific way of seeing the world.	“I see the world as black and white, and that is exactly how science is: It either is or it isn’t. There’s no gray area, and that is probably my favorite part of it” (Ada, first-year student, biochemistry).
2. Influential People	2a. Great or Passionate Educator	References to a teacher in a science class being “great”—supportive and/or inspirational—as well as going the extra mile by perhaps meeting outside of class and explaining/advising.	“My lab professor, for example, Doctor Z, is someone I don’t even consider a professor. I kind of consider her my friend because she’s so uplifting, and she talks to us about her life, like as a friend to friend, and not as a professor to student. That kind of relationship is really helpful because I feel like I could talk to her about anything and not just lab” (Rosalind, first-year student, biochemistry).
	2b. Supportive Family or Close Friend	References to parents, other family members, or close friends who are not classmates who cultivate, model, or recognize a participant’s interest or ability in science.	“My mom used to work in a lab for the Red Cross, before she had me and my sisters. [...]. My dad is an environmental biologist, so he would always teach me things about outside. [...]. So my mom is kind of like chem, and my dad is kind of bio I guess” (Rosalind, first-year student, biochemistry).
	2c. Outside-of-School	References to having talked to actual working	“Before that [going to a Merck plant and observing scientists], I was sort of under

	Scientists	scientists about becoming/being a scientist in the workforce.	the impression that chemical engineers were people that supervised and didn't do too much research" (Ramsay, junior, chemistry).
3. Influential Environments	3a. Supportive Learning Environments	References to the school or department making changes to support students' scientific development, meeting students' needs appropriately given the subject, or creating a positive learning environment.	"I have friends at the state university up north who haven't been able to get in the labs their whole four years because there are too many people whereas here it's a lot easier to get in the labs. [...]. At bigger schools, good luck: You're probably not going to get into a lab until your senior year" (Kiki, senior, biochemistry).
	3b. Challenging/Demanding Learning Environment	References to the school or department presenting a challenging or difficult learning experience.	"In Organic Chemistry, the number will drop from 60 to like 25 kids after the add/drop period. It's just that difficult to some people" (Reatha, junior, chemistry).
	3c. Lacking/Too-Easy Learning Environments	References to being less prepared or engaged than possible because of school's or department's shortcomings.	"In middle school, I didn't really learn anything in my science class. [...]. Back in high school, I didn't understand the applications of chemistry. We did strictly stoichiometry back in high school, just conversions and stuff like that" (Arykaj, junior, pre-pharmacy).
4. Influential Experiences	4a. Research in Science	References to conducting and/or presenting research as rewarding or life-changing experiences.	"That professor does X-ray diffraction and crystallography research, so I went down to the lab and started asking questions. I started learning things, and this past summer, I started doing a synthesis project. I'm synthesizing lithium copper(II) germanium oxide as a possible dilute magnetic semiconductor. [...]. This research changed my life. It gave me hands-on experience" (Arykaj, junior, pre-pharmacy).
	4b. Fun or Engaging Class	References to science classes that were fun, engaging, or intriguing.	"Eleventh grade was the dreaded year in my school because you had to take Organic Chemistry. Compared to college Organic Chemistry, it was nothing, and I don't know why any of us were afraid. I really liked Organic Chemistry in high school" (Kiki, senior, biochemistry).
	4c. Society or Fraternity Participation	References to joining and participating in disciplinary societies or fraternities.	"It's something [joining Alpha Chi Sigma] that looks good on the resume and everything, and it's not just a fraternity—it's boys and girls—and it has chem, bio, nursing, or whatever you are in any STEM major. Like, if you are in Earp Hall, then you can join this fraternity" (Rosalind, first-year student, biochemistry).

5. Motivation for Being a Science Major at This College	5a. Job or Career Outlook	References to choosing to be a science major because the job outlook looked good—perhaps relative to another interest or choice for a possible major—and liking research.	“Maybe physics can give you general language to explain many things, but physics isn’t for me. The thing for me is the amount of application you can have with chemistry. Even though I’ll graduate with a degree in chemistry, the amount of jobs that I can apply to is infinite” (Arykaj, junior, pre-pharmacy).
	5b. Science Provides a Means or Language to Answer Questions	References to getting into science because it can help answer questions a student always had and/or provide a vocabulary to address questions/problems related to the world.	“Then while growing up, and as I was paying attention to the news more, I noticed people would talk about all sorts of problems. Then when I got to chemistry class, it was a different scenario. It wasn’t about complaining about the problems or placing blame. Instead it was more like, <i>Here’s a problem, and here’s how we can use this information to fix it</i> ” (Ramsay, junior, chemistry).
	5c. The College Had a Program for It	References to finally settling on a major because it was offered at the college of choice.	“I ended up going into Chemistry/Pre-Med because they have a program for it here” (Linus, first-year student, pre-medical).

Finding 1: All seven participants (100%) indicated they bore *mental orientations* that led them logically toward the chemistry major. These mental orientations fell mainly in three subcategories: (a) interest in science, (b) aptitude for science, and (c) science mindset.

Table 5

Mental Orientations (Chemistry): Frequency of Utterance

	Name	Mental Orientations					
		Interest in Science		Aptitude for Science		Science Mindset	
		Before College	In College	Before College	In College	Before College	In College
1	Ada	12	6	-	-	7	1
2	Arykaj	10	1	5	4	3	-
3	Kiki	6	-	1	-	-	-
4	Linus	6	2	1	-	2	-
5	Ramsay	11	2	2	-	2	-
6	Reatha	6	1	4	1	-	-
7	Rosalind	6	2	-	-	3	-
TOTAL	7	7/7 (100%)	6/7 (86%)	5/7 (71%)	2/7 (29%)	5/7 (71%)	1/7 (14%)
		7/7 (100%)		5/7 (71%)		5/7 (71%)	
		7/7 (100%)					

What themes from participant-authored writing tell us. Participant-authored academic life narratives corroborate that participants understand their becoming and being chemistry majors in terms of certain chemistry major-suitable characteristics and mental orientations. Table 6 presents the codebook labels and definitions for the themes (defined here as the overall meaning, message, or storyline) developed to categorize participant-authored life-narrative writing stories as a whole. To be clear, the unit of analysis when examining the paragraph-length stories participants wrote was the entire one-paragraph story, of which each participant wrote three. Each story was meant to bring to life events participants selected as meaningful to their decision to become chemistry majors.

Table 6

Story Themes for Participant-Authored Academic Life Narratives (Chemistry): Codebook and Examples

Category	Code	Definition	Example Story Excerpts
Realization	1. Character or Interest Fits Science Career	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a career in science.	“Previously I had been turned off to the idea of chemical engineering because I was under the impression that chemists work in the lab and focus on experimentation and research, my area of interest, while engineers were more focused on manufacturing and getting the product ready for mass production” (Ramsay, junior, chemistry).
	2. Character or Interest Fits Science Major	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a major in science.	“This moment is kind of odd, but it does come to mind when I think of my major. In my sophomore year of high school, during honors biology, I remember the sick satisfaction of cutting the frog’s jaws for the kids who were too squeamish to do it themselves” (Kiki, senior, biochemistry).
	3. Science-Major Character	Stories that feature a moment of realization or turning point in which participants see something they had not seen before about their own characters.	“I made the realization that, for me, music was not an art. I am not an artist. It can be agreed upon that music is, in fact, a form of art. As I was watching this performance, I saw how incredibly expressive this young musician was. Music for me has always been a science” (Ada, first-year student, biochemistry).

	4. Wonder of Science	Stories that feature a moment of realization or turning point in which participants are in awe of or moved by science.	“There was a specific science show that I will never forget, the lady who was upfront was showing and teaching us about liquid nitrogen. I thought that was so cool, also there was an experiment involving electrochemistry and this girl used friction and balloons to make someone’s hair stand up” (Arykaj, junior, pre-pharmacy).
Affirmation	5. Character or Interest Fits Science Career	Stories that serve to reaffirm or restate that participants’ characters or interests fit science careers.	“[N]ow, in my junior year, I am very pleased and satisfied with my undergraduate life as a chemistry major. I now conduct research under Dr. [...], as we study photodynamic therapy. This therapy is an alternative cancer treatment. My cousin, Jamar [...] is what drives me through this research. He was only seventeen years old when he was claimed by cancer. So my ultimate goal is to study cancer therapeutics, which hopes of getting these alternate therapies applied universally” (Reatha, junior, chemistry).

Table 7 reports frequencies of participants writing life narratives that expressed one of these themes, illustrating that all seven participants (100%) wrote stories about either a realization or an affirmation of their chemistry-major characters.

Table 7

Story Themes for Participant-Authored Academic Life Narratives (Chemistry): Frequency of Utterance

	Name	Story Message/Theme				
		Realization				Affirmation
		Character or Interest Fits Science Career	Character or Interest Fits Science Major	Science-Major Character	Wonder of Science	Character or Interest Fits Science Career
1	Ada	-	2	1	-	-
2	Arykaj	-	1	-	2	-
3	Kiki	-	1	2	-	-
4	Linus	-	-	-	3	-
5	Ramsay	1	1	-	1	-
6	Reatha	1	-	-	-	2
7	Rosalind	2	-	-	1	-
TOTAL	7	3/7 (43%)	4/7 (57%)	2/7 (29%)	4/7 (57%)	1/7 (14%)
7/7 (100%)						

Note. Each participant composed a total of three individual paragraph-length narratives.

Finding 2: All seven participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being chemistry majors. The category of influential people can be divided into three subcategories: (a) great or passionate educator, (b) supportive family or close friend, and (c) outside-of-school scientist (See Table 8).

Table 8

Influential People (Chemistry): Frequency of Utterance

	Name	Influential People					
		Great or Passionate Educator		Supportive Family or Close Friend		Outside-of-School Scientist	
		Before College	In College	Before College	In College	Before College	In College
1	Ada	1	4	2	1	2	-
2	Arykaj	1	2	2	1	2	-
3	Kiki	3	4	5	2	1	-
4	Linus	6	2	1	-	-	-
5	Ramsay	2	1	1	-	1	3
6	Reatha	1	1	4	-	-	-
7	Rosalind	3	2	4	1	3	-
TOTAL	7	7/7 (100%)	7/7 (100%)	7/7 (100%)	4/7 (57%)	5/7 (71%)	1/7 (14%)
		7/7 (100%)		7/7 (100%)		5/7 (71%)	
		7/7 (100%)					

Finding 3: All seven participants (100%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being chemistry majors. The category of influential environments excludes classrooms (its own important experience organized elsewhere) and can be divided into three subcategories: (a) supportive learning environment, (b) challenging/demanding learning environment, and (c) lacking/too-easy learning environment (See Table 9).

Table 9

Influential Environments (Chemistry): Frequency of Utterance

	Name	Influential Environments					
		Supportive Learning Environment		Challenging/Demanding Learning Environment		Lacking/Too-Easy Learning Environment	
		Before College	In College	Before College	In College	Before College	In College
1	Ada	3	4	-	-	1	-
2	Arykaj	2	1	-	2	2	1
3	Kiki	2	3	-	2	1	3
4	Linus	3	2	-	1	-	3
5	Ramsay	-	2	-	3	-	-
6	Reatha	-	3	-	6	1	-
7	Rosalind	-	3	1	2	-	-
TOTAL	7	4/7 (57%)	7/7 (100%)	1/7 (14%)	6/7 (86%)	4/7 (57%)	3/7 (43%)
		7/7 (100%)		6/7 (86%)		5/7 (71%)	
		7/7 (100%)					

Finding 4: All seven participants (100%) specified *influential experiences*, including *research experiences* and *engaging classroom experiences*, that supported or inspired their becoming and being chemistry majors. The category of influential experiences can be divided into three subcategories: (a) research in science, (b) fun or engaging class, and (c) society or fraternity participation (See Table 10).

Table 10

Influential Experiences (Chemistry): Frequency of Utterance

	Name	Influential Experiences					
		Research in Science		Fun or Engaging Class		Society or Fraternity Participation	
		Before College	In College	Before College	Before College	Before College	In College
1	Ada	-	-	1	2	-	-
2	Arykaj	2	6	4	2	-	3
3	Kiki	-	2	3	-	-	4
4	Linus	3	3	4	-	-	-
5	Ramsay	2	3	2	3	-	-
6	Reatha	2	3	-	-	1	2
7	Rosalind	6	3	1	-	-	2
TOTAL	7	5/7 (71%)	6/7 (86%)	6/7 (86%)	3/7 (43%)	1/7 (14%)	4/7 (57%)
		6/7 (86%)		6/7 (86%)		4/7 (57%)	

Finding 5: All seven participants (100%) expressed specific *motivators* that moved them to choose to become and to remain a chemistry major as a reasonable decision. The category of motivators can be divided into three subcategories: (a) job or career outlook, (b) science provides a means or language to answer questions, and (c) the college had a program for it (See Table 11).

Table 11

Motivators for Choosing a Science Major at This College (Chemistry): Frequency of Utterance

		Motivators for Choosing a Science Major at This College					
		Job or Career Outlook		Science Provides a Means or Language to Answer Questions		The College Had a Program for It	
		Before College	In College	Before College	In College	Before College	In College
1	Ada	4	-	-	1	-	-
2	Arykaj	-	2	4	3	-	-
3	Kiki	1	1	2	-	-	-
4	Linus	1	-	1	-	1	-
5	Ramsay	1	-	6	-	-	-
6	Reatha	2	-	-	-	2	-
7	Rosalind	1	-	1	-	1	-
TOTAL	7	6/7 (86%)	2/7 (29%)	5/7 (71%)	2/7 (29%)	3/7 (43%)	0/7 (0%)
		7/7 (100%)		6/7 (86%)		3/7 (43%)	
		7/7 (100%)					

Chemistry majors' imagined futures. Also important to understanding how participants understand becoming and being in their majors is how they imagine their futures. Analysis of academic life narratives indicated the following:

1. Six of seven participants (86%) indicated they saw themselves going to graduate school to continue their studies in a STEM-related field.
2. Six of seven participants (86%) expressed that they were still trying to figure out exactly what their futures would look like.
3. All seven participants (100%) saw themselves working as a chemist in the future.

Table 12 and 13 provide definitions, examples, and frequency of utterance.

Table 12

Imagined Futures (Chemistry): Codebook and Examples

Code	Definition	Examples
1. Graduate School	References to imagining themselves getting an advanced degree in their imagined future.	“I’m going to graduate school [...] to medical school” (Linus, first-year student, pre-medical).
2. Still Trying to Figure Out Exact Path	References to still being slightly unsure about the future.	“I’m not sure exactly what I want to do yet. [...]. I’m not very picky about what I want to do, so I guess that as I learn more about certain things, I’ll see what interests me the most” (Rosalind, first-year student, biochemistry).
3. Working as a Chemist or Researcher in an Undefined Capacity	References to imagining oneself being a chemist and/or researcher in a nonspecific role.	“I see myself getting a job as a chemist, some sort of analyst, for a while” (Ada, first-year student, biochemistry).
4. Working as a Chemist or Researcher in a Defined Capacity	References to imagining themselves using science and research in science for business- or industry-oriented careers; for the government doing science research (e.g., U.S. Food and Drug Administration [FDA]); for a private drug company researching and developing medication; or for medical or therapeutic areas.	<p>“I also see myself executing the business ideas that I have been thinking about” (Arykaj, junior, pre-pharmacy).</p> <p>“I could work in pharmaceuticals, like the Merck plant” (Ramsay, junior, chemistry).</p> <p>“I see myself maybe switching into a more educational area of science, like in the museum” (Kiki, senior, biochemistry).</p>

Table 13

Imagined Futures (Chemistry): Frequency of Utterance

	Name	Imagined Futures After College			
		Graduate School	Still Trying to Figure Out Exact Path	Working as a Chemist or Researcher	
				Undefined Capacity	Defined Capacity
1	Ada	3	2	4	5
2	Arykaj	2	1	-	6
3	Kiki	1	1	1	-
4	Linus	2	2	2	-
5	Ramsay	1	2	2	5
6	Reatha	2	-	1	2
7	Rosalind	-	3	6	3
TOTAL	7	6/7 (86%)	6/7 (86%)	6/7 (86%)	5/7 (71%)
				7/7 (100%)	

English Major-Specific Findings

Four major English major-specific findings are summarized here:

1. All ten participants (100%) indicated they bore *mental orientations* that led them logically toward the English major.
2. All ten participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being English majors.
3. Nine of ten participants (90%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being English majors.
4. Nine of ten participants (90%) specified *influential experiences*, including *engaging classroom experiences*, that supported or inspired their becoming and being English majors.

Table 14

English Major Findings for Research Question 1: Codebook Labels and Definitions

Category	Code	Definition	Examples
1. Mental Orientations of an English Major	1a. Interest in English as a Subject	Statements of being specially or exclusively interested in English, of it being something participants liked, and it relating to the classes they tried to take the most— leading to such actions as changing majors to get into English after realizing where their strengths lay.	“There’s really no other route I could have taken to further my education and go on to do better things and get paid doing something I love. This field is a prime opportunity to pursue and create my loves” (Warlock, first-year student, English Ed.).
	1b. Interest in Reading, Analyzing, or Discussing Literature	Statements of being interested in reading, analyzing, and/or discussing literature, of it being something they like, of it being something that was engaging to do, and it	“ <i>I always liked the part in English where we picked books apart.</i> I may not have enjoyed the books that much, but I found that when we were talking about them, I was able to offer some pretty good insights and to think critically about them” (emphasis added) (Sylvester, senior, pre-law).

		being the classes they tried to take the most.	
	1c. Interest in Writing	Statements of being interested in writing, of it being something they like, of it being something that was engaging to do, and it being the classes they tried to take the most.	“My grandma’s sick. She’s not doing well, so with my free time, I’ve been writing. My mom said she’s like a ticking time-bomb, like she’s fine one day and not fine the next. I’ll just try to get my mind off of things, and I’ll just start writing. I have a Google Doc called Story, because I don’t know what to call it. [...]. It’s helping because it’s taking my mind off the present” (Evelyn, first-year student, writing).
	1d. Aptitude for English	References to being good at English and/or writing, as well as being recognized by teachers or established English-field figures as having an aptitude for English.	“I did my practice teaching, and I seemed to do my best teaching in English and math. And I hate math. [...]. But like I said, it just seems that I teach English well. Most of the times I speak it well though there are times that I don’t. I notice mistakes very easily, even in my own papers” (Rudy, senior, English Ed.).
2. Influential People	2a. Great or Passionate Educator	References to a teacher in an English class being “great”—supportive and/or inspirational—as well as going the extra mile by perhaps meeting outside of class and explaining/advising.	“He’s awesome. Also Mike, the creative writing professor. I’m excited to take his course. I met his wife, too. I’ve talked to them at [the local art gallery and espresso bar], and they’ve recommended books” (Anna, first-year student, writing).
	2b. Lazy or Uninspiring Teacher	References to a teacher who seemingly didn’t care or was lazy.	“I had a different teacher, and she just didn’t care. She was pregnant and was going to go on maternity leave. Her attitude was basically, <i>Read it. Don’t read it. Do well on the quiz. SparkNote it. I don’t really care. I want to have this baby so I can leave</i> ” (Evelyn, first-year student, writing).
	2c. Supportive Family or Close Friends	References to parents, other family members, or close friends who are not classmates who cultivate, model, or recognize a participant’s interest or ability in English.	“My dad is a computer science professional. He does Internet security for the Army on an army base. He became an IT technician. He’s taking a master’s degree for free through work. My parents always told me I didn’t need to get a computer science degree. But I said I chose it because I liked it, but when I switched, they were totally fine with it. It was nice to be so supportive of me switching my major to English” (Zaphod, first-year student, writing).
3. Influential Environments	3a. Supportive Learning Environments	References to learning environments at home, school, or in a specific department meeting	“It was <i>The Shining</i> , <i>The Hitchhiker’s Guide to the Galaxy</i> that one of my teachers gave me when I was maybe in fourth grade, <i>To Kill a Mockingbird</i> . And

		students' needs appropriately given the subject or creating a positive learning environment.	I have all these books, still in my house, and they still have the numbers on them at the top and the teachers' names inside" (King, first-year student, English Ed.).
	3b. Cold/Unsupportive Learning Environments	References to learning environments at home, school, or in a specific department not feeling supportive or friendly.	"Plus I didn't really like the whole feel—the vibe—I got from the [food and nutrition] department. I just thought the head of the department was really condescending and patronizing. I didn't appreciate it" (Evelyn, first-year student, writing).
4. Influential Experiences	4a. Fun or Engaging Class	References to English classes that were fun, engaging, challenging, or intriguing.	"So I took the class not knowing what to expect and being a total noob, and I'm kind of stunned at how much I appreciate it now. I'm not a gamer, and I will not invest money in games, but I love the discourse that we've had so far in this class, and it's just completely blowing my mind how much focus is on text in video games" (Joanne, senior, writing).
	4b. Boring, Meaningless, Unoriginal Class	References to classes in English or in other departments that were not fun, not engaging, and boring.	"Eighth grade English was kind of my introduction to high school-level English. It was largely grammar, and I hated it right off the bat" (Sylvester, senior, pre-law).
	4c. Doubt About Major or College	References to not being sure that this major, or going to this or any college at all, was possible, suitable, or desirable.	"It wasn't an easy decision to make, though. I was tipping on the edge to do it because I was worried that I wouldn't get a job. That was a big thing because everyone says English and history majors are jokes because you're not going to get a job" (Zaphod, first-year student, writing).

Finding 1: All ten participants (100%) indicated they bore *mental orientations* that led them logically toward the English major. The category of mental orientations for English majors can be divided into four subcategories: (a) interest in English as a subject; (b) interest in reading, analyzing, or discussing literature; (c) interest in writing; and (d) aptitude for English (See Table 15).

Table 15

Mental Orientations (English): Frequency of Utterance

	Name	Mental Orientations							
		Interest in English as a Subject		Interest in Reading, Analyzing, or Discussing Literature		Interest in Writing		Aptitude for English	
		Before College	In College	Before College	In College	Before College	In College	Before College	In College
1	Anna	2	1	6	1	5	4	1	-
2	Astrid	3	2	8	-	8	3	8	-
3	Evelyn	3	2	25	1	12	1	1	-
4	Joanne	11	1	9	-	1	-	11	-
5	King	2	-	3	1	10	-	4	-
6	Nick	7	-	4	-	1	-	3	-
7	Rudy	7	-	3	-	-	-	6	-
8	Sylvester	12	1	2	-	2	-	3	1
9	Warlock	5	1	2	-	7	-	4	1
10	Zaphod	3	5	2	1	2	1	5	2
TOTAL	10	10/10 (100%)	7/10 (70%)	10/10 (100%)	4/10 (40%)	9/10 (90%)	4/10 (40%)	10/10 (100%)	3/10 (30%)
		10/10 (100%)		10/10 100(%)		9/10 (90%)		10/10 (100%)	
		10/10 (100%)							

What themes from participant-authored writing tell us. That English majors understand becoming and being English majors in terms of having certain English major-suitable mental orientations is further corroborated by participant-authored academic life narratives. Table 16 presents the codebook labels and definitions for the themes (defined here as the overall meaning, message, or storyline) developed to categorize participant-authored life-narrative writing stories as a whole.

Table 16

Story Themes for Participant-Authored Academic Life Narratives (English): Codebook and

Examples

Category	Code	Definition	Example Story Excerpts
Realization	1. Character or Interest Fits English-Related Career	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a career related to English.	“The last moment that pops in my mind is when my teachers would recommend me to a major that involved reading and writing. I knew that I liked writing, so I chose that I’d be a Journalism major. It didn’t feel right, and after discussion with my teachers and my family, the idea of teaching arose. That hole that was there with Journalism was filled with English Ed.” (Nick, first-year student, English Ed.).
	2. Character or Interest Fits English Major	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a major in English.	“I choose to make it into a storyboard, because I liked the idea of them and I love movies; so this was a small movie in my mind. It was an interesting experience. Because it has a different pov that you have to think about (camera angles and all that stuff). That was actually the assignment that fully convinced me to be an English major” (Astrid, first-year student, writing).
	3. English-Major Character	Stories that feature a moment of realization or turning point in which participants see something they had not seen before about their own character.	“I had a notebook all through high school that I would stream consciousness onto. I would put anything into that book, a cool character design, or a fun fight scene, anything. Honestly, I wrote some pretty R rated shit in that book. I left it in my tech classroom overnight and was mortified to see it on my teachers desk the next day. She began by telling me that she was disgusted by the content of the book, and that she was disappointed in me as a person. She followed by saying that it was startlingly well written, and she had enjoyed reading it despite herself. After that I spent twice as much time scribbling in that book as I had before” (King, first-year student, English Ed.).
	4. Wonder of Reading	Stories that feature a moment of realization or turning point in which participants are in awe of or moved by reading.	“Khaled Hosseini is my favorite author at the moment. His writing is so powerful, it pulls the reader in to where you feel like you are experiencing, not just observing the story. The imagery he uses in the <i>Kite Runner</i> and <i>A Thousand Splendid Suns</i> is absolutely stunning and when I read those books I was so emotional, and angry, wanted to throw the book down and stop reading, but I just couldn’t. I want to be able to affect people with words in that way” (Evelyn, first-year student, writing).
	5. Career Possibilities With English BA	Stories that feature a moment of realization or turning point in which participants learn about the career	“I then felt apprehensive. Switching majors from computer science to English would be a terrible decision. Everyone always said there was no work out there for English majors, that if you wanted a job in this time you went into the hard

		possibilities that exist with a BA in English.	sciences. I quickly googled jobs that English majors could gain and was wonderfully surprised. There were opportunities, I just had to have the courage to take them” (Zaphod, first-year student, writing).
Affirmation	6. Character or Interest Fits the English Major	Stories that serve to reaffirm or restate that participants’ characters or interests fit the English major.	“The fall that I was getting ready to apply to college, my father and I were out at lunch one afternoon and he asked me what programs I was thinking about applying to. He and I both agreed that my strengths were in writing and reading, and that afternoon was the first time I actually voiced my desire to major in English” (Joanne, senior, writing).

Table 17 reports frequencies of participants writing life narratives that expressed one of these themes, illustrating that all nine participants (9/9, 100%) wrote stories coded as being about a realization or an affirmation of their English-major characters

Table 17

Story Themes for Participant-Authored Academic Life Narratives (English): Frequency of Utterance

	Name	Story Message/Theme					
		Realization					Affirm.
		Character or Interest Fits English Career	Character or Interest Fits English Major	English-Major Character	Wonder of Reading	Careers Possible With English BA	Character or Interest Fits English Major
1	Anna	NA	NA	NA	NA	NA	NA
2	Astrid	-	2	1	-	-	-
3	Evelyn	-	-	-	3	-	-
4	Joanne	-	-	2	-	-	1
5	King	-	-	2	1	-	-
6	Nick	1	1	1	-	-	-
7	Rudy	-	-	-	-	-	3
8	Sylvester	-	2	-	-	-	1
9	Warlock	-	-	-	-	-	3
10	Zaphod	-	2	-	-	1	-
TOTAL	9	1/9 (11%)	4/9 (44%)	4/9 (44%)	2/9 (22%)	1/9 (11%)	4/9 (44%)
		7/9 (78%)					

Note. Each participant composed a total of three individual paragraph-length narratives.

Finding 2: All ten participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being English majors. The category of influential people can be divided into three subcategories: (a) great or passionate educator, (b) lazy or uninspiring teacher, and (c) supportive family or close friend. Table 18 presents frequencies in relation to these codes.

Table 18

Influential People (English): Frequency of Utterance

	Name	Influential People					
		Great or Passionate Educator		Lazy or Uninspiring Teacher		Supportive Family or Close Friend	
		Before College	In College	Before College	In College	Before College	In College
1	Anna	-	1	-	-	2	-
2	Astrid	4	-	-	-	6	-
3	Evelyn	6	-	2	-	5	-
4	Joanne	1	1	-	-	13	-
5	King	4	2	-	-	2	-
6	Nick	10	3	3	-	2	-
7	Rudy	7	2	-	3	3	-
8	Sylvester	11	3	-	-	-	-
9	Warlock	6	2	-	-	2	-
10	Zaphod	4	1	-	1	1	1
TOTAL	10	9/10 90%	8/10 80%	2/10 20%	2/10 20%	9/10 90%	1/10 10%
		10/10 (100%)		4/10 (40%)		9/10 (90%)	
		10/10 (100%)					

Finding 3: Nine of ten participants (90%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being English majors. The category of influential environments for English majors can be divided into two subcategories: (a) supportive learning environments, and (b) cold/unsupportive learning environments (See Table 19).

Table 19

Influential Environments (English): Frequency of Utterance

	Name	Influential Environments			
		Supportive Learning Environment		Cold/Unsupportive Learning Environment	
		Before College	In College	Before College	In College
1	Anna	-	1	-	-
2	Astrid	1	-	-	-
3	Evelyn	-	1	-	1
4	Joanne	1	2	-	-
5	King	1	1	-	-
6	Nick	1	11	-	-
7	Rudy	-	4	-	4
8	Sylvester	1	2	-	-
9	Warlock	-	4	-	-
10	Zaphod	-	-	-	-
TOTAL	10	5/10 (50%)	8/10 (80%)	0/10 (0%)	2/10 (20%)
		9/10 (90%)		2/10 (20%)	
		9/10 (90%)			

Finding 4: Nine of ten participants (90%) specified *influential experiences*, including *engaging classroom experiences*, that supported or inspired their becoming and being **English majors.** The category of influential experiences for English majors can be divided into three subcategories: (a) fun or engaging class; (b) boring, meaningless, or unoriginal class; and (c) doubt about major or college (See Table 20).

Table 20

Influential Experiences (English): Frequency of Utterance

	Name	Influential Experiences					
		Fun or Engaging Class		Boring, Meaningless, Unoriginal Class		Doubt About Major or College	
		Before College	In Coll.	Bef. Coll.	In Coll.	Bef. Coll.	In Coll.
1	Anna	-	1	-	-	-	-
2	Astrid	3	3	1	-	5	-
3	Evelyn	5	2	-	-	4	1
4	Joanne	-	2	-	-	-	-
5	King	2	-	-	2	-	-
6	Nick	3	-	-	-	-	-
7	Rudy	-	-	-	-	1	-
8	Sylvester	3	1	1	-	4	-
9	Warlock	-	-	-	-	-	-
10	Zaphod	1	7	-	3	1	1
TOTAL	10	6/10 60%	6/10 60%	2/10 20%	2/10 20%	5/10 50%	2/10 20%
		8/10 (80%)		4/10 (40%)		5/10 (50%)	

English majors' imagined futures. Also important to understanding how participants understand becoming and being in their majors is how they imagine their futures. Analysis of academic life narratives indicated the following:

1. Eight of ten (80%) indicated they saw themselves becoming teachers or professors in English.
2. Five of ten (50%) indicated they saw themselves becoming professional writers in the future.
3. Three of ten (30%) indicated they saw themselves going to graduate school in English.

Table 21 and Table 22 provide definitions, examples, and frequency of utterance.

Table 21

Imagined Futures (English): Codebook and Examples

Code	Definition	Examples
1. Teacher or Professor	References to imagining oneself as an English teacher/professor.	“When I’m walking through the department, I imagine myself being in the shoes of my professor someday. It’s the dream job, so I imagine myself hopefully teaching at the college level someday” (Joanne, senior, writing).
2. Writer	References to imagining oneself being a professional writer.	“In a perfect world, I see myself writing fiction professionally” (King, first-year student, English Ed.). “[C]ranking out a couple books—maybe not super valuable books except for their creative aspects” (Warlock, first-year student, English Ed.). “I see myself writing. In my future, after college, I see myself writing” (Zaphod, first-year student, writing).
3. Graduate School	References to imagining oneself getting an advanced degree in their imagined future.	“I also do see myself receiving my master’s as well as my doctorate within the next six year after graduating” (Rudy, senior, English Ed.).

Table 22

Imagined Futures (English): Frequency of Utterance

	Name	Imagined Futures After College		
		Teacher or Professor	Writer	Graduate School
1	Anna	-	-	-
2	Astrid	-	1	-
3	Evelyn	1	-	-
4	Joanne	1	-	1
5	King	1	1	-
6	Nick	2	-	-
7	Rudy	5	-	1
8	Sylvester	1	-	-
9	Warlock	1	1	2
10	Zaphod	1	2	-
TOTAL	10	8/10 (80%)	5/10 (50%)	3/10 (30%)

Shared Findings Between Groups

In the data just presented, five major overlapping findings are relevant to research question 1: *How do chemistry and English majors understand their becoming and remaining students in their majors?* Those findings are summarized here:

1. All 17 participants (100%) indicated they bore *mental orientations* that led them logically toward the chemistry or English major.
2. All 17 participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being chemistry or English majors.
3. Sixteen of 17 participants (94%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being chemistry or English majors.
4. Thirteen of 17 participants (76%) specified *influential experiences*, specifically *engaging classroom experiences*, that supported or inspired their becoming and being chemistry or English majors.
5. Nine of 17 participants (53%) indicated they saw themselves going to graduate school in their futures.

Shared finding 1: All 17 participants (100%) indicated they bore *mental orientations* that led them logically toward the English or chemistry major. Specific shared mental orientations that participants mentioned included (a) interest in major subject, and (b) aptitude for major subject (See Table 23).

Table 23

Shared Mental Orientations (Chemistry and English): Frequency of Utterance

	Name	Mental Orientations			
		Interest in Major Subject		Aptitude for Major Subject	
		Before College	In College	Before College	In College
1	Ada	8	6	-	-
2	Arykaj	5	1	4	4
3	Kiki	6	-	1	-
4	Linus	6	2	1	-
5	Ramsay	6	2	2	-
6	Reatha	5	1	4	1
7	Rosalind	5	2	-	-
8	Anna	2	1	1	-
9	Astrid	2	2	8	-
10	Evelyn	3	2	1	-
11	Joanne	11	1	10	-
12	King	2	-	2	-
13	Nick	5	-	-	-
14	Rudy	6	-	5	-
15	Sylvester	11	1	1	1
16	Warlock	4	1	4	1
17	Zaphod	-	5	4	2
TOTAL	17	16/17 (94%)	13/17 (76%)	14/17 (82%)	5/17 (29%)
		17/17 (100%)		14/17 (82%)	
		17/17 (100%)			

Shared finding 2: All 17 participants (100%) noted that *influential people* in their lives encouraged, inspired, or validated their becoming and being chemistry or English majors. Specific influential people that participants mentioned included (a) great or passionate educators, and (b) supportive family or close friends (See Table 24).

Table 24

Shared Influential People (Chemistry and English): Frequency of Utterance

	Name	Influential People			
		Great or Passionate Educator		Supportive Family or Close Friend	
		Before College	In College	Before College	In College
1	Ada	1	4	1	1
2	Arykaj	1	2	1	1
3	Kiki	3	4	5	2
4	Linus	6	2	1	-
5	Ramsay	2	1	-	-
6	Reatha	1	1	1	-
7	Rosalind	3	2	4	1
8	Anna	-	1	2	-
9	Astrid	4	-	3	-
10	Evelyn	6	-	5	-
11	Joanne	1	1	10	-
12	King	3	2	2	-
13	Nick	8	3	-	-
14	Rudy	5	2	2	-
15	Sylvester	8	3	-	-
16	Warlock	6	2	1	-
17	Zaphod	3	1	1	1
TOTAL	17	16/17 (94%)	15/17 (88%)	14/17 (82%)	5/17 (29%)
		17/17 (100%)		14/17 (82%)	
		17/17 (100%)			

Shared finding 3: Sixteen of 17 participants (94%) indicated that they had experienced *influential learning environments* that supported or inspired their becoming and being chemistry or English majors. The one specific influential learning environment that members from both groups mentioned was the supportive learning environment (See Table 25).

Table 25

Shared Influential Environments (Chemistry and English): Frequency of Utterance

	Name	Influential Environments	
		Supportive Learning Environments	
		Before College	In College
1	Ada	3	4
2	Arykaj	2	1
3	Kiki	2	3
4	Linus	3	2
5	Ramsay	-	2
6	Reatha	-	3
7	Rosalind	-	3
8	Anna	-	1
9	Astrid	1	-
10	Evelyn	-	1
11	Joanne	1	2
12	King	1	1
13	Nick	1	11
14	Rudy	-	4
15	Sylvester	1	2
16	Warlock	-	4
17	Zaphod	-	-
TOTAL	17	9/17 (53%)	15/17 (88%)
		16/17 (94%)	

Shared finding 4: Thirteen of 17 participants (76%) specified *influential experiences*, specifically *engaging classroom experiences*, that supported or inspired their becoming and being chemistry or English majors. The one specific influential experience that members from both groups mentioned was the fun or engaging class (See Table 26).

Table 26

Shared Influential Experiences (Chemistry and English): Frequency of Utterance

	Name	Influential Experiences Fun or Engaging Class	
		Before College	In College
1	Ada	-	2
2	Arykaj	2	2
3	Kiki	2	-
4	Linus	2	-
5	Ramsay	1	3
6	Reatha	-	-
7	Rosalind	-	-
8	Anna	-	1
9	Astrid	-	3
10	Evelyn	5	2
11	Joanne	-	2
12	King	2	-
13	Nick	3	-
14	Rudy	-	-
15	Sylvester	2	1
16	Warlock	-	-
17	Zaphod	1	7
TOTAL	17	9/17 (53%)	9/17 (53%)
		13/17 (76%)	

Research Question 2: How Participants Understand Writing in Chemistry and English

In this section, I present findings related to the second research question: *How do chemistry and English majors understand their disciplinary writing experiences?* Data to answer this question mainly came from disciplinary-writing interview transcripts. Since chemistry and English majors addressed this question differently, resulting in slightly different themes, major-specific codebooks were developed and validated for each, with some overlap. Disciplinary Writing Experience Interview codebooks were validated with high degrees of reliability, with an ICC of .99. What follows now are the codebook definitions, frequency tables, and thematic passages illustrating major findings for this question. This section follows the sequence of (a)

chemistry major-specific findings, (b) English major-specific findings, and (c) shared findings between groups.

Chemistry Major-Specific Findings

Data analysis resulted in the location of five major findings relevant to research question 2 for chemistry majors: *How do chemistry and English majors understand their disciplinary writing experiences?* Those findings are summarized here:

1. All seven participants (100%) defined science writing as unique and different from other kinds of writing.
2. All seven participants (100%) indicated being exposed to and writing the lab report genre primarily.
3. All seven participants (100%) expressed negative feelings toward the lab report, with more than half (5/7, [71%]) also expressing positive feelings toward it.
4. Six of seven participants (86%) explained the nature and structure of lab reports without any direct prompting.
5. Four of seven participants (57%) described science writing as a way of learning science.

The codebook definitions for these findings appear in Table 27.

Table 27

Chemistry Major Findings for Research Question 2: Codebook Labels and Definitions

Category	Code	Definition
1. Positions in relation to writing in science.	1. Science writing is unique and/or different.	Utterances about science writing requiring certain elements and audience awareness, as well as being different from English-class writing, regular writing, or actual writing.
	2. Science writing aids learning.	Utterances about writing enhancing science understanding, thinking, and learning.
	3. Lab reports have specific nature and/or structure.	Utterances about the purpose, structure, and nature of lab reports.
2. Feelings toward writing in discipline	4. Reports of negative feelings toward lab report writing.	Utterances of feeling generally negatively toward a selected writing experience and/or the product resulting from the experience.
3. Types of writing done in discipline.	5. Reports of being exposed to or mainly writing the lab report.	Utterances about experiences writing lab reports.

Finding 1: All seven participants (100%) defined science writing as unique and different from other kinds of writing. Utterances about science writing requiring certain elements and audience awareness, as well as being different from English-class writing, regular writing, or actual writing, appeared in the data as a primary finding. Participants expressed this kind of utterance, for instance, by comparing science writing to other kinds of writing. Here, Ada (first-year student, biochemistry) mentions the nature of lab reports in the context of discussing an honors-college open-ended philosophical writing assignment where she needed to argue for her position on the nature of art (See Appendix J for transcription conventions):

107 ADA: [5:00] Um but when you have such a large question like core like this unit it's how do we understand art.

108 There's so: many different things to: consider and so many different stances you can take and none of them is wr- none of them are wrong.

- 109 Um (0.5) but (0.5) when you have an essay like you do in high school or like a lab report you're either right or your wrong and it's—
- 110 JUSTIN: [5:23] Ah (.) like the way you're graded or [assessed?]
- 111 ADA: [05:25] [Yea:h,]

In this next example, Ramsay (junior, chemistry) distinguishes science writing as having a unique scope and purpose:

- 143 RAMSAY: [06:31] A:nd --
- 144 I don't know,
- 145 The interesting of (.) like as I guess the lab report is?
- 146 It's not like most (.) writing?
- 147 It's very (2.5) very focused on details?
- 148 Very much focused on the like --
- 149 (4.0) I'm not sure how to explain it.
- 150 It gets (1.0) --
- 151 like it's not a persuasive or an argument paper?
- 152 Or it's not an explanation paper?
- 153 You know what I mean,
- 154 It's more (.) okay.
- 155 We need to do an experiment.
- 156 Here's what happened.
- 157 Very (.) to the point?
- 158 And it could be very detailed,
- 159 But that's just to lay out (.) all of what happened so that if someone else reads it,

160 And if someone wants to repeat the experiment,
161 They're able to,
162 So it's very --
163 there's a lot of information?

Another way one participant (Kiki, senior, biochemistry) expresses the uniqueness of science writing is by explaining it in terms of what I (the interviewing researcher) am perceived to write:

128 KIKI: [4:54] It was more like (.) focus on giving you feedback so you could by
the end of the semester have like a- one good lab report written the right way?
129 'Cause like (.) it is hard to get in the mentality of like (.) lab report writing is not
(.) English writing.
130 Like you're not (.) like what you're writing is not what I do @@.

Finding 2: All seven participants (100%) indicated being exposed to and writing the lab report genre primarily. Aside from the lab report, homework writing (6/7, [86%]) and essay-exam writing (4/7, [57%]) were the kinds of disciplinary writing chemistry majors mentioned. This finding also reflects the distribution of writing purpose (in-class versus out-of-class) that chemistry majors mentioned, with all seven (100%) noting doing science writing for class purposes with only some (3/7, [43%]) indicating doing science writing outside of class.

Finding 3: All seven participants (100%) expressed negative feelings toward the lab report, with more than half (5/7, [71%]) also expressing positive feelings toward it. When participants were talking about their feelings toward disciplinary writing experiences, the lab report featured prominently in both the positive and negative column. Table 28 summarizes feelings participants noted in relation to kinds and genres of disciplinary writing encountered:

Table 28

Disciplinary Writing Experiences and Feelings Toward Them (Chemistry)

	Name	Kinds of Disciplinary Writing and Feelings Toward Them			
		Positive		Negative	
		Before College	In College	Before College	In College
1	Ada	1. lab reports	1. lab reports *reflective journaling *open-ended philosophical argument	1. lab reports	1. lab reports <i>if I didn't enjoy the lab</i>
2	Arykaj	1. analysis of science research reports 2. imaginative-informative writing about science topic	1. lab reports	2. hypothesis-driven science-fair writing	1. lab reports <i>in multiple classes at once and depending on depth of experiment</i>
3	Kiki	-	1. lab reports	1. lab reports <i>graded difficultly</i>	-
4	Linus	-	1. lab reports *open-ended philosophical argument	1. lab reports	-
5	Ramsay	*fiction writing	-	1. lab reports	1. lab reports <i>monotonous in nature</i>
6	Reatha	-	1. research proposal <i>on a project that will really be done</i>	-	1. lab reports <i>in multiple classes at once</i> 2. research proposal <i>on a project that will not really be done</i>
7	Rosalind	1. science exam writing	-	-	1. lab reports
TOTAL	7	3/7 (43%)	5/7 (71%)	5/7 (71%)	7/7 (100%)
		6/7 (86%)		7/7 (100%)	

Note. * = non-disciplinary writing experiences indicated as meaningful.

As noted in Table 25, the lab report was noted in relation to negative feelings, for instance, when it was assigned in multiple classes (Arykaj) or when it was assigned on a project unrelated to the participants' own or desired research (Ada, Reatha).

Finding 4: Six of seven participants (86%) explained the nature and structure of lab reports. Without prompting, a significant majority of participants went on to describe the lab

report after mentioning it. Reatha (junior, chemistry) elaborates here on the structure of the lab report in the following:

- 31 REATHA: [01:37] But every time in the lab report you have to write an
introduction objective the procedure,
32 You have to present your data with tables or graphs or just written out.
33 You have to present results and conclusions,
34 And sometimes people or a lot of the times they have post-lab questions.
35 So you have to answer questions about the experiment what the outcome was.
36 Just more engagement type questions.

Regarding the nature of lab reports, Kiki (senior, biochemistry) expresses here how the lab report represents a publishable genre of writing:

- 221 KIKI: [08:53] Lab reports are more meant (.) to be published.
222 So: we write them in the style that you would see in the journal?
223 So you have to have like (.) an abstract intro.
224 Um it has to be like in a two-column format usually.
225 So (.) which is actually really hard to get everything spaced on Word.
226 It's um (2.0) --
227 those lab reports? (2.5)
228 It takes you a while to learn? --
229 like if you read --
230 honestly you could- should not be writing lab reports --
231 like you aren't or better yet you are not writing good lab reports unless you've
read a bunch of journal articles?

Finding 5: Four of seven participants (57%) described science writing as a way of learning science. An example of this contextualized within Rosalind's (first-year student, biochemistry) before-college experiences follows:

55 JUSTIN: [03:39] What were your feelings or experiences like with those activities and tasks [science writing activities and tasks before college].

56 ROSALIND: [03:46] Um (.) I liked it.

57 Because again you know being creative,

58 And it gives you a chance to really (.) talk about something in depth.

59 And something like a reaction that can be hard to understand and really talk about it.

60 It also like writing it down also helps you remember a lot of the information.

61 So (.) I don't know that really helps.

Linus (first-year student, pre-medical) further indicated that writing could introduce new vocabulary and could prompt student writers to see what they know:

111 JUSTIN: [06:15] And sort of just to elaborate on that,

112 What were your (.) or what have your experiences been with the writing tasks and activities you just mentioned.

113 How would you characterize sort of how you feel toward that science writing and the tasks.

114 LINUS: [06:31] Overall I would say that I really do enjoy most writing assignments because,

115 (1.0) It's always an experience in learning words,

116 It's the easiest way to phrase it.

117 But it's always an experience in realizing how maybe short or wide your knowledge base on the subject is,

English Major-Specific Findings

Data analysis resulted in five major findings relevant to research question 2 for English majors: *How do chemistry and English majors understand their disciplinary writing experiences?* Those findings are summarized here:

1. Five of 10 participants (50%) expressed the nature and/or uniqueness of English writing.
2. Ten of 10 participants (100%) indicated having aptitude as well as being interested in writing.
3. Nine of 10 participants (90%) indicated personal, outside-of-class purposes for writing.
4. Nine of 10 participants (90%) expressed positive feelings toward English disciplinary writing while only four (40%) expressed feeling also negative feelings toward it.
5. Eight of 10 participants (80%) indicated being exposed to and writing reading-response or literary-analysis papers primarily.

Table 29 below presents the codes and definitions related to these findings.

Table 29

English Major Findings for Research Question 2: Codebook Labels and Definitions

Category	Code	Definition
1. Positions in relation to writing in English.	1. English writing is unique and/or different.	Utterances about English-class-related or creative writing requiring certain elements and/or being different from other kinds of writing.
	2. Writing aptitude and interest.	Utterances about having always had, or seen oneself as having, special aptitude and/or interest in writing generally or English-major-associated writing particularly.
	3. Writing for oneself (outside of class).	Utterances indicating that a selected writing experience was done for personal or out-of-class purposes.
2. Feelings toward writing in English.	4. Reports of positive feelings toward English-class/English-major writing.	Utterances of feeling generally positively toward a selected writing experience and/or the product resulting from the experience.
3. Types of writing done in English.	5. Reports of being exposed to or mainly writing reading responses.	Utterances about experiences carrying out persuasive, analytical, or reflective writing about assigned nonfictional or fictional readings.

Finding 1: Five of 10 participants (50%) expressed the nature and/or uniqueness of English writing. Joanne (senior, writing) expresses this here as she compares writing to other disciplines:

- 90 JOANNE: [04:15] So like math and science was challenging in a frustrating way.
 91 But (.) writing creatively was like a puzzle that (.) when it all came together in the end,
 92 It was such a sensation of accomplishment?

In another example, Warlock (first-year student, English Ed.) responds to a question in which I have asked him to tell me how he felt about the writing experiences he had before college. He replies here by addressing his current experiences in English:

- 158 WARLOCK: [7:00] And I think that's why I'm enjoying now in college there's so much --
 159 you're not bound as much.

- 160 Uh again Doctor Banks' class we have these- these like very very very broad (.) topics.
- 161 She's just like "Hey go off and write,
- 162 "I wanted to see what you have to- have to say."
- 163 I think the last one's actually (.) a class structure.
- 164 Like about this article we had to read.
- 165 And uh it was like related to your favorite TV show.
- 166 And I was like "Oh well *Game of Thrones* is pretty much like (.) all about class structure."
- 167 So (.) uh I think that's why I really enjoy the English Department here.
- 168 And in particular it's because I have been given freedom.
- 169 A lot.

Finding 2: Ten of 10 participants (100%) indicated having aptitude and being interested in writing. Supported by co-written and participant-authored academic life narrative data, this finding reflects participants' unanimous expression of being skillful or interested writers. Joanne (senior, writing) expresses her writing aptitude here in the context of before-college experiences:

- 76 JOANNE: [04:15] So in high school with those assignments,
- 77 I: knew that I was good at what I was doing?
- 78 Because I was always getting grades on my responses and on my tests or whatever.
- 79 I knew words and I knew I could at least guess my way through understanding meaning if I didn't know a word or how to spell it.

80 I could (.) usually figure it out.

Zaphod (first-year student, writing) further illustrates this finding regarding in-college experiences when, in the following, he compares writing in English to programming in computer science:

169 ZAPHOD: [06:38] I mean I- I am writing more?

170 But it's more interesting to me [than computer science].

171 Like maybe some people are like they learn more as from programming,

172 Maybe they have like easier time doing that stuff.

173 But for me (.) it's the other way around.

174 Like I don't mind writing papers.

175 Like uh (.) they're easy to me.

In addition to having aptitude, participants also unanimously expressed being interested in writing. Nick (first-year student, English Ed.) expresses this interest here in the context of a part of the interview when I have asked him to share how he felt about his experiences with disciplinary writing before coming to college:

58 NICK: [02:36] And I- I can take the skills that I learned in school and apply them
in --

59 and I- I don't know I feel like I- I do enjoy doing things like that?

60 And I do enjoy writing papers also?

61 But I feel like (.) writing emails is like the quick little fun like let's test out how-
how many wor- like my vocabulary and how I can say certain things certain ways.

62 I really think writing is --

63 I find writing fun.

In the context of a discussion of what writing meant to him, Warlock (first-year student, English Ed.) had this to say:

249 JUSTIN: [11:40] Uh anything else you'd like to ask uh add about writing and you and English?

250 WARLOCK: [11:47] Uh (.) I suppose just the- just the fact that uh it's pretty much who I am.

251 And altogether I think that if- if I couldn't write couldn't read didn't love it as much as I love it I wouldn't be Warlock Jones.

252 I (.) I- I think that it's honestly in my blood.

253 There's just something that makes me want to put pen to paper and just (.) smith as much as I possibly can out of that.

254 It's always been- it's always been a love and I hope it never ever stops.

Finding 3: Nine of 10 participants (90%) indicated personal, outside-of-class purposes for writing. Writing for a significant majority of participants occurred for them outside of class, or for purposes not classroom-bound. Participants indicated having outside-of-class writing experiences mainly in the context of before-college experiences (9/10, [90%]) while a couple of those same participants (2/10, [20%]) also expressed outside-of-class writing in the context of in-college experiences. A few participants (Evelyn, King, Warlock) mentioned this outside-of-class writing while mentioning a notebook or folder they maintained with writing before college. Evelyn (first-year student, writing) expresses outside-of-class notebook writing here in the following:

1 JUSTIN: [00:00] So last time I just kind of asked you about general life story events?

- 2 The point of this follow-up meeting is to ask more specifically about writing experiences you've had?
- 3 So what were your experiences like with writing in English before majoring in English at this college.
- 4 EVELYN: [00:29] Um (4.0) like anytime?
- 5 Well when I was little I had this little notebook I had where I wrote little spinoff stories from like fairy tales and stuff.
- 6 And from there I would try to create my own.
- 7 Which I mean I don't even think I kept those notebooks. @@
- 8 Um (.) I would do- I would write in that notebook.

In the following, Zaphod (first-year student, writing) discusses writing happening outside of class in the context of a response about what kind of writing he had been currently doing in his English major:

- 148 ZAPHOD: [05:35] Uh we have to do (.) uh responses to a writing in that class.
- 149 So like before we do the reading,
- 150 You're supposed to read it before the class.
- 151 And then you do a response to it,
- 152 Then you take that and to that class.
- 153 And it's pretty interesting.
- 154 All my- and then I (.) like over winter break I was trying to write a lot of poetry.

Finding 4: Nine of 10 participants (90%) expressed positive feelings toward English disciplinary writing while only four (40%) expressed feeling also negative feelings toward

it. Table 30 summarizes feelings participants noted in relation to kinds and genres of disciplinary writing encountered.

Table 30

Disciplinary Writing Experiences and Feelings Toward Them (English)

	Name	Kinds of Disciplinary Writing and Feelings Toward Them			
		Positive		Negative	
		Before College	In College	Before College	In College
1	Anna	1. reading responses <i>about personally favorite books or authors</i>	1. creative writing	-	-
2	Astrid	-	1. reading responses <i>more in depth than in high school</i> 2. reflection writing <i>without rules/limitations imposed</i> 3. fiction writing 4. nonfiction writing 5. playwriting	1. papers 2. research papers	1. creative writing <i>shared with others before it is finished</i>
3	Evelyn	-	1. exploration papers linking theory to readings	-	-
4	Joanne	1. fiction writing	1. surrounding-awareness homework 2. creative writing	-	-
5	King	1. fiction writing 2. poetry writing	1. research paper on personally interesting topic <i>writing without rules/limitations imposed</i> 2. fiction writing <i>without rules/limitations imposed</i>	1. persuasive writing <i>on exhausted topic</i> 2. creative writing <i>with rules/limitations imposed</i>	1. reading responses
6	Nick	1. papers 2. emails * journalism	1. reports 2. emails	-	
7	Rudy	-	1. writing <i>without rules/limitations imposed</i>	-	-
8	Sylvester	1. research paper <i>on personally interesting topic</i> 2. personal narrative/reflection	1. writing <i>on personally interesting topic</i> (video games) 2. literary analysis	-	-

9	Warlock	-	1. writing <i>on personally interesting topic</i> (video games) 2. reflection blog posts <i>without rules/limitations imposed</i>	1. writing about an author several times (Shakespeare) 2. poetry in iambic pentameter 3. writing about a disliked book	-
10	Zaphod	*history paper	-	-	1. reflection blog <i>after every class</i>
		5/10 (50%)	9/10 (90%)	3/10 (30%)	3/10 (20%)
TOTAL	10	9/10 (90%)		4/10 (40%)	

Note. * = non-disciplinary writing experiences indicated as meaningful.

As reflected in Table 30, positive feelings toward before-college disciplinary writing experiences were expressed primarily regarding in-college experiences while fewer than half of participants expressed positive feelings regarding before-college experiences. At the same time, fewer than half of all participants expressed negative feelings toward disciplinary writing regarding both before-college and in-college experiences. While creative writing, and mainly fiction and poetry writing, received noteworthy mention pertaining to positive feelings, also being mentioned in relation to positive feelings were those writing assignments without clear rules or limitations imposed.

Finding 5: Eight of 10 participants (80%) indicated being exposed to and writing reading-response or literary-analysis papers primarily. After (a) the reading-response or literary-analysis paper, English majors reported doing (b) creative writing (7/10, [70%]), with 7/10 (70%) indicating having written short stories and 5/10 (50%) indicating having written poetry; (c) “papers” or “essays” without specifying any genre (7/10, [70%]); and (d) “research papers” without specifying any genre (7/10, [70%]).

Shared Findings Between Groups

In the data just presented, one major overlapping finding is relevant to research question 2: *How do chemistry and English majors understand their disciplinary writing experiences?* That

is, both chemistry majors (7/7, [100%]) and English majors (5/10, [50%]) expressed the uniqueness and indicated the nature of their respective disciplinary writing activities and genres. While, for chemistry majors, disciplinary writing was mainly prescribed, such as in the lab-report genre, disciplinary writing for English majors was expressed in seemingly less-defined terms. Aside from the general genres of poetry and short stories, English majors mentioned mainly nondescript kinds of writing, specifically “papers” or “essays.” Chemistry majors described the lab report form in the context of its specified audience and purpose (mainly other scientists who needed to be able to replicate the science) as well as specific genre conventions (visuals of data, objective style, audience-centered parts and functions of specific paragraphs). Meanwhile, English majors did not specify audience or purpose for their disciplinary writing.

Research Question 3: How Participants Construct Their Disciplinary Identities

In this section, I present findings related to the third research question: *How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?* To answer this question, data in the form of co-written academic life narratives, participant-authored academic life narratives, and disciplinary writing interview transcripts was analyzed. Specifically, this data was analyzed for linguistic units suggesting construction of stances through evaluation and other acts of self-positioning. This section follows the sequence of (a) chemistry major-specific findings, (b) English major-specific findings, and (c) shared findings between groups.

Chemistry Major-Specific Findings

Ada. A first-year student majoring in biochemistry, Ada composed two stories coded as being about realizations of how her character fits science major, and a third story coded as being about a realization of her science character generally. In one narrative coded as dramatizing her

realization of what she seemed to understand as her scientific nature generally, she writes of being in high school and visiting a college with her mother in preparation of becoming a college music major. What happens next in the narrative changes her mind and life path:

As I was watching this performance, I saw how incredibly expressive this young musician was. Music for me has always been a science. Music, to me, is a mathematical way to fit pieces together. It has always been very technical, in that sense, to me. I recognized that to pursue music, I needed that true artist's expressiveness, and I knew I was lacking it. (autobiographical writing)

This story dramatizes Ada's conflict regarding what major to choose. As Ada's story tells of her choice to make her and her mother abruptly leave the university campus, it constructs her as a person who understands the world, including music, as technical. Although this story does not describe what major Ada does refer to belonging to, it indicates that music to her requires a different kind of world orientation and is therefore not for her. The stance that music is not for her is constructed as Ada displays a trend in chemistry students' data that I have coded as references made to a *science mindset*. References to this mindset (8 references), in addition to references to being interested in science (18 references), appear throughout Ada's narrative data. These references to a science mindset and to a special interest in science index a stance toward herself and the major that constructs her as being the kind of person who belongs in a science major. Other references Ada makes to construct this stance of belonging in science are references that positively evaluate college educators in science class both before and in college (5 references), references about family members (3 references) such as Ada's mother who explicitly point out Ada's personality/science major fit, and references that positively evaluate outside-of-school scientists (2 references). Though Ada does not mention research activity, she does

positively evaluate science classes she had (3 references), thereby constructing herself as the kind of person belonging in such classes. She also links her science mindset to attractive points of science by indicating that science provided a language or lens useful for understanding the world (8 references).

In relation to writing, Ada most positively and emphatically evaluates the open-ended philosophical writing assigned through her honors college requirements. This stance validates her choice of coming to the major, as she states in the disciplinary-writing interview:

347 ADA: [14:38] Because I didn't realize how much core would shape the way I
view the world.

348 It's really interesting because it's just one class.

349 But it's such an enriching environment.

350 And I --

351 I love it so much.

352 That's the main reason I came to this college.

353 It was because of the honors college.

In addition to positively evaluating honors-college writing, Ada positively evaluates writing the lab report, but then qualifies this stance by negatively evaluating it as sometimes "a chore" (interview, line 54) unless the lab itself was enjoyable. Finally, Ada positively evaluates journaling, which she describes as personally enjoyable. The reference to journaling is the only reference she makes to outside-of-class writing. These stances about kinds of writing construct her as the kind of person who desires a personal connection to what she writes, in the lab report or journal genres. Ada also expresses seeing the uniqueness and nature of science writing, with

science writing being evaluated as either right or wrong in contrast to honors-college writing, which allows freedom:

- 107 ADA: [5:00] Um but when you have such a large question like core like this unit
it's how do we understand art.
- 108 There's so: many different things to: consider and so many different stances you
can take and none of them is wr- none of them are wrong.
- 109 Um (0.5) but (0.5) when you have an essay like you do in high school or like a lab
report you're either right or your wrong and it's --
- 110 JUSTIN: [05:23] Ah (.) like the way you're graded or [assessed?]
- 111 ADA: [05:25] [Yea:h,]
- 112 yeah it really is,
- 113 and it's --
- 114 it's easy to be wrong and it's harder to be right.

This evaluation of science writing reflects how Ada describes herself and her own science mindset, such as in the following excerpt from the co-written academic life narrative: "I see the world as black and white, and that is exactly how science is: It either or it isn't. There's no gray area, and that is probably my favorite part of it." Thus Ada evaluates science as suitable for her way of seeing the world, constructing herself as belonging in her major while not belonging in others.

Arykaj. A junior in the pre-pharmacy track, Arykaj wrote three stories, one of which was coded as dramatizing herself realizing her character or interest in science. This character and interest seem to fit the chemistry major. Meanwhile, the second and third stories were coded as dramatizing realizations of the wonder of science. One of Arykaj's narratives about realizing a

sense of wonder toward science portrays her grandfather taking her to a science museum, where she witnesses a science exhibition. Arykaj writes, “There was a specific science show that I will never forget, the lady who was upfront was showing and teaching us about liquid nitrogen. I thought that was so cool” (autobiographical writing). This story makes a number of references that construct stances toward science. After the complicating action of the story, in which Arykaj summarizes the actions of the exhibition involving liquid nitrogen, we get an evaluation of what the story means for Arykaj. Her evaluation of the exhibition (as “cool”) displays her interest in science, thereby constructing her as a person whose interests match the content of her major. Other passages in the data developed from Arykaj contain references to what has earlier been coded as references to her science aptitude (9 references) and science mindset (3 references), as well as another important person in her life, a chemistry professor who at the time this study took place was both Arykaj’s advisor and professor with whom she was conducting research. In the co-written academic life narrative, Arykaj describes the influence of this professor as one that started with conflict. Arykaj tells of failing a chemistry class after her grandfather dies and, as a result, being advised to switch majors:

I don’t know how to explain it except to say that I was so pissed. I was so mad because I knew that I could’ve done better than that, and I used that emotion to go from failing the class to retaking it and getting an A. When I went back to go see him, he said, “For as long as I’ve been a professor, I have never seen that happen before.” He also said, “I want you to be in my research lab.” It was just so funny to me because this was the same guy that told me to change my major, and now he wanted me in his research lab. (academic life narrative)

This story shows Arykaj referring to a professor and, as a result, constructing herself as a person who belongs in the chemistry major. She does this by dramatizing the dialogue between herself and her professor, in which he evaluates her as a student unlike any other. This professor validates her choice of being a science major, thus indexing Arykaj's aptitude for science and belonging in the chemistry major. Following this episode, Arykaj describes in the co-written academic life story how that research has impacted her: "This research has changed my life" (academic life narrative). References indicating her interest and aptitude for science via references to research (8 references) further construct her as the kind of person who belongs in the major, since research is explained throughout the data of chemistry majors as a signature activity signaling meaningful participation in the department and discipline.

In terms of disciplinary writing, Arykaj positively evaluates both the lab report genre as well as a hybrid creative narrative/informative genre she wrote in high school. Regarding the creative narrative, Arykaj explains having to choose an element from the periodic table and anthropomorphizing it as if she were writing a biography. She evaluates this imaginative writing as "cool," constructing herself as a writer open to different writing experiences. She also directly evaluates herself as an apt and interested writer. Yet while Arykaj positively evaluates also the lab-report genre, she qualifies this evaluation by then negatively evaluating lab reports when written under some conditions. For her, lab reports become tedious when she has to write them for multiple classes at the same time. In explaining her stance toward lab reports, she also explains the nature and uniqueness of science writing:

- 53 ARYKAJ: [2:20] Because (1.8) like I said though I'm a good writer,
54 like I'm good at writing.
55 But (0.5) scientific writing and actual writ- like they're the same?

- 56 But they're totally different things.
- 57 Because you have to use certain wo: rds certain structures like.
- 58 Different styles of writing and I didn't understand that until I got into the sciences.

Here Arykaj evaluates scientific writing as more rule-bound than “actual” writing. What she means by “actual” is not clear. What is important is how she constructs the kind of writing she does in her major as containing particular words and structures. Explaining the distinction constructs Arykaj as knowledgeable of her own major's writing and as a relative insider, at least compared to me, the interviewer, who she knows is coming to interview her from English. Ultimately, Arykaj constructs herself as a person who understands and performs well in science writing genres: a kind of person who has come to belong in the major by being able to operate within it.

Kiki. A senior biochemistry major and Master Alchemist of Alpha Chi Sigma (AXE), the university's co-ed chemistry fraternity, Kiki composed autobiographical stories coded as dramatizing her realizing her character or interests fit the chemistry major in particular, and realizing her science-major character in general. In one of her stories, coded as expressing a realization of her science-major character, Kiki writes about a high-school experience in which she elects to take Earth and Space instead of Honors Biology. She writes,

I distinctly remember sitting in Earth and Space science, licking a rock, and feeling incredibly frustrated. The teacher was droning on in the background, and my lab partner was staring at the assignment in front of her like she was illiterate. I remember feeling like I would rather walk out of the room and out of the school, than stay there for another minute. (autobiographical writing)

This story reflects other findings related to Kiki's narratives and interview that speak to her positively evaluating challenging and supportive learning environments (5 references) and expressing almost disdain for laid-back learning environments (4 references). In the above story, Kiki negatively evaluates the classroom environment, which includes the task of licking a rock, passively listening to a droning teacher, and being coupled with another student as a lab partner who seems to find the class a challenge. Kiki's text shows her diverging from classroom activities and members, constructing herself as both not belonging in basic science and simultaneously as belonging in challenging science classes. In another of Kiki's stories, she writes not only of being in honors biology but also of being exceptional:

This moment is kind of odd, but it does come to mind when I think of my major. In my sophomore year of high school, during honors biology, I remember the sick satisfaction of cutting the frogs' jaws for the kids who were too squeamish to do it themselves. I remember thinking that if I could do things that other people were afraid to do, then I could be successful in life. (autobiographical writing)

In this story, Kiki portrays herself as distinct from classmates in being able to follow class instructions even when those instructions make some classmates squeamish, whom Kiki refers to diminutively as "kids." This story portrays Kiki as diverging from others in the classroom, thus indexing an aspect of her science-major identity as capable of carrying out science-lab instructions that seem unappealing to others.

In relation to writing, Kiki both positively and negatively evaluates the lab-report genre. She negatively evaluates it under some conditions, specifically when she discusses writing them in high school and being graded harshly and unfairly. In our interview, Kiki responds,

99 KIKI: [4:15] It was hard to like think in detail what could've gone wrong?
100 Or maybe like (1.5) different levels?
101 So that was always a (.) pain I think for high school.
102 Because you just felt like you didn't know enough?
103 To give good answers.
104 And then you were almost punished?
105 Because you couldn't think that way.
106 And I was like "This is (.) annoying."
107 So I did not like lab reports (.) at all.
108 I don't mind them now.
109 They're just (.) a- a lot easier now.
110 'Cause like I actually have some kind of scientific understanding of multiple
topics @@.

In explaining her negative and positive evaluations of lab-report writing, Kiki refers to her science aptitude (1 reference) compared to high school. This stance has the effect of constructing her as adapted to the college science environment and therefore better able to satisfy the requirements of the lab report, described throughout the chemistry-major data as a kind of signature science-major genre. In addition to discussing the difference between high-school and college lab-report writing, Kiki also discusses the nature and uniqueness of science writing at length (13 references). In evaluating the kind of writing she does, she refers to me specifically, the researcher interviewing her. To her, I seem to be an outsider to the science major:

131 Like you're not (.) like what you're writing is not what I do @@.

In aligning divergently from me and explaining her discipline's unique literacy practices, Kiki constructs herself as belonging within certain disciplinary boundaries.

Linus. A first-year student double-majoring in chemistry and mathematics, Linus composed three stories coded as dramatizing moments when he felt wonder toward science. In one of these stories, Linus writes of a physics experiment in high school:

There were dozens of designs online, different ways of making bridges, and different physical constructs. Our only limit was that it was to be no more than 150g. Being able to create an experiment and seeing it through, with so few limitations, it was a freedom I had not felt before, and one I looked forward to in the future. (autobiographical writing)

Here Linus takes the stance that the physics experiment is interesting, referring to his interest in science as well as his future intention of pursuing experimentation. In the other forms of data related to Linus's perceptions, interest in science is also noted (8 references). In addition to constructing himself as a chemistry major by referring to his interest in science, Linus also refers to and positively evaluates high-school science educators (6 references) who go beyond teaching to the test or to a limited, set curriculum.

Regarding science writing, Linus evaluates lab reports both positively and negatively. In evaluating lab reports negatively, Linus refers to high-school experiences with the genre:

41 JUSTIN: [02:17] Um (.) and what about you:r experience with those writing tasks you just described.

42 How would you characterize I guess how you felt while doing them or your feeling toward them.

43 LINUS: [02:30] With a lot of them (.) it kind of just felt like a summary of parts?

44 I definitely enjoyed what I did in high school on like a lab-work level,

- 45 But the writing afterward always felt like it was going over exactly what I had
already done.
- 46 I didn't feel like I was inferring that much,
- 47 And I think that was just kind of a symptom of (1.0) you know the- (.) the depth
that we were able to go into because of the limited amount of knowledge we had
and the limited amount of time especially that teachers had at the high school
level.

In replying to my question about how he feels about his high-school science writing experiences, Linus expresses joy for the lab work but then, with the coordinating conjunction “but,” seems to imply a contrasting emotion. While aligning himself with research done in labs and thus indexing a research-enjoying aspect of his disciplinary identity, Linus also negatively evaluates the experience of lab-report writing in high school. He does so reportedly not because of the science and research aspects but rather because, at the high-school level, students like Linus may lack depth of knowledge to do lab reports in a way that, for Linus, might be more satisfying. By referring to the joy he feels for research (6 references) as well as a change in aptitude for science developed in college visible in his greater ability to write personally satisfying lab reports that infer rather than only summarize, Linus constructs himself as belonging in a major that requires and provides practice in researching and lab-report writing as well as mathematics, which is his other major.

Ramsay. A junior chemistry major, Ramsay wrote one story coded as expressing how his character fit a science major, one coded as expressing a moment when he felt wonder toward science, and one coded as expressing how his character fit a science career. In the story about

him realizing how his interests fit a science career, Ramsay writes about visiting a Merck pharmaceutical research and production facility and encountering scientists:

What struck me was that both of my tour guides, one for the R&D department and one for the manufacturing part of the plant, were chemical engineers. Previously I had been turned off to the idea of chemical engineering because I was under the impression that chemists work in the lab and focus on experimentation and research, my area of interest, while engineers were more focused on manufacturing and getting the product ready for mass production. [...]. As it turned out, chemical engineering encompassed all chemistry had to offer and added to it. (autobiographical writing)

Here Ramsay takes a stance in relation to these scientists that achieves convergent alignment with chemical engineers and to the career opportunities associated with them. He does this by indicating his interest in research, which he realizes can be part of a chemical engineer's duties. He evaluates chemical engineering as encompassing a field he already positively evaluates (chemistry) and adding to it. In addition to referring to his interest in science (13 references), Ramsay refers to having a science mindset (2 references), and he evaluates science positively because it facilitates understanding the world (6 references). At the end of our interview, Ramsay wanted to take time to push against stereotypes that labeled science as lacking creativity:

431 JUSTIN: [18:52] Anything else you (.) could note about you and writing?

432 And/or chemistry?

433 RAMSAY: [19:00] (5.0) Um --

434 (10.0) I mean (.) maybe uh (.) hm.

435 I guess one of the interesting things about chemistry is,

436 And I guess a lot of sciences is I get the impression that people feel like (.) --

- 437 whereas say you were in an arts field it's very creative?
- 438 Whereas in the science fields it's the exact opposite?
- 439 It's very stifling very (.) analytical there can't be any creativity?
- 440 What I found is though (.) that especially if you're in the research side of things?
- 441 There is a definitely a certain amount of creativity.

In the co-written academic life narrative, Ramsay refers to getting into a science major after realizing that science provides a lens through which to understand the world and solve real-world problems. He points to a news story he encounters in high school that reports on the application of hydrocarbon-chewing microbes to clean up an oil spill committed by a multinational oil and gas company. Ramsay evaluates chemistry as involving creativity and as being a creative endeavor. In positively evaluating chemistry in that way and in explaining that this creative application of science to solve problems attracted him to the chemistry major, he constructs himself as aligning with and belonging in his major.

Regarding science writing, Ramsay acknowledges that he always has had an interest in writing—not only in science writing. In talking about meaningful writing experiences he had in high school in our interview, he mentions a horror story he wrote:

- 34 RAMSAY: [01:55] And I was writing it and I got really into it?
- 35 And it was supposed to be seven to eight pages?
- 36 Mine ended up being 20? @@@
- 37 And uh @@ I think for five or six days I got up at five o'clock,
- 38 Two hours earlier than I had to write this thing.
- 39 It was- I really got into it and I didn't like want to like half-ass it I guess.
- 40 JUSTIN: [02:15] Was it like a horror story?

- 41 Or like sci-fi?
42 RAMSAY: [02:19] Yeah.
43 Horror story basically.
44 Um (0.5) that was fun.

In positively evaluating this writing experience, Ramsay constructs himself as enjoying creative writing, which does not contradict with his earlier portrayal of science as a creative endeavor. In his only reference to the lab-report genre, he evaluates science writing negatively, referring to the lab report as “a little more monotonous at times” (interview, line 176). While the field of chemistry may involve creativity, the writing is evaluated as more predictable. Yet Ramsay’s overall evaluation of writing in science is that writing is beneficial for learning:

- 319 RAMSAY: [13:50] I guess (3.5) hmm (.) I guess one of the surprising things with chemistry is,
320 Between learning stuff in lecture?
321 And then actually doing the work?
322 Sometimes there’s a bit of a disconnect?
323 Like you’ll learn it in lecture “Oh that makes sense,
324 “I can see how that will work.”
325 Then you go to do a homework problem based on it and it’s like (.) what is this saying. @@
326 JUSTIN: [14:11] You mean when you’re writing it out?
327 RAMSAY: [14:13] Yeah.
328 And (.) I guess it’s --
329 with chemistry I found that it’s not just going to lecture and learning stuff?

330 You really have to practice it to --
331 because the learning how something works and (.) like on the molecular scale and
then learning how to apply this in the real world in say a lab,
332 There is a bit of a disconnect,
333 So it- you really hav- there is a certain amount of work you have to do to close
that gap.

This description of writing as part of learning works to minimize the negative evaluation of writing the lab report as monotonous. Ramsay constructs himself as valuing science writing overall. It is presented as a practical activity meant to communicate science and possibly be used for creative solutions of real-world problems. This description of a science field is constructed as not seemingly hostile to a person like Ramsay who describes himself as having both creative and practical leanings.

Reatha. A junior chemistry major and recipient of undergraduate research awards, Reatha composed a story coded as expressing how her character or interest fits a science career. Her other two stories were not coded as telling stories per se; that is, they did not dramatize action but rather affirmed in exposition that her character fits a science career. In a story she wrote coded as an affirmation of her science character, Reatha explains her father's influence:

He was excited that I was excited, but I know my father, and he had this look in his face. I asked him what was wrong. He replied "I want you to study something that you are passionate about, but I also want that passion to grant you a great future." I said to him "so what are you saying?" He told me maybe I should reconsider my choice of major. Criminology is great if you want to become a lawyer, police officer, or even go into the FBI, which I did not want to do neither of those. So I sat and re-evaluated my life. When

I came to [this college] again in the summer, I toured the science building and community. Within the first week of classes I changed my major to chemistry.

(autobiographical writing)

This story constructs Reatha as career-minded, and, at the same time, it evaluates chemistry as being a practical choice. Indeed, in Reatha's second story, she writes of joining chemistry "with hopes of becoming a forensic scientist, which is highly possible and very marketable with a degree in chemistry" (autobiographical writing). Meanwhile, her third story explains that she wants to study alternative cancer treatments because a family member died young of cancer. That all her autobiographical stories are coded as being about chemistry as a career path illustrates the stance Reatha has taken regarding chemistry as practical for a stable, well-paying future career and to practically address a serious human issue. Yet Reatha also speaks of her aptitude for science (5 references). In her co-written academic life narrative, she says,

Electron configurations of elements especially appealed to me. For some reason, I never studied them: They just clicked in my head, and I understood them. Also my high school professor made us memorize the entire periodic table, but we did it in parts, and we did it all at once in the end. That wasn't too difficult for me either. I just wanted to learn about each element afterwards. Overall, it just came kind of easy for me. (co-written academic life narrative)

Here Reatha refers to her aptitude for science ("just clicked in my head"). She constructs herself as a person who naturally and effortlessly understands science. Additionally, Reatha refers to her interest in science ("I just wanted to learn"), to which she refers elsewhere (7 references), especially in relation to research (5 references). In her academic life narrative, she says,

I could say I like [research]—even love it. That’s why I want to go into research now.

Before, I never thought that I would go into research. I never thought I would want to stay in a lab all day just doing reactions, but I enjoy it. (academic life narrative)

Here Reatha positively evaluates research, a signature activity in the chemistry department and discipline, thus constructing herself as someone whose interest, even love, fits the chemistry major.

Regarding writing, Reatha evaluates research proposals positively when they are projects she is or will be doing. On the other hand, she evaluates lab-report writing and research-proposal writing negatively under some conditions. Lab reports are negatively evaluated when they are required by multiple classes all at once, and research-proposal writing is negatively evaluated when the project being proposed is not a project Reatha is doing or really will do. This is reflected in the following interview excerpt:

75 JUSTIN: [04:15] Anything else about uh (.) I don’t know feeling you have when you write those or just any way you’d characterize the writing?

76 REATHA: [04:22] I could say (.) for an experiment for my actual research?

77 For our 390 seminar we had to do the proposal on our research and also for McNair.

78 So I was totally engaged.

79 You know writing *Oh I love my procedure*.

80 But for example my 490 seminar we have to write something on a research topic that we’re not doing.

81 It could still be of our interest but we’re not doing it.

82 So I can say I’m not totally as enthusiastic as I was about writing my research?

83 You know that topic appeals to me so I like doing it.

84 But you know it's not *Oh I want to do this now*.

85 Like *I'll do it later*.

86 Like you know I could procrastinate on that.

Here Reatha takes a stance in evaluating science writing about real ongoing research as especially interesting to her, as something she even loves. Meanwhile, she evaluates science writing that is just for practice, or not about a project she will really do, less positively. Overall, she constructs herself again as a person who prizes a practical side of the chemistry major, meaning the activities that lead to real scientific outcomes. These stances index practical, career-focused aspects of her disciplinary identity.

Rosalind. A first-year student biochemistry major, Rosalind wrote two stories coded as expressing how her character fit the chemistry major and one story coded as dramatizing a moment when she felt wonder toward science. In one story about her character and interests and how they fit the chemistry major, Rosalind writes about a lab from her first year of college:

[W]e titrated the solution to determine which antacid was the better buy. Using chemistry to determine useful everyday information such as which antacid is the better buy is unique to me. This is why I want to pursue this major, to indirectly help the public with useful information whether it is which antacid is a better purchase or something of greater importance such as a new antibiotic to fight a disease. (autobiographical writing)

This story presents a stance toward chemistry, portraying it as practical for everyday matters, such as pharmacy-aisle purchases of antacid tablets, as well as for life-and-death matters, such as developing a new antibiotic. In taking this stance, she constructs herself as valuing both the practical and medical aspects of chemistry. She is the kind of person who values practical and

medical knowledge, and the chemistry major offers her a path toward a career in which she can engage with these aspects. Indeed, Rosalind refers to her interest in (8 references) elsewhere during this study, and she explains some of this interest by referring to her scientist parents. In her academic life narrative, she says,

My mom used to work in a lab for the Red Cross, before she had me and my sisters. [...]. My dad is an environmental biologist, so he would always teach me things about outside. [...]. So my mom is kind of like chem, and my dad is kind of bio I guess. (academic life narrative)

Rosalind refers to her parents here, seemingly implying that they both contributed to her choice of the biochemistry focus in the chemistry department. She aligns herself with her scientist parents, a stance that constructs her as coming from a science family and thus having always had familiarity with science. In fact, Rosalind specifically refers to herself as always having done experiments, even in childhood: “My sisters and I would always do little science experiments, too. We would find books to help to make oobleck, that slime, and things like that” (academic life narrative). In referring to having always done research as a kid and having scientist parents, Rosalind conveys a continuity between her past actions and experience and present choice of being a chemistry major.

Regarding writing in her discipline, Rosalind positively evaluates essay-exam science writing and negatively evaluates lab-report writing. She evaluates lab reports in the following:

97 ROSALIND: [06:15] And for chemistry we always have to do a lab report after every single lab.

98 And @@ oh my God those are like (.) those are really long and they're time-consuming.

- 99 And they --
- 100 we have like discussion questions about the lab we did?
- 101 And it really makes us think about it.
- 102 And sometimes those can be (.) challenging.
- 103 And I- sometimes I don't enjoy writing about that @@.

Here Rosalind takes the stance that lab reports are not always enjoyable because of being long and time-consuming. Yet this does not mean Rosalind does not see the value of writing in science or that she does not refer to her interest in writing in general. In discussing writing as a means to understand science (4 references), she notes in the above excerpt that lab-report writing forces thought about the lab work. Rosalind also sees writing as a creative activity, and she constructs herself in relation to writing and her major by referring to her own creativity as well as her major as being a creative major:

- 19 ROSALIND: [00:35] With bio and chemistry they're both like very creative topics?
- 20 And I've always been like a very creative person.
- 21 So talking about that kind of stuff came naturally to me (.) if that makes sense?
- 22 So writing about --
- 23 like some people would think it's challenging,
- 24 Because of like the topic.
- 25 But I really enjoy it because I like (.) --
- 26 because they're both creative aspects,
- 27 Like writing and (.) um bio and chemistry.

In evaluating writing and her major as creative, as well as herself, she constructs herself as fitting and belonging in her major.

Summary of chemistry-major identity construction. The previous section highlighted noteworthy ways each participant uniquely constructed disciplinary identities. Generally, chemistry majors construct themselves as the kinds of people who belong in their major by (a) referring to their science interests and aptitudes, (b) referring to influential people who have validated their entry into the chemistry major, (c) positively evaluating and aligning themselves with challenging science classes and especially research activities, and (d) positively evaluating science writing as distinct from other kinds of writing (such as English-class writing) especially when that writing has personal value.

English Major-Specific Findings

Anna. A first-year student English major in the writing track, Anna explains why she got into English in the following:

The reason why I picked Writing Studies is because I used to make up wild stories when I was a kid, for my cousins and others. I just liked storytelling and making up worlds that I can escape into and go into, characters who usually weren't good people. (academic life narrative)

Anna here explains the writing track as suitable for writers, and she constructs herself as a writer by explaining that writing is something she has always done. She creates a sense of continuity between her past and present, thus presenting her choice as logical given her past.

Complementing this explanation are Anna's references to her interest in the subject of English (3 references), to reading (7 references), and to writing (9 references). Regarding reading, she notes an exclusive interest by implying less interest in other subjects: "That was pretty much the only

part of school that I paid attention to, that and writing” (academic life narrative). She also further verifies her interest in reading by noting that she did it even when it was not assigned in class: “Sure, I read a lot of books for school, but I just read a lot on my own too” (academic life narrative). Anna expresses special personal significance for writing. She says,

I’ve been going through a lot of personal stuff lately that has made me really want to focus on my studies. I’ve been reading and writing a lot more since I’ve been going through all this stuff. I usually like to write fiction, but I’ve been writing a lot of poetry lately. Creative writing has meant a lot to me in my life, and that was part of my decision to become an English major. Pretty much creative writing means the same thing that reading has. It gives me the ability to escape any situation—to focus on other problems, made-up problems even, to get me out of my own head. (co-written academic life narrative)

Writing and reading are explained here as more than only entertainment for Anna. They are escapes that are therapeutic. Evaluating writing and reading in this way, coupled with how Anna explains her own interests and aptitudes in writing and English (1 reference), presents Anna as the kind of person who, by choosing to be an English major, is following something she has always followed as well as doing so almost necessarily to have emotional harmony. Thus she constructs herself as belonging in her major and not in any other.

Astrid. A first-year student double majoring in English and theater, Astrid composed three stories, two of which were coded as stories about realizing how her character or interests fit the English major in particular and another about realizing something about her character in general. In explaining what got her into her major, she writes,

I always liked making up stories, I never wrote them down, but I always had them in my mind. This stemmed from my childhood, when my mom used to tell me stories to go to sleep. And later, when my brother was born, I would tell him stories so he could go to sleep. (autobiographical writing)

Here Astrid portrays her current action of being in the English major as part of a continuity between her past and present by referring to her own storytelling since childhood, something passed on from her mom, and implying that her English major involves or requires storytelling interest or aptitude. Indeed, Astrid continues her autobiographical writing by noting a specific activity that has pulled her into the English major:

A memorable moment would have to be in my English composition 1 class. We had to write a short story, and show it somehow. I chose to make it into a storyboard, because I liked the idea of them and I love movies; so this was a small movie in my mind. It was an interesting experience. Because it has a different pov that you have to think about (camera angles and all that stuff). That was actually the assignment that fully convinced me to be an English major. All I knew in that confusing first semester was that I really, really enjoyed writing and working on that story. (autobiographical writing)

Being a first-year student and lacking experience in the English major, Astrid refers to her first English class, English Composition 1, as significant. Specifically, she aligns with the specific storytelling activity within that class and thus constructs herself as especially engaged by and belonging to a major that includes creative writing.

In further evaluating the writing experiences she has had in college, Astrid negatively evaluates research writing. She refers to her online English Composition 2 class, which she describes as “horrible” (academic life narrative). She continues,

You have to cite things, and if you cite something wrong, that's bad news for you because it's plagiarism. It was a lot of hair pulling and late nights just trying to get it perfect, and it was still not good. I don't know, I just can't focus when it's a research-type assignment. [...]. After that I thought, *Never doing research again*. I am glad I tried it, but I learned that I probably shouldn't go into a field with research. (co-written academic life narrative)

Here Astrid constructs herself as belonging in the writing track as well as in theater, which she describes as involving creative writing especially, partly by describing what she does not belong in. Here research writing and citing sources are evaluated as not something Astrid has always been skilled at—as a kind of natural ability or knack of hers, unlike her lifelong ability to tell stories. Overall, Astrid emphasizes her interest in (5 references) and aptitude for (8 references) English, especially in relation to creative writing—while also noting that storytelling is something she has done since childhood. Meanwhile, she diverges from research writing. In selecting memorable moments mainly from creative writing classes in college to describe the major, she constructs herself as belonging in her majors (English and theater) by conveying stances that index those creative aspects of her disciplinary identity.

Evelyn. A first-year student English major in the writing track, Evelyn composed three stories all coded as dramatizing moments when she felt wonder toward reading. In one of her stories, she discusses reading fiction after being diagnosed with diabetes:

I love reading, and I have an extremely long booklist. Books have acted as an outlet for me, just as writing has, through difficult times in my life. For example, when I was diagnosed with type 1 diabetes, I was given a *Babysitter's Club* book by one of my mom's friends. The main character in this book had diabetes and reading what she was

going through and relating it to my own experience was very helpful. (autobiographical writing)

As illustrated in the above passage, Evelyn refers to her interest in reading as driven by personal factors. Reading here is evaluated as enabling self- and other-understanding, as well as a way of coping with a health challenge. Indeed, interest in reading, analyzing, or discussing literature appears robustly in Evelyn's narratives and interview responses (26 references). In addition to reading, writing for Evelyn is described as having therapeutic benefits. In her academic life narrative, she writes,

My grandma's sick. She's not doing well, so with my free time, I've been writing. My mom said she's like a ticking time-bomb, like she's fine one day and not fine the next. I'll just try to get my mind off of things, and I'll just start writing. (academic life narrative)

While constructing herself as a person who gets personal and even therapeutic benefit from reading and writing, activities described as part of being an English major, Evelyn's data also further reflects her constructing herself as belonging in her major when she negatively evaluates her previous department and major: "I didn't really like the whole feel—the vibe—I got from the [Nutrition] [D]epartment" (academic life narrative). In contrast, she positively evaluates the English Department, characterizing everybody as being helpful, including the department administrative assistant:

If I had a friend who was thinking about becoming an English major and wanted to know more about the English Department, I would say it's friendlier than the Nutrition Department. When I went up to the English Department, to the fifth floor to change my

major, I was sent in all different directions. The secretary was very helpful, who is way in the back in the corner. She helped me. (academic life narrative)

In further discussing herself being in the English major, however, Evelyn also expresses doubt she will remain, saying explicitly, “I’m not sure if I’ll remain an English major” (academic life narrative). Evelyn explains this doubt in terms of not knowing, and having a mother who is not sure, what jobs will come of it. Regarding the disciplinary writing she has done before and in college English classes, Evelyn speaks entirely positively, and she makes particular positive mention of writing in which she links theory to texts—which she notes makes her think of other disciplines, such as sociology and psychology class content—perhaps reflecting her unsure commitment to the major or equally emphatic interest in other majors. Overall, Evelyn constructs herself as someone interested in reading and writing but not necessarily belonging in the major.

Joanne. A senior in the writing track and editor-in-chief of the university’s literary magazine, Joanne composed two stories coded as expressing her realizing something about her character and a third story coded as affirming (rather than narrating about) how her character or interests fit the English major. In her narratives and interview, she refers to interest in English as a subject (12 references), interest in reading (9 references), and aptitude for English (11 references). Regarding her interest and aptitude for English, Joanne refers to being different from her friends:

In high school, English was always my favorite subject. Everyone else hated English. I was the only one of my friends who actually liked it. When we got around to reading Shakespeare, everyone dreaded it and couldn’t understand it. To me, that’s how difficult math was. I hated math. I hated any science because I just couldn’t get it no matter how hard I tried. And my friends were struggling to just write essays and things like that. I

never had any problem with writing. I did really well in it, and I got great feedback on all my essays. (academic life narrative)

Here Joanne aligns divergently from her friends, who dislike or have less aptitude in English, as well as from other subjects, such as math and science. In doing so, she constructs herself as uniquely interested in and able to study English. Indeed, when speaking of disciplinary writing, she only evaluates her past and present experiences positively, especially emphasizing creative writing. Here Joanne evaluates her college English-major writing experiences:

145 JOANNE: [07:48] I don't remember there ever being any like (1.5) dreadful assignments?

146 Where I genuinely did not like them.

147 Um (1.0) I think from the beginning I always understood why an assignment was being asked of us,

148 And what we needed to do,

149 And like what I needed to put into an assignment.

150 And (0.5) I think that I really appreciated um (.) the professors in the department making time to meet with us individually for conferences,

151 And walking us through like the process.

152 I don't know if it would look the same with any other major,

Joanne positively evaluates her English-major writing experiences, meanwhile aligning with the professors she remembers as well as diverging from other majors she imagines. By referring to her interests, aptitude, and evaluations, Joanne constructs herself as belonging in the English major.

King. A first-year student English Education major, King composed three narratives, two coded as being about him realizing something about his English-major character and one other about him feeling wonder toward reading. In one of the stories, King talks of being praised by teachers in high school when they encounter his creative writing. In one story, he writes,

It was one of the only times I ever heard a nice thing come out of that teacher's mouth. She even sent the script to one of her buddies that worked in television and he gave me back a copy of the script covered in actual professional scribbles. (autobiographical writing)

In another of King's autobiographical stories, as well as in an episode recounted in his academic life narrative, King mentions teachers he impressed with his writing, usually in spite of themselves. In one story, he writes of forgetting a writing notebook in a classroom, where his teacher reads it and later confronts him about what he has written inside it:

She began by telling me that she was disgusted by the content of the book, and that she was disappointed in me as a person. She followed by saying that it was startlingly well written, and she had enjoyed reading it despite herself. After that I spent twice as much time scribbling in that book as I had before. (autobiographical writing)

Here, King mainly refers to his interest in and aptitude for writing, especially creative writing. He notes writing as something he has always done, so much that he realizes he needs to have a backup plan to make money someday: "I've been writing stories since even before I was eight. After seven years of writing a novel and realizing that that doesn't pay the bills, I got into English education" (academic life narrative). For King, writing is something more than a mere interest, however, as he describes what ultimately got him into it:

[A]n experience that put me on the path to eventually becoming an English major happened when I was about eight years old. My mom died of a drug overdose. I didn't know how to tell people about it. And so what I did was I spent a long time locked away in my room and I just wrote about it—a short story about it. I would just give it to people. When they would ask me what was wrong, I would just give it to them. (co-written academic life narrative)

Writing is something he does even outside of class, for personal reasons developed at a young age, and his talent is validated by teachers. By selecting these events, he refers to his interest in, aptitude for, and personal investment regarding writing, a key aspect of the English major for him. Further discussing disciplinary writing, King positively evaluates research writing when it is on a topic he cares about, and he also positively evaluates creative writing when no limitations are imposed. On the other hand, he negatively evaluates reading-response papers, which he describes as being painstakingly covered in high school, and creative writing when limits are imposed. From stances that position himself in relation to creative writing for personal expression and English Education as a practical fallback to his real dream of writing professionally, King constructs himself as belonging in the English major.

Nick. A first-year student English Education major, Nick composed one story coded as a realization of how his character or interests fit an English-major career, one story coded as a realization of how his character or interests fit the English major, and a final story about a realization of his English-major character more generally. In a story coded as being about him realizing his English-major character, Nick writes,

It was my eleventh grade year and I had Survey of American Literature. We were discussing *The Catcher in the Rye* and I made an observation that no one in the class had

thought of. That feeling of being the first person to think that way in an honors class spiked my interest more so than anything else. The magic and the gratification of reading a piece and analyzing it is something that I feel all students should experience.

(autobiographical writing)

Here Nick refers to his aptitude for English, as well as his interest in reading, analyzing, and discussing literature. Nick positively evaluates the experience of reading and analyzing literature, projecting a stance that constructs himself as both a supporter and skilled practitioner of literary analysis. Importantly, Nick explains literary analysis as beneficial to students. This is the evaluation of the story, or what the story means to him, and indexes the English-educator aspect of his disciplinary identity. Indeed, Nick's academic life narrative details the chronology of his English-class experiences organized by grade and teacher. For instance, he writes of his high-school English teacher:

I first realized that English was cool when I had my freshman-year high school teacher. He was a guy, and he was the second guy teacher for English I've ever had. It was nice because I had him for sixth grade and then again in ninth grade. Other than that, English was mainly female-dominated, and then I got to him, and he was insanely smart. He was a nice guy and really understood what his students wanted and needed. He didn't take anything from anybody. He was more of the attitude that you were expected to do your work and then get the payoff in the end. That really appealed to me. (academic life narrative)

Nick aligns himself with this teacher from his past, and he continues in his academic life narrative in aligning with every other teacher he has had and whom he notes as having influenced him positively. Regarding writing, Nick consistently evaluates his writing experiences

positively. The specific writing experiences he mentions include “papers,” “reports,” and email messages. In his emphasizing his interest in English as a subject, and with the reference he makes between it and students, Nick constructs himself as a student who belongs in the English Education track of the English major.

Rudy. A senior English Education major, Rudy composed three stories all coded as affirming (rather than narrating) that his character or interests fit the English major. In one of his stories, he tells of a memorable event in which his elementary school is evacuated after a fire alarm is sounded. After all the children file outside, his English teacher takes role and promptly resumes the spelling test started before the alarm: “Once we were outside, she counted us and started the spelling test again. I can’t believe she made us do that. She did not care if the school was on fire. LOL. I love that teacher” (autobiographical writing). Here Rudy aligns with a teacher who values the subject of English, at least in terms of spelling, and testing students even in the event of a fire. Throughout his narratives and interview, Rudy refers to and mainly positively evaluates English teachers who cause him discomfort or even, as he describes it, agony. In his academic life narrative, he explains how he settled on being an English teacher:

I wasn’t sure what kind of teacher I wanted to be. Then I had a fantastic English teacher my first year. Doctor Nowicki. She really opened my eyes to grammar. She was a grammar Nazi. I write pretty well, at least I thought I did, until I took her class. She would tear up my papers and have me crying. (academic life narrative)

Here and elsewhere in his narratives and interview, Rudy evaluates teachers positively while also describing them in sometimes extreme, martial terms. In fact, Rudy uses the term “Nazi” four times, two times about teachers (“grammar Nazi,” “spelling Nazi”) he admires and two times about himself (“grammar Nazi”) in explaining how he came to be an English major. Through

these allusions, Rudy aligns with these teachers he admires, thus constructing himself as a strict, grammar-oriented teacher who belongs in the English department he describes as a place of achievement and discomfort.

Sylvester. A senior English pre-law major, Sylvester wrote three stories, two coded as depicting him realizing how his character or interests fit the English major and one coded as affirming how his character or interests fit the major. In one of those stories, Sylvester makes a distinction between himself and his English-major peers:

I was in ENGL 122 [...]. It was a test of whether English was right for me. I remember feeling out of place for a long time. My peers just didn't seem to be like me. We were on two very different wavelengths or ways of thinking. But the professor liked my input, just as she appreciated that of my peers. It was an enlightening moment for me: I may not share much in common with many of my peers, but exposing myself to new ways of thinking could only be beneficial. (autobiographical writing)

In explaining how he comes to be an English major, in addition to noting his aptitude for English, Sylvester tells in his academic life narrative that he was failing out of the business department, but because of a positive experience in a business-law class, he goes into pre-law. In the pre-law track, Sylvester has a range of choices regarding what major he wants choose to complement the pre-law focus. He tells of almost choosing philosophy because “philosophy majors scored third highest on the LSAT or Law School Admission Test” (academic life narrative). He then tells of almost choosing history, which he passes on because “it just didn't seem as practical or as meaningful to me” (academic life narrative). In explaining his choice of English, he says the following:

Then there was English, which had the literature component to it, which I might not be the biggest fan of. I had developed some positive feelings toward the English Department even before college, when I first submitted my portfolio to be exempt from Basic Writing as a high school student about to be an incoming freshman. (academic life narrative)

Here Sylvester aligns with the English Department based on interactions he has even before college. In referring to this positive feeling, he portrays his decision as part of a continuity between pre- and in-college experiences, minimizing any sense of discontinuity possibly presented by a narrative that shows him switching majors from business. Sylvester further presents himself as making a logical choice to enter English when he speaks of his experiences in his English Composition 1 class, where rhetoric and persuasion are prominently featured: “That was one of the things that really drew me to English. I knew I could be in rhetoric and persuasion. I could focus it more toward that” (academic life narrative). That English can be about communication is represented as important to Sylvester, especially as he evaluates the major in relation to his career aspirations:

Ultimately, at its core, English is teaching communication: both verbal and written. As a lawyer, I’m going to be using that every single day very intensively. I figured I might as well refine those skills as much as I can at this level, so I made the switch to English, and it was definitely the correct choice for me. (academic life narrative)

In referring to those aspects of the English major that involve rhetoric and persuasion, and by referring to his own abilities and professional interests in those aspects given his future career goals, Sylvester constructs himself as belonging in his major.

Warlock. A first-year student English Education major, Warlock wrote three stories that were all coded as affirming that (rather than narrating how) his character or interests fit the

English major. In one of his stories, he writes of almost a spiritual experience moving him into creative writing:

The greatest push for my creative hand thrust forward the night my mind wandered into the clouds and entered a sort of “dreamstride” as I have begun to call it. This world, this imaginary life that I feel as if was my own for the twenty years I witnessed has nearly forged my personality and being into what it is today. I was given a gift, whether it be from some deity, if it so exists, or rather the mystical anomaly of chemicals creating signals in my brain, [and] I felt that English would be the only way to make that dream somewhat of a reality, honing and sharpening my hand into something truly capable of a story that will rival tales of legends. (autobiographical writing)

Warlock here not only refers to an interest in writing but also describes it as a sort of decree from outside forces. In his academic life narrative, this dream and the fiction that he says has been inspired by the dream are of importance to him in explaining his getting into English, which he describes as a major that can support him in becoming a more skilled writer of fiction who can make a mark in the world of fantasy literature. In addition to referring to his interest in writing (7 references), Warlock refers to his interest in the subject of English (6 references) and his aptitude for English (5 references). One way he refers to his aptitude for English is by talking about how easy it is to complete writing assignments, especially in relation to non-English-major peers:

Last semester, I had my Composition 1 class, and I was the only English major in the class. It was writing-intensive but not as much as I was expecting, so it was rather easy. We had to write three five-page arguments. That was a joke to me, but all the kids were freaking out, not knowing what to do. (academic life narrative)

In diverging from his peers in relation to their portrayed attitude toward and ability to carry out writing, Warlock constructs himself as being skilled at the kind of work he portrays as integral to being an English major: writing. As earlier noted, Warlock most positively evaluates short-story writing, and he explains how he characterizes his understanding of the uniqueness and nature of English writing in the following:

- 132 WARLOCK: [06:30] So I went off about how much I hated the book.
- 133 And then I was just like “Well I feel like he should have wrote like Tolkien.”
- 134 “And been creative.”
- 135 And then I got a C on the paper.
- 136 And she’s just like “You missed the entire point.”
- 137 And I’m like “That’s bullshit.
- 138 “That’s not fair.”
- 139 I’m like “Writing’s about being creative and being about expressing yourself,
- 140 “You shouldn’t (.) punish me for taking my own view.”
- 141 And she’s just like “Yeah but you had a set of rules.”
- 142 And I’m like (1.5) “I guess I shouldn’t argue.
- 143 “You’re gonna get a- you’re gonna drop me down more.” @

Here Warlock dramatizes an interaction with a teacher who awarded him a C on a high-school reading-response assignment. He refers to a view of writing in English as about “being creative” and “expressing yourself” (line 139). This excerpt comes in the context of Warlock talking about never getting low grades in English classes except for this one time. In explaining his earning this grade, Warlock refers to his strength in expression rather than a weakness in following rules or conventions in a writing assignment. In this way, he mitigates any contradictory interpretation

of his earning a C in English, thus preserving the overall message that he belongs in English, with its permission and even encouragement of expression and creativity, given his own ability and interest in being creative.

Zaphod. A first-year student English major, Zaphod composed three stories, two coded as being about him realizing his character or interests fit the English major and one about him realizing the career possibilities with a Bachelor of Arts in English. In his story about realizing career possibilities, which was the only story from English majors coded under this category, Zaphod writes of his struggle of choosing a major after deciding to leave the Computer Science Department:

I then felt apprehensive. Switching majors from computer science to English would be a terrible decision. Everyone always said there was no work out there for English majors, that if you wanted a job in this time you went into the hard sciences. I quickly googled jobs that English majors could gain and was wonderfully surprised. There were opportunities, I just had to have the courage to take them. I downloaded the pdf to change my major, printed it out, and handed it in the next day. Feeling better than I had the whole semester. (autobiographical writing)

Here Zaphod dramatizes his conflict about leaving a major he dislikes but that seems to offer more job opportunities for a major that everyone says currently offers few job opportunities. In the evaluation portion of this story, in which Zaphod expresses what this story means for him, he refers to his realization that jobs do in fact exist, settling the question for him and easing his mind. Through this story, Zaphod explains that, since he is practical and English offers a practical choice, he belongs in his major. Additionally, Zaphod refers to his lifelong interest in English as a subject (8 references), his interest in analyzing and discussing literature (3

references), his interest in writing (3 references), and his aptitude for English (7 references). In indicating his aptitude, Zaphod refers to a paper from high school and his teacher's reaction to it:

What stands out to mind is we had to read a book over the summer for my eleventh-grade class, a French book and an early feminist attempt. I hated the book, it was so dry, but what stands out to mind is that I had to write a paper about what I liked or disliked about the novel, but the teacher liked it so much that the teacher read parts of it to the class. She told me later that she loved it and was laughing out loud at some of the lines that I wrote and she thought it was great. (academic life narrative)

Here Zaphod refers to his aptitude for writing, validated by a teacher being affected by the writing and presenting it in class as a model. In addition to referring to personal characteristics, Zaphod negatively evaluates the Computer Science Department while positively evaluating the English Department. He evaluates computer science mainly by referring to a painful class and instructor experience:

The computer science major was really boring at first, and I had to get a math minor for the degree I was going for, and I'm really bad at math. I just couldn't get past Calculus 1, so that was really brutal. And I just was not enjoying my classes. [...]. I was, however, enjoying my English classes. (academic life narrative)

While diverging from computer science as a major and aligning with English, Zaphod evaluates English as more suitable for him and his interests.

Summary of English-major identity construction. The previous section highlighted noteworthy ways each participant uniquely constructed disciplinary identities. Generally, English majors construct themselves as the kinds of people who belong in their major by (a) referring to English-major related interests and aptitudes, (b) referring to influential people who have

validated their entry into the English major, (c) positively evaluating and aligning themselves with class and environments that especially promote freedom of expression or creativity, and (d) positively evaluating English-major-related writing as personally meaningful as well as possibly therapeutic.

Shared Findings Between Groups

In the data just presented, major overlapping findings are relevant to research question 3: *How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?* Those findings are summarized here.

In constructing themselves as students who belong in their respective majors, participants did the following:

1. Referred to major-specific interests and aptitudes;
2. Referred to influential people who validated their entry into their majors;
3. Positively evaluated and aligned themselves with activities characteristic of major-specific classes and environments (such as chemistry research and English creative writing/literary analysis); and,
4. Positively evaluated major-specific writing as distinct from other kinds of writing and/or as otherwise personally meaningful.

Chapter Summary

What follows is a summary of findings in relation to each research question, following a sequence of (a) major-specific findings and (b) shared findings.

Summary of Chemistry Major-Specific Findings

Research question 1. Chemistry majors understand their becoming and remaining students in their majors in terms of (a) mental orientations they have that suit the chemistry major; (b) influential teachers or family members who encouraged or validated them as chemistry majors; (c) supportive or challenging learning environments such as the Chemistry Department; (d) influential experiences such as research and science classes; and (e) specific motivators such as a fascination for a STEM-related career and science's ability to facilitate understanding and explaining the world.

Research question 2. Chemistry majors understand their disciplinary writing experiences in terms of (a) science writing being uniquely different from English or high-school science writing in needing to conform to an audience of scientists; (b) the lab report being the signature genre that chemistry students are most exposed to, that they evaluate both positively and negatively depending on whether the underlying science experiment was personally meaningful, and that they explain in terms of audience-focused rhetorical-situation concerns and specific genre conventions; and (c) science writing representing a means of more deeply processing and learning science content.

Research question 3. Chemistry majors construct their disciplinary identities by (a) referring to their science interests and aptitudes, presenting themselves as matching what they describe as requirements in their major; (b) referring to and aligning themselves with influential people, such as teachers and family members, who are described as having inspired or validated their being chemistry majors, thus presenting themselves as already belonging in a community of scientists; (c) positively evaluating and aligning themselves with challenging science classes and research experiences, thus presenting themselves as being attracted to and belonging in the

major; and (d) positively evaluating science writing as distinct from other kinds of writing (such as English-class writing) and referring to their understanding and skill in science writing as a way of showing belonging in the major via performing major-specific competence.

Summary of English Major-Specific Findings

Research question 1. English majors understand their becoming and remaining students in their majors in terms of (a) mental orientations they have that suit the English major; (b) influential teachers or family members who encouraged or validated them as English majors or specifically as creative writers; (c) supportive or challenging learning environments such as the English Department; and (d) influential experiences such as classroom experiences.

Research question 2. English majors understand their disciplinary writing experiences in terms of (a) English major-related writing, such as creative writing, being uniquely satisfying and engaging; (b) having always had interest in and aptitude for English major-related writing; (c) having always had engaged in writing even, and importantly, outside of class; (e) evaluating English major-related writing experiences, such as reading-response written assignments and creative writing, positively while relatively rarely evaluating such writing negatively; and (f) being exposed primarily to reading-response or literary-analysis assignments, without a specific genre being referred to in relation to these assignments.

Research question 3. English majors construct their disciplinary identities by (a) referring to their English major-related interests and aptitudes, presenting themselves as matching what they describe as requirements in their major; (b) referring to and aligning themselves with influential people, such as teachers, who are described as having inspired or validated their being English majors, thus presenting themselves as already belonging in a community of writers or “English people”; (c) positively evaluating and aligning themselves

with classes and other environments that especially promote freedom of expression or creativity; and (d) positively evaluating English-major-related writing as personally meaningful as well as sometimes therapeutic.

Summary of Shared Findings

Research question 1. Chemistry and English majors understand their becoming and remaining students in their majors in terms of (a) mental orientations they have that suit their majors; (b) influential teachers or family members who encouraged or validated them as members of their majors; (c) supportive or challenging learning environments such as their departments; and (d) influential experiences such as classroom experiences.

Research question 2. Chemistry and English majors understand their disciplinary writing experiences in terms of their discipline-specific writing experiences being uniquely different from other kinds of writing.

Research question 3. Chemistry and English majors construct their disciplinary identities by (a) referring to their discipline-specific interests and aptitudes, presenting themselves as matching what they describe as requirements in their majors; (b) referring to and aligning themselves with influential people, such as teachers, who are described as having inspired or validated their being in their majors, thus presenting themselves as already belonging in a specific disciplinary community; (c) positively evaluating activities characteristic of major-specific classes and environments (such as chemistry research and English creative writing/literary analysis); and (d) positively evaluating major-specific writing as distinct from other kinds of writing and/or as otherwise personally meaningful.

Preview of Discussion and Conclusion Chapters

What do the findings above mean for college-student engagement, college-student persistence and retention, composition teachers generally, and WAC practitioners specifically? In the next chapter, Chapter 6, I synthesize and discuss the many disparate findings above in relation to the concept of investment (Norton, 2000) and mainly existing retention and WAC literature. Then, in Chapter 7, I conclude the dissertation by explaining how to use my theoretical frame and concrete results to promote persistence through writing.

CHAPTER 6

INTERPRETATION AND DISCUSSION

The purpose of this case study was to explore how undergraduate chemistry and English majors understand and construct their disciplinary identities in relation to (a) their past and present life and disciplinary experiences as well as their imagined futures, and (b) their past and present disciplinary writing experiences. Knowing answers to these questions, it was hoped, would inform composition and the WAC movement about what life and writing experiences undergraduates selected as meaningful in relation to their choices of becoming and remaining in their majors, in that way focusing future WAC and retention programs. This study further aimed to look at how undergraduates constructed disciplinary identities. Understanding this was expected to assist in suggesting in what conditions and experiences participants invested (Norton, 2000).

As an instrumental case study, meaning the kind of case study meant to extrapolate from cases to a broader issue (Stake, 2000), this study has focused on how individual students used language to indirectly index aspects of disciplinary identities. The broader issue I wanted to explore was college-student persistence. The data I collected and analyzed included co-written academic life narratives, paragraph-length participant-authored autobiographical narratives, and transcripts from disciplinary-writing interviews. Participants in the study were 17 total undergraduates (7 = chemistry majors, 10 = English majors), and data was coded cooperatively for themes. Three research questions guided this study:

1. How do chemistry and English majors understand their becoming and remaining students in their majors?

2. How do chemistry and English majors understand their disciplinary writing experiences?
3. How do chemistry and English majors construct their disciplinary identities in relation to their life experiences, departmental experiences, and disciplinary writing experiences?

While the previous chapter presented findings to answer each research question, what follows now are synthesis, interpretation, and discussion of findings.

Character as Adequate Causality

One strategy that Linde (1993) described for creating coherence for narrative order in life narratives was for storytellers to refer to their own character traits as obvious causes for a decision, with no explanation of how those character traits developed seemingly being needed. As noted in Chapter 5, all seven chemistry majors and all ten English majors referred to what I coded as *mental orientations* to explain how they got into their majors. Those mental orientations included interest in and aptitude for their majors.

For chemistry majors, those mental orientations also included what I coded as a *science mindset*, illustrated in the following excerpt from Ada's (first-year student, biochemistry) academic life narrative, "I see the world as black and white, and that is exactly how science is: It either or it isn't. There's no gray area, and that is probably my favorite part of it." Nowhere in the data I developed with Ada did she refer to how she came to have this science mindset, but it frames her academic life narrative and also reappears in her autobiographical writing, as in the following:

I made the realization that, for me, music was not an art. I am not an artist. It can be agreed upon that music is, in fact, a form of art. As I was watching this performance, I

saw how incredibly expressive this young musician was. Music for me has always been a science.

This is the evaluation (Labov, 1972) component of Ada's narrative, where she explains what her story means for her as the storyteller.

Ada's narratives, in which she refers to her science mindset, might also help to explain how *common sense* can be used as a coherence strategy (Linde, 1993). The implication Ada may be making here is that science is objective while music is subjective, that science can be observed and analyzed while music and art are to be felt and expressed.

For English majors, mental orientations included the interest and aptitude that chemistry majors also referred to, but whereas chemistry majors tended to express aptitude in terms of getting good grades and doing well in classes, English majors tended to express aptitude in terms of writing and interpreting texts. Joanne (senior, writing) tells of English being her favorite subject and of writing being easy:

In high school, English was always my favorite subject. Everyone else hated English. I was the only one of my friends who actually liked it. When we got around to reading Shakespeare, everyone dreaded it and couldn't understand it. To me, that's how difficult math was. I hated math. I hated any science because I just couldn't get it no matter how hard I tried. And my friends were struggling to just write essays and things like that. I never had any problem with writing. (academic life narrative)

Joanne never goes into how those aspects of her character developed. She does not have to. As Linde (1993) explained, one property of the self that is constructed in narrative is a self that is "continuous" through time (p. 101). Utterances about a person's character traits are told in or imply simple-present statement of fact, without markers of beginning or ending points. Thus

referring to a person's character implies a narrated persona not bound by time, implying a continuous storyteller persona.

A second property of the self that is constructed in narrative is a self that is distinguishable from others, "such that [the narrated self] is different and unique but at the same time related to others" (Linde, 1993, pp. 101-102). In the above excerpt, Joanne expresses having aptitude in English while portraying her narrated persona in comparison to others. This is a common way that participants in this study constructed their disciplinary identities. Bucholtz and Hall (2005) referred to this mechanism of identity performance as the *relationality principle* of identity formation, by which identity positions are taken up partly through contrasting with others.

In fact, participants from chemistry sometimes specifically referred to being different from English majors while English majors referred to being different from STEM majors. Joanne (senior, writing) notes that she "hated math" above and that math was "difficult" (academic life narrative). Linus (first-year student, pre-medical), in contrast, says this of his aptitude in relation to other majors: "I didn't want to go into something that was intensely writing heavy because, while I had been good at writing, I didn't always feel confident with what I had put forward. And I suck at art" (academic life narrative). Here Linus evaluates himself as disliking writing and performing poorly in art, thereby implying that he belongs in his chemistry major, which, according to common sense as a coherence strategy, does not involve undesirable qualities of writing or art.

This finding that participants perceive themselves, or perform identities, as belonging in or matching a certain major is reflected in retention-studies literature (Allen & Robbins, 2010; Allen & Robbins, 2008; Dika & D'Amico, 2016), suggesting that a student's personal interests

matching up with what the major actually offered was a factor directly impacting timely completion of a degree. What WAC practice can do is leverage the identity-constructing/performing function of writing (a) to prompt students across the curriculum and disciplines to write reflectively in a way that asks them to explain their place in disciplinary communities of practice—to articulate this fit between a major and a narrated self, and (b) to underscore to faculty in WAC workshops and on WAC task forces that identity construction signals and creates belonging. Writing not only helps with coverage and learning of course content or with the development of disciplinary communication skills. Writing fosters identity, which fosters belonging and promises a greater likelihood that students persist in their majors.

In earlier studies, grades measured by grade-point average (GPA) were more impactful variables on persistence than any other (Allen & Robbins, 2008, 2010). That grades impact persistence has been robustly established in retention studies, with variables such as failing a fall remedial course in the first year of college (Cholewa & Ramaswami, 2015), getting below a B in first-year writing (Garrett et al., 2017; Volpe, 2011), and having a first-year GPA below 2.5 (Ma & Cragg, 2013) statistically significantly increasing the risk of dropping out.

In the present study, grades figured into participants' construction of their disciplinary identities, often implicitly but sometimes explicitly. Astrid, a first-year English major in the writing track, says in her academic life narrative, "Ever since I learned English, all the classes I was strongest in were English and history. Those were my two classes that I was very good at and got good grades." Grades were also powerful reasons why two English majors switched out of their original majors. Sylvester (senior, pre-law) tells of nearly failing out of his business major while Zaphod (first-year student, writing) tells of nearly failing out of his computer

science major. In explaining his breaking point with computer science, Zaphod writes the following:

I was taking a 300 level computer science class the following semester, and I hated the class. Learning how to program using assembly seemed pointless to me at least and was difficult. I remember the day I got back my first assignment for the class. I had worked hard on the assignment the night before and used the greatest research tool in the book to help, Google. When I got the assignment back I wasn't expecting the grade I got, an F. After reading through the notes the professor left I understood why I did terribly, but that class permanently shut down my want to be a computer science major and set me onto my path to becoming an English major. (autobiographical writing)

This narrative illustrates that, for many participants, it is not only aptitude in a major that they refer to in explaining how their performed persona fits in their description of their major. Importantly, it is often *effortless* success that becomes themes of important reconstructed events. Here, Zaphod refers to numerous reasons that might explain his final shift to English: he hated computer science; it was hard; he worked hard but perhaps not until the night before. In the evaluation section of the story, the final, compound-complex clause, Zaphod explains that this event signaled the end of one major and the start of another.

A similar story is told by Astrid (English, first-year student, writing), who in her academic life narrative tells of doing poorly in Composition 2 and therefore shutting down any plan of someday having a career that included research, meaning the kind of writing that included in-text citations of other people's articles and writing. Effortless aptitude, however, appeared in numerous places in the data across majors—with English majors often referring to how easy it is to write many-paged writing assignments (e.g., Joanne, King, Sylvester, Zaphod,

Warlock). For chemistry majors, effortless aptitude could resemble the science mindset character trait, with Arykaj (junior, pre-pharmacy) saying, “[chemistry] was something that just clicks with me” (academic life narrative), and Reatha (junior, chemistry) saying, similarly, “For some reason, I never studied them: They just clicked in my head, and I understood them” (academic life narrative).

Teachers and Family Members as Character Foils

A third property of the self that is constructed in narrative is a reflexive self (Linde, 1993). For Linde (1993), “The nature of the process of narration contributes to the creation of this reflexivity, because one can never immediately speak the present in the present” (p. 105). This reflexivity and separation of narrator and narrated, constructed self has an important function:

Because of its social function, narrative is crucially involved with the social evaluation of persons and actions; it is always involved in the question of whether an action (and hence an actor) is expected or unexpected, proper or incorrect. [...]. Perhaps the most important function of reflexivity is to establish the moral value of the self. People do not want just any objectifiable self; they want a good self, and a self that is perceived as good by others. (Linde, 1993, pp. 121-122)

Grades are important in these narratives about academic paths partly because getting good grades is portrayed, often implicitly, as a common-sense expectation for someone who belongs in a major. In addition, those grades are more reliable when given by a teacher or professor who represents that discipline. In constructing themselves as protagonists in their own academic life narratives, participants in this study, according to Linde, would be expected to present what participants perceived as a good self in the context of the narrative as well as in the context of

talking with me, the researcher, a PhD student who might be perceived as exceedingly invested in my own academic context, the same context I am inviting participants to describe.

Perhaps partly because of the narrative-self principle of reflexivity, and partly because the topic of my study was specifically inviting descriptions of disciplinary experiences, all 17 participants mentioned influential people, including teachers and family members, as important in their academic life-narrative portrayals of how they got into and may remain in their majors. These influential people encouraged, inspired, or validated the selves that were constructed in narratives, thereby contributing to the portrayal of the “good self” expected in life narrative (Linde, 1993, p. 122). Teachers and family members to whom participants referred serve as character foils to participants’ own constructed personas, in main part validating the character traits participants referred to in their narratives. The effect is to support the portrayal of a continuous constructed self.

All 17 participants referred to what was coded as a *great or passionate teacher* in narrating about becoming members of and being in their majors. Sometimes participants referred to how pre-college or college instructors awakened or challenged them with course content, such as when Linus (first-year student, pre-medical) tells of his Advanced Placement Physics teacher finishing the required content of the school year early and offering to spend two weeks on quantum physics (academic life narrative). Other times, especially for English majors, teachers praise participants’ assignments or thoughts. For instance, English majors Anna (first-year student, writing) and Zaphod (first-year student, writing) tell of writing reader-response assignments that their teachers evaluated so favorably that the assignments were read or presented to the rest of the class as models. Anna, for instance, says this about an online high-school English class experience: “I really liked it because my teacher put my paper up on the

system for the class to see. Then she started using it as an example for the next class the next semester. I thought, I actually did something here. I'm actually getting this" (academic life narrative). This example illustrates how references to teachers can really be about references to a storyteller's aptitude for their chosen discipline.

Sometimes the relationship with teachers begins with tension but then leads to a sort of transformation, more frequently presented as the teacher adjusting to align with the storyteller than as the other way around. For instance, Arykaj (junior, pre-pharmacy) zeroes in on one important event during her first year of college. For her, this event is described as maybe the most meaningful to her. Arykaj tells of failing a chemistry class after her grandfather dies and, as a result, being advised to switch majors:

I don't know how to explain it except to say that I was so pissed. I was so mad because I knew that I could've done better than that, and I used that emotion to go from failing the class to retaking it and getting an A. When I went back to go see him, he said, "For as long as I've been a professor, I have never seen that happen before." He also said, "I want you to be in my research lab." It was just so funny to me because this was the same guy that told me to change my major, and now he wanted me in his research lab. (academic life narrative)

This *proving-a-teacher-wrong* kind of story appears in others' narratives as well. Sylvester (senior, pre-law) writes of being somewhat of a troublemaker in high school, to such a degree that, when he is getting full points on vocabulary tests, his teacher accuses him of cheating:

It certainly didn't help that I didn't show any interest in reading *Beowulf*. However, we took weekly vocab tests on SAT level words: anthropomorphic, zealot, etc. I had a real talent for learning new words so out of the 500 possible vocab points we had over the

course of the semester, I got 500. [My teacher] was certain I was cheating, so she made me take the tests in isolation, turn in any notes I had at my desk, and many other things until she finally pulled my state test scores. After realizing I wasn't bluffing, she suggested I be an English major. I laughed at it then, but I think it meant something to me, even then. (autobiographical writing)

King (first-year student, English Ed.), meanwhile, tells of teachers who stumble upon a secret writing notebook he keeps. In one instance, an English teacher finds his notebook full of fiction and is portrayed as being so impressed he decides to grade King on what he was writing in the notebook (academic life narrative), and in another episode, King writes of leaving a notebook in class loaded with “some pretty R rated shit” and having the teacher admit “that it was startlingly well written, and she had enjoyed reading it despite herself” (autobiographical writing). While these teachers and the storytellers align with each other, the act of alignment is portrayed as asymmetrical. Teachers make greater adjustments in attitudes or behaviors to accommodate the students. While a teacher praising a student by itself can be looked at as the teacher positively evaluating and thus aligning with the student, the effect of portraying a teacher as somewhat reluctantly or surprisingly aligning with the storyteller—”despite herself” or himself—even more forcefully emphasizes that the student belongs in her or his major. Not only does the student operate successfully within that major, but also the student's talent is such that it can change the conditions of the settings and structures that mediate contact with activities and experiences pertaining to that major. The student becomes not only a member of the major but also manufacturer—*owner*—of it.

The importance of perceptions of teachers as allies or mentors has been robustly established in retention studies (de Lourdes Villarreal & García, 2016; Price, 2010). Contact with

professors has been associated with asking for writing advice, college-life adjustment, and institutional satisfaction (Nalbone et al., 2016), and the perceived quality of teaching is likewise a factor supporting persistence (Seymour & Hewitt, 1997). In fact, the participants who switched majors in this study to English refer to perceptions of low-quality teaching in their narratives. Evelyn (first-year student, writing), Sylvester (senior, pre-law), and Zaphod (first-year student, writing) all tell of switching their major to English. In switching from nutrition, Evelyn says, “I just thought the head of the department was really condescending and patronizing. I didn’t appreciate it” (academic life narrative). Evelyn explains a relationship with the head of her department portrayed as having distance existing between Evelyn-the-narrated-protagonist and the narrated department head. Zaphod, in switching from computer science, also refers to a painful learning experience, with a computer-science teacher who is “brutal in his response” to Zaphod’s assignment (academic life narrative). Zaphod tells of getting an F on an assignment he realizes later he simply misunderstood (academic life narrative). In explaining his switch from business, Sylvester writes, “In retrospect, [my Business Law professor] was a pretty bad professor, but he did put me on the path I’m on today” (autobiographical writing). Sylvester goes on in this narrative to tell how he impresses his teacher in his mock trial final, thus getting him into pre-law—another example of stories of teachers offering praise in spite of themselves or contrary to expectation.

Family members, in addition to teachers, represent character foils in participants’ academic life narratives. Fourteen of 17 participants (82%) referred to supportive family members or close friends. These 14 participants mentioned supportive family or close friends in the context of before-college experiences, with some of those same participants (5/17, [29%]) also referring to these influential people in the context of in-college experiences. The function of

referring to family members or close friends resembles that of referring to teachers, which is often to corroborate that the portrayed character really possesses certain character traits that are needed to portray that character as continuous.

In referring to her parents as a way of referring to an aspect of her narrated self, Ada (first-year student, biochemistry) tells that “As a kid, my parents always found me mixing things together” (academic life narrative). Rosalind (first-year student, biochemistry) refers to her parents and, in doing so, seems to invoke what she may perceive as a common-sense argument that a person’s parents being in a certain field is sufficient cause for a child of those parents to get into the same field. Rosalind tells of her mom having worked for the Red Cross and her dad being an environmental biologist, and she evaluates this section of her narrative in the following way: “So my mom is kind of like chem, and my dad is kind of bio I guess” (academic life narrative). No further interrogation of this cause-effect argument is offered; Rosalind portrays herself as an intellectual mixture of both parents and also a sort of incarnation of the biochemistry major. Reatha (junior, chemistry) writes that a family tragedy helps to shape her narrated self that is now a chemistry major:

I now conduct research under Dr. [name removed for anonymity], as we study photodynamic therapy. This therapy is an alternative cancer treatment. My cousin, [name removed for anonymity] is what drives me through this research. He was only seventeen years old when he was claimed by cancer. So my ultimate goal is to study cancer therapeutics, [with] hopes of getting these alternate therapies applied universally.
(autobiographical writing)

Among English majors who referred to their parents in explaining getting into and staying in their majors, family loss also appeared as a topic. In fact, a loss of a loved one is

presented as the most impactful event for King (first-year student, English Ed.): “[A]n experience that put me on the path to eventually becoming an English major happened when I was about eight years old. My mom died of a drug overdose” (academic life narrative). King goes on to tell about coping with his mom’s death by frequently writing, which is a way he is able to tell people about the experience and about what it means to him. The writing experience is so meaningful, he tells, that he gets on the life path that takes him to the English major, where writing is a central activity. This theme of writing to cope with family loss or distress appears in the narratives of other English majors as well. For instance, Anna (first-year student, writing) tells of writing to cope: “I’ve been going through a lot of personal stuff lately [...] and writing a lot more since I’ve been going through all this stuff. I usually like to write fiction, but I’ve been writing a lot of poetry lately” (academic life narrative). She tells later of a Composition 1 assignment in which she addresses a specific family member who is dealing with addiction:

We were supposed to do a persuasive essay, and she said that we had to really pay attention to audience. I ended up picking a member of my family, and I wrote a letter to them for the class about them getting into rehab. They’re addicted to pain medication and stuff. (academic life narrative)

Similarly, Evelyn (first-year student, writing) tells of writing outside of class to keep her mind off her grandmother’s illness and hospitalization: “I’m writing my book, and I’m not writing it by chapter according to what happened first, second, third. I’m writing it by scenes that are scattered all over the place. I think that thinking about the story rather than what’s happening in my life right now is good” (academic life narrative). For English majors, writing is sometimes therapeutic (Bishop, 1993).

While some chemistry and English majors refer to family distress in their narratives, English majors' narratives contain episodes where family members openly doubt or urge against participants' choices of majors. Joanne (senior, writing) writes of her father withholding full support of her getting into the English major until he reads up on the career and income opportunities of the major. This is a theme that Zaphod (first-year student, writing) writes about as his own concern: He questions switching majors from computer science to English until going online to see what jobs he might get. Evelyn's (first-year student, writing) mom is portrayed as questioning Evelyn's switch from nutrition to English: "I called my mom, and she said, 'What are you going to do other than be an English teacher if you switch your major to English?' I said, 'I don't know'" (academic life narrative). In a more confrontational episode, Warlock (first-year student, English Ed.) writes of his father's ridicule of the English major:

There was a time that my father believed that English was simply a "Pussy's subject" of a bunch of "over-privileged jack-offs." He told me that I would not be able to succeed if I traveled this road. I of course told him to piss off and followed my dreams. I am one who has a problem with following orders; probably being why I didn't go to the Airforce. Some may refer to it as being rather dickish, but I simply love to prove people wrong. And at that moment, well I knew that he would bow his head in shame as I showed him the power of English when I receive my degree and possibly a book publishing or two. (autobiographical writing)

This excerpt illustrates how parents can represent character foils for the narrated selves constructed in participants' academic life narratives. Whether experiencing supportive or discouraging influences, storytellers can portray themselves as possessing character traits suitable for their major, at least as they describe those majors, and thus as continuous characters.

The importance of parents has been established in retention studies. Direct positive and statistically significant correlation has been found, for instance, between the following variables and parents' children's persistence: (a) parental valuing of education (Walsh & Robinson Kurpius, 2016); (b) parents' socioeconomic status (Robb et al., 2012); (c) parents' avoiding a parental style that gives rewards or punishments for grades (Spruill, Hirt, & Mo, 2014); (d) parental education encouragement (Gloria, Castellanos, Lopez, & Rosales, 2005; Matos, 2015; Ojeda, Navarro, & Morales, 2011); (e) parents' expectation pre-college that their child will obtain a college degree (Arbona & Nora, 2007); (f) parent-son experiences and emotional closeness (Spruill et al., 2014); and, to name one more, (f) parents' having some higher-educational experience regardless of whether they themselves graduated (Attinasi, 1989; Padgett, Johnson, & Pascarella, 2012). Regarding friends and college-student persistence, retention studies has found that a student is more likely to persist in college if (a) they have friends going to college (Arbona & Nora, 2007); (b) they have friends who value school (Spruill et al., 2014); (c) they are in classes where people seem genuinely interested in the class (Hazari et al., 2017); and, to name one more, (d) they receive social support from those friends (Gloria et al., 2005; Mahaffy & Pantoja, 2012).

These findings are reflected in the narratives of the present study as well. For instance, Arykaj (junior, pre-pharmacy) narrates about the importance of friends as follows:

I'm also a member of Alpha Chi Sigma, which is the academic chemistry fraternity here on campus. What that has done is surround me with people who are in my field. It's allowed me to be around people who are like-minded. When I first got to this college, I wasn't hanging with the right crowd. I was hanging with the wrong people. Because of that, you can easily get lost. Also it's hard having friends who don't understand when you

say, “I can’t go out. I have to write a five-page paper. I have a lab report to do.” Having people who can understand that is another thing that really changed my life. (academic life narrative)

For Kiki (senior, biochemistry), friendships are also competitive: “And there’s only like ten of us, max. We all know each other, and it gets competitive. If you do worse than others, or if you are at the bottom of that ten, you feel like garbage” (academic life narrative). Referring to pre-college experiences, Joanne (senior, writing) talks about the importance of friends in realizing her own academic strengths, as she excels in English and writing and they in math and science. Meanwhile, Anna (first-year student, writing) refers to the importance of friends in her English major, saying, “I’ve made quite a few friends here through creative writing. I have one friend here, and every time we hang out, we just write poetry. We shout out random words and write together and read what we’ve written” (academic life narrative).

As illustrated here and in earlier examples, parents and friends can represent character foils in academic life narratives, with an effect of offering further evidence, or additional outside sources, helping to portray a continuous storyteller persona in a coherent, ordered narrative. WAC practice may leverage its cross-campus reach to continue to support low-stakes writing activities, such as writing-to-learn activities including journaling, with prompts for students across majors to reflect on influential people who encouraged them in their lives. Additionally, WAC practitioners may promote low-stakes as well as published writing assignments where faculty and other disciplinary insiders have chances to validate students’ academic engagement and contribution to the disciplinary community as represented in and through the classroom and department. Such writing activities promise the effect of supporting writing as a procedure and

skill and as a reflective, identity-performing activity with chances of outside validation of performed disciplinary selves.

Richness of Account as Adequate Causality

A second strategy explained by Linde (1993) that life storytellers use to establish causality and thus coherence of narrative order involves giving a rich account. A rich account can be achieved by covering a long period of time, for example by describing some activity as having started in a person's youth. This strategy is apparent across participants' data in this study and was coded as a subcategory of *interest* in a participant's major.

The narratives of chemistry majors sometimes refer to experiments participants carried out as children. Ada (first-year student, biochemistry) tells of experiments that were less successful:

Much to [my parents'] dismay, these experiments of mine didn't always work out. I tried to make my own mouthwash when I was six or seven so that I wouldn't have to brush my teeth. I just wanted to beat the system, but my parents said no. I also tried to make my own crayons using the super-hot halogen lamp over my piano. I melted crayons on the lamp's surface and tried to mold them together for new colors. I also put candy in the microwave to see what would happen. Of course, what happened was the sugar caramelized and became a permanent part of the plate, and my mom was upset that I ruined her dishes. (academic life narrative)

Similarly, Rosalind (first-year student, biochemistry) tells of having always done experiments in her family: "My sisters and I would always do little science experiments, too. We would find books to help to make oobleck, that slime, and things like that" (academic life narrative).

Meanwhile, Arykaj (junior, pre-pharmacy) points to watching television, specifically the live

action science program *Bill Nye the Science Guy*. For Arykaj, “All that stuff always resonated with me while I was growing up” (academic life narrative). Yet while some (3/7, [43%]) chemistry majors’ narratives refer back to the storytellers’ childhoods outside of school, all the others, more than half (4/7, [57%]), composed narratives that refer to interest in science developing in school settings before college: Kiki (senior, biochemistry); Linus (first-year student, pre-medical); Ramsay (junior, chemistry); and Reatha (junior, chemistry). All participants, then, in chemistry (7/7, [100%]) tell academic life narratives that position their interests in science as developing before college. Sometimes that interest appears in the context of the participants’ homes while, somewhat more frequently, it appears in the context of school settings.

English majors also composed narratives indicating an interest in English-related content and activities that begin deep in their personal histories, both at home and in school. For two participants, that interest is portrayed in narratives as beginning before they are able or inclined to write. Anna (first-year student, writing) expresses this as follows: “The reason why I picked Writing Studies is because I used to make up wild stories when I was a kid, for my cousins and others. I just liked storytelling and making up worlds that I can escape into and go into, characters who usually weren’t good people. I’d make up games for us to play and entire worlds. Eventually my cousin Nisha said to me, ‘Why don’t you write some of this stuff down sometime?’” (academic life narrative). As a first-year student in the writing track of the English major, Astrid (first-year student, writing) tells of experiencing storytelling orally before experiencing them alphabetically:

It starts like every other English major. When I was younger, I lived in Moroleón, Mexico. It’s where my mom’s side of the family is, so we lived there for a couple years.

During those years when I lived there, prime years for learning how to read, there wasn't a lot of books there. There were just little books and not really a book store, so I didn't get into reading until I was older. My mom always read to me when I was younger, and she'd tell me stories, verbal stories, but never really from a book. (academic life narrative)

Later, as Astrid writes, she becomes the family storyteller for her brother:

I always liked making up stories, I never wrote them down, but I always had them in my mind. This stemmed from my childhood, when my mom used to tell me stories to go to sleep. And later, when my brother was born, I would tell him stories so he could go to sleep. (autobiographical writing)

Joanne (senior, writing) tells of a similar situation, but it is her dad who reads to her. She says, My parents' influence definitely shaped how I responded to texts at a young age. When I was really young, my dad never read me the traditional short books. Instead, he read me things like *Alice in Wonderland*, and that was before I was a year old. He also read these weird storybooks of Titanic and other history-type books. I loved it. (academic life narrative)

Mentioned earlier, King (first-year student, English Ed.) explains that the most meaningful event to push him toward the English major is his mother's overdose death. It is the first episode he describes, and it places him in the narrative as eight years old. Likewise, Evelyn (first-year student, writing) tells of always telling stories as a kid, at an age when she was able to begin writing: "I used to write a spinoff where Peter Pan had a sister. I was little, and I was just writing silly stuff" (academic life narrative). Some English majors' narratives, then, place

emphasis on early, sometimes painful, sometimes intimately important literacy experiences in childhood.

Other English majors place their narrated selves in middle school and high school when their English-major life journeys begin. Zaphod (first-year student, writing) tells of writing papers that were simply “just fun” in high school and receiving praise from teachers for it, as well as publishing a poem when he is in sixth grade (academic life narrative). Warlock (first-year student, English Ed.), meanwhile, places himself in his narrative as being in eighth grade, around the age of thirteen, when English becomes a sort of calling. He explains it in terms of a dream he has that motivates his fantasy-writing aspirations:

Part of the reason English stayed at the forefront was because, the summer before eighth grade, I ended up having a dream. It was not like any other dream because it felt like a long time passed. I could sit here and talk to you for fourteen days about six months of the maybe twenty years of material and ideas that unfolded in that dream. It set out this framework for this story I’ve been writing ever since. (academic life narrative)

While a majority of English majors’ narratives (7/10, [70%]) refer to these literacy experiences occurring early in their lives, some others (3/10, [30%]) explain more career-oriented reasons for getting into their majors. For instance, Nick (first-year student, English Ed.) presents himself as a focused English Education major with aims of becoming an effective and empowering teacher. In explaining how he finally settled on English, he writes,

The last moment that pops in my mind is when my teachers would recommend me to a major that involved reading and writing. I knew that I liked writing, so I chose that I’d be a Journalism major. It didn’t feel right, and after discussion with my teachers and my

family, the idea of teaching arose. That hole that was there with Journalism was filled with English Ed. (autobiographical writing)

Rudy (junior, English Ed.) also tells of the English-major choice in some ways being made for him through a combination of what his professors recommended and his own disinterests: “I did my practice teaching, and I seemed to do my best teaching in English and math. And I hate math” (academic life narrative). Finally, Sylvester (senior, pre-law), though he tells of being talented at writing persuasive and research-based genres in high school and of scoring in the top percentiles in standardized tests, explains choosing English to help to be prepared for law school:

That was one of the things that really drew me to English. I knew I could be in rhetoric and persuasion. I could focus it more toward that. [...]. Ultimately, at its core, English is teaching communication: both verbal and written. As a lawyer, I’m going to be using that every single day very intensively. I figured I might as well refine those skills as much as I can at this level, so I made the switch to English, and it was definitely the correct choice for me. (academic life narrative)

Ultimately, the excerpts presented above illustrate storytellers placing their narrated selves as involved in aspects of their majors at various points in their lives. Often that point of time is deep in a participant’s past, in a participant’s pre-college schooling experiences, or in a participant’s college years. Because participants create personalized versions of the English or Chemistry Department in which their narrative self operates, it is not possible to say that we can infer a level or quality of investment based on where in time storytellers place themselves as embracing aspects of their majors.

Additionally, while it might be tempting to conclude that English majors in the English Education track, for instance, could be more focused on careers as teachers and therefore maybe

less likely to construct themselves as writers and readers in their writing, the data suggests differently. While Nick (English Ed.), Rudy (English Ed.), and Sylvester (pre-law) do present themselves in their narratives as getting into English for reasons other than primarily being interested in writing and reading literary texts, powerful counter examples come from King (English Ed.) and Warlock (English Ed.), who present themselves as profoundly invested in creative writing. All this is to say that, in fact, to understand investment in a major and in a student's disciplinary identity, indicators other than a student's major alone are required. A candidate for this kind of indicator seems to be students' imagined futures—including their imagined communities (B. Anderson, 1983/1991) and imagined identities (Norton, 2001).

Future Possibilities as Indicators of Richness of Account

In this study, the final question I asked participants before wrapping up the academic life narrative interview was, "How do you see or imagine your future? What does it look like?" I did not ask them what careers they expected being in, but many answered along those lines. Findings for participants' imagined futures tell much about how participants perform their disciplinary identities but also how they describe their majors as more or less career-oriented.

When chemistry majors' narratives indicate future career plans, six of seven (86%) mention they are still trying to figure out the exact path, six of seven (86%) mention they are planning on going to graduate school, and all seven (100%) indicate they see themselves eventually being chemists or researchers. While 100% express seeing themselves as chemists or researchers in the future, six of seven (86%) indicate they imagine themselves being a chemist and/or researcher in a nonspecific role, and five of seven (71%) refer to imagining themselves using science and research in science for business- or industry-oriented careers, such as (a) for the government doing science research (e.g., U.S. Food and Drug Administration [FDA]); (b) for

a private drug company researching and developing medication; or (c) for medical or therapeutic areas.

As Norton (2001) wrote, “different learners have different imagined communities, [and] these imagined communities are best understood in the context of a learner’s unique investment in the target language and the conditions under which he or she speaks or practices it” (p. 165). Applying Norton’s concept to the present study, it can be said that chemistry and English majors’ imagined communities, indicated in part by how they talk about their future career roles, can be best understood in the context of their investment in their discipline and in the classroom and departmental conditions where they experience their major.

Arykaj (junior, pre-pharmacy) illustrates this point in the following excerpt, when she tells where her strengths lie:

After being in the McNair Scholars program, I have presented my research multiple times. I got picked to go to Niagara Falls, New York, to present my research. I’ve been to several other colleges, too, including this coming weekend. The opportunities that I’ve had to present my research have been huge. This is important because I don’t have the best GPA. I’m hoping to get a 3.0 before I get out of here. But I make up for that in other areas. While I’m not the best test-taker, if you give me a project, I’ll give you the best results you’ve ever seen. (academic life narrative)

Arykaj here constructs herself as invested in the research component of her major, though not as much invested in an image of herself as a student who earns high grades or performs well on tests. For Arykaj, two experiences are presented as being life-changing: doing research and being in the McNair Scholars program, as indicated in the excerpt above. Arykaj presents herself as knowing exactly what she wants to be in the future, and her career choice and the imagined

community it implies can be understood in the context of her investment in research and the chemistry department as a support system for research.

My data does not indicate that first-year chemistry students' narratives differ from junior- or senior-year chemistry students' narratives in terms of how specifically they describe future careers. Of the two chemistry majors whose narratives present themselves as wanting to be chemists or researchers in roles they do not define or specify, one belongs to Linus (first-year student, pre-medical) and the other to Kiki (senior, biochemistry). Although it might be assumed that first-year students talk more vaguely or generally about their futures because they have not been exposed, perhaps, to oldtimers (Lave & Wenger, 1991) in the department who may know more about what a person can do with a chemistry degree, the present data set does not allow this conclusion. Rosalind's (first-year student, biochemistry) data, for instance, was analyzed and three utterances were coded as references to specific future career positions as a chemist or researcher while six utterances were coded as references to nondescript future career positions as a chemist or researcher. Rosalind's narrative refers to her imagined future as follows:

In my future, I definitely see myself working in a lab. I'm not sure exactly what I want to do yet, but my aunt in Virginia would tell me they have a bunch of cool little underground labs for the government that work with forensics and stuff like that. I just think that would be really cool to work for the government doing forensics kind of stuff. But even like what my mom said to me about working at the Red Cross interests me. I could see myself analyzing people's blood. Anything like that would be cool to me. I'm not very picky about what I want to do, so I guess that as I learn more about certain things, I'll see what interests me the most. Still, I see myself in the lab doing something.
(academic life narrative)

Rosalind, who refers to herself and the subject of biochemistry as *creative*, constructs herself as invested in the creative, problem-solving aspects of her major. That problem-solving happens in the lab, so it is unsurprising that she expresses being invested specifically in the research components of her major. Also noteworthy is how much familial support Rosalind tells of receiving. Having family familiar with job possibilities helps her narrate about her future in a vivid and specific way, as she refers to specific buildings where she might work (“cool little underground labs”) as well as to specific tasks she might carry out (“analyzing people’s blood”).

English majors, on the other hand, composed narratives that present themselves as expecting to become teachers. Eight of 10 participants’ (80%) narratives express participants seeing themselves becoming teachers or professors. The two participants whose narratives do not express seeing teaching in their futures are in the writing track, while the eight whose narratives do express seeing themselves teaching are majors in English Ed. (King, Nick, Rudy, Warlock), writing (Evelyn, Joanne, Zaphod), and pre-law (Sylvester). After teaching, half of all participants (5/10, [50%]) present themselves in their narratives as expecting to become writers. These include writing-track majors (Astrid, Zaphod, both first-year students) and English Ed. majors (King, Warlock, also both first-year students). Just three of ten (30%) narratives present their authors as seeing themselves going to graduate school compared to the six of seven (86%) chemistry majors’ narratives that reflect graduate-school aspirations. Of the three whose narratives portray expecting to go to graduate school, two were seniors (Joanne, writing; Rudy, English Ed.) and one was a first-year student (Warlock, English Ed.).

Though participants’ narratives express various imagined career-oriented futures, sometimes a preference is expressed. Two noteworthy examples involve the narratives of King (first-year student, English Ed.) and Warlock (first-year student, English Ed.). When it comes to

Warlock's academic life narrative, creative writing represents a sort of spiritual experience, as he tells of a dream he has around eighth grade that fills his imagination with storylines and characters he wishes to write about in groundbreaking works of fantasy literature. Although his major is English Education, his academic life narrative does not seem to present an author who chooses the English major to become a teacher: "There's really no other route I could have taken to further my education and go on to do better things and get paid doing something I love. This field is a prime opportunity to pursue and create my loves" (academic life narrative). When specifically referring to an imagined future, Warlock's narrative again does not seem to reflect the career path in a major that is preparing him to teach in U.S. secondary schools:

I see a bright, bright future with the English program. Really I see my view of English expanding. I see that I'll probably broaden my horizons and go to England, maybe Oxford, and see if I can mess around there for a little bit if they'll let me. I see myself eventually getting my doctorate, becoming a professor, and cranking out a couple books—maybe not super valuable books except for their creative aspects. I see myself trying to establish a legacy. (academic life narrative)

The loftiness of Warlock's goals and imagined future fit the almost fantastic origin story he tells about becoming an English major. His goals and imagined future also can be understood in relation to the aspects of the English major Warlock indicates investment in: the creative-writing, liberating aspects. In addition to the almost otherworldly dream he tells about, Warlock also tells about inspirational words received from a high-school teacher:

And he said it only to two other students throughout his teaching—that he felt that I was one of those three who could write for more than a hobby. He said he hadn't seen someone who could write like me in a long time. He said my writing was unique and

fresh. He said that the fantasy world was hard to write into because there was so much out there, but “You have potential. You really, really could do this.” Those words inspired me. (academic life narrative)

What is especially striking, however, is that Warlock’s goals as narrated here seem at odds with the track he is on in his major.

King (first-year student, English Ed.), another participant whose narrative indicates that he would prefer becoming a writer before becoming a teacher, seems aware that becoming a writer of fantasy literature professionally may not be as likely as becoming a high-school teacher. In expressing how he imagines his future, King says,

In a perfect world, I see myself writing fiction professionally. That said, I’m not sure if I could ever get my work out there because of how crazy difficult it is to break into mainstream fantasy. So I don’t realistically see myself writing fiction professionally, but I’d love to, because that would be amazing. But honestly, I see myself teaching, until I retire, and just writing for myself and not letting it get out there. (academic life narrative)

King’s narratives, like Warlock’s, refer to writing and reading. He does not refer to teaching in his narratives as something he likes, although he does tell about his grandmother being a teacher and, as a result, his teachers saying to him that they expect he too will someday become a teacher.

Retention studies has established that persistence is related to the extent to which students see their majors as pathways to reaching personal life goals (Tinto, 2015). In one of few empirical studies on why humanities students drop out, Mestan (2016) reported that students’ explanations for leaving college before graduating could be categorized as course-related reasons and personal reasons, with the most important course-related reason being that coursework “did

not provide career direction and lacked purpose” (Mestan, 2016, p. 4). Other research has suggested that the level of connection students feel to future-time careers can impact persistence (Shell, Soh, Flanigan, & Peteranetz, 2016).

The present analysis of chemistry and English majors’ imagined futures suggests that chemistry majors are more likely to construct themselves as current members of their majors in relation to future careers that involve activities they frequently practice in their major (doing research). On the other hand, among English majors are students who, when asked, express seeing themselves in careers that, according to their own descriptions, involve activities not centrally practiced or not especially prized in the tracks they chose within their majors.

WAC practitioners may draw on this finding in using reflective and imaginative writing prompts across students’ academic journey to help students articulate pathways toward careers as well as the procedural steps students can take while in college to reach career goals. WAC practitioners may also draw on this finding in encouraging faculty across campus to reflect on the types of writing their students are completing and whether this writing prepares students for the types of jobs they want or are trying to obtain.

Strategies for Repairing or Explaining Apparent Breaks in Narrative Order

Though occurring in only some (2/17, [12%]) of the academic life narratives, and only among English majors, it is noteworthy that not all participants tell narratives that present themselves as being certain they will persist in their majors.

Evelyn (first-year student, writing), who switched majors from the Nutrition Department, begins the “Being an English Major” section of her academic life narrative with the following disclaimer: “I’m not sure if I’ll remain an English major, but right now, I really like the classes I’m in.” In describing how she imagines her future, however, she says, perhaps reluctantly, “I say

I don't want to be an English teacher, but I can see it. And my mom can see it too. I mean, my middle school teachers were very influential, so I can see that" (academic life narratives). Evelyn then continues by discussing a second path she sees herself possibly pursuing: "But I can also see myself spending the rest of my life reading manuscripts, books, that people have written and making determinations of publishing that manuscript or not" (academic life narrative). Evelyn does not refer to imagining herself becoming a teacher anywhere else in her academic life narrative, and her narrative does not offer any hints of her investing in those aspects of her major that may help her become a teacher. Evelyn does talk about being moved by books, and their personal meaning to her as a diabetic and writer. Yet again, nowhere in her narrative does she refer to aspects of her major that may prepare her to become a publisher.

Astrid (first-year student, writing) also tells of doubting if English is the right major for her. She says,

[A]ctually, even when I chose English, I was still kind of floating around it and hesitant. I thought, *I like it, but I don't know what I'm going to do with it. I know that it's something I'm good at*, but I still didn't know if I was good enough for the major because I didn't really write that much. (academic life narrative)

Here, Astrid's narrative presents what appears to be a break in continuity. According to Linde (1993), strategies are available to storytellers when such breaks seem to appear. One strategy, *temporary discontinuity*, is for the storyteller to reject the presence of a break by describing a decision or life event as merely temporarily discontinuous. Astrid seems to use a break-repairing strategy when, immediately after this point in her narrative, she tells of a writing experience that makes her sure she belongs in the major. She submits a play for the English Department's spring

contest for writing. She tells of rewriting a play she wrote for her theater class and winning first place. Astrid explains the evaluation section of this episode in the following:

Anyway, winning kind of cemented my place in the English Department. I thought, *Okay, this is what I want to do. Clearly I have some talent for this.* So I specialized my track as writing, but I want to take different types just to see what I like or what my options would be for jobs in the future. (academic life narrative)

Instead of the narrative seeming to have a temporary discontinuity, Astrid's reparation presents what Linde (1993) has called an *apparent break*, meaning that what seemed to be a break in narrated-self continuity is rejected because the life event was only seemingly discontinuous.

In both of these cases, English majors tell about having some doubt they will stay in their major (Evelyn) or in the English-major focus they have chosen (Astrid). While Astrid can be said to repair that break in continuity, presenting it as only an apparent break, she also concludes by saying she is still looking at different options in the English major to see what jobs she can get. Evelyn is likewise presented in her narrative as being concerned with jobs. Unlike Astrid, however, she does not narrate a repairing episode to mend the break she presents when she says she may not persist in English.

Just as it is important to understand how participants present themselves as continuous characters in their academic life narratives to understand their investment in their majors, it is important also to understand whether their narratives present apparent breaks. These breaks present some counter narrative, inserting some narrative doubt, that the character being portrayed is continuous—is on a narrative life path convincingly leading to a logical life decision, such as becoming a certain major and staying in that major, possibly into a specific future career role. It is possible, though more research would be needed, to wonder if unrepaired breaks in academic

life narratives indicate less coherence pertaining to the portrayed self and, simultaneously, less investment in the construction of a college-persisting disciplinary identity.

Learning Experiences and Environments as Objects of Evaluation and Investment

In distinguishing the concept of investment from motivation, Norton (2013) said that “A learner may be a highly motivated language learner but may nevertheless have little investment in the language practices of a given classroom or community, which may, for example, be racist, sexist, elitist or homophobic” (p. 7). In applying Norton’s discussion to the present study, I have argued that a chemistry or English major may accordingly be highly motivated to obtain, for example, a chemistry or English degree but may not be invested in the specific institutional or departmental practices that instantiate that major and mediate engagement with immediate and imagined members of that disciplinary community. Further extrapolating from Norton (2000), a student’s investment in her or his disciplinary identity is simultaneously to some degree an investment in the learning conditions and contexts where that disciplinary learning is encountered. Investing in a major, in other words, implies investment in specific learning conditions.

Investment in Learning Experiences

In this study, in narrating about and explaining how they understand getting into and remaining in their majors, a majority of participants (13/17, [76%]) referred to the shared influential experience of having a fun or engaging class while a significant majority of participants (16/17, [94%]) referred to experiencing an influential, supportive learning environment. Understanding what general and discipline-specific learning experiences and environments students evaluate favorably can suggest what may prompt disciplinary identity construction in college and in departments. In evaluating experiences and environments, students

are taking stances, and taking a stance positions a speaker in a way that indexes aspects of that speaker's performed identity (Du Bois, 2007).

While chemistry and English majors both align with fun or engaging classes and with supportive learning environments, differences appear in the data between these two groups. These discipline-specific objects of evaluation and investment suggest discipline-specific qualities of persistence.

For chemistry majors, research in science (6/7, [86%]), fun or engaging classes (6/7, [86%]), and society or fraternity participation (4/7, [57%]) were most frequently named as being meaningful discipline-specific experiences. A closer look at how participants evaluate their majors and position themselves along affective scales appears in Table 31.

As noted in Chapter 3, when students are evaluating experiences and environments, they are taking stances (Du Bois, 2007). Stancetaking, for Du Bois (2007), always entails evaluation: "The act of taking a stance necessarily invokes an evaluation at one level or another, whether by assertion or inference" (p. 141). Stancetaking is also a "triune act" that at once evaluates objects, positions speakers, and aligns (converging with or diverging from) speakers in relation to objects of evaluation (Du Bois, 2007, p. 169). Taking a stance, which is displayed through sentence predicates and a sentence's objects, positions a speaker in a way that indexes aspects of that speaker's performed identity.

Table 31

Stance Predicates and Objects of Evaluation of Learning Experiences (Chemistry)

	Stancetaker	Positions/Evaluates	Stance Objects
1	Ada	Interested in; Like; Was attractive Is exciting and dynamic; Really excites me; Love	Science; Classes; Interdisciplinary science; Biochemistry; To make connections; Empirical nature of science; Pharmacology; Development of drugs; Research Research; Data analysis; Time in the lab; How dynamic the field is; How empirical biochemistry is; Chemistry; Empiricism
2	Arykaj	Interest in; Resonated with; Really like; Is cool Was my passion; Changed my life	Science; Chemistry; Pharmacy Chemistry; Research
3	Kiki	Like Love Hate	Organization and application of math, Biology; Chemistry classes; Competitive environment Biological processes; [Not] English Geometry
4	Linus	Interest in Enjoy Didn't feel confident; Not interested in	Mathematics; Synthetic chemistry; Usage of math Chemistry and math Writing; Writing-intensive subjects
5	Ramsay	Like; Is cool; Is interesting; Find very interesting; So interesting Impressed me Was enthralling; Is my love	Science; Math; Technology; Chemistry; How [the world] works [as explained by chemistry]; How reactions work; Learning how atoms bonded using electrons; The difference between covalent and ionic bonds; How energy affected how the atoms and molecules interacted The way of thinking that [science] presented Chemistry
6	Reatha	Liked; Appealed to me; Am pleased and satisfied	Science; Electron configurations of elements; Chemistry classes; Chemistry major; Undergraduate life as a chemistry major

		Is my passion	Lab research
7	Rosalind	Appeals to me; Interested in; Enjoy	Form[ing] things out of nothing; Science classes; Organic; AP Chem; Molecular; Bio; Physics; Chem; Watching science in action
		Are my favorite	Chem and Bio
		Can never be deemed boring	Job as a chemist
		Loved	Science classes
		Was so hard	Learning science

Table 31 illustrates how chemistry participants evaluate aspects of their majors through stance-taking predicates with articulated objects of evaluation. For some chemistry majors, some of the more emphatic evaluations are reserved for research. Ada (first-year student, biochemistry), for instance, “likes” classes but “loves” empiricism and research. Reatha (junior, chemistry) also reserves the phrase “is my passion” for “lab research.” Overall, the objects of evaluation that participants align with are more centered on knowledge and content than are the objects of evaluation from English majors, illustrated in Table 32.

Table 32

Stance Predicates and Objects of Evaluation of Learning Experiences (English)

	Stancetaker	Positions/Evaluates	Stance Objects
1	Anna	Always really liked; A nice escape Like Meant a lot to me in my life	Reading Writing track of English major; To Write Fiction Creative writing
2	Astrid	Interested in I really liked Always knew I liked I really like Is really important for jobs (even minor)	Film track High-School English class Books Reading Writing; Analyzing
3	Evelyn	I was comfortable with; One of my favorite subjects Really enjoyed Sat there awestruck [after]; Made me so angry; Made me so mad I like The cool thing is Love Didn't like	English Discussing literature Reading Analyzing books; Class I'm in (for now); Originality that comes with studying English (different ways to write and look at things) Criticisms link to other subjects' content Reading Original major [nutrition and dietetics]
4	Joanne	I liked; Was always my favorite subject; Was really interested in I loved I hated Good for jobs (even minor); Is an incredible tool	High-School English Performing well on vocabulary tests; English High-School math; Science English major

5	King	-	-
6	Nick	Is a very underappreciated field of study Didn't feel right	English Journalism major
7	Rudy	Was my favorite class Love it I hate	Middle-School English English major Math and science
8	Sylvester	Liked it; Saw the merit of it I appreciated I hate	High-School English Versatility of what I've been exposed to (e.g., film study) Business major
9	Warlock	Felt right I truly love, Love Find tedious	Being English major English; Being able to read and write based on my personal experiences and loves; The school work in English major Other school work
10	Zaphod	Really interested in Always liked Was really boring Hated	Reading English classes Computer science major Book to read over summer; 300-level Computer Science class

As reflected in Table 32, the objects of evaluation that English participants align with are more centered on processes (reading and writing) than with English-major content. The difference between chemistry and English majors as indicated in the present data is that the English major entails largely literacy experiences and development, with the subject of the major largely implied as being the English major's thinking and feelings.

The finding in this dissertation that research represents meaningful experiences in relation to chemistry majors' becoming and remaining in their major reflects established knowledge in retention studies. Described elsewhere as a high-impact educational practice (HIP)

(Kuh, 2008), one of the most promising ways of engaging STEM students in academic practices related to STEM communities is course-based research experiences (Hanauer & Bauerle, 2012; Hanauer et al., 2016; Hanauer et al., 2009; Hanauer et al., 2006). Undergraduate research experiences generally have been linked to STEM-student persistence (Gardner & Willey, 2016; Goonewardene et al., 2016; Jones et al., 2010; Schultz et al., 2011) and intent to become research scientists (Hanauer et al., 2016). As Seymour and Hewitt (1997) established twenty years ago, “We met very few students who had been given the chance to work with S.M.E. faculty in a research capacity or to observe them in a hands-on relationship with their discipline. However, students (largely non-switchers) who reported such experiences pointed to the pleasant and open way in which faculty treated undergraduates in a research relationship, compared with their apparent indifference in a teaching context” (p. 147). In addition to research experiences with faculty being positive experiences, undergraduate research in STEM has also been linked to students’ desiring to themselves become professors in STEM, for instance in computer science (Tamer & Stout, 2016), or to students’ identifying with scientific thinking, identifying with scientists, and self-identifying as scientists (Kortz & van der Hoeven Kraft, 2016).

Kuh (2008) explained that high-impact educational practices (HIPS) are teaching and learning practices that “educational research suggests increase rates of student retention and student engagement” (p. 9). While “undergraduate inquiry” or research has long been an original HIP, recently “creative activity” was added to the list (Kuh, 2008; Moore, 2016; Watson et al., 2016). The existing 11 HIPS appear here:

1. first-year seminars and experiences;
2. common intellectual experiences;
3. learning communities;

4. writing-intensive courses;
5. collaborative assignments and projects;
6. undergraduate inquiry and creative activity;
7. diversity/global learning;
8. service/community-based learning;
9. internships and field placements;
10. capstone courses and projects;
11. ePortfolios. (Kuh, 2008; Moore, 2016; Watson et al., 2016)

The data from English majors suggests English majors most positively evaluate writing (HIP number 4) and creative activity (the second part of HIP number 6). Meanwhile, chemistry majors seem to most positively evaluate undergraduate inquiry (the first part of HIP number 6).

Investment in Learning Environments

Also suggestive of conditions relevant to discipline-specific persistence are stances chemistry and English majors take about their departments and other learning environments. Just as exploring stancetaking toward disciplinary experiences suggests discipline-specific aspects of persistence, so too does exploring stancetaking toward the environments where students engage with immediate and imagined members of their disciplinary communities. Table 33 illustrates how chemistry participants evaluate aspects of their learning environments through stance-taking predicates with articulated objects of evaluation.

Table 33

Stance Predicates and Objects of Evaluation of Learning Environments (Chemistry)

	Stancetaker	Positions/Evaluates	Stance Object
1	Ada	Was attracted to Is nice; Is a great place to learn Is a very supportive environment I love so much	Teaching philosophy of the honors college Small class sizes Chemistry Department Enriching environment [of honors college]
2	Arykaj	Gets intense Is not easy	Upper-level classes Chemistry
3	Kiki	Used to love Full of very knowledgeable people; Is very divided Really wears on your soul sometimes Don't care as much as others A lot easier [than at bigger schools]	Super competitive high-school science classes Chemistry Department Science; Seeing funding getting cut Some professors Getting into a lab
4	Linus	Really enjoyed Isn't that relevant to average person Not an easy field Don't care as much as others	Professors in the honors college STEM Chemistry Some professors
5	Ramsay	Is dangerous/carcinogenic Can be rough at times Weeds people out Not so much an atmosphere of people willing to help each other as maybe in the humanities and social sciences	Chemistry-lab materials Chemistry major Classes past General Chemistry Chemistry Department
6	Reatha	Are very nice Is tough; Is very thorough and in depth; Is very hard; Is very difficult; Can be hard to grasp	Chemistry-Department faculty Organic Chemistry; Analytical Chemistry; Calculus 3

		Can be very tedious	Inorganic lab; Organic lab; Physics lab
		Weeds people out	Organic Chemistry
7	Rosalind	Is so nice; Uplifting	Everyone in the Chemistry Department
		Really just a nice environment; A fun atmosphere	Chemistry Department
		Is hard; Is hard stuff	Science-class content

Six of seven participants (86%) evaluate the department or the content as being difficult. Getting a chemistry degree, these participants say, is not an easy thing. As evidence, both Ramsay (junior, chemistry) and Reatha (junior, chemistry) refer to seeing the number of students enrolling in their chemistry-major classes dropping each semester. Ramsay (junior, chemistry) explains it in the following:

Another thing to know in general is that a lot of people don't make it past the general chemistry class. There were like 30-40 students in my Gen Chem, and that wasn't the only general chemistry class. There were like two to three per semester, so there were a lot of students that were chemistry or like chemistry pre-med or natural sciences or something like that. There were a lot of students there. And then you get to organic chemistry, and then suddenly between the first and second organic chemistry class, that number is weeded down to maybe 15 or 20 people and there's only one class, because that's the first tough one. (academic life narrative)

For Ramsay, the Chemistry Department can be described in comparison to other, non-science departments: The department is “not so much an atmosphere of people willing to help each other as maybe in the humanities and social sciences” (academic life narrative). This is the evaluation of even first-year students, such as Linus (first-year student, pre-medical), who describes some professors as people who “Don't care as much as others” (academic life narrative). Similarly,

Reatha (junior, chemistry) explains this experience of seeing fewer returning classmates as an expectation and warning from faculty:

In Organic Chemistry, the number will drop from 60 to like 25 kids after the add/drop period. It's just that difficult to some people. Professors will tell us that it will be hard and that we will see a decline in number of students, but it didn't really affect me. I don't care. I still have to learn, and I still have to pass. If anything, I'd say it makes the class more engaging [...]. We feel like we got through some challenges, actually. It's very difficult, and the topics can be hard to grasp, but once you make it through O Chem and P Chem, you're a saint. (academic life narrative)

That it is apparently *common sense* (Linde, 1993) or expected that chemistry will be hard is further reflected in the narratives of others. For instance, Arykaj (junior, pre-pharmacy) explains that people looking to get into chemistry should not do it only for the money; instead, they should be passionate about it because there are classes meant to tempt a chemistry student to question if they want to continue in the major: "That's the point of [Physical Chemistry]: to weed those out who aren't passionate or curious about chemistry" (academic life narrative).

While six of seven participants emphasize how difficult chemistry is, Kiki (senior, biochemistry) speaks specifically about emotional and intellectual trials chemistry majors go through and, in her opinion, need to be used to:

I definitely think in science, you have to get used to being beaten down a little bit. [...]. You're going to spend a lot of time writing lab reports, in your room studying things, while maybe your other friends are going to spend a little less time doing that—not that they don't have the same amount of work, but their work comes in the form of a big

paper that's due at the end of the semester. [...]. It's just, for example, that you can't force cells to grow. (academic life narrative)

For Kiki, scientists are also under pressure from outside funding entities, and the threat of funding being cut is painful for Kiki. She says, "science really wears on your soul sometimes. Especially when I see stuff about funding being possibly cut" (academic life narrative).

While chemistry majors evaluate their department as challenging and containing professors who do not care as much about helping or interacting with students, English majors evaluate their department as unanimously helpful (See Table 34).

Table 34

Stance Predicates and Objects of Evaluation of Learning Environments (English)

	Stancetaker	Positions/Evaluates	Stance Object
1	Anna	Filled with really passionate people	English Department
2	Astrid	-	-
3	Evelyn	Is friendlier than nutrition department (even secretary)	English Department
4	Joanne	Genuinely care about students	All profs in English Department
		Super warm and friendly; Full of opportunities	English Department
5	King	Really cares even if not great teachers	Department faculty
6	Nick	Very open; Is nice; Like a family	English Department; People in it
		I love it	Being in the department
		Accommodating because small; Inexpensive	School
7	Rudy	Accessible; Helpful (even secretary)	Department Faculty
		Is superb	Department
8	Sylvester	Is helpful; Willing to help	Department faculty
		More welcoming and supportive than business department	Department
9	Warlock	Really kind hearted and willing to help	Everyone in department
10	Zaphod	Was excited to see me; Helpful	English department secretary

The English Department is evaluated as “super warm and friendly” (Joanne, senior, writing), with faculty members who are “really kind hearted and willing to help” (Warlock, first-year student, English Ed.). In fact, three of ten (30%) participants identify even the department secretary as being helpful. Zaphod (first-year student, writing), for instance, writes of switching majors and going to the English department to turn in paperwork (autobiographical writing). There, he encounters a secretary who is very excited to see him and who gives him a bag of department materials.

For more than forty years, since Tinto (1975) drew on an economics-of-education concept of “investment” to refer to a “cost-benefit analysis of individual decisions” related to alternative educational experiences (p. 91), retention studies has established the importance of human interactions students have on college campuses for persistence. Tinto argued that students decided to persist in college based on perceptions of whether it was worth it to stay, and that these perceptions resulted partly from interactions with administrators, teachers, and clerical staff who created a sense of an institutional environment for students. Since then, retention studies has produced data suggesting that persistence is less likely when students perceive the school environment as hostile (Cokley, McClain, Jones, & Johnson, 2012) or have a negative attitude toward the institution (Campbell & Mislevy, 2013; Gloria et al., 2005). In other research, supportive relationships (with peers and faculty) was linked to satisfaction of college for male students of color, which was then linked to greater persistence expectations (Strayhorn, 2008). The data here supports the importance of everyday interactions students have with a range of university representatives, from faculty members to administrative assistants.

Summary

Participants' investment in their disciplinary identities can be understood in terms of the work they put into telling coherent academic life narratives. This coherence-making work can be seen, for instance, in ways participants present themselves as continuous characters in their narratives and explain episodes that, if not repaired, could seem to lead to counter narratives about why they may not belong in their major. Participants' narratives also suggest what experiences and environments in particular may encourage investment. I have drawn on Norton's (2000) concept of investment to suggest how a student's investment in her or his disciplinary identity also implies at least some degree of simultaneous investment in specific learning conditions and practices characterizing contact with that discipline. Since investment in a major is also investment in a disciplinary identity, and since I am arguing that persistence can be understood as disciplinary identity investment and performance, it is useful for instructors and program administrators to know what general and department-specific experiences may invite investment.

Disciplinary Writing and Identity Construction

While I have so far drawn on data from this study that facilitated investigating life and department experiences in general to understand how participants understand getting into and remaining in their majors (research question 1), now I turn to the data I collected to understand how participants perceived their disciplinary writing experiences in relation to entering and persisting in their majors (research question 2).

Chemistry-Major Writing and Disciplinary Identity

Chemistry majors mainly referred to lab reports (7/7, [100%]) and general homework-related writing (6/7, [86%]) in their narratives and interview replies. In elaborating on

disciplinary writing, participants mainly discussed the lab report, which they evaluated both positively and negatively, thus either converging with or diverging from that literacy practice. Exploring when chemistry majors aligned themselves with and against lab report writing indicates what aspects of disciplinary identity participants perform from those stances and what relationships comprise that literacy experience.

Regarding chemistry-major disciplinary writing in general, six of seven participants (86%) evaluated aspects of that writing positively, and all seven participants (100%) also evaluated aspects of that writing negatively. When chemistry majors positively evaluated specifically the lab report, also explaining why they evaluated it that way, it was when lab report writing was (a) related to a project they would actually carry out (Reatha, junior, chemistry) and (b) related to a lab they enjoyed (Ada, first-year student, biochemistry). When chemistry majors negatively evaluated lab reports, explaining why, it was when it was (a) graded difficultly (Kiki, senior, biochemistry), (b) required from multiple classes all at once (Arykaj, junior, pre-pharmacy; Reatha, junior, chemistry), or (c) monotonous in nature (Ramsay, junior, chemistry).

Assessing these stances as possibly encouraging identity construction and imagination, it is helpful to refer back to Norton (2010), who wrote that, when students lacked ownership over their literacy experiences, meaning-making became “meaningless and ritualized” (p. 10). The above stances seem to indicate that lab-report writing prompted divergent alignment from chemistry majors when that writing did not allow writers to put some of their own interest into that writing. It may also be the case that lab-report writing that was not connected somehow to writers’ interest placed the writers in relatively powerless positions regarding the assignment. Norton (2010), after all, said that meaning-making is facilitated when learners are “in a position of relative power in a given literacy event” (p. 10). Lacking choice of what to write about in a lab

report, chemistry writers may be less inclined to invest in that writing, which feels “meaningless and ritualized” (Norton, 2010, p. 10).

Another way of thinking about ownership of chemistry-major disciplinary writing is to explore in what contexts and under whose support participants expressed carrying out that writing. I organized participants’ utterances about disciplinary writing as occurring in either in-class or outside-of-class contexts, as shown in Table 35.

Table 35

Purposes and Contexts of Disciplinary Writing (Chemistry): Frequency of Utterance

	Name	Purposes of Writing			
		For Class		Outside of Class	
		Before College	In College	Before College	In College
1	Ada	6	8	-	-
2	Arykaj	6	10	1	-
3	Kiki	9	4	-	2
4	Linus	3	6	-	-
5	Ramsay	3	6	-	-
6	Reatha	1	3	-	-
7	Rosalind	3	8	-	-
TOTAL	7	7/7 (100%)	7/7 (100%)	1/7 (14%)	1/7 (13%)
		7/7 (100%)		2/7 (29%)	

As illustrated in Table 35, chemistry-major writing was referred to as taking place mainly for class purposes. Additionally, four of seven (57%) participants referred to getting support for their disciplinary writing from chemistry-department faculty members. When discussing teacher influence, however, the relationship is often one where teachers prescribe and students follow. Rosalind (first-year student, biochemistry) refers to getting help from a biology teacher in high school, and she explains this help as follows:

8 ROSALIND: [00:25] I remember in high school we would always have lots of essays to write on this test.

- 9 About like a- the little um like Krebs cycle and whatever and stuff like that?
- 10 And our bio profess- teacher in high school was like,
- 11 “I’m not an English teacher but I want it to be (.) like I want you follow the
format in everything,
- 12 “Like (.) what a good essay should be:” blah blah blah.

Participants (Arykaj, junior, pre-pharmacy; Kiki, senior, biochemistry; Reatha, junior, chemistry) who referred to teacher support for science writing also noted this emphasis on correctness. Kiki (senior, biochemistry) tells of co-authoring with her professor, but explains it as an asymmetrical relationship:

- 156 KIKI: [06:25] Like (.) for --
- 157 I submit to the undergraduate scholars’ forum?
- 158 Um (.) on Tuesday?
- 159 And like (.) I had to write that poster with Doctor Simmons and my lab group.
- 160 So like (.) even if he was hovering over me the whole time I was- like we were
writing it.

That disciplinary writing is described as happening in classrooms and under the correcting eyes of professors suggests that chemistry participants responding this way may find themselves in relative positions of powerlessness in these literacy experiences. Yet participants also positively evaluate the lab report. Participants (Arykaj, Kiki, Ramsay) explain, as do their supporting professors, that lab reports need to meet the expectations of expert-scientist readers and journal editors, who are described as also expecting correct format and specific execution of genre conventions.

Overall, the relationships constituting the lab-report literacy experience in particular are sometimes marked by relative powerlessness for chemistry-major writers. The relationship between text and reader for chemistry readers is one where student writers are trying to meet rhetorical-situation and genre-convention expectations. The relationship between student and teacher also puts student writers in positions of needing to conform to rigid prescriptions. What identities are supported in the lab-report literacy experience as described, then? Chemistry majors take ownership of the lab-report experience not through execution of genre conventions but rather through the exploration of the science in the lab that is meaningful to them. As described, the disciplinary writing experiences of chemistry majors here become meaningful and encourage disciplinary identity construction when that writing communicates results to scientific questions they have invested in.

These findings reflect STEM-writing research that indicates chemistry students perceive writing as meaningful experiences in their disciplinary lives (Gupta et al., 2015; Stewart et al., 2016; Waratuke & Kling, 2016). These findings also reflect earlier STEM-writing literature that identified co-authorship as one of the “signature-pedagogies” for learning how to write in the sciences (Maher, Timmerman, Feldon, & Strickland, 2013, p. 140). Adding to this literature, however, is the conclusion here that chemistry majors still care much about the personal connection or ownership they have for their writing, even when that writing may be prescribed formally.

English-Major Writing and Disciplinary Identity

English majors mainly referred to reading-response and analysis writing (8/10, [80%]), nondescript “essays” or “research papers” (9/10, [90%]), and creative writing (7/10, [70%]) in their narratives and interview replies. In elaborating on English-major disciplinary writing,

participants all positively evaluated their experiences while only four of ten (40%) also evaluated experiences negatively.

When English majors positively evaluated major-related writing, it was when that writing was (a) creative writing (Anna, first-year student, writing; Astrid, first-year student, writing; Joanne, senior, writing; King, first-year student, English Ed.; Warlock, first-year student, English Ed.); (b) reading-response writing about a personally meaningful topic (Anna, first-year student, writing; Sylvester, senior, pre-law; Warlock, first-year student, English Ed.); and (c) presented without burdensome limitations or rules (Astrid, first-year student, writing; King, first-year student, English Ed.; Rudy, junior, English Ed.; Warlock, first-year student, English Ed.).

The above stances seem to indicate that English-major writing prompted convergent alignment from English majors when that writing allowed writers to put some of their own interest into that writing and when that writing seemed to offer freedom in the form the writing took. English majors, as they described their writing experiences, then, seemed to describe themselves as being in what Norton (2010) may refer to as “a position of relative power in a given literacy event” (p. 10). Given choice of what to write about and what forms that writing could possibly take may have kept the writing from becoming “meaningless and ritualized” to the degree that the audience-focused lab-report genre was reported to have seemingly become (Norton, 2010, p. 10).

Another way of thinking about ownership of English-major disciplinary writing is to explore in what contexts and under whose support participants expressed carrying out that writing. I organized English-major participants’ utterances about disciplinary writing as occurring in either in-class or outside-of-class contexts, as shown in Table 36 below.

Table 36

Purposes and Contexts of Disciplinary Writing (English): Frequency of Utterance

	Name	Purposes of Writing			
		For Class		Outside of Class	
		Before College	In College	Before College	In College
1	Anna	1	-	1	-
2	Astrid	5	5	1	-
3	Evelyn	4	2	2	-
4	Joanne	5	2	3	-
5	King	3	5	3	-
6	Nick	2	3	1	1
7	Rudy	1	1	-	-
8	Sylvester	4	4	1	-
9	Warlock	6	6	2	-
10	Zaphod	7	7	1	1
TOTAL	10	10/10 (100%)	9/10 (90%)	9/10 (90%)	2/10 (20%)
		10/10 (100%)		9/10 (90%)	

As illustrated in Table 36, English-major writing was referred to as taking place in and outside of class nearly equally, particularly in relation to experiences before coming to college.

Additionally, six of ten (60%) participants referred to getting support for their disciplinary writing from English faculty. When discussing teacher influence, the relationship is sometimes one where teachers prescribe and students follow (e.g., Rudy, junior, English Ed.; Zaphod, first-year student, writing). In other utterances, it is also, however, a relationship where teachers prompt students to develop their own thoughts. Sylvester (senior, pre-law) discusses this in the following:

- 191 SYLVESTER: [09:38] So I guess prior to becoming an English major,
 192 I- I (.) for a time had the same kind of mentality of you know you just gotta do
 English to get it out of the way.
 193 I have a couple listed regardless of where my major is,
 194 Um research writing being one of them.

195 And it was with research writing when she asked us to include the rhetoric
component in our paper that (.) it um started to shift my perception of it a little bit,
196 And um (1.5) from then on out I- I looked at writing like I said less as a task and
more as a chance to improve a very valuable skill (.) at every turn,

Here Sylvester describes writing as an opportunity for self-development of skills useful for his future as a lawyer. Yet English writing is also described at times as a way for teachers to become involved in the thoughts of students. Joanne (senior, writing) explains college English faculty engaging with her writing in the following:

159 JOANNE: [08:30] And I'm sure other professors in other departments care the
same way.

160 But it just looks different I think?

161 And I think it's because English is a very personal kind of major in a way that
math isn't.

162 I don't think that you can connect to math in the same way you can someone's
(0.5) narrative.

163 Um so I always had a feeling of like (1.0) these professors care about me,

164 And they're not just like brushing my assignments away,

165 They uh are interested in what I'm doing,

Joanne here refers to "what she's doing" (line 165). The use of the progressive aspect refers to an action that began before meeting with a teacher and will continue afterward. The action of writing and developing thoughts or fiction does not represent a response to a teacher; it is not something Joanne did and completed. She is in control, and the college instructor is in effect opening a window to view an already-underway action.

Overall, that disciplinary writing is described as happening in and outside of classrooms and generally not under the correcting eyes of professors suggests that English participants may find themselves in relative positions of power in these literacy experiences. The relationships constituting English major-related literacy experiences can be characterized as positioning English majors in relative positions of power over their writing content and form. The relationship between text and reader for English readers is one where student writers are not explicitly trying to meet rhetorical-situation or genre-convention expectations; instead, they are trying to develop their own thoughts and texts to encourage English faculty to approve rather than direct. Thus the relationship between student and teacher also puts English majors in positions of control, at least compared to chemistry majors.

What identities are supported in English major-related writing experiences as described? English majors report having chances to take ownership of the content and forms of their writing. They are their own primary audiences, with their thoughts or creative-writing worlds earning positive reviews from teachers. As described, the disciplinary writing experiences of English majors here become meaningful and encourage disciplinary identity construction when that writing communicates thoughts and options about literary worlds and persuasive positions the writers are invested in.

These findings reflect English-major writing research that indicates undergraduate English majors claim greater ownership over creative writing than over research writing (Nicholes, 2017). Adding to this literature, however, is the conclusion here that English majors especially feel ownership when the writing they do allows them to pursue personally meaningful topics, such as in research assignments, readings, and creative writing. It also adds to this literature by suggesting that English majors most invest in having a sense of freedom regarding

the content and form of their writing, which is not so much prescribed by English faculty but underwritten through cooperative evaluation meant more to encourage personal growth than to interact with an actual audience of expert readers in the field.

Disciplinary Writing and WAC Theory and Practice

WAC theory is useful for categorizing the discipline-specific writing experiences participants in this study reported having. McLeod (1992/2000) defined WAC as comprising a continuum of approaches, with more “expressive” or “cognitive” approaches on one end of the continuum and “rhetorical” approaches on the other (pp. 2-3). Given this, it would seem that English-major writing would fall on the more expressive, author-centered, WTL end while chemistry-major writing would fall on the more rhetorical, audience-focused, WID end. An important implication, it seems, of being in majors with WTL- or WID-oriented writing concerns the communities (both immediate and imaginary) with which those writing experiences offer immediate and imaginary engagement and thus ways of belonging in disciplinary communities.

That English majors do not identify specific writing genres, except perhaps for the short-story, that characterize their major reflects that the primary audience for undergraduate English-major writing is classroom-bound and often the writers themselves, thus making their experiences more of the WTL kind. Personal writing for these participants is engaging and meaningful. It offers freedom of expression and license for exploration. Students do not write specific persuasive genres meant to be published, thus behooving them to carefully conform to audience expectations in the sense of genre conventions. Rather, students make connections with the words and thoughts of often provocative authors who created imaginative worlds that are either mimetic of an identifiable historical account or fantastic. Or English majors create their own compelling imaginative worlds, which is engaging and fulfilling. When teachers evaluate

that writing, the relationship between teacher and student is often one where the teacher is being invited in to look at an ongoing activity, and not so much to prescribe but to sponsor that writing activity. Ownership and power are described as more on the side of the English major than the teacher of an English-disciplinary community.

On the other hand, chemistry majors identify the lab-report genre most frequently as representative of chemistry-major writing. They show themselves as capable of speaking in detail about the form of the lab report and also of the rhetorical functions of those formal aspects. Thus their experience is more of a WID experience. Science writing for these participants is meaningful when the underlying science being described has some personal connection. The lab-report genre itself is not a genre that is evaluated in positive terms when the science lacks this personal connection. Instead, it is monotonous and tedious. Ownership of the lab report, then, is expressed in terms of the science being explored but not in terms of the writing itself, and the power dynamic is tipped toward the teacher, the audience, and even the genre, all of which demand adherence to conventions, at least as described in the data here.

The effects of a WTL- or WID-oriented set of disciplinary writing experiences may be reflected in the imagined futures, for instance, that participants refer to in their academic life narratives. Most English majors talked about being teachers while half talked about being writers when they graduated. If meaningful literacy experiences facilitate entering into communities that are both immediate and imagined (Norton, 2010), the effect of English-major writing is not so much to create texts to use to communicate with immediate others but rather to orient oneself to a kind of thinking to be able to facilitate those experiences for others, either an audience of students or readers. The immediate community for English majors is generally the teacher, who engages with the ideas in the text often in intimate one-one-one meetings or comments to writing

assignments. The effects of disciplinary writing are transformational for the writer, who enters into imagined communities by interpreting literary or historical worlds personally but not cooperatively in the sense of contributing to a body of knowledge that may characterize that discipline. Genre conventions and even the quality of the ideas as judged by disciplinary insiders are secondary to personal discovery and development.

For chemistry majors, however, the effect of science writing is to create texts to communicate with others. The immediate community for chemistry writers is still the college professor-scientist, but the professor-scientist represents and exhorts students to be aware of their science-discipline audience. Chemistry majors work with professors to co-author science reports, and those reports are frequently published in posters. Lab reports become genres that become keys used for entering immediate and imagined communities of scientists. The signature genre, the lab report, is not just a genre used to orient the writer to a discipline but is a genre that will be used in a science career. Thus it may be that chemistry majors' ability to explain the lab report and its form and rhetorical function signals awareness that they already belong in a science community. The writing of lab reports may not always be engaging and enthralling, but the science underlying it often is. The writing they describe is career-oriented, since it is the signature way of writing for professional scientists. Thus they themselves imagine their futures in career- or profession-oriented ways.

The future writing expectations of chemistry and English majors also may reflect their having experienced predominantly WTL or WID experiences. Both majors expect a job involving communication, if not writing. Yet that communication is described as having quite different emphasized purposes. Chemistry majors imply a desire to continue to write the audience-focused genre of the lab report (WID) whereas English majors often express a desire to

continue to write the author-based creative or therapeutic kinds of writing (WTL), with the hopes of being published and making it in the field.

Summary of Interpretation of Findings

The strategies that participants drew upon in constructing themselves as coherent characters in their narratives included (a) referring to their own character as adequate cause to get into their majors, presenting their interests and aptitudes as suitable to the major without having to explain how those character traits were formed; (b) referring to teachers and parents as character foils that further reflect or verify the participants' character traits; (c) creating rich accounts of their engagement with their major telling of engaging with their majors deep in their pasts; (d) creating rich accounts of their engagement with their major by also predicting being involved in their major in a future career; and, (e) when necessary, repairing or explaining any apparent breaks in the narrative that might create the appearance of not always having been engaged with, or on a logical path to be in, their major.

In analyzing discipline-specific qualities of strategy use for narrative order and coherence of participants' narrated, constructed selves, chemistry majors are more likely to construct themselves as current members of their majors in relation to future careers that involve activities they frequently practice in their major (doing research). On the other hand, among English majors are students who, when asked, express seeing themselves in careers that, according to their own descriptions, involve activities not centrally practiced or not especially prized in their majors. English majors invest in learning experiences that are creative activity and personal interpretation of texts whereas chemistry majors invest in research or undergraduate inquiry, and while English majors invest in learning environments they describe as liberating and supportive, chemistry majors invest in environments they describe as more selective and competitive.

When categorizing the discipline-specific writing experiences participants in this study reported having, the WAC approach continuum is useful. The effects of a WTL- or WID-oriented set of disciplinary writing experiences may be reflected in the imagined futures, for instance, that participants refer to in their academic life narratives. The immediate community for English majors is generally the teacher, who engages with the ideas in the text often in intimate one-one-one meetings or comments to writing assignments. The effects of disciplinary writing are transformational for the writer, who enters into imagined communities by interpreting literary or historical worlds personally but not cooperatively in the sense of contributing to a body of knowledge that may characterize that discipline. Genre conventions and even the quality of the ideas from outsiders are secondary to personal discovery and development. For chemistry majors, however, the effect of science writing is explicitly to create texts to communicate with others. The immediate community for chemistry writers is still the college professor-scientist, but the professor-scientist represents, and exhorts students to be aware of, their science-discipline audience. The writing they describe is career-oriented, since it is the signature way of writing for professional scientists. Thus they themselves imagine their futures in career- or profession-oriented ways.

What These Findings Mean for WAC and Composition

What I have hoped to offer WAC practitioners in particular and compositionists in general is a methodological approach that allows for a view of how writing fits into writers' perceptions and constructions of their lives. The approach modeled in this dissertation begins with the academic life narrative as a broader unit of analysis that can complement earlier studies, such as Emerson's (2016), that started at the literacy-narrative level. An important note here is that chemistry majors in this study do not construct themselves in relation to their discipline by

drawing on writing or literacy experiences primarily. English majors in this study, however, construct themselves as belonging in their majors by referring to their engagement primarily with literacy experiences—reading, analyzing, and creating their own texts. A study beginning with literacy would surely learn about literacy, but a view of where those literacy experiences fit in the context of life experiences, if at all, might be lost.

Another way I have hoped to offer useful interpretations for WAC and composition is by suggesting how the WAC-approach continuum (McLeod, 1992/2000; Russell, 2002) represents a useful heuristic not only for exploring how to approach WAC but also for categorizing the predominant impressions students report having about writing in their majors. This continuum might be useful for assessing what writing experiences students report having, what writing experiences faculty members report incorporating into their classes, and what the implications may be for how students perceive their majors and construct themselves as belonging or not in those majors in relation to disciplinary-specific literacy experiences.

Finally, the overall aim of my dissertation is to further support how WAC and composition, as well as departments such as English or rhetoric and writing studies, might further concern themselves with supporting institutional initiatives, such as student engagement and retention. If literacy experiences can prompt disciplinary identity construction in relation to immediate and imagined disciplinary communities, and if those identities signal investment in programs and persistence in college, then WAC programs, composition courses, and writing and rhetoric-related departments may prove to be among the most valuable on a college campus. Not only can we help colleges remain solvent, but we can do so while offering engaging learning experiences that help students define better lives for themselves.

Preview of the Conclusion Chapter

In the next and final chapter, I explain how to use my theoretical frame and concrete results to promote persistence through writing. I also offer recommendations for WAC and other administrators, faculty members, and researchers who work across disciplines and departments. These recommendations concern how to engage and retain undergraduates in general and chemistry and English majors in particular.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Since its establishment in the 1970s, writing across the curriculum (WAC) has always been about helping an increasingly diverse body of students navigate and become members of disciplinary communities that have specialized literacy practices (Russell, 2002), and WAC practitioners remain today in advantageous positions to support institutional priorities (Boquet & Lerner, 2016; Melzer, 2014). Writing is central to academic and professional life, but writing has the potential to do much more than enhance learning achievement and disciplinary communication. With writing, identity can be explored and persistence can be supported.

If literacy experiences can prompt disciplinary identity construction, and if those identities signal investment in programs and persistence in college, then WAC programs, composition courses, and writing and rhetoric-related departments stand among the most valuable on a college campus. We help colleges remain solvent, and we do so while, and by, offering engaging learning experiences that help students define better lives for themselves.

What follows now is discussion of the major findings and conclusions drawn from these major findings, including how to use my theoretical frame and concrete results to promote persistence through writing. After the conclusions come recommendations for stakeholders. The dissertation concludes with a final reflection.

Conclusions

Research Question 1

Chemistry majors understand being and remaining in their majors based on a combination of inner strengths and orientations, outside shaping experiences specific to a research-oriented major, and motivators to make chemical reactions and aspects of the world

visible through science and to have a fulfilling career in science. Similarly, English majors understand being and remaining in their majors based on a combination of inner strengths and orientations, as well as outside shaping experiences specific to a major emphasizing individual interpretation, uniqueness, and development. Participants from both majors understand becoming and remaining in their majors based on a combination of inner strengths and orientations, as well as outside shaping experiences, that are unique to aspects of their majors.

A conclusion to be drawn from this finding and interpretation is that, in explaining getting and staying in their majors, students select validating moments. It may be common sense for students that validation should come in the form of their own performed competence in a major as well as personal interest in a major. But competence in a major is defined by disciplinary oldtimers and established measures. Validation most powerfully comes in the form of representatives of that major, mainly teachers, giving encouragement and, importantly, giving grades. While teachers might most saliently represent encouragement or discouragement, often materially by the grades they give, the learning environments should also offer validation of students' competence or belonging. Disciplinary curriculums operationalize learning environments and are most validating when students can carry out coursework over which they can exercise ownership. Ownership over coursework is experienced when students can insert their own interests in their work and when that work supports engagement with immediate or imagined members of their disciplinary communities.

Research Question 2

Chemistry majors understand their writing experiences as being on the writing-in-the-disciplines (WID) side of a WAC-approach continuum, but they also perceive this writing as also a way of processing and learning science content, making them aware of writing to learn (WTL)

or writing as a way of enhancing learning. Meanwhile, English majors understand their writing experiences as intimately connected to themselves, as something they do even outside of class, and of being on the more author-based, WTL side of the WAC continuum maybe without as much practice in WID in the sense of writing to conform to specific genre conventions for specific rhetorical situations. Chemistry and English majors therefore see their writing practices as partly defining their major and the work they do in that major, with English majors writing more for self-development and discovery and chemistry majors writing more to communicate and further understand science.

A conclusion to be drawn from this finding and interpretation is that the disciplinary writing experiences in chemistry and English, as described in this study, reflect different discipline-specific career orientations. Chemistry majors focus on a genre that, while supporting learning, is a specific genre that exists saliently in the science world. The focus is on writing as a way of entering into immediate communities of scientists, but also the rhetorical knowledge chemistry majors develop and can explicate allows them to present themselves as having solid competence in a science field, and thus they may be able to draw on this writing competence to more easily imagine communities to which this writing ability grants them entry. Yet chemistry majors report that writing facilitates learning; other genres of writing with WTL orientations could be integrated into chemistry curriculums to allow chemistry majors to see personal writing as also part of their discipline and not just part of English-major territory. English majors, meanwhile, report focusing on almost no specific genre. Instead, they talk about the purposes of the writing they do, such as reading response, research, and creative expression. The writing that English majors do reflects a career orientation in the major that looks to instill general critical thinking and literacy preparedness for a range of careers, even while students report wanting to

be teachers or writers, professions perhaps at odds with the signature kinds of writing in English participants selected as meaningful. Yet since jobs are concerns for English majors, greater WID experiences and training could take place to stretch the understanding of what English-major writing can look like. The peer-reviewed journal article genre might be used to focus research on links between literary reading and writing and social issues, and arts-based research formats could draw on English majors' interest in stories, poetry, and literary texts.

Research Question 3

Both chemistry and English majors construct themselves as belonging in their majors by referring to character traits that portray them as characters in their narratives that belong in the version of their department and major as they describe it in those same narratives; by taking stances in relation to people, experiences (including disciplinary writing experiences), and environments that work as character foils to further illustrate those character traits conveyed in their narratives and interview responses; and, by imagining futures that add further richness of the account of their engagement with their major.

A conclusion to be drawn from this finding and interpretation is that, in constructing themselves as students suitable for their majors, students select validating moments and experiences. In order to select them, students need to be put into situations where they can experience validation. They must also be put in situations where they can construct themselves in academic life narratives. This construction in narratives allows them to present themselves as continuous characters in their stories who belong in their majors and who might persist in their majors. Writing, as an organizing practice, can be used to help students construct coherent narrated versions of themselves in relation to their majors.

Recommendations

I now offer recommendations for administrators, faculty members, and researchers based on the findings, analysis, and conclusions of this study.

Recommendations for Administrators

WAC practice has long emphasized its ability to support student success in college (Russell, 2002). Signature methods of WAC practice and reach include WAC workshops with faculty across the disciplines, writing-intensive courses, writing centers, interdisciplinary learning communities, and curriculum-based peer writing tutors (Bazerman et al., 2005; McLeod, Miraglia, Soven, & Thaiss, 2001; McLeod & Soven, 1992/2000). Meanwhile, WAC theory has long regarded writing as a way of learning content in a way that supports test performance as well as a way of questioning that same content and its underlying assumptions (Thaiss, 2001).

What I recommend for administration is, first, a reconsideration of how writing also allows for identity work to be done (Ivanič, 1998; Norton, 2010; Scott, 2015). As my study has suggested here, identity construction in relation to a discipline and the departmental conditions and experiences that mediate contact with a discipline fosters and enacts belonging, and belonging remains a powerful predictor of college-student persistence toward graduation (Tinto, 2015). Administrators, then, can build on decades of theorizing in WAC on writing-to-learn (WTL) and learning-to-write (LTW) by stretching the intended and theoretical outcomes of writing in disciplinary classrooms to learn content and of writing disciplinary genres for disciplinary and professional audiences. In doing so, WAC practitioners ought to find themselves in positions to better explain the strategic value of WAC programs to college administration in terms of WAC being able to support student engagement and retention. At the same time, WAC

practitioners can sell writing in faculty workshops in terms of writing's ability to support learning and students' entering specific careers.

WAC practice has long urged WAC directors and practitioners to cooperate with faculty members across campus for guidance on disciplinary-specific writing and the specific rhetorical situations and contexts arising from each new classroom (Bazerman et al., 2005). In furtherance of WAC's commitment to forging alliances across campus, I recommend here that WAC practitioners team up with colleagues in the disciplines to assess the kinds of experiences students are having in different majors and to determine if signature genres are being used that might support students' engagement with immediate and imagined disciplinary communities.

Chemistry department directors, as the data in this study would suggest, would do well to continue the important work of disciplinary writing instruction, including instruction related to the lab-report genre. Chemistry faculty members, however, might further consider how to clarify to STEM students that writing is a central activity to scientists and can include not only science report genres but also persuasive and imaginative genres (Emerson, 2016). While continuing the important work of lab research and co-authoring of research posters and reports between faculty members and chemistry undergraduates, chemistry faculty might also consider complementing disciplinary work with WTL experiences that prompt students to make personal connections to the science they are reporting.

Given the data presented in this study, I recommend that English department directors be aware that first-year English majors may begin constructing themselves as belonging, or not, in the English major in their first-year writing classes. Lacking experiences in upper-level classes, English majors in this study reported looking to who was teaching them and what they were doing in Composition 1. English department faculty may do well to consider how to underscore

English majors as valuable resources in those classrooms while also emphasizing writing as central to all disciplines, while being selective about who is representing the department in those crucial first weeks of an English major's student life.

The academic life narratives of English majors in this study also indicate the importance of remaining aware that recruiting students into the major may depend on presenting various aspects of the field, since some participants entered English from other fields, such as nutrition, computer science, and theater, while one student entered English in order to enhance his pre-law focus. Many students may enjoy creative writing and literary analysis, but some may prefer rhetorical studies and composition.

English departments often promote the wide range of careers English majors may enter via the English major (Matz, 2016). Yet data here suggests that some English majors see themselves becoming teachers or writers whereas the kinds of skills and writing they report having and doing and as being most meaningful to them seem to not be preparing them for these career paths. English departments may choose to explore critically what their classes and the department are doing to prepare students for a range of careers, while working with faculty to determine whether signature genres may assist in helping students enter disciplinary communities both immediately through audience-focused genre writing or imaginative engagement with target disciplinary/professional audiences.

Recommendations for Faculty

The academic life narratives of participants in this study suggest that students' decisions to stay in their majors and in college are significantly related to classroom experiences and grades. That being the case, faculty members may consider how assignments can allow students

to take ownership of the content or form of assignments, and meanwhile consider flexible grading systems that promote personal and intellectual growth through revisions or portfolios.

A new addition to Kuh's (2008) list of high-impact educational practices, ePortfolios have been linked to effective engagement and retention of college students (Moore, 2016; Watson et al., 2016). The ePortfolio may also, however, be considered a collection of identity texts that can be used to prompt students to write in ways that ask them to construct narrated personas that belong in their majors. Writing in the ePortfolio may include chances for students to demonstrate ownership over the form and content of writing, but also it may ask students to specifically reflect on validating moments in their lives that represent evidence that supports the thesis that a student belongs in college or in a major. While serving as a collection of identity texts, the ePortfolio, spanning over a student's academic journey in a major, can also serve as a form of assessment so that WAC programs and individual programs and departments can reflect on the affective outcomes of their learning experiences, especially those outcomes that have bearing on students' engagement and persistence.

One candidate for the kind of writing activity that prompts disciplinary identity construction can be seen in the methodology used in this dissertation, the academic life narrative. The academic life narrative asks students to select meaningful past moments that help explain how they entered their majors. It also asks students to point to meaningful present moments in their majors, thus asking them to reflect on how they fit their majors. Finally, the academic life narrative includes future imaginings. Thus faculty members may consider how ungraded WTL exercises assist in covering course content deeply and efficiently while further considering how WTL and WTL/WID exercises prompt students to imagine themselves as members of their disciplinary communities, either by academic life narrative writing, imaginative dialogues with

famous theorists, signature genres used in the field, or other writing or similar communicative experiences.

Recommendations for Further Research

Future research possibilities include the exploration of how WAC programs—guided also by identity and retention theories—impact retention and instruction across campus. Among these possibilities is research into the impact of writing an academic life narrative on persistence expectations, future-career orientations, and identity. Another question that findings from this study raise is whether chemistry majors’ using writing to reflect upon themselves in narrative genres expands how they define writing, so that chemistry writing is not explained as being less *real* than the kind of writing they perceive English majors as doing. Additionally, this study urges exploration of how English departments are preparing their students in various departmental settings for the wide array of career options often touted on English department homepages. Overall, the relationship between seeing a major’s writing experiences as principally oriented toward WTL or WID and future career expectations needs to be explored, as the implications for pedagogy and curricula design are critically important.

Yet another question worth exploring is to what degree students’ accurate understanding of their disciplines should be emphasized and encouraged. In the present study, some participants (e.g., Ada) seemed to view science as black and white, as fact or speculation, whereas a more accurate view of science may be represented in Kiki’s description of science as involving trial and error and much failure and doubt. Meanwhile, some English majors seemed to have almost fanciful understandings of where creative writing might take them, most clearly illustrated in Warlock’s almost spiritual investment in his creative work. What happens, in other words, when these students encounter disciplinary and department experiences that challenge their academic

life narratives? Longitudinal studies of participants' disciplinary and department experiences, as well as how they present themselves and construct disciplinary identities, would help to answer these and related questions.

A Final Reflection on the Study

Listening to my participants' stories over these months has been a gift. My participants shared their lives with me. I pray I presented them justly.

Each student's story implies a family, a society, and a history. Each story implies countless narratives that make up what each student means to others. Each story implies a group of people, I would suspect, who dedicated parts of their own lives to get any given student to college. The expectation perhaps is that college should be rigorous but that it also should represent a transformational place that helps the student belong and prosper in society. The son, daughter, cousin, grandchild, father, mother, sister, brother, friend, grandfather, grandmother, and so on. It should be a safe place. It should encourage self-empowerment, health, and growth.

I realize my dissertation is only a beginning. Yet what I hope is that this dissertation can advance a view of college as a place where we as a society have agreed to be responsible for each other—and where writing helps that happen.

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Appendix A

Informed-Consent Form

You are invited to participate in a research project that aims to shed light on how college students in your major understand and experience their disciplinary lives. In the study, you will take part in a one-hour interview. You will then be asked to check analysis and conclusions based on your interviews and narratives for accuracy in a second, shorter meeting. Interviewing will be audio-recorded for transcription and analysis. Benefits include getting a better sense of how your life experience connects to your past, present, and future involvement with your major. Outcomes of this study will be used to improve and direct future instruction in your major and across the curriculum.

Your participation will be confidential. If you choose to take part in this study, you will write your name on this Qualtrics form, but in no other place will your real name be used or appear. Neither you nor your institution will be named or referred to in any report about this data. Every effort will be made to protect your privacy. There are no known risks associated with participation in this study.

Students who participate will have access to 3 hours of individualized writing instruction with a PhD student in English. Topics can include CV building, paper development, research writing, writing for scholarly publication, writing to apply for grad school, or another focus of your choice. Your participation in this study is voluntary and is not a requirement related to your studies in your program or department. You are invited to email me at any time if you have questions during participation.

Please consider participating. If you would like to participate, please click the CONSENT button below. It will take you directly to a brief survey where I can gather some information about you. Otherwise, you may WITHDRAW, and I thank you for your time.

Yours,
Justin Nicholes

This project has oversight from the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Email: grad-research@iup.edu / phone number: 724-357-7730).

CONSENT

WITHDRAW

Appendix B

Interview/Autobiographical Writing Protocol

Meeting 1

1. Take a minute and reflect on experiences you had before coming to this college. Then, tell me, how did you come to be [a chemistry/an English] major? What experiences do you think made you choose to be a Chemistry/English major?
2. What were your experiences like with the topic of [chemistry/English] before coming to college?
 - a. What else can you tell me about your past experiences with [chemistry/English] that led you to being here?
3. Could you tell me about some experiences you are having now in the [Chemistry/English] Department?
 - a. What else can you tell me about your experiences in the [Chemistry/English] Department or in your [chemistry/English] classes?

Meeting 2

1. Narrative Summary Member Checking

2. Pre-Instruction Assessment/Interview Questions

1. What were your experiences like with writing in [chemistry/English] before majoring in [chemistry/English] at this college?
 - a. What kind of writing tasks or activities—in or outside of class—did you encounter?
 - b. What were your experiences with those writing tasks or activities?
2. Could you tell me about some writing experiences you have had in your [chemistry/English] major here at this college?

- a. What kind of writing tasks or activities—in or outside of class—did you encounter?
- b. What were your experiences with those writing tasks or activities?

3. Academic Life Narrative Writing

4. Life Narrative Writing Questions

1. What significance do the three scenes you chose in the life narrative writing have for you in relation to your choice of becoming [a chemistry/an English] major?
2. Given what we have talked about so far in this interview, where do you see yourself going in the future? Take a minute and really try to imagine what your future looks like—where you will live, what you will do, what the people around you are like.

5. Individualized Writing Instruction

Further Meetings

At the participant's request, further meetings may take place to reach 3 hours of writing instruction.

Appendix C

Writing Prompt Sheet

Please focus on 3 specific moments or episodes that we just discussed, which were especially memorable or important in relation to your becoming a student in your major. Now, one by one, describe in detail what happened. Who was there, what were you thinking and feeling in the scene, and what significance does each scene have for you? Please write one paragraph for each specific moment or episode you select, for a total of three paragraphs.

1. Please write one paragraph that narrates a significant moment related to you becoming a student in your major.
2. Please write a second paragraph that narrates a significant moment related to you becoming a student in your major.
3. Please write a third paragraph that narrates a significant moment related to you becoming a student in your major.

Appendix D

Chemistry Major Academic Life Story Codes

Table 37

Chemistry Major Academic Life Story Codes

Category	Code	Definition	Examples
1. Character Traits of a Chemistry Major	1a. Interest in Science	Statements of being specially or exclusively interested in science, of it being something participants liked, and it relating to the classes they tried to take the most—maybe leading to such actions as changing major to get into science after realizing where their strengths lay.	<p>“All that stuff always resonated with me while I was growing up.”</p> <p>“The empirical nature of science always was attractive to me, as well as how dynamic the field is. There’s always new research, and that really excites me.”</p>
	1b. Aptitude for Science	References to being good at science/math and/or realizing science simply clicked with a person or fit—as well as being recognized by teachers or established science-field figures as having an aptitude for science.	<p>“I did well in math and chemistry.”</p> <p>“I won first place among undergraduates and graduate students when I presented it for the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers.”</p>
	1c. Science Mindset	References to simply having curiosity, or a mindset or scientific way of seeing the world.	<p>“It was a mindset I found, where I liked how to use the information.”</p> <p>“I see the world as black and white, and that is exactly how science is: It either or it isn’t.”</p>
2. Influential People	2a. Great or Passionate Educator	Reference to a teacher in a science class being “great”—supportive and/or inspirational—as well as going the extra mile by perhaps meeting outside of class and explaining/advising.	<p>“I had a great teacher.”</p> <p>“Doctor Black is also very supportive since he’s our head of AXE too.”</p>
	2b. Supportive Family or Close Friend	References to parents, other family members, or close friends who are not classmates who cultivate, model, or recognize a participant’s interest or ability in science.	<p>“I remember too that, when I was maybe ten or something, my mom would take me to science classes.”</p> <p>“Even my grandparents, who didn’t have a college education, would always take the time.”</p>

	2c. Outside-of-School Scientists	References to having talked to actual working scientists about becoming/being a scientist in the workforce.	“I talked with everyone at that internship and asked them what led them to this career, what majors they had before working there.”
3. Influential Environments	3a. Supportive Learning Environments	Reference to the school or department making changes to support students’ scientific development, meetings students’ needs appropriately given the subject, or creating a positive learning environment.	“In my next chemistry class, there’s 13 people in the lecture, and it’s a very small class, and I can interact with everyone, teacher and students alike, and it’s a great place to learn.”
	3b. Challenging/Demanding Learning Environment	Reference to the school or department presenting a challenging or difficult learning experience.	“Still, I definitely think in science, you have to get used to being beaten down a little bit. You’re going to spend a lot of time writing lab reports, in your room studying things, while maybe your other friends are going to spend a little less time doing that.”
	3c. Lacking/Too-Easy Learning Environments	References to being less prepared or engaged than possible because of school’s or department’s shortcomings.	“My high school didn’t have AP chemistry.”
4. Influential Experiences	4a. Research in Science	References to conducting and/or presenting research as rewarding or life-changing experiences.	“I loved the research lab component of that class.” “the water will hit it, it will expand to steam, and then cause the metal in the water to blow everywhere. I thought, <i>Wow, I almost died. That was cool.</i> ”
	4b. Fun or Engaging Class	References to science classes that were fun, engaging, or intriguing.	“I really liked Organic Chemistry in high school.” “Inorganic is for me, which is what my research is related to now.”
	4c. Going to Science Events and Forums	References to going to museums or school/family field trips and seeing demonstrations in/out of school.	“We also went to Smithsonian museums.” “I was always just so much more interested in the science shows brought into the schools than anything else.”
	4d. Community Outreach for Science	References to going out into the community to present science demonstrations or otherwise support science initiatives.	“They would also try to get us to do things like go out to local schools, and we would put on science shows for people and for kids.”

	4e. Society or Fraternity Participation	References to joining and participating in disciplinary societies or fraternities.	“Doctor Black is also the head of Alpha Chi Sigma, so I see him all the time because I’m the Master Alchemist.”
	4f. Doubt About Major or College	References to not being sure that this major, or going to this or any college at all, was possible, suitable, or desirable.	“And honestly there was a point when I was taking Gen Chem where I was thinking that, if this was all there is, is this really what I want to do?”
5. Motivation for Being a Science Major at This College	5a. Job or Career Outlook	References to choosing to be a science major because the job outlook looked good—perhaps relative to another interest or choice for a possible major—and liking research.	“I was very close to becoming a music major, but the job outlook is not so great.” “Because I wanted to go into forensics.”
	5b. Science Provides a Means or Language to Answer Questions	References to getting into science because it can help answer questions a student always had and/or provide a vocabulary to address questions/problems related to the world.	“Science in my opinion is the perfect field to get those questions answered, and I always wanted to ask more questions.” “You can start to say that something happens because of a specific reaction.”
	5c. The College Had a Program for It	Reference to finally settling on a major because it was offered at the college of choice.	“I ended up going into Chemistry/Pre-Med because they have a program for it here.”
6. Imagined Futures After College	6a. Graduate School	References to imagining themselves getting an advanced degree in their imagined future.	“If I had to say, however, then I’d say see myself in ten years as having completed a master’s degree in some kind of science management program.”
	6b. Still Trying to Figure Out Exact Path	References to still being slightly unsure about the future.	“When I imagine my future, it’s hard. I’m in a big transition point in my life right now. I just decided I don’t want to be doctor, and I am not sure I want to be a fulltime researcher.”
	6c. Working as a Chemist or Researcher in an Undefined Capacity	Reference to imagining oneself being a chemist and/or researcher in a nonspecific role.	“another thing I see myself doing is earning my degree in chemistry or biochemistry (I don’t really know, and it doesn’t really matter). Then I see myself getting a job as a chemist, some sort of analyst, for a while.”
	6d. Working as a Chemist or Researcher in a Defined Capacity	References to imagining themselves using science and research in science for business- or industry-oriented careers; for the government doing science research (e.g., U.S. Food and Drug	“I also see myself executing the business ideas that I have been thinking about.” “I could work in pharmaceuticals, like the Merck plant.”

		Administration [FDA]); for a private drug company researching and developing medication; or for medical or therapeutic areas.	“I see myself teaching people alternative, preventative medicine.”
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Appendix E

English Major Academic Life Story Codes

Table 38

English Major Academic Life Story Codes

Category	Code	Definition	Examples
1. Character Traits of an English Major	1a. Interest in English as a Subject	Statements of being specially or exclusively interested in English, of it being something participants liked, and it relating to the classes they tried to take the most—leading to such actions as changing major to get into English after realizing where their strengths lay.	“English was one of my favorite subjects before college.”
	1b. Interest in Reading, Analyzing, or Discussing Literature	Statements of being interested in reading, analyzing, and/or discussing literature, of it being something they like, of it being something that was engaging to do, and it being the classes they tried to take the most.	“I always knew I liked books. It’s one of those constant things.”
	1c. Interest in Writing	Statements of being interested in writing, of it being something they like, of it being something that was engaging to do, and it being the classes they tried to take the most.	“I have always liked writing a lot.” “I’ve loved writing ever since I was a kid.”
	1d. Aptitude for English	References to being good at English and/or writing, as well as being recognized by teachers or established English-field figures as having an aptitude for English.	“English I did pretty well in those classes.” “Not to boast or anything, but I always found English to be rather easy. I felt like it always came naturally to me.”
2. Influential People	2a. Great or Passionate Educator	Reference to a teacher in an English class being “great”—supportive and/or inspirational—as well as going the extra mile by perhaps meeting outside of class and explaining/advising.	“She taught us a lot, and she made us talk about those books, in a very in-depth way.” “I first realized that English was cool when I had my freshman-year high school teacher.”

	2b. Lazy or Uninspiring Teacher	References to a teacher who seemingly didn't care or was lazy.	"I had a different teacher, and she just didn't care."
	2c. Supportive Family or Close Friends	References to parents, other family members, or close friends who are not classmates who cultivate, model, or recognize a participant's interest or ability in English.	"When my dad got to read to me was always my favorite time of the day." "Reed, my cousin, is the head of the English Department at Cardinal University. He's always had an influence on me."
	2d. Friends or Classmates in the Major	References to having friends who are in English, were planning on going into or were already in English, or were themselves writers.	"I've made quite a few friends here through creative writing. I have one friend here, and every time we hang out, we just write poetry."
	2e. Doubters	Reference to people who doubted a participant should go into English because of the perception that it was not a useful degree.	"My teacher John Hardy was also the one man that told me that the English major was a tough road and that I should reconsider my choice because of restrictions on it nowadays."
3. Influential Environments	3a. Supportive Learning Environments	Reference to learning environments at home, school, or in a specific department meetings students' needs appropriately given the subject or creating a positive learning environment	"And our house was stocked with textbooks." "I had developed some positive feelings toward the English Department even before college, when I first submitted my portfolio to be exempt from Basic Writing."
	3b. Cold/Unsupportive Learning Environments	Reference to learning environments at home, school, or in a specific department	"Plus I didn't really like the whole feel—the vibe—I got from the department."
4. Influential Experiences	4a. Fun or Engaging Class	References to English classes that were fun, engaging, challenging, or intriguing.	"From that English class, I had more respect for English." "getting into that class was probably a really big event for me."

	4b. Boring, Meaningless, Unoriginal Class	References to classes in English or in other departments that were not fun, not engaging, and boring.	“In the class I’m taking now, it feels like a high school English class, so that’s a little disappointing.”
	4c. Submitting Writing for Evaluation	References to submitting writing for evaluation or to be judged.	“You have to send in a portfolio of your work, and back then, when I was about fifteen years old, it seemed really professional to me to send in a portfolio of my work.”
	4d. Participating in Conferences or Literary Events	References to presenting at conferences or going to/participating in literary events, such as book fairs or readings.	“I really like the Lit Night at The Artist’s Hand. It’s getting up in front of people and reading.” “One of the amazing experiences I’ve had has involved presenting at conferences.”
	4e. Doubt About Major or College	References to not being sure that this major, or going to this or any college at all, was possible, suitable, or desirable.	“I thought, I like it, but I don’t know what I’m going to do with it.” “In fact, I don’t think the high school version of myself would have ever thought that I would end up as an English major.”
5. Imagined Futures After College	5a. Teacher or Professor	References to imagining oneself as an English teacher/professor.	“When I’m walking through the department, I imagine myself being in the shoes of my professor someday. It’s the dream job, so I imagine myself hopefully teaching at the college level someday.”
	5b. Writer	References to imagining oneself being a professional writer.	“In a perfect world, I see myself writing fiction professionally.” “I see myself writing. In my future, after college, I see myself writing.”

	5c. Graduate School	References to imagining themselves getting an advanced degree in their imagined future.	“I also do see myself receiving my master’s as well as my doctorate within the next six year after graduating.”
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Appendix F

Chemistry Major Academic Life Story Writing Theme Codes

Table 39

Chemistry Major Academic Life Story Writing Theme Codes

Category	Code	Definition	Example Story Excerpts
Realization	1. Character or Interest Fits Science Career	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a career in science.	Previously I had been turned off to the idea of chemical engineering because I was under the impression that chemists work in the lab and focus on experimentation and research, my area of interest, while engineers were more focused on manufacturing and getting the product ready for mass production.
	2. Character or Interest Fits Science Major	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a major in science.	As I was sitting in class this week, I realized that a chemistry, pre-pharmacy track may be the best major to prepare me for a career in pharmacology. This particular major was crafted specifically for people who are considering pharmacy or pharmacology, with a strong focus in chemistry. To me, it just makes sense to switch to this major, given my love for chemistry.
	3. Science-Major Character	Stories that feature a moment of realization or turning point in which participants see something they had not seen before about their own characters.	I made the realization that, for me, music was not an art. I am not an artist. It can be agreed upon that music is, in fact, a form of art. As I was watching this performance, I saw how incredibly expressive this young musician was. Music for me has always been a science.
	4. Wonder of Science	Stories that feature a moment of realization or turning point in which participants are in awe of or moved by science.	There was a specific science show that I will never forget, the lady who was upfront was showing and teaching us about liquid nitrogen. I thought that was so cool, also there was an experiment involving electrochemistry and this girl used friction and balloons to make someone's hair stand up.
Affirmation	5. Character or Interest Fits Science Career	Stories that serve to reaffirm or restate that participants' characters or interests fit science careers.	now, in my junior year, I am very pleased and satisfied with my undergraduate life as a chemistry major. I now conduct research under Dr. [...], as we study photodynamic therapy. This therapy is an alternative cancer treatment. My cousin, Jamar [...] is what drives me through this research. He was only seventeen years old when he was claimed by cancer. So my ultimate goal is to study cancer therapeutics, which hopes of getting these alternate therapies applied universally.

Appendix G

English Major Academic Life Story Writing Theme Codes

Table 40

English Major Academic Life Story Writing Theme Codes

Category	Code	Definition	Example Story Excerpts
Realization	1. Character or Interest Fits English-Related Career	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a career related to English.	The last moment that pops in my mind is when my teachers would recommend me to a major that involved reading and writing. I knew that I liked writing, so I chose that I'd be a Journalism major. It didn't feel right, and after discussion with my teachers and my family, the idea of teaching arose. That hole that was there with Journalism was filled with English Ed.
	2. Character or Interest Fits English Major	Stories that feature a moment of realization or turning point in which participants see how their characters or interests seem to fit logically with a major in English.	I choose to make it into a storyboard, because I liked the idea of them and I love movies; so this was a small movie in my mind. It was an interesting experience. Because it has a different pov that you have to think about (camera angles and all that stuff). That was actually the assignment that fully convinced me to be an English major.
	3. English-Major Character	Stories that feature a moment of realization or turning point in which participants see something they had not seen before about their own character.	I got into making stories up because of a website my best friend showed me: Fanfiction. It opened my mind to writing, or starting to write the easiest way possible; by making stories out of already existing characters. After I took that first step, I would start creating my own characters.
	4. Wonder of Reading	Stories that feature a moment of realization or turning point in which participants are in awe of or moved by reading.	Khaled Hosseini is my favorite author at the moment. His writing is so powerful, it pulls the reader in to where you feel like you are experiencing, not just observing the story. The imagery he uses in the Kite Runner and A Thousand Splendid Suns is absolutely stunning and when I read those books I was so emotional, and angry, wanted to throw the book down and stop reading, but I just couldn't. I want to be able to affect people with words in that way.
	5. Career Possibilities With English BA	Stories that feature a moment of realization or turning point in which participants learn about the career possibilities	I then felt apprehensive. Switching majors from computer science to English would be a terrible decision. Everyone always said there was no work out there for English majors, that if you wanted a job in this time you went into the hard sciences. I quickly googled jobs that English majors could gain and was wonderfully surprised. There were

		that exist with a BA in English.	opportunities, I just had to have the courage to take them.
Affirmation	6. Character or Interest Fits the English Major	Stories that serve to reaffirm or restate that participants' characters or interests fit the English major.	The fall that I was getting ready to apply to college, my father and I were out at lunch one afternoon and he asked me what programs I was thinking about applying to. He and I both agreed that my strengths were in writing and reading, and that afternoon was the first time I actually voiced my desire to major in English.

Appendix H

Chemistry Major Writing Then and Now Codes

Table 41

Chemistry Major Writing Then and Now Codes

Category	Code	Definition	Examples
1. Types of Science Writing	1a. Lab Report	Utterances about experiences writing lab reports.	"I've definitely written a lot of lab reports. Um it's just the nature of my major."
	1b. Proposal for Research	Utterances about experiences writing research proposals.	"For our 390 seminar we had to do the proposal on our research and also for McNair."
	1c. Essay Exams	Utterances about experiences writing essay exams.	"I mean you'd be asked to do like uh short- short answer long answer kind of questions on certain tests and things."
	1d. Homework Writing	Utterances about experiences writing for homework such as reading responses, content question-and-answers, and background research on a science topic.	"And then the third semester that I'm in now is more so pick a research topic that you're interested in, Do research in that area, Find -- not actual like do a project but like do homework, Like do your homework and find a different -- find a specific project that interests you and then find other research that supports that idea."
	1e. Imaginative Writing	Utterances about creative or imaginative writing.	"I would call it um Nile Nitrogen or like come up with a fake name for it. And then basically create a character from that element."
	1f. Open-Ended Philosophical Arguments	Utterances about writing persuasive papers about large, open-ended questions.	"Your final paper, your thesis paper which isn't really a thesis paper, is largely about academic review of all the things you've learned over the semester and applying it to these really broad questions that don't even have answers."
	1g. Other	Utterances about other writing experiences, such as compare-and-contrast essays, scholarship essays, science fair writing, lab notebook writing, poster writing, and journaling.	"posters are a lot harder to write than you would think because you only have so much space."
2. Feelings Toward Writing	2a. Positive	Utterances of feeling generally positively toward a selected writing experience and/or the product	"And then we had to get up and present it to each other, So that was cool."

		resulting from the experience.	
	2b. Negative	Utterances of feeling generally negatively toward a selected writing experience and/or the product resulting from the experience.	“Annoying. Tasks back in high school and stuff. It was annoying.”
3. Purposes of Writing	3a. Class	Utterances indicating that a selected writing experience was done for class purposes.	“I took every science class my high school offered. Um so I have pretty much all of them, but the only writing I ever did was in my Advanced Biology class.”
	3b. Outside of Class	Utterances indicating that a selected writing experience was done for personal or out-of-class purposes.	“the only thing that I would say that I spent a lot of time and effort into writing was essays for scholarships”
4. Writing Support Influences	4a. Teacher	Utterances about getting writing support from a teacher.	“And our bio profess- teacher in high school was like, “I’m not an English teacher but I want it to be like I want you follow the format in everything, “Like what a good essay should be.”
	4b. Friend or Family	Utterances about getting writing support from a friend or member of one’s family.	“And I had like my grandfather overlook those ‘cause he was a professor himself. So he was able to give me feedback on that kind of stuff?”
	4c. Program	Utterances about getting writing support through participation in a program.	“Like I know how to write these lab reports, And I know how to write a proposal for research? And thanks to the McNair program I really learned how to do that.”
5. Stances in Relation to Writing	5a. Nature and Uniqueness of Science Writing	Utterances about science writing requiring certain elements and audience awareness, as well as being different from English-class writing, regular writing, or actual writing.	“In scientific writing (.) to me is very concise.” “But scientific writing and actual writ- like they’re the same? But they’re totally different things.”
	5b. Nature and Uniqueness of College Science Education	Utterances about college science education being different from that at the high-school level.	“See I didn’t really do labs though in high school. Like we did? But like it wasn’t anywhere in depth as what we do now.”
	5c. Limitations of High School Education	Utterances about participants’ high school experiences, curriculum, or classes not totally preparing them for college science education.	“My high school kind of like had to get all their ducks in a row? Because it was like a brand new high school? So the curriculum definitely wasn’t the greatest. Um the only writing I ever did was

		--”
5d. Nature and Structure of Lab Reports	Utterances about the purpose, structure, and nature of lab reports.	“They’re all pretty: standard um. The- each professor wants something a little bit different, but there’s basic parts. There’s obviously like a title your name date. Then there’s um procedure which you just -- some professors omit that some don’t it’s just a generalized explanation of what you did.”
5e. Benefits of Writing to Learn Science	Utterances about writing enhancing science understanding, thinking, and learning.	“It really: generates a new kind of thinking. Not just for me but for everybody.”
5f. Strategies for Writing or Learning How to Write in Science	Utterances about what strategies can be used to write science or learn how to write science.	“Like get the answer to how it should be written. So it was easy to make improvement and like you had to be self-aware about what you need to improve, especially if you’re me, like I knew I um sometimes would lose patience at the very end.”
5g. Creative Nature of Science and Writing	Utterances about science and writing generally or science writing particularly being creative activities.	“With bio and chemistry they’re both like very creative topics? And I’ve always been like a very creative person.”
5h. Interest in Writing	Utterances about having always been interested in writing generally or science writing particularly.	“I’ve kind of always like a little I guess [been] interested in writing.”
5i. Aptitude for Writing	Utterances about having always had, or seen oneself as having, special aptitude in writing generally or science writing particularly.	“So I’ve always been told that I’m a really good writer.”

Appendix I

English Major Writing Then and Now Codes

Table 42

English Major Writing Then and Now Codes

Category	Code	Definition	Examples
1. Types of English Writing	1a. Short Stories	Utterances about experiences writing fictional short stories.	“Well when I was little I had this little notebook I had where I wrote little spinoff stories from like fairy tales and stuff. And from there I would try to create my own.”
	1b. Poetry	Utterances about experiences writing poetry.	“All my- and then I like over winter break I was trying to write a lot of poetry.”
	1c. Personal Narratives and Memoirs	Utterances about writing personal narratives generally or memoirs particularly.	“There is one I- I recall where- which is you know it was a little more literary because it was recalling my life experiences.”
	1d. Reading Response and Analyses	Utterances about experiences carrying out persuasive, analytical, or reflective writing about assigned nonfictional or fictional readings.	“So in high school all of my English classes had me write papers responding to whatever we were reading? So I remember writing about <i>Macbeth</i> and <i>The Old Man and the Sea</i> and just stuff like that.”
	1e. Papers or Essays (nondescript)	Utterances about experiences writing “papers” or “essays” that are not described in terms of any specific genre.	“Okay well mostly it was just like school work. Like we had to write a paper and that kind of stuff.”
	1f. Research Papers (nondescript)	Utterances about experiences writing “research papers” or “research essays” that are not described in terms of any specific genre.	“And then we had to write a research paper.”
	1g. Blog Posts	Utterances about experiences writing blog posts.	“And then uh and then in another class I had to write- I have to write a blog post like for every class.”
	1h. Other	Utterances about other writing experiences, such as emails, letters, news articles, journal entries, plays, reports, and review essays.	“But like the emails are nice because it’s like you’re writing formally but you’re also writing in your own voice.”
2. Feelings Toward Writing	2a. Positive	Utterances of feeling generally positively toward a selected writing experience and/or the product resulting from the experience.	“But it’s more- at least most of my teachers have been asking more in depth what we think. Or how we interpret it. So that- that definitely makes it better for me. I like writing that kind of stuff.”

	2b. Negative	Utterances of feeling generally negatively toward a selected writing experience and/or the product resulting from the experience.	“I mean [...] this semester not [...] so much. They’ve been kind of more like read this thing and react to it. Which I hate.”
3. Purposes of Writing	3a. Class	Utterances indicating that a selected writing experience was done for class purposes.	“And so I mean and we’re writing not necessarily -- we’re preparing to write in a certain type of criticism for our final paper?”
	3b. Outside of Class	Utterances indicating that a selected writing experience was done for personal or out-of-class purposes.	“All my- and then I like over winter break I was trying to write a lot of poetry.”
4. Writing Support Influences	4a. Teacher	Utterances about getting writing support from a teacher.	“So I think that receiving feedback from Doctor Barnwell and Doctor Zane on the same piece. It was like two different worlds. But um yeah it was really really interesting to get different perspectives that I’m not yet at that point of seeing what they’re seeing.”
5. Stances in Relation to Writing	5a. Interest in Writing	Utterances about having always been interested in writing generally or English-major-associated writing particularly.	“And it’s something I actually enjoy doing today. I love you know writing those papers now.”
	5b. Aptitude for Writing	Utterances about having always had, or seen oneself as having, special aptitude in writing generally or English-major-associated writing particularly.	“I’m always writing. And um you know page after page I’ve gotten very good at it.”
	5c. Nature and Uniqueness of English Writing	Utterances about English-class-related or creative writing requiring certain elements and/or being different from other kinds of writing.	“And I’m sure other professors in other departments care the same way. But it just looks different I think? And I think it’s because English is a very personal kind of major in way that math isn’t.”
	5d. Nature and Uniqueness of College English Education	Utterances about college English education being different from that at the high-school level or in other departments and majors.	“It’s actually really interesting because I haven’t- I was never exposed to all the different types of criticism in high school. And that’s what my English- my Intro to Writing Studies class is focused on, all different types of criticism.”
	5e. Strategies for Writing or Learning How to Write in the English Major	Utterances about what strategies can be used to write for the English major or learn how to write for the English major.	“your paper will be like ten times better if you start writing it not the night before it’s due. Which is a big one. So uh I learned to do that.”
	5f. Limitations of High School Education	Utterances about participants’ high school experiences, curriculum, or classes not totally preparing them for college	“So I- I honestly don’t really have that much writing experience. Before like in high school.”

		English-major education.	
5g. Enjoyment for Freedom in Assignments or the English Major	Utterances about enjoying or especially liking having freedom in terms or topics or guidelines for English-major classes and writing.	“Cause he didn’t set like any rules for it. He was just like it’s a thought paper just think it and write it down. And as long as it’s not a thousand words.”	
5h. High-School Performance or Interests Seeming to Contradict Choice to Become English Major	Utterances that not writing frequently or liking to write before major in English college may seem like a contradiction to participants’ currently being English majors.	“Yeah so like I- when I think back it’s so weird that now I’m like majoring in and hoping to get a job in writing when I never wrote when I was younger.”	
5i. College Instilling Writing Ability or Writing Appreciation	Utterances that being in college and especially in the English major instilled an ability to write and/or an appreciation for what writing could do.	“But yeah. I really- I feel like my writing style’s developed a long way from freshman year to right now, or even to senior year last year. I feel like I really- really learned how to write.”	
5j. Writing as an Aid to Introspection	Utterances about the experience of writing facilitating self-understanding or self-awareness.	“My- it just makes me think more. It makes me think more about you know am I living up to what they taught me.”	
5k. Workshopping or Peer-Reviewing Being Rewarding	Utterances about enjoying or having rewarding experiences with workshopping or peer-reviewing writing.	“I got a lot of information back so I was able to like check what they thought and see whether it was needed or not. And make those kind of changes. So it was a very different experience but I really enjoyed it.”	

Appendix J

Transcription Conventions

Transcription conventions are adopted mainly from Bucholtz (2000):

.	end of intonation unit; falling intonation
,	end of intonation unit; fall-rise intonation
?	end of intonation unit; rising intonation
--	self-interruption; break in the intonational unit
-	self-interruption; break in the word, sound abruptly cut off
<u>underline</u>	emphatic stress or increased amplitude
(.)	pause of 0.5 seconds or less
(n.n)	pause of greater than 0.5 seconds
@	laughter; each token marks one pulse
[]	overlap beginning and end
=	latching (no pause between speaker turns) (p. 1447)