Chapter 3
The Impact of College Students' Interactions with Faculty: A Review of General and Conditional Effects

Young K. Kim and Linda J. Sax

Introduction

Universities and colleges are increasingly under public scrutiny for their effectiveness in educating and graduating students. The National Center for Education Statistics (2014) reports that of first-time undergraduates matriculating to four-year colleges and universities in the fall of 2006, only 59.2 % completed a degree within 6 years (or by 2013). A steady stream of reports and initiatives, including the Spellings Commission report (U.S. Department of Education, 2006) and the Voluntary System of Accountability (McPherson & Shulenburger, 2006), has triggered dialogue among various higher education stakeholders about the quality and value of a college education. State legislators, accreditors, parents, and employers want to know what students are learning in college and how these institutions affect student development. Rising college costs and shrinking public funds have also fueled this concern.

Critical to this conversation is the consideration of the college experiences that facilitate students' learning and development, and student-faculty interaction is perhaps among the most widely heralded college experiences associated with positive college outcomes. Chickering and Gamson (1987) proposed "Seven Principles for Good Practice in Undergraduate Education," one of which was student-faculty interaction. They argued that students' frequent interactions with their faculty members,

Y.K. Kim (✉)
Department of Higher Education, Azusa Pacific University,
Duke Academic Complex 502, Azusa, CA 91702-7000, USA
e-mail: ykkim@apu.edu

L.J. Sax
Graduate School of Education & Information Studies, University of California, Los Angeles,
Moore Hall 3045, Los Angeles, CA 90095-1521, USA
e-mail: lsax@ucla.edu

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both in and out of classes, not only improve student motivation to work harder but to be more engaged in other desired educational experiences. In *What Matters in College? Four Critical Years Revisited*, Astin (1993) also found that student-faculty interaction is positively related to a wide range of college outcomes, including college satisfaction, intellectual and personal development, personality and attitudinal outcomes, and career outcomes. Specifically, he highlighted that faculty interaction is positively associated with "*every* academic attainment outcome" (Astin, 1993, p. 383) included in his study, such as college GPA, degree attainment, graduation with honors, and enrollment in graduate or professional school. Similarly, the first national report of the National Survey of Student Engagement (NSSE, 2000), *the NSSE 2000 Report*, set five national benchmarks for effective educational practice in college, one of which was students' interactions with faculty members. A case study of Kuh, Kinzie, Schuh, Whitt, and associates (2005) investigated about twenty institutions with high scores on the five NSSE national benchmarks and confirmed the importance of meaningful student-faculty interaction to students' "high-quality learning experiences" (p. 207).

Longstanding college impact models also identify faculty members as one of the most influential socializing agents within institutions (Astin, 1984; Pascarella, 1985; Tinto, 1987, 1993; Weidman, 1989). For example, Tinto (1987, 1993) suggests in his theory of student departure that the degree of students' academic and social integration at their institutions determines their voluntary college departure and that integration is largely shaped by their interactions with faculty, both formally in the classroom and informally outside of class. In his general causal model for assessing the effects of college experiences on student outcomes, Pascarella (1985) also situates faculty members as critical institutional agents that contribute to student learning and cognitive development in college.

While numerous empirical studies have supported the theorized favorable link between student-faculty interaction and student outcomes, it is also important to acknowledge that the impact of student-faculty interaction may be conditioned not only by students' demographic characteristics but also by their academic subenvironments. Studies since the 1990s have paid increased attention to the conditional (i.e., differential) effects of student-faculty interaction, specifically how the impact of student-faculty interaction may differ by various student characteristics such as gender (Colbeck, Cabrera, & Terenzini, 2001; Kezar & Moriarty, 2000; Kim & Sax, 2009; Sax, Bryant, & Harper, 2005), race (Cole, 2010; Kim, 2010; Kim & Sax, 2009), and socioeconomic status (Kim & Sax, 2009). Some more recent studies have also expanded the investigation of conditional effects by disaggregating student samples by institutional sub-environments, such as academic majors, departments, or disciplines (Kim, Armstrong, & Edwards, 2015; Kim & Sax, 2011, 2014). Furthermore, consideration of the nature (or type) of student-faculty interaction has been identified as another critical factor that uniquely shapes the outcomes of student-faculty interaction. For example, studies have shown that, despite the general association between faculty interaction and positive student outcomes, some types of student-faculty interaction may have no effect or even negative effects

on student outcomes (Cole, 2007; Kim & Sax, 2009, 2014, 2015; Komarraju, Musulkin, & Bhattacharya, 2010).

Consequently, it seems reasonable to assume that the impact of student-faculty interaction may be *conditional* depending on various influences. However, the field lacks a nuanced understanding of the relationship between student-faculty interaction and student learning and development. This chapter provides a comprehensive review of the literature relevant to the effects of student-faculty interaction among undergraduate students, including general and conditional effects, and proposes a research agenda that will improve our understanding of the theoretical and practical implications of the impact of student-faculty interaction. We begin our review by examining theoretical frameworks used in the current research on the impact of student-faculty interaction. We then highlight the methodology used in these studies, both quantitative and qualitative. Next, we discuss empirical findings on the impact of student-faculty interaction. Finally, we offer conceptual and methodological recommendations for future research in this topic.

Theoretical Approaches to Studying the Impact of Student-Faculty Interaction

In explaining how student-faculty interaction might impact student outcomes, researchers have relied on the underlying principles of various theories and models not only from the field of higher education (i.e., college impact theories and models) but also from other academic disciplines, mostly sociology and psychology. In the following section, we first discuss how the relationship between student-faculty interaction and student outcomes is explained by major college impact models and theories. Then, we discuss how sociological and psychological theories have been used in higher education research on this topic.

Models of College Impact

In American higher education research, college experiences are believed to shape student learning and development. Major works in the college impact literature suggest that interaction with the college environment, such as a student's contact with faculty, is central in shaping his or her college engagement and outcomes (Astin, 1977, 1984, 1993; Kuh et al., 2005; Mayhew et al., 2016; Pascarella, 1980, 1985; Pascarella & Terenzini, 1991, 2005; Tinto, 1975, 1987, 1993; Weidman, 1989). In this review, we discuss four specific college impact models that have been widely used by researchers to explain how student-faculty interaction might impact college student outcomes: (1) Astin's theory of student involvement (1984) and Input-Environment-Outcome (I-E-O) model (Astin, 1991); (2) Weidman's (1989) undergraduate socialization model; (3) Pascarella's (1985) general model for assessing change; and (4) Tinto's (1975, 1987, 1993) theory of student departure.

Astin's Involvement Theory and I-E-O Framework

Astin's involvement theory (1984) and I-E-O (Inputs-Environments-Outcomes) model (1991) have been used widely to explain the effects of student-faculty interaction on college student outcomes. Astin's involvement theory suggests that a student's level of involvement and engagement in college experiences is directly related to his or her learning and development in college (Astin, 1999). Specifically, Astin (1993) asserts that frequent student-faculty interaction is one of the most influential types of student involvement; and it is positively associated with a wide range of student outcomes, including academic achievement, intellectual and personal growth, college satisfaction, and career outcomes. In addition to his involvement theory, Astin's (1991) I-E-O model proposes a methodological framework that allows researchers to assess a less biased estimate of a specific college experience, student-faculty interaction in this case, on student outcomes, taking into account not only student entering characteristics but also institutional environments and other college experiences.

Numerous empirical studies have employed Astin's involvement theory and/or I-E-O (Inputs-Environments-Outcomes) model when they examined the impact of student faculty interaction (e.g., Bowman & Seifert, 2011; Bryant & Astin, 2008; Cole, 2007, 2011; Cole & Espinoza, 2008; Cotton & Wilson, 2006; Einarson & Clarkberg, 2010; Flowers, 2004; Kim, 2010; Kim & Sax, 2009, 2011, 2014, 2015; Kim, Armstrong, et al., 2015; Kim, Chang, & Park, 2009; Lundberg, 2003, 2010, 2014b; Lundberg & Schreiner, 2004; Outcalt & Skewes-Cox, 2002; Pike & Kuh, 2005; Reason, Cox, Quaye, & Terenzini, 2010; Sax, 2001; Strauss & Terenzini, 2007; Umbach & Wawrzynski, 2005; Webber, Krylow, & Zhang, 2013). For example, a series of studies conducted by Kim and Sax (2009, 2011, 2014, 2015) utilized Astin's involvement theory as a conceptual framework and his I-E-O model as a methodological framework to examine the role played by student-faculty interaction on student outcomes. Informed by Astin's involvement theory, their studies assumed that the more students were involved in the interaction with faculty, the more students were likely to learn and develop. Furthermore, based on Astin's I-E-O model, Kim and Sax organized their independent variables in temporal order—i.e., first student inputs, and then college environments and experiences (which include student-faculty interaction)—when predicting student outcomes.

Weidman's Model of Undergraduate Socialization

Weidman's (1989) model of undergraduate socialization suggests that social processes in college, including student-faculty interaction, impact students' affective outcomes (Carter, Locks, & Winkle-Wagner, 2013). That is, students enter college with certain aspirations, values, and aptitudes and then engage in both formal and informal socialization processes with faculty and peers through various academic and social normative contexts (Carter et al., 2013). Subsequently, the socializing influences of faculty and peers allow students to assess the aspirations, values, and

aptitudes that they had when they entered college and either modify or maintain them. Weidman's model also acknowledges that other forces, both inside and outside of the institution, such as student background characteristics, pre-college experience, normative context of the institution, and peer/parental socialization affect the college socialization process and the affective outcomes of college students.

Higher education researchers have used Weidman's model to identify the type and extent of student-faculty interaction that positively influences students' psychosocial outcomes (Cruce, Wolniak, Seifert, & Pascarella, 2006; Dey, 1996; Eagan et al., 2013; Ethington, 2000; Fuentes, Alvarado, Berdan, & DeAngelo, 2014; Kim & Sax, 2014, 2015; Padgett et al., 2010). For example, Fuentes et al. (2014) employed Weidman's model to examine how students' faculty contact in their freshman year influenced their faculty mentorship in the senior year. Guided by Weidman's model, they assumed that student-faculty interaction during the first year of college was the crucial factor of undergraduate socialization process, that this early faculty contact influenced students' experience of faculty mentorship in their senior year, and that pre-college socialization, academic normative contexts, and peer/parental socialization uniquely shaped both the college socialization process (early faculty contact in this case) and the student outcome (faculty mentorship in the senior year). Similarly, Padgett et al. (2010) used Weidman's model to investigate the impact of student socialization on their need for cognition (i.e., desire for purposeful engagement in cognitive activities) and how the impact may differ by students' socioeconomic status and race. The socialization scales used by Padgett et al. included quality of non-classroom faculty interaction, cooperative learning, and meaningful discussions with diverse peers. Informed by Weidman's model, they also accounted for the effects of students' background characteristics (e.g., gender, race, income, first-generation status), pre-college experience (e.g., ACT score), and normative context of institution (e.g., institutional type) when examining the relationship between the quality of non-classroom faculty interaction and need for cognition, the outcome measure of the study.

Pascarella's General Model for Assessing Change

Pascarella (1985) developed a general causal model that included both within- and between-institution characteristics, both of which may affect student learning and cognitive development. Pascarella suggests that student learning and cognitive development are a function of the direct and indirect effects of five major sets of variables (Pascarella & Terenzini, 1991, 2005). When focusing on student-faculty interaction within college, Pascarella's model deals with student-faculty interaction and its relationship to other factors, such as student background and pre-college traits, institutional characteristics, quality of student effort, and learning outcomes (Pascarella & Terenzini, 1991, 2005). His model postulates that student background and pre-college characteristics (e.g., family background, aptitude, personality, achievement, and ethnicity) influence the selection of an institution for which a student applies. Once students attend college, these student input traits, and

institutional characteristics, shape the institutional environment. Finally, all the three clusters influence student-faculty interaction, which in turn affects student learning and development—directly or indirectly—through quality of student effort.

Higher education researchers have widely used Pascarella's model to address the role of student-faculty interaction on students' learning and development (Cruce et al., 2006; Flowers & Pascarella, 2003; Franklin, 1995; Kim & Lundberg, 2016; Kim & Sax, 2011; Kuh & Hu, 2001; Laird & Cruce, 2009; Lundberg, 2003; Pike, Kuh, & Gonyea, 2003; Seifert, Gillig, Hanson, Pascarella, & Blaich, 2014; Strauss & Volkwein, 2002; Whitt, Pascarella, Nesheim, Marth, & Pierson, 2003). For example, Laird and Cruce employed Pascarella's model to guide their study based on the model's applicability to a wide range of student outcomes and its inclusion of student-faculty interaction in relationship to college environments and student outcomes. Using a nationwide undergraduate student sample, Laird and Cruce examined the effect of faculty interaction on students' general education gains and its conditional effects across full-time and part-time students. Guided by Pascarella's model, they incorporated students' demographics, pre-college experiences, and college experiences into their multi-level model that tested the effect of student-faculty interaction on students' general education gains.

Given that Pascarella's model postulates both the direct and indirect relationship between student-faculty interaction and students' learning/development, it is particularly useful for studies on indirect effects of faculty interaction. For instance, Kim and Lundberg (2016) utilized Pascarella's model to develop a hypothesized structural model for the relationship between student-faculty interaction and cognitive skills development among college students. Informed by Pascarella's model, they assumed that faculty interaction is both directly and indirectly (mediated by classroom engagement) related to students' cognitive skills at their senior year. Furthermore, as Pascarella's model suggested, they postulated that not only student input characteristics but also other college experiences are either directly or indirectly associated with student-faculty interaction.

Tinto's Model of Student Departure

Tinto's (1975, 1987, 1993) conceptual model of student departure is the most widely used model for understanding factors that influence college student persistence. In general, his theory suggests that students' degree of integration or community membership determines their voluntary departure. Specifically, Tinto's theory argues that the institutional experiences of students are largely shaped by the academic and social system, and that persistence in college is a function of this academic and social integration. Student-faculty interaction is critical in this academic system and is related to students' academic performance. Accordingly, Tinto's model of student departure asserts that student-faculty interaction helps determine academic integration and can encourage or discourage a student's departure decision. Although Tinto

focuses on the college attrition process, his model has been frequently adopted by studies examining other student outcomes because its fundamental principle is comparable to other student engagement theories (Pascarella & Terenzini, 1991, 2005).

Numerous empirical studies have employed Tinto's (1975, 1987, 1993) conceptual model of student departure to examine the impact of student faculty interaction on college student persistence and other college outcomes (Barnett, 2011; Berger & Milem, 1999; Cole, 2007; Cotten & Wilson, 2006; Crisp & Nora, 2009; D'Amico, Dika, Elling, Algozzine, & Ginn, 2013; Fischer, 2007; Flynn, 2014; Hausmann, Schofield, & Woods, 2007; Jones, Barlow, & Villarejo, 2010; Lundberg, 2003; Mamiseishvili, 2012; Nagda, Gregerman, Jonides, von Hippel, & Lerner, 1998; Phillips, 2001; Strayhorn, 2010; Umbach & Wawrzynski, 2005; Wilson, Smith, Lee, & Stevenson, 2013). For example, guided by Tinto's model, Fischer (2007) incorporated diverse variables that represent student's academic and social integration on campus—one of which was formal academic ties to professors—and investigated the effects of these variables on students' college GPA, college satisfaction, and college departure. She also added, as suggested by Tinto's model, a set of student input (e.g., minority, socioeconomic, and first-generation status) and pre-college experience (e.g., high school GPA, quality of high school infrastructure) variables to her analytic models to address the influence of students' pre-entry attributes on their college experience and outcomes. In another study, Hausmann et al. (2007) examined the role played by students' sense of belonging on their intentions to persist, using Tinto's model as a fundamental research framework for their study. They presumed that students' sense of belonging is significantly determined by their academic and social integration including student-faculty interaction, all of which influence students' institutional commitment and eventually their intentions to persist. Similar to Fischer's study, they included some student background characteristics (e.g., gender, race, financial difficulty, SAT comprehensive score) in their statistical model to explain the possible impact of students' pre-entry attributes on student persistence as well as social/academic integration, sense of belonging, and institutional commitment.

Theories from Sociology or Psychology

In addition to the college impact models and theories discussed above, studies in higher education have also employed some theoretical frameworks from the field of sociology or psychology to understand the meaningful link between student-faculty interaction and student outcomes. Among others, four sociological or psychological theories are particularly useful in explaining the role of faculty in college students' learning and development: (1) socialization theory, (2) social capital theory, (3) social exchange theory, and (4) theory of student validation. We discuss below these theoretical approaches, highlighting their applications to college impact research.

Socialization Theory

Socialization is understood as the process by which individuals acquire the norms, values, knowledge, and skills that allow them to participate and perform successfully in an organized society (Bragg, 1976; Brim, 1966; Dunn, Rouse, & Seff, 1994; Merton, Reader, & Kendall, 1957). College students learn the normative contexts of their institutions through both formal and informal interactions with faculty members; this socialization process improves students' ability to fit into their institution, which in turn leads to positive student outcomes (Tinto, 1975; Weidman, 1989). Socialization theory situates faculty as an important socializing influence in higher education institutions that not only transmits the institutional norms to students but also reinforces the norms via rewards and affirmations during their interactions with students. Most of the college impact models discussed earlier were heavily grounded in socialization theory in their explanation of the hypothesized favorable connection between faculty interaction and student outcomes.

Some studies in higher education have applied socialization theory to the college context to investigate the impact of student-faculty interaction on students' outcomes (Bean & Kuh, 1984; Caboni, Mundy, & Duesterhaus, 2002; Chang, Cerna, Han, & Sàenz, 2008; DeAngelo, 2010; Dey, 1996; Eagan, Herrera, Garibay, Hurtado, & Chang, 2011; Museus & Quaye, 2009; Strayhorn & Saddler, 2009). For example, using socialization theory as a guiding framework of their study, Strayhorn and Saddler (2009) assumed that faculty mentoring is a major component of the socialization process among college students, which eventually promotes students' satisfaction with their institutions. They further postulated that the impact of faculty mentoring is different depending on the nature of the mentoring; hence, they operationalized faculty mentoring in two different measures: formal research-focused mentoring and informal interpersonal mentoring. A few other studies have also highlighted particular aspects of the socialization process that occur through student-faculty interaction, using the concepts of anticipatory socialization (whereby individuals accept and learn norms and values of a future role; Chang et al., 2008; DeAngelo, 2010) and bicultural socialization (whereby members of minority groups adopt both the majority culture and their own culture; Museus & Quaye, 2009).

Social Capital Theory

Social capital refers to social networks among people and the actual or potential resources that result from such networks (Bourdieu, 1985, 1986; Coleman, 1988; Putnam, 2000). In the higher education context, social capital refers to instrumental, productive relationships or networks (Stanton-Salazar, 1997, 2001) that provide access to opportunity or lead to successful student outcomes (Coleman, 1988). That is, social capital theory focuses on instrumental relationships between students and institutional agents, such as faculty, who are able to provide students with various forms of academic and social support (Stanton-Salazar, 2011). The theory posits that the faculty's role as a form of social capital manifests when they actively equip

students with academic and social support, resources, opportunities, and privileges (Stanton-Salazar, 2011).

Several studies have employed social capital theory to examine the impact of student-faculty interaction on college student adjustment, learning, and development (Dika, 2012; Hu & Wolniak, 2010; Nuñez, 2009; Palmer & Gasman, 2008; Soria & Stebleton, 2012; Stanton-Salazar, 1997, 2001, 2011; Strayhorn, 2010; Tovar, 2015; Walpole, 2003; Yosso, 2005). For example, Dika used social capital theory to examine the effects of faculty interaction on students' academic performance. Informed by social capital theory, she considered students' interactions with faculty a form of social capital that potentially contributes to their educational outcomes. Accordingly, she utilized multiple survey items measuring both the quantity and quality of student-faculty interaction to better address the social capital transmitted to students by faculty members.

Social Exchange Theory

Social exchange theory is another lens through which we can understand the underlying mechanisms of student-faculty interaction. Social exchange theory asserts that individuals are more likely to build relationships with those who they believe can offer benefits as they exchange resources and support, and that this involvement in exchange ultimately produces positive personal outcomes (Blau, 1964; Emerson, 1981; Gouldner, 1960; Lawler & Thye, 1999). In the context of student-faculty interaction, social exchange theory suggests that faculty may decide whether or to what degree they form relationships with students based on their perceived balance between the costs and benefits of such a commitment.

While it is not common in college impact literature, a few studies have utilized social exchange theory as a guiding framework for topics on student-faculty interaction (Eagan, Sharkness, Hurtado, Mosqueda, & Chang, 2011; Griffin, 2008; Umbach, 2007). For example, informed by social exchange theory, Eagan et al. (2011) hypothesized that, in the research-focused faculty mentoring context, faculty and students exchange valued resources such as time, knowledge, and labor among each other. They also postulated that faculty members' decisions on such involvement depend on their estimates of potential benefits (e.g., research labor, friendship) in relation to possible costs (e.g., time, energy).

Theory of Student Validation

Rendón's (1994, 1996, 2002) theory of validation has been used to understand college students' affirming and supportive experiences, which mostly occur via interactions with socializing agents within institutions (e.g., faculty members) and how these experiences possibly contribute to student success. Rendón defines validation as interactions with students, faculty, and other institutional agents on campus that enable and confirm students' perceptions of their own capability of learning and

achieving success. While the impact of validation can hold for all students, Rendón argues that validation may be particularly important for the success and persistence of underrepresented, underserved, and/or disadvantaged college students who need additional assistance and support to be involved and integrated into college campus.

Several studies have employed Rendón's (1994, 1996, 2002) conceptual model of student validation to examine the impact of student-faculty interaction on college student learning and development (Acevedo-Gil, Santos, Alonso, & Solorzano, 2015; Barnett, 2011; Lundberg, 2010; Maramba & Palmer, 2014; Terenzini et al., 1994). For example, Acevedo-Gil et al. (2015) used the theory of validation in conjunction with critical race theory as a guiding framework to examine how institutional agents, including faculty members, support the success of Latino/as in the community college setting. Informed by Rendón's construct of student validation, they suggested that faculty's pedagogical practices create learning environments that either validate or invalidate students' perceptions about their cognitive proficiency and ability to learn. In this case, their findings led them to conceptualize a critical race validating pedagogy.

Empirical Research on the Impact of Student-Faculty Interaction

Through the aforementioned review on the theoretical perspectives on the impact of student-faculty interaction, we have learned how various theories and models have uniquely framed the role of faculty in the context of college students' learning and development. Now we turn to a review of the empirical literature examining the impact of student-faculty interaction. We begin by reviewing the methodological approaches used in the research on this topic and then we discuss empirical findings derived from the literature.

There are three criteria for literature selection for this review. First, while there is a broader scope of the literature related to the topic of student-faculty interaction, our review exclusively focused on research that examined the impact of faculty interaction on college student outcomes. Therefore, we only included studies for our review which reported findings on the relationship between at least one student-faculty interaction measure *and* at least one student outcome measure. Also, because the nature and outcomes of faculty interaction for graduate students is different from the interaction for undergraduate students, any studies on student-faculty interaction among graduate students were excluded from our review. Lastly, while we collected 363 studies on student-faculty interaction from the 1960s to 2016, our review predominantly relied on 284 studies published since 2000, with a few exceptions, for a better reflection of interactions between current students and faculty members.

Our literature research procedures included an electronic search using the following five internet databases: Academic Search Premier, EBSCO, PsycINFO, JSTOR, and Project Muse. Key search terms included "student-faculty interaction", "faculty interaction", "student-faculty relationship", "faculty relationship", and "college students." Furthermore, we conducted a manual search of each volume of several major higher education journals—e.g., *Research in Higher Education*, *Journal of Higher Education*, *Review of Higher Education*, *Journal of College Student Development*, and *NASPA Journal*—to ensure the inclusion of all possible empirical studies on this topic. Consequently, our review included 220 quantitative studies, 54 qualitative studies, and 10 mixed-method studies published in 2000 and later.

Quantitative Research

This section provides a review of the quantitative literature relevant to the effects of student-faculty interaction among undergraduate students across the following areas: (1) populations studied, (2) measures of student-faculty interaction, (3) student outcome measures, (4) types of effects, and (5) methodological approaches.

Populations Studied

While sample size varied widely depending on the type of dataset used by studies, research on the impact of student-faculty interaction has predominantly drawn samples from traditional-aged, undergraduate students attending four-year colleges and universities. The majority of the quantitative studies we reviewed have relied on either longitudinal or cross-sectional student samples from multiple institutions with sample sizes ranging from approximately 1,000 to 70,000 students. Some examples of student-faculty interaction studies focusing on traditionally-aged aggregate student samples from multi-institution data include those by Carini, Kuh, and Klein (2006); Cole (2007, 2011); Cruce et al. (2006); Flynn (2014); Fuentes et al. (2014); Kim (2010); Kim and Lundberg (2016); Kim and Sax (2009, 2011, 2014); Kim, Armstrong, et al. (2015); Kuh and Hu (2001); LaNasa, Olson, and Alleman (2007); Lundberg and Schreiner (2004); Pike, Kuh, McCormick, Ethington, and Smart (2011); Sax et al. (2005); and Seifert et al. (2014). Other studies utilized student samples from single institution data with sample sizes of approximately 150 to 1500 (Campbell & Campbell, 1997; Cole & Zhou, 2014; Eimers & Pike, 1997; Johnson, 2014; Nagda et al., 1998; Terenzini, Springer, Pascarella, & Nora, 1995; Theophilides & Terenzini, 1981; Twale & Sanders, 1999).

Some research on this topic has drawn samples from particular student subgroups; those sample sizes tended to be relatively smaller, generally ranging from 100 to 11,000. Many of these studies examined the relationship between student-faculty interaction and select college outcome/s for one or more racial/ethnic

minority groups (Anaya & Cole, 2001; Cole, 2008, 2010, 2011; Cuellar, 2014; DeFreitas & Bravo, 2012; Flowers, 2004; Hausmann et al., 2007; Hausmann, Ye, Schofield, & Woods, 2009; Kim & Conrad, 2006; Kim et al., 2009; Kim, Rennick, & Franco, 2014; Lundberg, 2007, 2010; Lundberg & Lowe, 2016; Mayo, Murguía, & Padilla, 1995; Palmer & Maramba, 2015; Strayhorn & Saddler, 2009; Walpole, 2008). Another significant volume of studies addressed the topic of student-faculty interaction among students in STEM majors, investigating the effect of faculty interaction on student outcomes or other college experiences (Cole & Espinoza, 2008; Eagan et al., 2013; Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012; Gayles & Ampaw, 2014; Griffin, Pérez, Holmes, & Mayo, 2010; Hurtado et al., 2007; Kim & Sax, 2015; Litzler, Samuelson, & Lorah, 2014; Strauss & Terenzini, 2007; Szelényi, Denson, & Inkelas, 2013) or the patterns/predictors of student engagement with faculty (Eagan, Herrera, et al., 2011; Eagan, Sharkness, et al., 2011; Hurtado et al., 2011; Zhao, Kuh, & Carini, 2005). Studies have also investigated the effect of student-faculty interaction on student athletes (Comeaux, 2008; Gayles & Hu, 2009), low income students (Hu, 2010), first-generation students (Inkelas, Daver, Vogt, & Leonard, 2007; McKay & Estrella, 2008; Pike & Kuh, 2005), international students (Kim, Collins, Rennick, & Edens, in press; Mamiseishvili, 2012; Zhao et al., 2005), adult students (Lundberg, 2003), community college students (Chang, 2005; D'Amico et al., 2013; Lundberg, 2014b; Thompson, 2001; Tovar, 2015), and online students (Lundberg & Sheridan, 2015).

Measures of Student-Faculty Interaction

Over the last half decade, student-faculty interaction has been operationalized in a variety of ways in the quantitative literature, mostly utilizing measures from large-scale, multi-institutional surveys of college students. The following section discusses some of these surveys along with specific measurements relevant to student-faculty interaction and their application to empirical studies. Most of these surveys have evolved over time, so our description refers to the most recent version of each survey that we were able to obtain.

The College Senior Survey

The 2016 College Senior Survey (CSS) of the Cooperative Institutional Research Program (CIRP) includes over 20 questions on student-faculty interaction (to view the 2016 and other versions of the CSS instrument, refer to the website: http://heri.ucla.edu/researchersToolsCodebooks_041216.php). Ten of these questions assess the extent to which students received various forms of positive support from faculty, including feedback on academic work, help in achieving professional goals, advice about educational program, and emotional support and encouragement. Survey questions also gauge the frequency of faculty contact, both in and outside of the classroom, such as challenging a professor's ideas in class and communicating

regularly with professors. Other sets of questions address the quality of student-faculty interaction, measuring students' perceptions of their interactions with faculty (e.g., feeling that faculty encouraged to ask questions, agreeing that faculty empowered to learn) or satisfaction with the amount of faculty contact and with their ability to find a faculty/staff mentor. Recent studies that used measures of student-faculty interaction from the CSS include Cole (2007, 2011); Cole and Espinoza (2008); Eagan, Herrera, et al. (2011); Kim and Conrad (2006); Kim and Sax (2014, 2015); Kim et al. (2009); and Sax et al. (2005). The CIRP also measures students' interactions with faculty on the Your First College Year (YFCY) survey, with emphasis on the nature of those interactions in the first year of college (to view the 2016 and other versions of the YFCY instrument, refer to the website provided above for the CSS).

The National Survey of Student Engagement

The 2016 National Survey of Student Engagement (NSSE) instrument contains six questions on student-faculty interaction (to view the 2016 and other versions of the NSSE instrument, refer to the website: http://nsse.indiana.edu/html/survey_instruments.cfm). Four of the questions assess the frequency of faculty contact on the following items: talking about career plans with a faculty member, working with faculty on activities other than coursework, discussing topics or ideas with faculty outside of class, and discussing academic performance with faculty. Another NSSE question gathers the information on students' research engagement with faculty (i.e., working with faculty on a research project), though notably it gauges both actual and *anticipated* interactions. A set of the NSSE questions also asks students to indicate the quality of their interaction with different types of socializing agents on campus, including faculty members. Some examples of studies that employed student-faculty interaction measures from the NSSE instrument are: Carini et al. (2006); Dika (2012); Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008); LaNasa et al. (2007); Lundberg (2012); Lundberg and Lowe (2016); Pike et al. (2011); Umbach and Wawrzynski (2005); and Webber et al. (2013).

The College Student Experiences Questionnaire

The College Student Experiences Questionnaire (CSEQ) includes an intensive set of questions related to student-faculty interaction (to view the CSEQ instrument, refer to the website: http://cseq.indiana.edu/cseq_generalinfo.cfm). Though annual administration of the CSEQ ended in 2014, for several decades the instrument collected information on students' interactions (or experiences) with their faculty. The most recent CSEQ included questions on: academic interaction (e.g., talking with instructor about course, discussing academic program with faculty, asking instructor for comments about academic performance, discussing ideas for a term

paper with faculty), personal interaction (e.g., talking with faculty about personal concerns), outside of class interaction (e.g., socializing with faculty outside of class, discussion with faculty outside of class), research engagement with faculty (e.g., working with faculty on research), and elevated academic effort due to faculty contact (e.g., working harder as a result of instructor feedback, working harder to meet instructor's expectations). Some empirical studies that used measures of student-faculty interaction from the CSEQ include Anaya and Cole (2001); Cole (2010); Flowers (2004); Kuh and Hu (2001); Lundberg (2003, 2007, 2010); Lundberg and Schreiner (2004); Rocconi (2010); Strayhorn (2010); and Strayhorn and Saddler (2009).

The University of California Undergraduate Experience Survey

The 2014 University of California Undergraduate Experience Survey (UCUES)—also known as the Student Experience in the Research University (SERU)—is another multi-institutional survey of college students, and it includes almost 20 questions relevant to student-faculty interaction (to view the 2014 and other versions of the UCUES/SERU instrument, refer to the website: http://studentsurvey.universityofcalifornia.edu/admin/survey.html). The survey gathers information on student background characteristics, academic and personal development, college experiences, satisfaction, and evaluation of the major (Brint, Douglass, Flacks, Thomson, & Chatman, 2007) from a consortium of large, research universities including nine University of California (UC) campuses and 15 other institutions nationwide. The UCUES/SERU instrument contains a wide range of questions about students' faculty contact, including frequency of contact, degree and nature of research engagement with faculty, degree of faculty supportiveness, and satisfaction with faculty. Specifically, the instrument solicits information about the frequency of various forms of faculty interaction: academic interaction (e.g., taking a small research-oriented seminar with faculty, interacting with faculty during class sessions), out of class interaction (e.g., talking with instructor outside of class, working with faculty on an activity other than course work), and elevated academic effort due to faculty contact (e.g., raising standard for acceptable effort to meet the high standards of faculty). The UCUES/SERU instrument includes three items about the degree and nature of research engagement, including whether students assisted faculty with research as a volunteer, for course credit, or for pay, as well as three additional items concerning whether students worked on creative projects with faculty for the same reasons. The survey also acknowledges the students' perceptions of their interactions with faculty by including not only questions about the degree of faculty supportiveness but also their satisfaction with academic advising and accessibility to faculty. Although relatively few, some quantitative studies employed measures of student-faculty interaction from the UCUES/SERU: Kim and Lundberg (2016), Kim and Sax (2009, 2011), Kim, Franco, and Rennick (2015), Kim et al. (2014, 2015).

The National Longitudinal Survey of Freshmen

It is also noteworthy that the National Longitudinal Survey of Freshmen (NLSF) contains some questions about student-faculty interaction (for more information on the NLSF, refer to the website: http://nlsf.princeton.edu/). The NLSF, housed at Princeton University, is a multi-wave longitudinal survey of approximately 4000 students from 28 selective institutions. The survey was administered to students in waves at five different time points (i.e., at the beginning of the first year, and end of the first through fourth year of college) and gathered an extensive amount of information on students' backgrounds, high school experiences, college experiences, and their college outcomes. Waves 2 and 3 of the survey include the same five questions about student's academic engagement with faculty (e.g., asking professors questions in class, approaching professors after class to ask questions) and also includes questions about *negative* form of faculty contact, such as students' perceptions of faculty prejudice (e.g., professor made me uncomfortable because of my race or ethnicity; I felt that I was discouraged by professor from speaking out in class because of my race or ethnicity). While wave 4 of the survey includes a question about students' time devoted to meeting with faculty, wave 5 of the survey includes an item on satisfaction with faculty and some items concerning students' perceived importance of faculty interaction. Using student-faculty interaction measures from wave 2 of the NLSF, Fischer (2007) found that students' academic interaction with faculty was associated with higher college GPA and that this positive association held for all four racial groups included in the study (i.e., White, Asian, Hispanic, and Black).

The Wabash National Study of Liberal Arts Education

The Wabash National Study of Liberal Arts Education (WNSLAE) is another multi-institutional research initiative in the field of higher education (to view the WNSLAE survey instruments, refer to the website: http://www.liberalarts.wabash.edu/study-instruments/). As part of a broader study to assess liberal arts education that is sponsored by the Center of Inquiry in the Liberal Arts at Wabash College, the WNSLAE utilized a large-scale, longitudinal research design to investigate college experiences and environments that contributed to cognitive and psychosocial outcomes of liberal arts education. The WNSLAE precollege survey was administered in fall 2006 to collect information on students' demographic and background characteristics, their pre-college experiences, and pre-test measures of outcomes of liberal arts education; the follow-up surveys were administered in both 2007 and 2010, using the NSSE instrument and the WNSLAE Student Experiences Survey. The WNSLAE follow-up surveys included over 30 questions about faculty interaction and gathered the following information: frequency of faculty contact (e.g., discussing ideas with faculty members outside of class, working with faculty on activities other than coursework), academic challenge provided by faculty (e.g., faculty asked

challenging questions in class, faculty asked to argue for or against a particular point of view), prompt feedback (e.g., faculty provided prompt written or oral feedback on academic performance), faculty attitudes toward students and teaching (e.g., faculty are genuinely interested in students, faculty are genuinely interested in teaching), and student perceptions of the quality of faculty interaction outside of classroom (e.g., non-classroom faculty interaction have had a positive impact on personal growth, non-classroom faculty interaction have had a positive impact on intellectual growth). Some studies that used measures of student-faculty interaction from the WNSLAE surveys include Bowman (2010); Bowman and Seifert (2011); Mayhew, Seifert, and Pascarella (2010); Padgett, Johnson, and Pascarella (2012); and Seifert et al. (2014).

The National Study of Living-Learning Programs

The National Study of Living-Learning Programs (NSLLP) also includes some measures of student-faculty interaction (for more information on the NSLLP, refer to the website: http://drum.lib.umd.edu/handle/1903/8392). Funded by the National Science Foundation (NSF), Association of College and University Housing Officers International (ACUHO-I), College Student Educators International (ACPA), and Student Affairs Administrators in Higher Education (NASPA), the NSLLP examined the impact of living-learning (L/L) programs on student outcomes. The NSLLP administered an initial survey in 2004 when students entered college and a follow-up survey in 2007 when students were in their fourth year of college. The 2007 NSLLP survey included four questions about course-related faculty interaction (e.g., asking instructor for information related to course, working with instructor involving research) and three question about faculty mentorship (e.g., discussing personal concerns with instructor, discussing career plans with instructor). Some empirical studies that used measures of student-faculty interaction from the NSLLP survey include: Inkelas et al. (2007); Johnson et al. (2007); Soldner, Rowan-Kenyon, Inkelas, Garvey, and Robbins (2012); Szelényi and Inkelas (2011); and Szelényi et al. (2013).

Student Outcome Measures

In college impact research, student-faculty interaction is typically conceptualized as a factor that contributes to students' learning and development during college; hence, the majority of quantitative studies have used the measures of faculty interaction described above as independent variables in relationship to various types of student outcome measures (i.e., dependent variables). Consequently, at this point it is important to analyze the nature of outcome variables that have been studied in research on the impact of student-faculty interaction. Our review identified the following seven types of student outcome measures prevalent in this area of research: (1) academic achievement, (2) college persistence, (3) cognitive

outcomes, (4) affective outcomes, (5) civic outcomes, (6) spiritual outcomes, and (7) vocational outcomes. A review of these outcomes and specific measures that have been used to assess them is discussed below.

Academic Achievement

A significant body of literature has focused on students' academic achievement as an outcome of student-faculty interaction. The majority of these studies have examined the impact of faculty interaction on college GPA (e.g., Anaya & Cole, 2001; Clifton, Perry, Roberts, & Peter, 2008; Comeaux, 2008; Cole, 2008, 2010, 2011; Dika, 2012; Gordon, Ludlum, & Hoey, 2008; Kim, 2010; Kim & Sax, 2009; Kim, Armstrong, et al., 2015; Kim et al., 2009, 2014; Komarraju et al., 2010; LaNasa et al., 2007; Micari & Pazos, 2012; Sax et al., 2005; Tovar, 2015; Vogt, Hocevar, & Hagedorn, 2007; Webber et al., 2013). Some studies also examined the impact of faculty interaction on degree attainment (Flynn, 2014; Gayles & Ampaw, 2014; Kim & Conrad, 2006; Sax et al., 2005) or study progress as measured by number of credits earned (Meeuwisse, Severiens, & Born, 2010).

College Persistence

Also noteworthy is the favorable relationship between student-faculty interaction and college persistence. Mostly informed by Tinto's (1987, 1993) model of student departure, studies have suggested that frequent student-faculty interaction might strengthen the tie between students and their institution, consequently increasing the likelihood of student persistence (Barnett, 2011; Chang, Eagan, Lin, & Hurtado, 2011; Chang et al., 2008; Crisp, 2010; DeAngelo, 2014; Fischer, 2007; Flynn, 2014; Gordon et al., 2008; Hausmann et al., 2007; Jones et al., 2010; Mamiseishvili, 2012; Tovar, 2015).

Cognitive Outcomes

Cognitive or intellectual abilities and skills are among the most desired college student outcomes given their "applicability and utility across a wide range of different content areas" (Pascarella & Terenzini, 2005, p. 155); these abilities and skills have been considered some of the key byproducts of student-faculty interaction. Studies have examined the impact of faculty interaction on general cognitive/intellectual skills or development (Einarson & Clarkberg, 2010; Flowers, 2004; Good & Adams, 2008; Kim & Lundberg, 2016; Kim & Sax, 2011; Kim et al., 2009, 2014, in press; Kuh & Hu, 2001; Laird & Cruce, 2009; Lundberg, 2007, 2010, 2012, 2014a, 2014b; Lundberg & Lowe, 2016; Lundberg & Sheridan, 2015; Pike et al., 2011; Strauss & Volkwein, 2002; Umbach & Wawrzynski, 2005), thinking, writing, or reading skills

(Cabrera, Colbeck, & Terenzini, 2001; Cruce et al., 2006; Flowers, 2004; Kim & Sax, 2009; Kim, Armstrong, et al., 2015; Padgett et al., 2012; Seifert et al., 2014), and design or analytical skills (Lambert, Terenzini, & Lattuca, 2007; Strauss & Terenzini, 2007). Other studies have utilized self-reported learning (Gayles & Hu, 2009; Lundberg, 2003, 2007; Lundberg & Schreiner, 2004) or subject-specific skills or gains in areas such as science and math (Cruce et al., 2006; Flowers, 2004; Kuh & Hu, 2001; Lundberg, 2010, 2014b; Thompson, 2001) as outcomes of student-faculty interaction.

Affective Outcomes

Not only is student-faculty interaction examined in relationship with academic or cognitive outcomes, this interaction has also been considered a predictor of positive affective outcomes among college students. Examples of affective outcomes predicted by faculty interaction include college satisfaction (Einarson & Clarkberg, 2010; Kim & Sax, 2009; Kim, Armstrong, et al., 2015; Kim et al., 2009; LaNasa et al., 2007; Martin, 2012; Outcalt & Skewes-Cox, 2002; Sax et al., 2005; Strayhorn, 2010), academic/personal self-concept (Cole, 2007, 2011; Cuellar, 2014; Gayles & Hu, 2009; Kim & Sax, 2014, 2015; Komarraju et al., 2010; Litzler et al., 2014; Sax et al., 2005), social/personal skills or development (Cabrera et al., 2001; Flowers, 2004; Kim et al., 2009, 2014, in press; Lambert et al., 2007; Lundberg, 2012, 2014a, 2014b; Lundberg & Lowe, 2016; Lundberg & Sheridan, 2015; Strauss & Terenzini, 2007), and educational aspiration (Kim, 2010; Kim & Sax, 2009; Kim, Franco, et al., 2015; Sax et al., 2005). Some research has also focused on psychosocial traits as an affective outcome of student-faculty interaction, including psychological well-being (Bowman, 2010; Padgett et al., 2012; Sax et al., 2005), sense of belonging (Hausmann et al., 2007; Johnson et al., 2007; Meeuwisse et al., 2010), motivation (Komarraju et al., 2010), coping strategies (Clifton et al., 2008), and academic control (Clifton et al., 2008).

Civic Outcomes

Research on student-faculty interaction has also examined its impact on civic outcomes among college students. These studies investigated how student-faculty interaction was associated with students' political orientation and engagement (Dey, 1996; Kim et al., 2009; Sax et al., 2005), civic abilities or attitudes (Cole & Zhou, 2014; Dugan & Komives, 2010; Kim et al., 2009, 2014, in press), cultural/social awareness (Gayles & Hu, 2009; Kim & Sax, 2009; Kim, Armstrong, et al., 2015; Reason et al., 2010), and racial tolerance (Kim, 2010).

Spiritual Outcomes

Recent studies have also tapped into various measures of spiritual outcomes of college students to examine the association between faculty interaction and these outcomes. In a national, longitudinal study, Astin, Astin, and Lindholm (2011) assessed how different aspects of faculty interaction—i.e., faculty focus on spirituality, faculty encouragement of search for meaning and purpose, faculty encouragement of religious/spiritual discussion, talking with faculty outside class—were associated with a wide range of spiritual outcomes, including spiritual quest, equanimity, charitable involvement, ethnic of caring, ecumenical worldview, religious commitment, religious engagement, and religious/social conservatism. Similarly, some other studies have investigated the effect of student-faculty interaction on college students' spiritual identification and spiritual quest (Bowman & Small, 2010, 2013), religious tolerance and spiritual/religious growth (Bryant & Astin, 2008), and development of an ethic of care (Fleming, Purnell, & Wang, 2013).

Vocational outcomes

Some studies have also examined how students' vocational outcomes are predicted by their interactions with faculty. Examples include studies that assessed the impact of faculty interaction on vocational or career preparation (Flowers, 2004; Kuh & Hu, 2001; Lundberg, 2014b), occupational awareness (Cabrera et al., 2001), job placement (Gordon et al., 2008), and career choice (Sax et al., 2005).

Types of Effects

We learned from the aforementioned review on student outcome measures that research on this topic has examined the *impact* or *effect* of student-faculty interaction on various aspects of college students' learning and development. We now turn to examine how the effect of student-faculty interaction has been framed in the quantitative literature. Our review suggests that these can be categorized as general effects, conditional effects, direct/indirect effects, and reciprocal effects, acknowledging that there may be some overlap in these categories. These effects are discussed below in terms of the nature of the effect and its application to empirical studies.

General Effects

College impact research has well-established the *general* positive effects of student-faculty interaction on student outcomes utilizing aggregate student samples that do not distinguish among student subgroups as defined by gender, race/ethnicity, or

other characteristics. Using undergraduate aggregate samples of four-year institutions, studies have examined the link between student-faculty interaction and a wide range of student outcomes, as discussed in the prior section.

Research has also investigated the general effect of student-faculty interaction using aggregate samples of particular student groups. The majority of these studies have drawn samples from a specific racial group of students, such as African American students (Cole, 2011; Flowers, 2004; Kim & Conrad, 2006), Asian American students (Kim et al., 2009), Latino students (Anaya & Cole, 2001; Kim et al., 2014; Tovar, 2015), Native American students (Lundberg, 2007; Lundberg & Lowe, 2016), and White students (Strayhorn, 2010). Other studies have examined the general effect of faculty interaction, focusing on aggregate samples of community college students (Barnett, 2011; Lundberg, 2014b; Thompson, 2001), student athletes (Comeaux, 2008; Gayles & Hu, 2009), online learners (Lundberg & Sheridan, 2015), international students (Kim et al., in press; Mamiseishvili, 2012), and STEM students (Cabrera et al., 2001; Chang et al., 2008, 2011; Eagan, Sharkness, et al., 2011; Gayles & Ampaw, 2014; Lambert et al., 2007; Litzler et al., 2014; Litzler & Young, 2012; Strauss & Terenzini, 2007).

Conditional Effects

Although higher education research in this area has historically focused on *general* effects of faculty interaction, studies in the past a few decades have begun paying attention to *conditional* effects of students' contact with faculty using disaggregated student subsamples to better understand how the relationship between student-faculty interaction and student outcomes varies across different student subgroups. Studies have tested the differential effects of student-faculty interaction depending on various student characteristics such as gender (Clifton et al., 2008; Colbeck et al., 2001; Cruce et al., 2006; Dika, 2012; Kim & Sax, 2009, 2015; Mayhew, Grunwald, & Dey, 2005; Salisbury, Paulsen, & Pascarella, 2010; Sax, 2001; Sax et al., 2005; Seifert et al., 2014), race/ethnicity (Cole, 2010; Cruce et al., 2006; Einarson & Clarkberg, 2010; Johnson et al., 2007; Kim, 2010; Kim & Sax, 2009; Lundberg, 2012; Lundberg & Schreiner, 2004; Mayhew et al., 2005; Meeuwisse et al., 2010; Salisbury, Paulsen, & Pascarella, 2011), and first-generation status (Dika, 2012; Kim & Sax, 2009; Padgett et al., 2010, 2012). Research has also investigated the conditional effect of student-faculty interaction by other types of student characteristics such as age (Lundberg, 2003), social class (Kim & Sax, 2009), class standing (Dika, 2012; Pike et al., 2011; Umbach & Wawrzynski, 2005; Webber et al., 2013), enrollment status (i.e., full time versus part time; Laird & Cruce, 2009), and profile of sports (within student athletes sample; Gayles & Hu, 2009).

Another category of studies has examined the conditional effect of student-faculty interaction with disaggregated student samples by academic environments. For example, Cuellar (2014) and Cruce et al. (2006) investigated how the effect of

student-faculty interaction differed by the type of institution students attended. Other studies also tested the differential effect of student-faculty interaction, depending on academic majors (Kim & Sax, 2011, 2014; Kim, Armstrong, et al., 2015) and living arrangement (Inkelas et al., 2007; LaNasa et al., 2007).

Direct and Indirect Effects

Studies on this topic have also examined both the direct and indirect effects of student-faculty interaction to identify variables that may mediate the relationship between student-faculty interaction and student outcomes (e.g., Crisp, 2010; Fuentes et al., 2014; Good & Adams, 2008; Kim & Lundberg, 2016; Meeuwisse et al., 2010; Vogt et al., 2007). For example, Kim and Lundberg (2016) tested both direct and indirect effects of student-faculty interaction to examine whether psychosocial factors (i.e., academic self-challenge, sense of belonging) and/or classroom engagement mediate the favorable link between such interaction and students' cognitive skills development. Similarly, Crisp (2010) investigated how academic/social integration and/or institutional commitment possibly intervene the relationship between faculty mentorship and students' intention to persist by testing the direct and indirect effect of the mentorship.

Reciprocal Effects

While traditional college impact models—such as Astin's involvement theory (Astin, 1984) and I-E-O model (Astin, 1991), Tinto' (1987, 1993) model of college departure, or Pascarella's (1985) general causal model—have generally shared an assumption that the college experience in general, and student-faculty interaction in particular, influence student outcomes rather than vice versa, a few studies have addressed the reciprocal effects of faculty interaction assuming the possible bidirectional influences between the interaction and student outcomes (Bean & Kuh, 1984; Iverson, Pascarella, & Terenzini, 1984; Kim, 2006, 2010). In other words, they consider whether certain student experiences or outcomes both *lead to* and *result from* interactions with faculty.

Methodological Approaches

The quantitative literature has used a wide range of descriptive and inferential statistics to address the relationship between student-faculty interaction and student outcomes, and our review suggests that there are four major categories of methodological approaches used by this area of research: (1) regression analysis including ordinary least squares (OLS) regression, logistic regression, and two-stage least

squares (2SLS) regression; (2) hierarchical linear modeling; (3) structural equation modeling; and (4) ANOVA statistics. A review of these major categories is discussed below.

Ordinary Least Squares (OLS) Regression

The majority of quantitative studies regarding student-faculty interaction has utilized ordinary least squares (OLS) regression to examine the net effect of faculty interaction on desired student outcomes, controlling for a set of relevant confounding variables such as students' demographic and background characteristics, college environment, academic major, and other types of college experiences. Some studies used longitudinal data to conduct OLS regression, which allowed researchers to estimate the effect of student-faculty interaction on the *change* or *growth* in select student outcomes (e.g., Bowman, 2010; Cole, 2008, 2011; Comeaux, 2008; Dey, 1996; Kim et al., 2009; Sax, 2001; Sax et al., 2005; Seifert et al., 2014). Other studies were more cross-sectional in nature and investigated the relationship between student-faculty interaction and student outcomes at a certain time point (e.g., Anaya & Cole, 2001; Cruce et al., 2006; Dika, 2012; Flowers, 2004; Einarson & Clarkberg, 2010; Inkelas et al., 2007; Johnson et al., 2007; Kim & Sax, 2009; Kim, Armstrong, et al., 2015; Kim et al., 2014; Komarraju et al., 2010; Kuh & Hu, 2001; LaNasa et al., 2007; Lundberg, 2007, 2010, 2012, 2014a; Lundberg & Lowe, 2016; Lundberg & Schreiner, 2004; Lundberg & Sheridan, 2015; Strauss & Terenzini, 2007; Strayhorn, 2010; Tovar, 2015). Research has also employed OLS regression to examine the predictors of student-faculty interaction—i.e., student characteristics and college environments that facilitate or hinder student-faculty interaction (e.g., Chang, 2005; Cole, 2007; Gayles & Hu, 2009; Kim et al., 2009; Kuh & Hu, 2001; Wawrzynski & Jessup-Anger, 2010; Wenglinsky, 1996).

Logistic Regression

Where researchers have utilized binary or multinominal measures of student outcomes as they relate to student-faculty interaction, they have often employed logistic regression for their data analysis. For example, studies have examined how the frequency of or satisfaction with faculty interaction contributed to students' persistence or degree attainment (Chang et al., 2008; DeAngelo, 2014; Gayles & Ampaw, 2014; Jones et al., 2010), college dropout (Fischer, 2007), intent to study abroad (Salisbury et al., 2010, 2011), overall college satisfaction (Outcalt & Skewes-Cox, 2002), and degrees of commitment to degree completion (Litzler & Young, 2012). In some studies, student-faculty interaction measures were embedded in academic integration/engagement factor scales; the relationship between the factor scales and persistence/degree attainment was estimated using logistic regression (Flynn, 2014; Mamiseishvili, 2012)

Two-Stage Least Squares (2SLS) Regression

While most studies in this area of research have generally hypothesized the unidirectional effect of student-faculty interaction on student outcomes, a few studies have examined the reciprocal nature of student-faculty interaction and college outcomes using two-stage least squares (2SLS) regression (Bean & Kuh, 1984; Iverson et al., 1984; Kim, 2006, 2010). Unlike OLS regression, 2SLS regression tests nonrecursive causal models, which allows researchers to estimate the causal directions between variables (Asher, 1983; Berry, 1984; Duncan, 1975). For instance, using a nonrecursive causal model and 2SLS regression, Kim (2010) found that the relationship between student–faculty interaction and college GPA tends to be bidirectional (reciprocal) rather than unidirectional, suggesting that higher levels of interaction with faculty improve student's college GPA, and the enhanced college GPAs facilitate more frequent interactions with faculty.

Hierarchical Linear Modeling

For more than a decade, higher education literature has grown to include the multilevel, hierarchical structure of college student data and has employed hierarchical linear modeling (HLM) in order to better estimate individual- and cross-level effects of college experiences. The following studies have utilized a range of HLM techniques to examine the relationship between student-faculty interaction and college outcomes: two-level HLM where students are nested within either academic majors or institutions (Bowman & Small, 2010; Cole, 2007; Jessup-Anger, 2012; Kim & Sax, 2011; Laird & Cruce, 2009; Pike et al., 2011; Strauss & Volkwein, 2002; Umbach & Wawrzynski, 2005), cross-classified multilevel modeling where students are cross-nested by academic majors and institutions (Kim & Sax, 2014, 2015), and individual growth modeling (Hausmann et al., 2007). Researchers have also used hierarchical generalized linear modeling (HGLM) or hierarchical non-linear models (HNLM) to test the effect of student-faculty interaction on binary or multinominal measures of student outcomes (Chang et al., 2011; Eagan et al., 2013; Eagan, Sharkness, et al., 2011; Hurtado, Cabrera, Lin, Arellano, & Espinosa, 2008; Kim & Conrad, 2006). Furthermore, in some studies, HLM was employed to identify those student- and institution-level variables which predict the frequency of student-faculty interaction (Eagan, Herrera, et al., 2011; Laird & Cruce, 2009; Pike et al., 2011).

Structural Equation Modeling

A few studies have added to the literature on student-faculty interaction by utilizing structural equation modeling (SEM) to examine both direct and indirect effects of faculty interaction on student outcomes (Crisp, 2010; Fuentes et al., 2014; Good & Adams, 2008; Kim & Lundberg, 2016; Meeuwisse et al., 2010; Vogt et al., 2007).

As an extension of the general linear model, SEM allows researchers to test more than one regression equation simultaneously, which helps uncover the complex dynamics among student-faculty interaction, student outcomes, and other related variables. For example, Kim and Lundberg (2016) used SEM to examine how students' academic self-challenge, sense of belonging, and classroom engagement mediated the positive link between faculty interaction and their cognitive skills development. Similarly, Crisp (2010) used SEM to investigate the direct and indirect relationships of faculty mentorship, academic integration, institutional commitment, and intent to persist.

ANOVA Statistics

Quantitative studies regarding student-faculty interaction have often used a range of analysis of variance techniques such as ANOVA, ANCOVA, and MANCOVA. While other statistics discussed earlier are mainly interested in examining the relationship between student-faculty interaction and desirable college outcomes, taking into account the confounding effects of other relevant variables, ANOVA statistics were mostly used to compare the patterns of student-faculty interaction across different student subgroups. For example, studies have employed ANOVA to compare the frequency of student-faculty interaction by student gender (Twale & Sanders, 1999), race (Einarson & Clarkberg, 2010; Kim, 2010; Kim et al., 2014), age (Lundberg, 2003), class standing (Caboni et al., 2002; Twale & Sanders, 1999), academic major (Twale & Sanders, 1999), Greek membership (Caboni et al., 2002), and residential environment (Szelényi et al., 2013). Lundberg and Schreiner (2004) also employed MANCOVA to compare the combined level of satisfaction with faculty relationships and frequency of faculty interaction by students' ethnicity while controlling for their gender, age, institutional selectivity, and also utilized ANCOVA to compare the mean score of each of the measures related to faculty interaction.

Qualitative Research

Although the majority of student-faculty interaction studies have used quantitative approaches, there are studies that have examined the student-faculty relationship and its impact on college student learning and development using qualitative methodologies. Most of the qualitative studies that examined the nature and outcomes of student-faculty interaction have focused on the experiences of students of color (Ceja & Rivas, 2010; Chhuon & Hudley, 2008; Nuñez, 2011; Palmer & Gasman, 2008; Perna et al., 2009; Sandoval, Lucero, Maes, & Kingsmith, Sandoval-Lucero, Maes, & Klingsmith, 2014; Wood & Turner, 2010). Several studies have also investigated the unique differences in student-faculty interaction based on students'

gender (Ceja & Rivas, 2010; Palmer & Gasman, 2008; Perna et al., 2009; Sullivan, 1999) and institutional type (Palmer & Gasman, 2008; Sandoval-Lucero et al., 2014; Wood & Turner, 2010). Furthermore, there are a few studies that garner additional insight about student-faculty interaction among first-generation college students (Collier & Morgan, 2008; Nuñez, 2011; Wang, 2014) and students with physical and cognitive disabilities (Patrick & Wessel, 2013). While most studies have focused on students' experiences and their reported benefits of interacting with faculty, several studies have also captured the expectations and experiences of faculty in their interactions with students (Anderson & Carta-Falsa, 2002; Collier & Morgan, 2008; DeAngelo, 2010; Lewis & Abdul-Hamid, 2006; Menchaca & Bekele, 2008; Perna et al., 2009; Ryser, Halseth, & Thien, 2009).

Topics addressed by these qualitative student-faculty interaction studies include student persistence (Schreiner, Noel, Anderson, & Cantwell, 2011); college transition (Chhuon & Hudley, 2008; Nuñez, 2011); effects of student engagement (Mara & Mara, 2011); role mastery (Collier & Morgan, 2008); perceptions of campus climate (Palmer & Maramba, 2015); the role of social capital in promoting academic success (Palmer & Gasman, 2008); cultivating students' aspirations to pursue advanced degrees (Ceja & Rivas, 2010; DeAngelo, 2010); and careers in science, technology, engineering, and math (STEM; Perna et al., 2009).

Various methodologies have been used by qualitative studies to examine the conditions and outcomes related to student-faculty interaction, yet most studies have employed grounded theory (Ceja & Rivas, 2010; Cox & Orehovec, 2007; Guiffrida, 2005; Nuñez, 2011; Palmer & Maramba, 2015; Schreiner et al., 2011). The most commonly used data collection techniques in qualitative student-faculty interaction studies include in-depth focus groups (Collier & Morgan, 2008; Palmer & Gasman, 2008; Palmer & Maramba, 2015) and one-on-one semi-structured interviews (Ceja & Rivas, 2010; Chhuon & Hudley, 2008; DeAngelo, 2010; Nuñez, 2011; Schreiner et al., 2011). In some instances, participant observation and case study analysis have been used as a qualitative technique to narrow the focus of a student-faculty interaction study to a specific place, group, or program (Cox & Orehovec, 2007; Mara & Mara, 2011; Perna et al., 2009; Ryser et al., 2009; Tsui, 2001, 2002). Overall sample sizes in the qualitative studies ranged from 10 to 122 participants. Those studies that included faculty as part of the participant group had faculty sample sizes ranging from 3 to 98.

In conclusion, while the number of qualitative studies on student-faculty interaction and its impact on college student development is relatively small compared to that of quantitative studies, the depth of understanding collected by qualitative research has added to the literature by providing a more nuanced understanding of the nature and outcomes of student-faculty interaction. The rich contributions of qualitative studies on student-faculty interaction research warrant continued use of this methodological approach to garner individual points of view on the benefits of this relationship to college student outcomes (Denzin & Lincoln, 2005).

Findings on the Impact of Student-Faculty Interaction

This section discusses the empirical findings derived from the literature, classifying the findings across the four major types of effects of student-faculty interaction that were identified in the previous section: (1) general effects, (2) conditional effects, (3) direct and indirect effects, and (4) reciprocal effects.

General Effects

Most of the empirical studies we reviewed were designed to examine the general effects of student-faculty interaction on student outcomes utilizing aggregate college student samples. We organized the major findings from these studies based on the seven types of student outcome measures prevalent in student-faculty interaction research, which were identified and discussed in an earlier section: (1) academic achievement, (2) college persistence, (3) cognitive outcomes, (4) affective outcomes, (5) civic outcomes, (6) spiritual outcomes, and (7) vocational outcomes.

Academic Achievement

One major focus of the research on student-faculty interaction has been the effect of student-faculty interaction on students' academic achievement during college. A number of studies have found that frequent interaction with faculty is associated with higher college GPA (e.g., Anaya & Cole, 2001; Cole, 2011; Comeaux, 2008; Gordon et al., 2008; Kim et al., 2009, 2014; Komarraju et al., 2010; Tovar, 2015; Vogt et al., 2007). For example, Cole (2011) found that faculty support and encouragement was positively related to college GPA among African American students. Similarly, using a national college student sample of Asian Americans, Kim et al. (2009) suggested that students who had higher quality student-faculty relationships and those who frequently challenged professors' ideas in class tended to also report higher college GPAs in their senior year compared to those who did not or did so less frequently. This positive effect of student-faculty interaction on college GPA also held for community college students, particularly for the Latino population (Tovar, 2015). While most studies indicated the general positive link between student-faculty interaction and college GPA, Anaya and Cole revealed that the nature of the interaction may shape its effect on college GPA. Specifically, they found that having high quality relationships with faculty and talking frequently with faculty were positively related to college GPA, whereas visiting professors informally after class was negatively associated with college GPA. Some studies also have found a positive impact of student-faculty interaction on other types of

academic achievement measures, such as degree attainment (Flynn, 2014; Gayles & Ampaw, 2014; Kim & Conrad, 2006) and number of credits earned (Meeuwisse et al., 2010).

College Persistence

Student-faculty interaction has been positively connected to college students' persistence (Barnett, 2011; Crisp, 2010; DeAngelo, 2014; Jones et al., 2010; Mamiseishvili, 2012). For example, DeAngelo (2014) found that students' frequent interactions with faculty outside of class had a positive impact on their first-year retention at four-year institutions. Similarly, using a community college student sample, Barnett (2011) also identified the positive link between faculty validation and students' intent to persist in their institutions. However, our review also revealed some mixed findings on the relationship between faculty interaction and college persistence. Research has found that certain types of faculty interaction—such as receiving negative feedback from faculty about academic work, receiving advice from faculty about an educational program, or talking about career plans with faculty—seemed to have a negative effect on students' persistence in their institutions or majors (Chang et al., 2008, 2011; Gordon et al., 2008). Tovar (2015) also demonstrated that meeting with faculty outside of class had no significant effect on intention to persist among Latino community college students.

Cognitive Outcomes

College impact literature has well documented the positive relationship between student-faculty interaction and cognitive outcomes among undergraduate students. Studies have suggested that frequent interaction with faculty is linked to larger growth in general cognitive/intellectual skills (Flowers, 2004; Kim & Lundberg, 2016; Kim & Sax, 2011; Kim et al., 2009, 2014; Kuh & Hu, 2001; Lundberg, 2014b) and that this link held for community college (Lundberg, 2014b) and international students (Kim et al., in press). Some studies measured quality, rather than frequency, of relationships with faculty to examine its contribution to student development in general cognitive/intellectual skills and reported similar findings (Lundberg, 2007, 2010; Lundberg & Lowe, 2016). Some other research also found the positive effect of faculty interaction on domain-specific cognitive skills, such as thinking, writing, problem-solving, and analytical skills (Cabrera et al., 2001; Flowers, 2004; Lambert et al., 2007; Strauss & Terenzini, 2007). For example, Cabrera et al. (2001) found that instructor interaction and feedback had a positive effect on gains in problem-solving skills among engineering students. In terms of the ability to understand science and technology, discussing career plans with faculty and working with faculty on research projects were positive predictors (Flowers, 2004), while out-of-class faculty interaction was a negative predictor (Kuh & Hu, 2001).

Affective Outcomes

Student-faculty interaction has been positively related to various affective outcomes among college students. Studies have found that frequent interaction with faculty can assist students in developing different forms of positive self-concept during college, including academic/intellectual self-concept (Cole, 2007, 2011; Kim & Sax, 2014; Komarraju et al., 2010), mathematical self-concept (Kim & Sax, 2015), and STEM confidence (Litzler et al., 2014). While most research suggested the general positive contribution of interaction with faculty to college students' self-concept development, Cole (2007) revealed that the effect of such interaction on self-concept may be conditioned by the *type* of interaction. He found that faculty advice and critique was negatively related to students' intellectual self-concept, whereas other types of faculty interaction, such as course-related faculty contact and established faculty mentorship, was positively linked to the self-concept.

A significant portion of the research has found a positive relationship between student-faculty interaction and students' social/personal skills or development (Cabrera et al., 2001; Flowers, 2004; Kim et al., 2009, 2014, in press; Lambert et al., 2007; Lundberg, 2012, 2014b; Lundberg & Lowe, 2016; Lundberg & Sheridan, 2015; Strauss & Terenzini, 2007); and this finding was particularly true for students of color (Flowers, 2004; Kim et al., 2009, 2014; Lundberg & Lowe, 2016).

Studies also have revealed that student-faculty interaction is associated with greater college satisfaction (Kim et al., 2009; Martin, 2012; Outcalt & Skewes-Cox, 2002; Strayhorn, 2010) and higher educational aspiration (Kim, 2010; Kim & Sax, 2009; Kim, Franco, et al., 2015). Some other studies have identified the positive influence of student-faculty interaction on the psychosocial aspects of college students, such as psychological well-being (Bowman, 2010; Padgett et al., 2012), sense of belonging (Hausmann et al., 2007; Johnson et al., 2007; Meeuwisse et al., 2010), motivation (Komarraju et al., 2010), coping strategies (Clifton et al., 2008), and academic control (Clifton et al., 2008).

Civic Outcomes

College impact literature has indicated that college attendance can play a meaningful role on students' civic outcomes development during the college years (Antonio, 2001; Colby, Ehrlich, Beamont, & Stephens, 2003; Ehrlich, 2000; Hurtado, 2007; Hurtado & DeAngelo, 2012; Jacoby, 2009; Pascarella & Terenzini, 2005). While researchers still have a relatively limited understanding of civic outcomes as it relates to student-faculty interaction, some studies have investigated the potential effect of such interaction on civic outcomes among college students. One major focus of these studies has been the contribution of student-faculty interaction to students' civic abilities and attitudes, and the findings suggest that frequent faculty contact and quality mentoring relationships are positively related to students' gains in civic abilities and attitudes during college (Cole & Zhou, 2014; Dugan & Komives, 2010; Kim et al., 2009, 2014, 2015). Some other research also found the

positive effect of student-faculty interaction on other aspects of civic development such as political engagement (Kim et al., 2009), cultural/social awareness (Kim, Armstrong, et al., 2015; Reason et al., 2010), and racial tolerance (Kim, 2010). For example, using a nationwide sample of Asian American undergraduates, Kim et al. (2009) found that students who had higher quality faculty relationships and frequently challenged professors' ideas in class tended to also report higher level of political engagement and that this positive impact was particularly strong when it came to the college experience of challenging professors' ideas.

Spiritual Outcomes

Recent research on the topic of college students' spirituality sheds some lights on the possible contribution of faculty interaction to students' spiritual or religious development (Astin et al., 2011; Bowman & Small, 2010, 2013; Bryant & Astin, 2008; Fleming et al., 2013). Using a nationwide, longitudinal college student sample, Astin et al. found that various forms of student-faculty interaction positively affect students' spiritual or religious outcomes. For example, they found that both faculty encouragement of students to search for meaning and purpose and faculty encouragement of religious/spiritual discussion were related to greater development in spiritual quest, equanimity, an ethnic of caring, and an ecumenical worldview among college students. They also indicated that talking with faculty outside of class tended to have a positive effect on students' charitable involvement, while faculty's focus on spirituality was positively linked to their equanimity and religious commitment. Research has also investigated the impact of student-faculty interaction on other forms of spiritual outcomes, such as spiritual identification, religious tolerance, and spiritual/religious growth (Bowman & Small, 2010, 2013; Bryant & Astin, 2008), and the findings of these studies were consistent with those of Astin et al.'s study. A recent study by Fleming et al. (2013) also found that faculty mentoring—not only ethical/spiritual but also academic/career—and faculty's use of a student-centered pedagogy contributed to greater development of an ethic of care for college students.

Vocational Outcomes

Research has also shown that students' interactions with faculty could positively affect their vocational outcomes. For instance, Flowers (2004) found that various forms of student-faculty interaction—e.g., talking with faculty, asking faculty for information related to a course, discussing career plans and ambitions with faculty—are all associated with better vocational preparation among African American students. Similarly, Lundberg (2014b) examined the relationship between frequency of student-faculty interaction and career preparation among community college students, and the findings were consistent with Flowers' (2004) study. A study by Cabrera et al. (2001) also found that student-faculty interaction and faculty

feedback contributed to larger gains in occupational awareness among college students, while a study by Sax et al. (2005) found that students who had talked frequently with faculty outside of class tended to also report greater interest in careers as research scientists.

Conditional Effects

While research has well established the general, positive effects of student-faculty interaction (either for all students or for a specific subgroup of students), a significant volume of recent studies has also examined the conditional (or differential) effects of student-faculty interaction utilizing disaggregated student subsamples. We organize the major empirical findings on the conditional effects of student-faculty interaction into the following two categories: (1) conditional effects by student characteristics (individual- or student-level conditional effects) and (2) conditional effects by academic environments (group-level conditional effects).

Conditional Effects by Student Characteristics

Gender

A majority of the literature on the conditional effects of student-faculty interaction has focused on answering how the magnitude of the relationship between student-faculty interaction and college outcomes differs by students' gender (Clifton et al., 2008; Colbeck et al., 2001; Cruce et al., 2006; Dika, 2012; Kim & Sax, 2009, 2015; Mayhew et al., 2005; Salisbury et al., 2010; Sax, 2001; Sax et al., 2005; Seifert et al., 2014). Using a longitudinal, nationwide college student dataset, Sax et al. examined the differential effects of student-faculty interaction on an intensive set of college outcomes across male and female students. For example, they found that while faculty support was positively related to course satisfaction, critical thinking ability, college GPA, and political engagement for both male and female students, the strength of the positive relationship was stronger for male students. In contrast, when it comes to challenging a professor's ideas in class, they found that the positive effect of this type of interaction on students' critical thinking ability and self-rated competitiveness was more pronounced among female students.

In another study that focused on the conditional effects of best practices in higher education on first-year college outcomes, Cruce et al. (2006) found that interaction with faculty was positively linked to reading comprehension and positive attitude toward literacy among female students, whereas the interaction had no effect on these outcomes for their male counterparts. They also found that student-faculty interaction was positively related to female students' mathematics knowledge, but the relationship was negative for male students. Similarly, Kim and Sax (2009) tested the gender-based conditional effect of student-faculty interaction on a select

set of student outcomes; and they found that while course-related faculty interaction had a positive relationship with degree aspiration for both male and female students, the magnitude of the positive relationship was stronger for male students compared to their female peers. Their study also documented that, when it comes to the patterns of faculty interaction, female students were more likely than male students to interact with faculty in individualized settings (e.g., communicating with faculty by email or in person) while male students were more likely than female students to interact with faculty in public or group settings (e.g., interacting with faculty during lecture class session).

Race/Ethnicity

There is another significant body of research on the conditional effects of student-faculty interaction based on students' race/ethnicity (Cole, 2008, 2010; Cruce et al., 2006; Einarson & Clarkberg, 2010; Fischer, 2007; Johnson et al., 2007; Kim, 2010; Kim & Sax, 2009; Lundberg, 2012; Lundberg & Schreiner, 2004; Mayhew et al., 2005; Meeuwisse et al., 2010; Salisbury et al., 2011). For example, Fischer (2007) found that having higher levels of formal academic ties to faculty (e.g., asking faculty questions in class, seeing faculty in office to ask questions) was associated with higher college GPA for all four racial/ethnic groups in the study (i.e., White, Asian American, Hispanic, and Black), while the *magnitude* of the positive association was relatively smaller for Black students compared to their peers in other racial groups. She also found that the formal academic ties to faculty positively affected college satisfaction among Hispanic and Black students, but this was not the case for White and Asian American students.

A study by Einarson and Clarkberg (2010) investigated not only the race-based conditional effects of a student-faculty interaction factor scale but also the conditional effects of six indicators of the factor scale. They found that the faculty contact factor scale was positively related to students' self-estimated intellectual gains and this relationship held for all four racial/ethnic groups of the study (i.e., White, Asian American, African American, and Latino students). However, when they individually examined the six survey items that constituted the faculty contact factor scale, their study demonstrated some conditional effects across these groups. For instance, working on research with faculty and discussing course selection with faculty were linked to greater intellectual gains among White, Asian American, and African American students, but not for Latino students. They also found that while having intellectual discussions with faculty outside of class contributed to larger intellectual gains among White, Asian American, and Latino students, this effect did not hold for African American students.

While most research on the conditional effects of student-faculty interaction has examined race-based conditional effects either between White students and students of color (Cruce et al., 2006; Mayhew et al., 2005) or across four major racial/ethnic groups including White, African American, Asian American, and Latino students (Einarson & Clarkberg, 2010; Fischer, 2007; Kim, 2010; Kim & Sax, 2009), a few

studies have tested the conditional effects across five or more racial subgroups of students (Johnson et al., 2007; Lundberg, 2012; Lundberg & Schreiner, 2004). For example, Lundberg (2012) found that frequent faculty interaction predicted greater personal development among African American, Asian/Pacific Islander, and Hispanic students but not among Native American and White students.

First-Generation Status

There are some studies that have addressed the differential effects of student-faculty interaction depending on parents' education level, usually framed by students' first-generation college student status (Dika, 2012; Kim & Sax, 2009; Padgett et al., 2010, 2012). For example, Padgett et al. (2012) found that high quality interaction with faculty (e.g., faculty's prompt feedback, quality of classroom interaction with faculty, faculty interest in student development) was positively related to psychological well-being for non-first-generation students (whose parents had some college experiences or had Bachelor's or higher degree), but it was not for their first-generation counterparts. Using a student sample from a single institution in Puerto Rico, Dika also indicated that talking frequently with faculty about career plans was associated with higher college GPA for non-first-generation students, whereas this type of faculty contact did not significantly affect college GPA for their first-generation peers. In contrast, their findings showed that higher quality faculty relationships predicted higher college GPA for both first-generation and non-first-generation students.

Class Standing

There has also been investigation of how the effects of student-faculty interaction may be conditioned by students' class standing (Dika, 2012; Pike et al., 2011; Umbach & Wawrzynski, 2005; Webber et al., 2013). Webber et al. (2013) found that interaction with faculty positively affected cumulative college GPA for first-year students, but it did not for senior students. Similarly, Dika found that while frequent discussion with faculty about grades or assignments was related to higher college GPA among first-year students, this form of faculty contact had no effect on college GPA for senior students.

Other Student Characteristics

A few other studies have also investigated the conditional effect of student-faculty interaction by other types of student characteristics such as age (Lundberg, 2003), social class (Kim & Sax, 2009), enrollment status (Laird & Cruce, 2009), and profile of sports (within a sample of student athletes; Gayles & Hu, 2009). For example,

Lundberg found that while both the frequency of the interaction and the quality of student-faculty relationships positively contributed to students' learning for all three ages groups in the study (students of ages 20–23, 24–29, and 30 and older), the positive impact on student learning was more pronounced among students 30 and older. When it comes to the conditional effects of student-faculty interaction by students' social class, Kim and Sax indicated that while frequent course-related faculty interaction was related to higher college satisfaction for students from all social class categories, the magnitude of the positive relationship was significantly greater for upper-class students compared to their middle-class peers.

Conditional Effects by Academic Environments

Institutional Type

Some studies have examined the conditional effect of student-faculty interaction across different academic environments. One focus of this research has been the differential effect of student-faculty interaction, depending on the type of institutions students attended (Cruce et al., 2006; Cuellar, 2014). Using multi-institutional data, Cruce et al. found that student-faculty interaction combined with faculty's effective teaching was significantly related to higher educational aspirations among students who attended research universities, but that this relationship was not significant for those students who attended other types of institutions, such as community colleges, historically Black colleges, Liberal Arts colleges, and regional institutions. In another study that addressed the conditional effects of student-faculty interaction by the type of institution, Cuellar (2014) found that while frequent interaction predicted higher academic self-concept among Latina/o students at both Hispanic-serving institutions (HSIs) and non-HSIs, this was not true for their peers at emerging HSIs. In contrast, she found a negative relationship between having felt intimidated by their professors and academic self-concept among Latina/o students at non-HSIs, whereas it was not the case for their counterparts at HSIs and emerging HSIs.

Academic Major

As the attendance rate at higher education institutions has increased and the categories of academic disciplines within institutions has become more diverse, researchers have also investigated how the effect of student-faculty interaction differs by institutional academic sub-environments, such as academic major (Kim & Sax, 2011, 2014; Kim, Armstrong, et al., 2015). For instance, using Holland's (1973, 1985, 1997) theory of careers, Kim and Sax (2014) found that the positive effect of having been a guest in a professor's home on students' academic self-concept significantly varied across different academic majors. More specifically, they indicated

that the positive effect of this type of interaction was relatively stronger among students who were in Artistic (e.g., Arts, Language/Literature) or Social (e.g., Philosophy, Sociology) majors compared to their peers in Investigative (e.g., Chemistry, Mathematics, Biology) or Enterprising (e.g., Journalism, Business Administration, Finance) academic major fields. Furthermore, the findings of their study revealed that students who were in academic majors with a larger proportion of students of color and in majors where students were more satisfied with accessibility to faculty also tended to benefit more from the experience of having been a guest in a professor's home in terms of academic self-concept development. In another study, Kim, Armstrong, et al. tested the disciplinary conditional effects of faculty interaction guided by Biglan's (1973) Model of Academic Disciplines. They found that while frequent student-faculty interaction was significantly related to higher college GPA for all student groups in four different academic disciplines (i.e., Hard/Pure, Hard/Applied, Soft/Pure, and Soft/Applied), this positive effect of faculty interaction was more pronounced among students who were in Soft/Pure and Soft/Applied (e.g., Education, Social Work, Public Health) disciplines. They also documented that the positive effect of faculty interaction on academic satisfaction was much stronger among students in Hard/Pure (e.g., Biology, Physical Science, Chemistry) disciplines compared to their peers in other academic disciplines.

Living Arrangement

There are some studies that have examined how the effects of student-faculty interaction differ depending on students' living arrangement (Inkelas et al., 2007; LaNasa et al., 2007). For instance, LaNasa et al. found that while frequent academic interactions with faculty (e.g., discussing grades or assignments with faculty, asking questions to faculty in class, receiving prompt feedback from faculty) significantly predicted higher cumulative GPA for on-campus, first-time freshman students, this was not the case for their off-campus peers. Using a first-generation student sample, Inkelas et al. also investigated the differential effects of student-faculty interaction based on living-learning program participation. They found that course-related faculty interaction (e.g., making appointment to meet faculty in his/her office, asking faculty for information related to course) was positively related to a perceived ease of *academic* transition to college for both students who participated in a living-learning program and those who lived in a traditional residence hall setting. In contrast, their findings indicated that faculty mentorship was negatively associated with a perceived ease of *social* transition to college among students in a living-learning program while faculty mentorship had no significant effect on such transition for students in a traditional residence hall setting.

Direct and Indirect Effects

Studies on the topic of student-faculty interaction have also examined both the direct and indirect effects of student-faculty interaction on student outcomes to untangle the underlying mechanisms of the impact of such interaction (e.g., Crisp, 2010; Fuentes et al., 2014; Good & Adams, 2008; Kim & Lundberg, 2016; Meeuwisse et al., 2010; Vogt et al., 2007). Testing both sociological and psychological variables in their structural model, Kim and Lundberg found that frequent student-faculty interaction was both directly and indirectly associated with greater cognitive skills development. Regarding the indirect effects, they found that interaction with faculty was positively related to students' classroom engagement—which in turn predicted larger growth in their cognitive skills—and that the positive relationship between faculty interaction and classroom engagement was mediated by students' academic self-challenge and sense of belonging. Similarly, Meeuwisse et al. found that frequent formal interactions with faculty had an indirect positive effect on students' study progress (operationalized by the number of credits earned), mediated by their greater sense of belonging. These findings generally validate the basic premise of Pascarella's (1985) model (refer to Theoretical Approaches section of this chapter) and its applicability to college student data, uncovering both the direct and indirect pathways from student-faculty interaction to a desired college outcome.

Reciprocal Effects

As discussed earlier, while most studies on student-faculty interaction have assumed a unidirectional influence of faculty interaction on student outcomes, some research has also addressed the reciprocal nature of the relationship between student-faculty interaction and student outcomes (Bean & Kuh, 1984; Iverson et al., 1984; Kim, 2006, 2010). Using a national, longitudinal sample of undergraduate students, Kim (2006) found that both academic and personal student-faculty interaction had positive reciprocal relationships with students' college GPA and racial tolerance, suggesting not only that frequent interaction with faculty improves college GPA and racial tolerance, but also that higher college GPA and greater racial tolerance facilitate more frequent student-faculty interaction. In contrast, when it comes to the relationship between student-faculty interaction and educational aspirations, she found a unidirectional effect of educational aspirations on both types of student-faculty interactions rather than the other way around. This finding is consistent with Iverson et al.'s general finding that students' educational aspirations influenced the level of student-faculty interaction rather than the other way around, thereby rejecting the hypothesis that faculty interaction affects educational aspirations.

Recommendations for Future Research

In our review of the literature, we recognized several conceptual and methodological gaps related to student-faculty interaction. In this section, we address these literature gaps in terms of their implications for future research. In particular, we probed the literature asking ourselves two guiding questions: *What* major questions still remain unanswered about student-faculty interaction (conceptual recommendations), and *how* should those questions be addressed (methodological recommendations)?

Conceptual Recommendations

Our review identified a number of conceptual or theoretical gaps in the student-faculty interaction literature. Below we discuss some conceptual lenses that future researchers might consider to gain more accurate and nuanced knowledge about the impact of student-faculty interaction.

Impact of Student-Faculty Interaction on a Broader Range of Outcomes

While significant evidence of the impact of student-faculty interaction on student outcomes was found in the literature, the research has tended to focus more on traditional, short-term college outcomes, such as academic achievement, persistence, and cognitive or affective outcomes (refer to the Findings on the Impact of Student-Faculty Interaction section of this chapter). Among these empirical studies on the general effects of student-faculty interaction, of the 89 quantitative studies we reviewed, 72 studies (81 %) examined these types of traditional outcomes in relation to student-faculty interaction.

However, the growing body of literature suggests that student-faculty interaction might possibly affect an even broader range of college outcomes, including post-graduate outcomes. For example, studies by Bowman and Small (2010) and Bryant and Astin (2008) found a positive relationship between faculty interaction and spiritual development among college students. Some researchers have also found a relationship between faculty interaction and development of civic attitudes (Cole & Zhou, 2014; Dugan & Komives, 2010; Kim et al., 2009, 2014), post-college outcomes (such as early career earnings; Hu & Wolniak, 2010, 2013), and inclination to lifelong learning (Seifert et al., 2014). While we are encouraged by this broadening lens, the existing student-faculty interaction literature has not yet sufficiently addressed these and other types of non-traditional outcomes. Therefore, future research on this topic should help improve our understanding of the impact of student-faculty interaction by expanding the realm of possible outcomes connected to student-faculty interaction.

Conditional Effects of Student-Faculty Interaction

Whether and *how* faculty interaction might differently impact various student subpopulations is another important question future studies should continue to address. Research has shown that student background characteristics and college environments may, for various reasons, moderate the effects of high impact practices, such as student-faculty interaction (Seifert et al., 2014). Given the substantial increase in the diversity of the college student population in recent years, researchers should give more attention to how certain student background characteristics might condition the impact of student-faculty interaction (Kim & Sax, 2011). While studies have increasingly examined the conditional effects of student-faculty interaction, much of the literature on this topic has centered around gender and race. Future research might aim to fill this research gap through the disaggregation of student samples by more diverse types of student characteristics (e.g., socioeconomics, language heritage, transfer status) and investigating how these traits moderate the relationship between student-faculty interaction and student outcomes. Particularly, future research should pay greater attention to examining how student-faculty interaction affects outcomes for historically underrepresented or understudied student subpopulations—such as disabled students, student veterans, student athletes, and religious minority students—and how the effects are different from those of their majority counterparts.

The recommendation for research also extends to the need of more studies on *group*-level conditioned effects of student-faculty interaction. The examination of conditional effects of faculty interaction has become more popular in the past decade. Still, these studies are mostly interested in examining individual- (or student-) level conditional effects by disaggregating student samples by race, gender, or other student characteristics; they are less interested in investigating group-level conditional effects (e.g., disaggregated by different academic environments such as institutions, academic majors or departments, residence settings, student organizations). Some recent studies did identify the group-level conditional effects of student-faculty interaction (refer to the Conditional Effects by Academic Environments section of this chapter), which warrants further investigations on this topic.

The consideration of the *nature* or *type* of student-faculty interaction would add another layer to the conditional effects of faculty interaction. While student-faculty interaction is generally heralded to be associated with positive student outcomes, it has not always been the case; in fact, there is evidence that the effects of student-faculty interaction may be conditioned by the nature or type of interaction (Cole, 2007; Kim & Sax, 2014; Komarraju et al., 2010), with some interactions associated with negative outcomes. Thus, there is much more to be learned about how the effects of student-faculty interaction depend on the unique qualities of the interaction.

Origins of the Conditional Effects

It is also important to acknowledge that we have limited understanding of the *origins* (or *whys*) of the conditional effects of student-faculty interaction. While studies have documented the existence of differential effects of student-faculty interaction across disparate student subgroups (refer to Findings on the Impact of Student-Faculty Interaction section of this chapter), very little is known about the factors that explain the stronger or weaker effects of these interactions for certain student subgroups (Einarson & Clarkberg, 2010; Kim & Sax, 2009, 2014, 2015). Specifically, one of the shortcomings of research on this topic is a lack of knowledge about the individual faculty with whom students are interacting; we believe that the faculty's own characteristics may be critical to explaining why some students benefit more or less from their interactions with faculty. Thus, future research on student-faculty interactions would ideally capture information not just on the students' characteristics, but also the faculty member's characteristics, including race/ethnicity, gender, and academic department. Collecting data on the race/ethnicity and gender pairings inherent in these interactions would be particularly useful to understanding whether any conditional effects we observe for non-White or female students are due to the fact that they are typically interacting with White or male faculty (to the extent that White and male faculty are generally more dominant on college campuses).

Faculty Perspectives

A dearth of research on the perspectives of faculty on student-faculty interaction leaves several open areas for future inquiry (Eagan, Herrera, et al., 2011; Fuentes et al., 2014; Hoffman, 2014; Kim, Armstrong, et al., 2015). While the well-established literature on the positive effects of student-faculty interaction may place an additional burden on faculty who feel pressured to adopt mentoring or out-of-class interactions with their students, a qualitative study by Adedokun, Dyehouse, Bessenbacher, and Burgess (2010) revealed that faculty who involved undergraduate students in their research, although an additional time burden, found their interactions with students deeply satisfying and beneficial to their work. Future studies should investigate more about how faculty perceive their interactions with students in terms of the benefits from such interactions and motivations that might encourage or discourage such interactions, as well as how these faculty perspective might differ depending on faculty characteristics, such as gender, race, rank, or tenure status.

Pedagogical Contexts

Several studies recognize the importance of faculty accessibility cues to more frequent and better student-faculty interactions (Cole, 2007; Cotten & Wilson, 2006; Eagan, Figueroa, Hurtado, & Gasiewski, 2012; Eagan, Herrera, et al., 2011; Hurtado et al., 2011; Kim & Sax, 2014; Wilson, Woods, & Gaff, 1974); still, few studies have

addressed the pedagogical contexts that not only improve the level of interactions between students and faculty but also magnify the beneficial effects from such interactions. A recent study by Cejda and Hoover (2010) examined the strategies that community college faculty use to engage Latino students and found that, among other strategies, understanding cultural values was important to improve their engagement. Another study by Lindholm and Astin (2008) examined the relationship between faculty spirituality and its influence on pedagogical approaches to their college teaching and found that more spiritual faculty members tended to more frequently use student-centered pedagogical approaches to their teaching. While studies on this topic would be indirectly related to the student-faculty interaction literature given their main focus on pedagogical styles and the strategies faculty utilize related to their impact on student learning and development, these studies could potentially contribute to student-faculty interaction literature by uncovering another tier of context that possibly shapes the dynamics between faculty and students.

Methodological Recommendations

Our review also identified some methodological gaps in the research on student-faculty interaction. Below we propose some methodological approaches that can be considered by future student-faculty interaction studies in order to advance both theoretical and practical knowledge on this topic.

Test of Causal Inferences

Perhaps one of the greatest limitations in the existing quantitative studies on student-faculty interaction is its reliance on correlational research design. While a large body of student-faculty interaction studies were designed to examine the *effects* or *impact* of faculty interaction on student outcomes, the findings from most of these studies should be interpreted as correlational connections between the variables rather than causal connections. Specifically, since the majority of surveys in higher education measures students' college experiences—student-faculty interaction in this case—and their outcomes simultaneously, they do not inform researchers of any time ordering between the variables, which leaves the undesirable ambiguity of causal directions. Although researchers generally accept the shared assumption of traditional college impact models that college experiences such as student-faculty interaction affect student outcomes, research has demonstrated the reverse that student-faculty interaction is affected by variables typically thought of as outcomes (Iverson et al., 1984; Kim, 2006, 2010). Therefore, in order to assess more thoroughly the potential causal linkage between faculty interactions and student outcomes, future research should consider using experimental or multi-wave data where experiences (treatments) and outcomes are measured in a sequence at multiple time points.

Use of Multilevel Models

College student data mostly have a hierarchical, multilevel structure where individual students are nested within academic sub-environments (such as academic majors/departments, residence settings, or student organizations), which are in turn nested within institutions. However, the majority of quantitative research on the impact of student-faculty interaction has historically employed OLS techniques—which assume no hierarchy in data—for their data analysis; findings of these studies provide a limited understanding of the impact of faculty interaction due to their analytical shortcomings such as aggregation bias, misestimated precision, and the unit of analysis problem (Raudenbush & Bryk, 2002). Fortunately, a growing number of studies in higher education have addressed the hierarchical nature of college student data by using multilevel models (Cheslock & Rios-Aguilar 2008, 2011; Niehaus, Campbell, & Inkelas, 2014; Pascarella & Terenzini, 2005). Some scholars have employed multilevel models specifically to examine the impact of student-faculty interaction (refer to the Methodological Approaches section of this chapter), and the findings from these studies do justify the use of multilevel models not only for improving the accuracy of estimation but also for uncovering the cross-level effects—e.g., how the effects of student-faculty interaction occurring at the student level are affected by variables measured at other levels such as the department-level (e.g., typology of academic disciplines, departmental peer culture) or institution-level (e.g., institutional selectivity, student-faculty ratio).

While it is promising to see the growing number of student-faculty interaction studies using multilevel models, the existing multilevel modeling studies on the topic of student-faculty interaction predominantly tend to use two-level HLM, mostly assuming students are nested only within institutions. However, some studies suggest that the patterns or impact of student-faculty interaction may be moderated by their socialization context within distinctive academic sub-environments, for example, majors/departments, academic disciplines, student organizations, and residence settings (Inkelas et al., 2007; Kim & Sax, 2011, 2014; Kim, Armstrong, et al., 2015; LaNasa et al., 2007). These findings warrant the use of three-level HLM that addresses variance in both within-institution sub-environments and between-institution environments, which can provide a more comprehensive perspective on the nature and impact of faculty interaction.

Test of Indirect Effects

While the college impact literature has well established the positive link between student-faculty interaction and student outcomes, researchers still have a limited understanding of the pathways from the interaction to a desired college outcome. Particularly, given that traditional college impact models or theories are heavily rooted in sociological perspectives, little is known about psychological or

motivational factors that potentially mediate the association between faculty interaction and student outcomes. A few recent studies utilized SEM to examine the indirect effects of student-faculty interaction on student outcomes and found some mediators of these effects, including sense of belonging and academic self-challenge (Crisp, 2010; Fuentes et al., 2014; Good & Adams, 2008; Kim & Lundberg, 2016; Meeuwisse et al., 2010; Vogt et al., 2007). Future research may add to the literature by examining the additional factors—both sociological and psychological—that are hidden in the relationship between student-faculty interaction and student outcomes. Future research may also employ multiple-group analysis, an advanced technique of SEM, to test how the role played by such factors on the pathways of student-faculty interaction to student outcomes vary across different student subgroups (e.g., gender, race, socioeconomic subgroups).

Development of Improved Measures

Many student-faculty interaction studies have underscored the significance of the *nature* or *type* of interaction as it related to desirable college outcomes and have emphasized the need for the development of improved measures of student-faculty interaction (Cole, 2007; Cox & Orehovec, 2007; Dika, 2012; Gayles & Ampaw, 2014; Griffin et al., 2010; Kim & Sax, 2014, 2015; Kim, Armstrong, et al., 2015; Komarraju et al., 2010). Findings of these studies documented that the effects of student-faculty interaction on student outcomes may differ based on the type of interaction. As we seek to adequately address the multiple dimensions of such interactions and how they uniquely shape the educational efficacy of each type of the interaction, it is imperative to develop more specific measures that differentiate a variety of forms of encounters between students and faculty (e.g., formal vs. informal, positive vs. negative, academic vs. social). It is also important to update measures by adding newer communication channels (e.g., texting, emailing, video-calling, using social media) that today's college students may utilize to interact with their professors. Furthermore, because the *quality* of student-faculty interaction is also important to determining the effects of the interaction, particularly for students of color (Astin, 1993; Kim & Sax, 2009, 2014; Kim et al., 2009; Lundberg & Lowe, 2016; Lundberg & Schreiner, 2004), measures should assess both the quantity and quality of students' interactions with faculty.

When it comes to the use of these measures in data analysis, future studies ought to use multiple individual items, or at last use multiple subscales, rather than aggregating various types or forms of faculty interaction into a single, value-free factor scale or merging faculty interaction measures into a macro concept of academic/social engagement or integration. This approach would allow researchers to better identify which types of student-faculty interaction are more or less effective in facilitating student learning and development.

Use of Qualitative and Mixed-Methods Methodologies

Student-faculty interaction research would also benefit from a qualitative or mixed-methods approach to the topic. While the quantitative literature has well documented both the general positive effects of student-faculty interaction (*whether* and *how* the interaction affects college outcomes) and the conditional effects of it (*whether* and *how* the effects differ across various student subgroups), it is important to uncover the *whys* of these effects in more depth to understand the meaning and context of the associated educational benefit and any differences related to student characteristics and academic environments. While quantitative studies may continue to investigate the complex nuances of student-faculty interaction using more detailed measures of such interaction and more advanced analytic approaches, many questions about the quality or dynamics of the interaction still require the contributions of qualitative studies. Ideally, the use of diverse types of qualitative studies such as case studies, phenomenological studies, grounded theory studies, and mixed-methods studies could fill the gaps in knowledge that quantitative studies cannot.

Conclusion

As our review of the literature has shown, student-faculty interaction is one of the most frequently cited institutional practices thought to be linked to a wide range of positive outcomes among college students. This chapter reviewed the current empirical understanding of the effects of student-faculty interaction, with particular attention given to both general and conditional effects. We also highlighted the theoretical and methodological approaches that have been used to study this topic. We have concluded that, despite the myriad studies on the impact of student-faculty interaction, there still exist some major questions—both conceptual and methodological—to be more fully answered by future research in this area. Among other questions, given the rapidly diversifying college student population, *how* and *why* student-faculty interaction might differently influence student outcomes across various student subgroups—particularly historically underrepresented, underserved, or disadvantaged groups—would be a key question for future research. We believe that the findings from such research would substantially advance our knowledge of the impact of student-faculty interaction, not only by filling gaps in the literature but also by providing higher education institutions and their members with practical implications on how to maximize the educational benefits of student-faculty interaction for *all* students.

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Young K. Kim, Ph.D., is Associate Professor of Higher Education at Azusa Pacific University. She received her Ph.D. in Higher Education at the University of California, Los Angeles. Her research interests include college student development, conditional effects of college experience, and diversity and educational equity in higher education. In her scholarly work, she has been extensively utilizing large national or statewide datasets including the CIRP, UCUES, and NLSF along with quantitative methods. Her work has been published in *Research in Higher Education*, *Review of Higher Education*, *Journal of Diversity in Higher Education*, *Journal of Hispanic Higher Education*, and *Journal of the Professoriate*.

Linda J. Sax, Ph.D., is Professor in the Graduate School of Education & Information Studies at UCLA.She teaches graduate courses in research methodology, evaluation of higher education, and gender issues in higher education.Her research focuses on gender differences in college student development, specifically how institutional characteristics, peer and faculty environments, and forms of student involvement differentially affect male and female college students. She is currently principal investigator on a national, longitudinal study of gender and racial/ethnic diversity in undergraduate computer science.Dr. Sax is the author of more than 90 publications, including *The Gender Gap in College: Maximizing the Developmental Potential of Women and Men* (Jossey-Bass, 2008), and is the recipient of the 2005 Scholar-in-Residence Award from the American Association of University Women and the 1999 Early Career Award from the Association for the Study of Higher Education.