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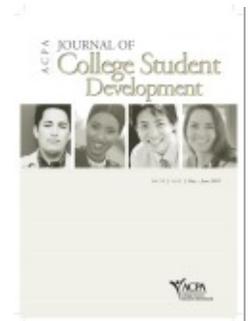
Role of Student–Faculty Interactions in Developing College Students’ Academic Self-Concept, Motivation, and Achievement

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Role of Student–Faculty Interactions in Developing College Students’ Academic Self-Concept, Motivation, and Achievement

Meera Komarraju Sergey Musulkin Gargi Bhattacharya

Student–faculty interactions can be crucial in developing students’ academic self-concept and enhancing their motivation and achievement. Colleges and universities that actively foster close and frequent contact between their students and faculty members are more likely to reap a host of benefits from such initiatives. Faculty members taking an interest in their students’ academic progress could potentially make significant contributions in increasing their intellectual and professional development (Anaya & Cole, 2001; Chickering, 1969; Chickering & Reisser, 1993; Cokley, 2000; Terenzini & Pascarella, 1980). There is evidence that students successful in knowing even one faculty member closely are likely to feel more satisfied with their college life and aspire to go further in their careers (Rosenthal et al., 2000). Although most interactions with faculty tend to occur within the formal classroom setting, students who experience informal interactions tend to be more motivated, engaged, and actively involved in the learning process (Thompson, 2001; Woodside, Wong, & Weist, 1999). Informal interaction between students and faculty has been identified as a primary agent of college culture, and has an important influence on the attitudes, interests, and values of college students (Chickering & Reisser, 1993; Lambert, Terinzini, &

Lattuca, 2007; Pascarella, 1980b; Pascarella & Terenzini, 1991, 2005; Thompson, 2001). However, although previous research has established that student–faculty interactions are important, we still need to identify which aspects of student–faculty interactions are helpful and how these could significantly influence students to stay in college, increase their desire to work hard, stimulate them to enjoy learning, and encourage them to strive toward high achievement standards (Bean, 1985). The current study addresses this gap in the literature by examining eight specific types of student–faculty interactions as predictors of academic self-concept and three types of academic motivation, as well as academic achievement in a sample of college students from a medium-sized, public university located in the Midwestern United States.

TYPES OF STUDENT–FACULTY INTERACTIONS

In examining why some students might interact more with faculty members and why some faculty may seem more approachable to students, it is important to acknowledge that a need for belonging, for frequent positive interactions, and to feel cared for by others is a fundamental human need (Baumeister &

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Leary, 1995). Interactions between students and faculty members are inevitable and personal connections that emerge through advisement and mentoring are highly valued (Light, 2001). In responding to several implicit, unspoken, and nonverbal cues, students are more likely to interact with faculty members perceived to be sociable, intelligent, showing leadership, supportive, and objective (Babad, Avni-Babad, & Rosenthal, 2003; Furnham & Chamorro-Premuzic, 2005). Faculty members allowing students to use their first names are perceived as higher in warmth, approachability, and respect in comparison to faculty members who are addressed by formal titles (McDowell & Westman, 2005).

Student–faculty interactions can be formal or informal, occurring either inside or outside instructional settings, with both playing an important role in determining students' academic success (Jacobi, 1991). The most frequent type of contact that students have with faculty members typically include situations in which they are asking for information about a course or visiting after class (Kuh & Hu, 2001). Faculty–student interactions could take on a more intense flavor in a tutorial-style classroom, where a faculty member may meet with two students at a time for an hour, eventually interacting closely with about five such pairs of students per week (Smallwood, 2002). Such close, intense, interaction seems to enhance student learning and intellectual stimulation, with both students and faculty valuing the opportunity to know each other at an informal and personal level. Cox and Orehovec (2007) identified four major types of student–faculty interactions with the most important, “functional interaction,” referring to academic-related interactions outside the classroom. The other three types include personal interactions about some personal issues unrelated to academics, incidental contact maintained by occasional greetings,

and finally disengagement, where there is minimal interaction with the faculty member inside the classroom and little or no interpersonal exchange.

However, all types of student–faculty interactions are not equally beneficial for the student (Ei & Bowen, 2002). Students report valuing interactions involving group activities and business relationships; at the same time, they consider sexual relationships, doing favors, and spending time alone as inappropriate. Further, student characteristics like gender and cultural background also influence the desire for and the type of interactions preferred. Researchers suggest that female rather than male students are likely to seek more interactions with faculty and also report having more positive interactions (Hagedorn, Maxwell, Rodriguez, Hocesvar, & Fillpot, 2000; Ryan, Stiller, & Lynch, 1994). Regarding cultural background, students with Asian or South African backgrounds, relative to Australian backgrounds, tend to have more positive perceptions of teachers with a strict and admonishing style (Evans & Fisher, 2000). Further, satisfying relationships and frequent interactions with faculty members who encourage hard work seem to be the strongest predictors of learning for Asian/Pacific Islanders and Mexican American students relative to students from other ethnic backgrounds (Lundberg & Schreiner, 2004).

INFLUENCE OF FACULTY INTERACTIONS ON MOTIVATION AND LEARNING

Even though faculty members may not always be aware of it, their interactions can have a far-reaching influence on their students. Faculty member–student relations are a strong motivator and indicator of learning (Christensen & Menzel, 1998). In particular, Decker, Dona, and Christenson

(2007) note that the student–faculty member relationship is more important in predicting students’ social–emotional functioning than their academic performance. This implies that there is a support-seeking dimension in student–faculty member relationships that can be carefully nurtured to shape positive outcomes for students.

Informal interactions with faculty members outside the classroom have been found to have an incremental effect on students’ motivation over and above the typical predictors of academic performance such as secondary school performance or academic aptitude (Pascarella & Terenzini, 2005; Pascarella, Terenzini, & Hibel, 1978). Informal discussions with faculty members about intellectual issues are associated with increases in students’ aspirations to achieve at a higher level than would be predicted by pre-enrollment characteristics. Initial interactions with faculty members are also very influential in increasing the value placed on high academic achievement and in compensating for the general student culture that does not typically value such achievement. Mentoring provided by faculty members as a sponsor, confidant, and protector seem to be relatively more important than even peer support, for students who are transitioning into college (Mann, 1992; Shore, 2003). Thus, faculty members seem to play an important role in the overall college experience for new and continuing students.

Adolescents who model themselves after their teachers rather than their friends report higher levels of school adjustment (Ryan et al., 1994). Informal faculty–student contacts play a particularly crucial role during the first year in college because they allow students to integrate their academic and extracurricular experiences (Goodman & Pascarella, 2006; Pascarella & Terenzini, 1977; Pascarella & Terenzini, 2005). Further, students reporting high and moderate levels of interactions with

faculty members (relative to low interactions) rate their academic program as being more interesting, exciting, and enjoyable, as well as more relevant and necessary for their career. Finally, substantive student–faculty interactions have been found to have a positive impact on students’ vocational preparation and intellectual development (Kuh & Hu, 2001). These findings suggest that student–faculty interactions have a multidimensional influence on the cognitive and emotional needs of students, thus validating the importance of faculty members as role models.

INFLUENCE OF FACULTY INTERACTIONS ON ACADEMIC SELF-CONCEPT AND ACHIEVEMENT

Some researchers have found that students who spoke more frequently with faculty outside class and received advice about their educational program reported significantly higher academic self-confidence (Plecha, 2002). This finding is congruent with Endo and Harpel (1982) and Astin (1999)’s work showing that interacting frequently with faculty members is part of being academically engaged and students who are more involved do better in college. Similarly, Bjorkland, Parente, and Sathiyathan (2002) note that students who are in more frequent contact with faculty members and receive more feedback on their performance show remarkable improvement in communicating in a group, competence in their specific field, awareness about their future occupation, and general problem-solving skills. Other reported benefits of such student–faculty relationships include greater satisfaction with academic life, lesser likelihood of dropping out, and feeling more intellectually driven (Hazler & Carney, 1993). In support of Chickering’s (1969) model, recent data suggest that students

engaging in meaningful interactions with faculty members are more likely to have a sense of purpose and competence for succeeding in college (Martin, 2000). Further, students who perceive their faculty members to be caring and have positive informal interactions with them often report greater learning (Teven & McCroskey, 1997) as well as satisfaction with college and enhanced intellectual and personal development (Lampert, 1993).

THE CURRENT STUDY

Although there is a substantial body of research documenting the importance of student–faculty interaction, most of the focus has been on the frequency of such interactions. There are few studies that have specifically and systematically examined specific dimensions of these interactions or how these aspects are valued by students, and the difference they make in students’ lives (Cox & Orehovec, 2007). The present study attempts to reduce this gap in the literature by examining eight different aspects of student–faculty interactions (respect, guidance, approachable, caring, interactions outside of class, connected, accessible, and negative experiences) as predictors of students’ academic self-concept, motivation, and academic achievement. Based on previous research we hypothesized that there would be a positive relationship between:

1. seven aspects of student–faculty interactions (respect, guidance, approachable, caring, interactions outside of class, connected, and accessible) and students’ academic self-concept, intrinsic motivation, extrinsic motivation, and achievement; and
2. one aspect of student–faculty interaction (negative experiences) and amotivation (lack of motivation).

METHOD

Participants

Respondents were 242 undergraduate students from a mid-size, Midwestern, public university where only first-year students are required to live in the residence halls. The respondents who participated for course credit were drawn from a class of 950 students enrolled in an introductory psychology course. This course enrolls approximately 900 to 1,000 students each semester, and students who take this course do so to fulfill the social science requirement of their core curriculum/general education requirement, within their first 2 years. They are representative of the approximately 2,000 new freshmen who arrive on campus each year. In this course, students have the option of participating in a variety of research studies and typically participate in studies that are offered at times that are available in their schedules. In this study, the survey was administered in small group sessions of about 10 participants each; the small group sessions were conducted across the semester. Every participant who signed up and arrived for the study completed the survey. A profile of the sample indicates that 54% of the respondents were female and 67% were European American. African Americans were the largest minority (24%), the average age was 19 years, a majority of the respondents were first- (62%) or second-year (25%) students, and their majors were represented across eight different colleges, including liberal arts (18%), education (20%), engineering (3%), mass communication (7%), agriculture (3%), business (12%), science (14%), applied science and arts (8%), and other (16%).

Instruments

Table 1 provides an overview of all the scales, number of items, and estimates of reliability using Cronbach’s coefficient alpha values. The

TABLE 1.

Brief Descriptions and Coefficient Alpha Values for the Student–Professor Interaction Scale, Academic Motivation Subscales, and Academic Self–Concept Scale

Subscales	No. of Items	Alphas
Student–Professor Interaction Scale	40	
Career Guidance	4	.83
Off-Campus Interactions	3	.73
Approachability	4	.86
Accessibility	4	.87
Negative Experiences	4	.76
Respectful Interactions	7	.89
Caring Attitude	3	.85
Connectedness	3	.86
Academic Self-Concept	40	.92
Academic Motivation	28	
Intrinsic	12	.92
Extrinsic	12	.86
Amotivation	4	.78

40-item Student–Professor Interaction Scale is designed to assess various types of student–faculty interactions and the authors provide details on the development of the scale, which went through two iterations to establish the validity of the subscales and report internal consistency alpha values ranging from .73 to .87 (Cokley et al., 2004, 2007). The scale utilizes a 7-point Likert scale and response options range from strongly disagree (1) to strongly agree (7). There are nine subscales and a brief description of each follows along with the internal consistency Cronbach’s alpha value for each subscale obtained in this study: Career Guidance (4 items; alpha = .83; sample items, At least one or more professors have provided me with guidance in developing my career goals, and My professors have encouraged me to succeed in achieving my academic dreams), Off-Campus Interactions (3 items; alpha = .73; sample item, I have a positive relationship with a professor outside

the classroom), Approachability (4 items; alpha = .86; sample item, I feel comfortable approaching professors to discuss my grades and class work), Validity Scale (3 items; alpha = .76; sample item, I work harder to succeed in a class if I know my professor genuinely cares about me), Accessibility (4 items; alpha = .87; sample item, Professors are available when I need guidance or assistance), Negative Experiences (4 items; alpha = .76; sample item, My professors seem distant and uninterested to me), Respectful Interactions (7 items; alpha = .89; sample item, Professors value my contributions and opinions, and When I interact with my professors I feel s/he truly listens to me), Caring Attitude (3 items; alpha = .85; sample item, I believe that there is at least one professor who cares about my well-being), and Connectedness (3 items; alpha = .86; sample item, I feel a bond with one or more faculty).

The 40-item Academic Self-Concept

scale (Reynolds, 1988) is designed to assess students' confidence in their academic skills and abilities and the author reports on its construct validity established by a positive correlation with general self-concept and grade point average (GPA). The internal consistency coefficient alpha value obtained in the current study is .78. A few sample items are: If I try hard enough, I will be able to get good grades; All in all, I feel I am a capable student; Most of my classmates do better in school than I do; and I have doubts that I will do well in my major (reverse scored).

The 28-item Academic Motivations Scale (Vallerand et al., 1992) is designed to assess responses to three subscales—*intrinsic*, *extrinsic*, and *amotivation*. The psychometric properties of this scale are well-established and it has been used frequently to assess students' motivation to attend college (Fairchild, Horst, Finney, & Barron, 2005; Vallerand et al., 1992). The number of items, the Cronbach's internal consistency coefficient value for each subscale obtained in this study, and sample items, are as follows: *intrinsic* motivation

(12 items; alpha = .92; sample item, For the pleasure that I experience in broadening my knowledge about subjects which appeal to me); *extrinsic* motivation (12 items; alpha = .86; sample item, In order to obtain a more prestigious job later on); and *amotivation* (4 items; alpha = .78; sample item, I once had good reasons for going to college; however, now I wonder whether I should continue). Finally, academic achievement was assessed by asking students to report their current college GPA.

Data were analyzed using correlation and regression analyses to examine the relationships between the eight types of student–faculty interactions as the predictors and each of the five outcome variables in the following sequence: academic self-concept, *intrinsic* motivation, *extrinsic* motivation, *amotivation*, and GPA. To reduce the likelihood of committing a type 1 error, the alpha level was set at the widely used and typically more conservative level of .05 or less. This would allow for at least a 95% probability that our conclusions regarding any significant differences were not due to chance.

TABLE 2.
Correlations Between Subscales of the Student–Professor Interaction Scale, Academic Motivation Subscales, Academic Self-Concept, and GPA

	Student–Professor Interaction Subscales							
	Career	Off-Campus	Approachability	Accessibility	Negative	Respect	Caring	Connection
Academic Self-Concept	.24**	.25**	.31**	.29**	-.28**	.33**	.25**	.24**
Intrinsic Motivation	.31**	.30**	.13*	.17**	-.10	.27**	.26**	.31**
Extrinsic Motivation	.13*	.09	.06	.08	-.08	.18**	.12	.09
Amotivation	-.07	-.02	-.14*	-.20**	.24**	-.25**	-.13*	-.04
GPA	-.02	-.06	.19*	.06	-.05	.11	.09	.03

p* < .05. *p* < .01.

TABLE 3.

Five Stepwise Multiple Regression Analyses With Student–Professor Interaction Subscales as the Predictors of Each of Five Outcome Variables: Academic Self-Concept, Intrinsic Motivation, Extrinsic Motivation, Amotivation, and GPA

Outcome	Step	Predictor	Beta	R ²	Change in R ²
Academic Self-Concept	1	Respect	.20**	.12	
	2	Approach	.21**		.04
	3	Off campus	.15*	.18	.02
Intrinsic Motivation	1	Career	.17*	.09	
	2	Respect	.16*		.03
	3	Off campus	.15*	.14	.02
Extrinsic Motivation	1	Respect	.16*	.03	
Amotivation	1	Respect	-.26**	.07	
GPA	1	Approach	.19*	.03	

* $p < .05$. ** $p < .01$.

RESULTS

Correlation Analyses

To establish the relationships between different aspects of student–faculty interactions, academic self-concept, student motivation, and achievement (GPA), we conducted Pearson product moment correlation analyses (Table 2). The largest number of significant correlations was between several aspects of student–faculty interactions and academic self-concept. Specifically, academic self-concept was negatively associated with negative feelings ($r = -.28$; $p < .01$) and positively with the remaining seven aspects of student faculty interactions, career guidance ($r = .24$; $p < .01$), off-campus interactions ($r = .25$; $p < .01$), approachability ($r = .31$; $p < .01$), accessible ($r = .29$; $p < .01$), respect ($r = .33$; $p < .01$), caring ($r = .25$; $p < .01$), and connectedness ($r = .24$; $p < .01$).

Intrinsic motivation was significantly and positively correlated with several aspects of student–faculty interactions: career guidance ($r = .31$; $p < .01$), off-campus interactions ($r = .30$; $p < .01$), being approachable ($r = .13$;

$p < .05$), accessible ($r = .17$; $p < .01$), respect ($r = .27$; $p < .01$), caring ($r = .26$; $p < .01$), and connected ($r = .31$; $p < .01$). Extrinsic motivation was positively associated with career guidance ($r = .13$; $p < .05$) and respect ($r = .18$; $p < .01$). Amotivation was negatively correlated with approachable ($r = -.14$; $p < .01$), accessible ($r = -.20$; $p < .01$), respect ($r = -.25$; $p < .01$), and caring ($r = -.13$; $p < .05$). There was also a positive relationship between amotivation and negative student–faculty interactions ($r = .24$; $p < .01$). Finally, GPA was positively associated with approachability ($r = .19$; $p < .05$).

Regression Analyses

Because there were numerous significant correlations and not much previous research examining specific aspects of student–faculty interactions, we conducted stepwise multiple regression analyses to explore and identify a parsimonious set of predictors with the greatest explanatory power in predicting each of four outcome variables, academic self-concept, three types of motivation (intrinsic, extrinsic, amotivation), and GPA (Table 3).

Results from these regression analyses indicate that 18% of the variance in academic self-concept was explained by three aspects of student–professor interactions: feeling respected, being approachable, and off-campus contact, $F(3, 233) = 16.73$; $p < .001$, adjusted $R^2 = .17$. Fourteen percent of the variance in students' intrinsic motivation, was explained by three aspects of student–faculty interactions (career guidance, respect, and off-campus interactions): $F(3, 233) = 12.01$; $p < .001$; adjusted $R^2 = .12$. In addition, 3% of the variance in students' extrinsic motivation was explained by respectful interactions: $F(1, 235) = 6.47$; $p < .001$; adjusted $R^2 = .02$. Further, 7% of the variance in amotivation was also explained by respectful interactions: $F(1, 235) = 16.34$; $p < .001$; adjusted $R^2 = .06$. Finally, 3% of the variance in GPA was explained by approachability of faculty members: $F(1, 146) = 5.20$; $p < .05$, adjusted $R^2 = .03$.

DISCUSSION

The results of our study offer strong empirical support for the notion that students' relationships with their faculty members are associated with important psychosocial and academic outcomes. Students who perceive their faculty members as being approachable, respectful, and available for frequent interactions outside the classroom are more likely to report being confident of their academic skills and being motivated, both intrinsically and extrinsically. Perhaps such interactions provide students with an opportunity to discuss their interest in their course work, get answers to their questions, and be exposed to their instructor's enthusiasm for their field of study. Students who are able to speak informally with faculty members also seem to be more likely to find the learning process to be enjoyable and stimulating and gain a better understanding of how their

college education could prepare them for the job market. In contrast, feeling alienated and distant from faculty members is associated with experiencing a lack of motivation. Students who perceive their faculty members as being less interested in them or in their learning seem to also report feeling discouraged and apathetic. These results are supported by previous research by Pascarella, Terenzini, and Hibel (1978), who note that student–faculty interactions are associated with increases in motivation, career aspirations, persistence (Pascarella, 1980a), and greater satisfaction with academic and nonacademic life (Pascarella & Terenzini, 2001).

Although frequency and quality of student–faculty interaction (such as being approachable and caring) have been consistently found to be important predictors of student motivation (Drew, 2001; Lampert, 1993; Shore, 2003; Teven & McCroskey, 1997; Thompson, 2001), feeling respected has not been explored as extensively. In our study, the perception of feeling respected during student–faculty interactions was repeatedly found to be a significant predictor of the variance in four outcome variables: academic self-concept, intrinsic motivation, extrinsic motivation, and amotivation. It is worth noting that students' perceptions of faculty members as being genuinely respectful toward them are associated with stronger student self-confidence and motivation. In particular, it seems likely that students who may be most vulnerable and “at risk”, that is, amotivated students, are most likely to perceive faculty members to be less respectful and less interested in their learning and progress. The importance of this interpersonal dimension of the classroom experience has been emphasized by Hammer (2005) and Keeley, Smith, and Buskist (2006) when describing an effective faculty member as one who is perceived by students to be understanding, respectful, encouraging, and accessible.

Besides the perception of feeling respected, students also seem to value the time that a faculty member may spend with them outside the classroom as well as any input they may provide regarding career development. While in college, students may see their faculty members as the experts in their field of study and may value their opinion, knowledge, and expertise. Whereas previously they may have relied on parents or other family members for professional guidance, they now have another resource they can draw on, their faculty members. This would be of particular relevance in the case of students who might be from first-generation, minority, or underprivileged backgrounds. Hence, students who perceive their faculty members as being approachable and are able to engage them in conversation outside the immediate classroom could likely benefit career-wise. Students could possibly come away feeling more confident, motivated, and interested in performing well. Some faculty members may not realize the extent to which their informal interactions with students could potentially be associated with students' self-confidence, motivation, and performance.

Even though the results of our study underscore the importance of various aspects of student–faculty interactions, we acknowledge some limitations that could potentially be addressed by future research. First, our study utilized cross-sectional rather than longitudinal data, making it difficult to draw causal conclusions. Second, because the study sample was relatively small, not completely random, and from one institution, the findings are limited in scope and generalizability; future researchers could obtain a larger, randomly selected sample of students from several educational institutions to address this issue. Third, like earlier researchers (Grzegorek, Slaney, Franze, & Rice, 2004) we utilized a self-report measure of GPA for assessing student

achievement. Despite research indicating that the association between self-report and objective reports of GPA is very strong (e.g., Nofle & Robbins, 2007 report this $r = .89$), it is suggested that, when possible, gaining respondents' permission and gathering GPA data from school records may increase accuracy. Fourth, future research could also examine the influence of personality traits on students' motivation, whether or not they seek out interactions with faculty members, and how they might perceive these interactions. Finally, we examined student–faculty interactions from the perspective of students; it would be interesting to find out how faculty members view their interactions with students and what they find enjoyable and beneficial from such relationships.

To conclude, the results of our study make a significant contribution to the literature by emphasizing the importance of specific aspects (approachable, respectful, off-campus interactions, and career development) of student–faculty interactions in predicting students' self-confidence, motivation, and achievement. University and college administrators, student affairs personnel, residence hall staff, and faculty members who value these social psychological and interpersonal aspects of teaching and learning, could direct resources into programs such as living learning communities, mentoring programs, and study halls that foster informal student–professor interactions. Further, as student bodies increase in diversity, it is important that faculty members consciously reach out to ethnic minority students who may not find it easy to approach them. Training programs that sensitize faculty members to the importance of interacting and connecting with all types of students and being perceived as approachable, particularly to ethnic minority students, would be valuable for student development. These training programs could include role plays, sessions on

listening skills, and communication skills for interacting effortlessly with the current generation of college students. Similarly, orientation programs for new faculty members and graduate student instructors could include tips, such as frequently reminding students about office hours, communicating an interest in helping students, and offering mentoring to students who do approach them. In addition, institutions of higher learning could communicate their commitment to such

efforts by providing recognition, rewards, and incentives to faculty members who actively promote student–professor interactions, thus increasing the likelihood of enhancing students’ confidence, motivation, achievement, and graduation rates.

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Research In Brief: Using Mobile Phones to Collect Daily Experience Data From College Undergraduates

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This research brief describes our recent efforts collecting daily experience data from college undergraduates at a large midwestern U.S. university through mobile phone text messaging. By daily experience data, we mean data that are collected at multiple points from individuals within their natural context, over a period of time. This approach to data collection provides a way to study phenomena under the conditions in which they naturally occur and to examine how those phenomena progress over time or across contexts (Bolger, Davis, & Rafaeli, 2003).

Gathering data from individuals at multiple points over the course of time as a way to better understand their experiences has been used as early as the 1920s. Since then, the methods of collecting that data have evolved alongside technological advances, with early paper and alarm watches eventually giving way to beepers and personal digital assistant (PDA) devices (Scollon, Kim-Prieto, & Diener, 2003). A variety of approaches are possible, including (a) time-based designs, in which participants are asked to respond at fixed intervals (e.g., at 10:00 a.m. and 4:00 p.m. each day), (b) event-based designs, in which participants are asked to respond when a certain event occurs (e.g., before each meal), and (c) interval-based designs, in which participants are asked to respond whenever prompted (e.g., by an electronic beeper). In the current study, we

examined the feasibility of an interval-based approach that might be considered a natural extension of these methods: collecting data from college students via text messaging.

The Experience Sampling Method

The experience sampling method (ESM) is a term associated with interval-based designs in which participants provide daily experience data when they are signaled at various (usually random) times during the day and across an extended period of time (Hektner, Schmidt, & Csikszentmihaly, 2007; Scollon et al., 2003). Other compatible terms include *ecological momentary assessment* (Stone, Shiffman, & DeVries, 1999) and *time-based diary research* (Bolger et al., 2003). Collecting data through this method has several strengths compared with traditional survey or laboratory-based methodologies. First, experience-sampling allows a useful way to explore the link between context and behavior or feelings, because data can be collected while the participant is within a particular context. Second, time-based methods allow the ability to assess changes that occur within individuals over time or across situations. Third, the accuracy of data need not rely on participants' retrospective memory, as is often required in traditional survey methods.

A large number of ESM studies have focused on adolescence. Topics of ESM

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research conducted with that population have included studies of time use (Larson, 1989), the context of mood (Larson, Moneta, Richards, & Wilson, 2002), student engagement during instructional activities (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003), and the relationship of cortisol levels to emotions (Adam, 2006). ESM methods have also been utilized to better understand the experiences of college students. For example, in order to study the experiences of Black students on predominately White campuses, Cole and Yip (2008) provided Black college freshmen with electronic pagers and paper data diaries. Over a 10-day period, participants logged data regarding their location and mood whenever they were beeped. The multiple data points allowed the researchers to explore the relationship between participants' emotional states in school versus nonschool settings. Other research topics studied in college settings through daily experience data methods have included motivators of alcohol use (Hussong, 2003), and events evoking social anxiety (M. R. Lee, Okazaki, & Yoo, 2006). In their study of risk perceptions among college students, Hogarth, Portell, and Cuxart (2007) used an event-based ESM design, but utilized students' own mobile phones rather than providing pagers. In that study, participants were supplied with questionnaires that they were asked to complete whenever they received a text message from the researcher.

Researchers are not limited to having participants complete responses on paper, however. In a number of EMS studies, participants have been provided with PDA devices so that they could enter responses directly into those devices whenever prompted (for a review of methods including PDA use, see Hektner et al., 2007). Each approach appears to come with advantages and disadvantages. In reviewing electronic and paper-based methods, Broderick (2008) pointed out that

one limitation to paper-based methods is that they assume that respondents will complete the form at the time of being signaled. That author's attempts to verify compliance with paper-based methods found evidence that participants frequently completed the requested data before or after the actual time of prompting. In comparing paper-based and electronic methods, Broderick concluded that providing PDA or other devices may hold advantages in terms of compliance, less missing data, and fewer data-entry errors; but doing so may hold disadvantages including technical problems, cost, and the need for training participants.

Text Messaging as a Research and Intervention Tool

As mobile phone use and text messaging has continued to play a more central role in people's daily lives, some researchers and clinicians have sought to use the medium as a tool for interventions and data collection. Such efforts have included sending tailored health messages to college students who are trying to quit smoking (Obermayer, Riley, Asif, & Jean-Mary, 2004), adolescents with diabetes (Franklin, Waller, Pagliari, & Greene, 2006), adults in a weight-loss program (Patrick et al., 2009), and patients with eating disorders (Bauer, Percevic, Okon, Meermann, & Kordy, 2003).

In one of the few known published studies that utilized text messages to systematically collect diary data, asthma patients (median age = 38.5 years) were asked to reply to at least three of four messages sent daily for 2 months (Anhøj & Møldrup, 2004). Message content included a variety of self-management topics and data. The researchers found less attrition than they had experienced in Web-based diary efforts and concluded that the method was feasible and resulted in acceptable response rates.

Text messaging appears to have several strengths as a tool to collect data from college students regarding their daily experiences. Like other ESM methods, data collection via mobile phone would allow data collection under natural environmental conditions and across multiple time points. But because text messaging is especially prevalent among youth (Faulkner & Culwin, 2005), using that medium for data collection might be a more viable alternative to implement than providing PDA or other electronic devices. In a survey of undergraduates ($N = 250$) conducted at the university where the current study took place, over 98% of students reported owning a mobile phone, and 85.6% of those students reported using text messaging (Ravert & Kile, 2007). Having participants use their own mobile phones would reduce costs and security risks associated with providing participants with PDAs or other electronic devices (Hektner et al., 2007). An additional advantage might be that, because mobile phones are already a part of college culture, students might be more likely to respond to messages in situations where they might be inclined to forgo paper or PDA methods (e.g., at a bar or beach).

The Current Study

We undertook the current pilot study to explore the feasibility of collecting quantitative and qualitative data from undergraduates by sending them text messages via their mobile phone. Our method involved asking participants to agree to receive and reply (within 15 minutes) to a series of daily messages sent over a 1-week period. Our objective was to assess the general feasibility of text messaging as a data collection tool and to identify problems or issues that might jeopardize reliability or validity. We were especially interested in evaluating (a) what response rate the approach would achieve, (b) how well text messaging could facilitate

collection of both quantitative and qualitative data, (c) what length and legibility of replies would result, (d) how promptly participants would reply to the daily messages, and (e) how users would perceive the method. In this brief we report findings and discuss the challenges and potential of the approach for researchers and student affair practitioners who might consider using similar methodologies to collect data on college student behaviors, attitudes, and experiences.

METHOD

Participants

Sixteen undergraduates, ages 19-23 ($M = 20.4$ yrs), were recruited from a large (approximately 200 students) undergraduate human development and family studies course. Procedures used in the study were approved by the campus institutional review board. Following a course announcement, we randomly selected a set of potential participants from the course roster and sent those students a recruitment e-mail. Students responding to the e-mail were invited to schedule a time to visit the researcher's lab for a brief intake session. A randomly selected study ID was assigned to each participant and used to replace identifying information (including phone number) in the final dataset in order to protect confidentiality.

The final sample included 14 females and 2 males and was evenly distributed among sophomores, juniors, and seniors. A large majority (87.5%) of students indicated White as their race. The demographic makeup of the sample was representative of the class, but was not representative of the university. Still, we considered the sample acceptable due to the exploratory nature of the study and given that our goal was to assess feasibility of a method (rather than to generate generalizable inferences).

Procedure

At the intake sessions, participants reviewed and agreed to the study consent form, were informed about the study, and completed a Web-based intake survey. We explained that they would receive the same text message twice a day, worded, “What are you doing now? How risky is what you are doing, 0-9? What could happen?” We requested that replies always include (a) a brief, legible sentence describing the activity they were engaged in when they received the text message; (b) a number, using a scale from 0 (*none*) to 9 (*extremely risky*), to describe how risky they considered their current activity; and (c) a brief explanation of what outcome could result from the current situation (if the rating had been anything other than 0).

Participants completed surveys that collected demographic data including the students’ age, year in school, gender, and race. In addition, they were asked to provide a list of times they would not be available to receive the text messages (i.e., during class). Although we were unable to tailor message times to fit individual schedules, we explained that messages would not be sent at times when a majority of participants were unavailable. Participants were told what date the messages would begin, but were not given the specific time that messages would be sent.

Participants received incentives of \$10 for completing the intake session, \$1 for every text message they replied to (14 possible), and \$15 for successfully completing the study and Web-based exit survey. They also received 10 cents per text message received or sent to reimburse any charges they might have accrued.

Data Collection

The research team consisted of the primary investigator, a doctoral-level research assistant, and a university information technology

administrator. Text messages were sent from and received by a university e-mail account created for use in the study. Two methods of text message delivery were piloted. The first set of messages was sent manually as a single message, using Microsoft Outlook, by including participant addresses in the blind carbon copy (bcc) field. The second set of messages was sent using a Visual Basic Script, developed by the third author, that automatically sent the set of messages at predetermined times. The ability to send messages at any predetermined time during a 24-hour cycle was one of the main benefits of using the automated system.

Participants were simultaneously sent a text message twice per day, for 7 days. The exact times of the text messages varied each day and were unknown to the participants. One message was sent between 9:00 a.m. and 4:00 p.m. daily, and the second was sent between 5:00 p.m. and 10:30 p.m. Message times were varied as widely as possible across the 7 days, purposely avoiding times that a large number of participants had indicated as being unavailable. For example, no messages were sent on weekdays between 9:00 a.m. and 11:00 a.m. because a large number of students had listed that time as unavailable (due to classes). All outgoing messages were worded, “What are you doing now? How risky is what you are doing, 0-9? What could happen?” This choice of wording allowed us to assess the feasibility of collecting quantitative as well as qualitative data.

RESULTS

Participation and Message Reception

In intake sessions we found that, although students all knew how to receive a text message on their mobile phone, none knew what e-mail address we would need to use in order to send them text messages from a computer. The standard protocol is that text

messages are addressed by the user's mobile phone number followed by @ and an extension specific to the cellular service provider for that individual (e.g. 5555555555@cingularme.com). Because participants did not know what extension should be used, we generated an initial e-mail address based on the participant's mobile phone number and the extension that we thought to be required by their respective service providers. In one case, a participant's first message was returned and we were successful after trying an alternate extension for the same service provider.

Two students who signed up to participate had to be dropped from the study due to technical problems that kept them from receiving our text messages. In one case, the participant sent the researchers a message on the second day of data collection explaining that she/he received notification that a message had been delivered, but did not receive any message content. In the second case, a participant sent the researchers an e-mail on the fourth day of the study saying that she/he hadn't received any text messages yet. We attempted to discuss the problem with the service provider, but their policy allowed only talking directly with the client, and we were ultimately unable to uncover the cause of the problem. The two students unable to complete the study were provided with incentives for their participation but are not included in analysis.

Response Rate

Among the 14 participants (excluding the 2 who were dropped due to technical problems), 4 students replied to all 14 messages for a 100% response rate. The lowest response rate was 64.3% for a participant who responded to 9 of 14 possible messages. Across participants, a total of 174 responses were received (out of 196 possible), representing an overall response rate of 88.8%.

Quality and Length of Responses

The 174 responses we received were examined to assess how frequently they included answers to all 3 questions included in the outgoing message (i.e., what the participant was currently doing, a numerical rating of how risky that activity was, why the activity was risky). All 174 responses were found to describe what the participant was doing (i.e., "watching tv," "i'm at the gym spotting someone," and "I'm studying in my room"). In 97.7% of those cases, the reply also included a numerical rating of risk associated with that activity. Those ratings ranged from 0 (i.e., for "sleeping" and "sitting on my couch") to 8 (i.e., for "texting while driving" and "using a knife"), with a mean rating of 1.73 ($SD = 2.01$). The final component, why the activity was risky, was addressed in 91.9% of responses (i.e., "I could get in an accident," "I could screw up and get a bad grade," and "nothing really could happen").

Participants typed an average of 42.6 characters (not including spaces), or 10.6 words, per reply. The shortest reply was 16 characters, worded, "Driving 7 accident ." The longest reply included 109 characters (or, 139 characters including spaces) and was worded, "i just drove home from campus level 8 the streets are very dangerous and an accident is likely or falling on the ice getting to the car." As a point of reference, the maximum length for text messages is typically 160 characters, including spaces. All messages were legible, and no text message short hand or other nonstandard jargon was included in messages.

Promptness of Replies

One purpose of the study was to assess how promptly participants would respond to the daily messages. Across all 174 replies, a large majority (81.8%) arrived in the researcher's

inbox within 15 minutes of the outgoing message. The mean time of reply (from the time the message was sent until a reply was received) was 14.5 minutes, with a median of 4 minutes. That mean was skewed by a small number of very slow responses. Four messages (2.3% of replies) were received more than 1 hour following the outgoing message. The longest delay in replying was 10 hours, for a message saying, "i was sleeping when u text last night 0 risk nothing could have happened." In some cases the cause of a late response was evident within the message, as in the case of one late message that explained that the participant had "just left a test." At other times it was not clear why a participant had failed to reply within the requested 15-minute limit. For example, one message worded "I am at a party. Rate 5 i could get drunk & do something stupid" was received 90 minutes after the outgoing message was sent.

User Perceptions

In an anonymous Web-based survey conducted upon completion of the week of text messaging, participants were asked what, if anything, had kept them from responding to all of our messages. Their explanations included that they (a) were sleeping ($n = 3$), (b) had the phone on silent ($n = 2$), (c) were working ($n = 2$), (d) were not near the phone ($n = 1$), and (e) received the message during an exam ($n = 1$).

Asked how accurate their responses were, 57.1% of participants indicated "extremely accurate," and 42.9% selected "quite accurate." No participants selected "slightly accurate" or "not at all accurate." Asked why their message might not have been 100% true, one participant explained that some time had passed before she/he replied, possibly limiting the accuracy of the response. Another participant described "feeling rushed" while responding and a third replied that her/his

responses depended on what mood she/he was in at the time. One participant reported giving "quite accurate" replies in general, but added that in some cases she/he might have embellished because she/he "wasn't doing anything" when the message came. The participant wrote, "I had to make it somewhat interesting, so it may not have been all true."

When asked their opinions about the questions that had been included in the daily text message they received, participants expressed general satisfaction. All participants described the first question ("what are you doing now?") favorably. However, there were different opinions regarding the quantitative scale used in the second question ("How risky is what you are doing, 0-9?"). Whereas some participants described the scale as "easy to understand" and "straight forward," one participant described it as "a little tricky." A second participant wrote that the scale was "hard to judge," and that "the degree of '0' and '9' should be more clear." Thus, it may be important to include the rating scale within the message itself, in addition to clarifying it at the beginning of the study as we did.

Limitations to the Method

Although we were pleased with the success of the text message data collection method overall, several limitations to the methodology were noted. Some of these limitations involve our decision to send and manage text messages within an e-mail environment. As noted, we were unable to identify an e-mail address that would successfully send a text message to the mobile phones of two participants. Also, we found that our e-mail program (Microsoft Outlook) did not store all of the data we wished regarding when and where messages were sent. For example, when messages were sent using the blind carbon copy (bcc) function, no record was automatically kept regarding which addresses the message was sent to. Further,

when we began retrieving participant's text replies, we found (unexpectedly) that some of those messages had been automatically forwarded to the junk mail box.

These challenges related to sending and receiving text messages through a computer-based e-mail program might be addressed by sending messages from a custom application or from another mobile phone. But other limitations involve the unique medium of text messaging. The first regards a lack of available information regarding the exact time that participants actually received and sent messages. Text messaging is unique compared with telephone calls, beepers, or PDAs, in that message transmission cannot be assumed to occur instantly. In cases where no reply is received, the researcher had no certainty that the participant received the message. Additionally, text messages are subject to being placed in cues or being rerouted before reaching the receiver. Although some service providers automatically include the time of reception in reply messages, that function is not standard. Therefore, the exact time that participants received the message was not always available. Likewise, the exact time that they sent a reply was not always available; only when we received that reply was known. So, identifying the amount of time that passed between the time a participant *received* and *replied* to a message could not be accurately assessed. Rather, we were limited to knowing when the original message was *sent* and when the reply was *received*. This limitation could be a substantial problem in studies where validity of data is strictly time dependent. Also, our ability to make participant incentives contingent on timeliness of replies was limited by a lack of accurate information regarding how much time might have passed before participants replied. Future feasibility studies of text messaging might use an alternate means to assess the speed and reliability of messaging from a technical

perspective, for example by having participants call to notify the researcher of the exact time that they receive and reply to the messages.

Although the data we collected was confidential, and responses were separated from identifying information, anonymity was not an option in the study because we were sending messages to participant's personal cell phones. The consent form specified that although responses would be kept confidential, under certain, extremely rare circumstances (for example, if presented with a court order to divulge the records), we might be required to divulge content of their responses to a third party. Although we had no indication that confidentiality concerns influenced results in any way, those types of concerns could potentially limit participant's willingness to fully disclose their actions in responses.

Also, for some research objectives, the limits (and norms) associated with the length of text messages might be problematic. Although replies we received were consistently legible and typically addressed all components of the question we had asked, they often lacked contextual information and richness that would be possible in other methods such as surveys or interviews. For example, one participant simply responded, "working 3 could get hurt," without including details of the type of work or what injury she/he expected might occur. For some research questions, brief responses such as this one might be sufficient. But in other cases, the researcher might desire a degree of detail and elaboration that exceeds the capacity allowed in text messages (160 characters). Additionally, students who are used to sending brief, single sentence text messages might be inclined to do so when responding to research questions as well. Researchers might consider using additional methods (i.e., e-mail, phone interview) to follow-up on data that is collected via text messaging but needs further explanation.

RECOMMENDATIONS

Text messaging was found to hold substantial potential as a way to collect small amounts of qualitative and quantitative data across multiple time points from college students. The response rate was exceptionally high. In a large majority of cases, participants responded as requested, providing legible text and a numerical rating. Our experience suggested several recommendations for others planning to use this method. The first set of suggestions includes issues to be addressed prior to data collection.

In presenting the study protocol, researchers should be clear about expectations in replies—for example, whether or not text shorthand or jargon is acceptable. Researchers might want to stress that participants provide an accurate and honest answer to each message, regardless of how well they think it matches the researchers' intentions (for example, even if they feel what they are writing is boring).

From a safety and human subjects perspective, we were concerned to see that almost one half of participants reported replying to our message while driving, even after having been specifically instructed not to do so and signing a consent form agreeing not to do so. The dangerous practice of using text messaging and other distractive technologies while driving is thought to be especially problematic among young drivers (J. D. Lee, 2007). For this reason, researchers might stress the importance of avoiding texting while driving or other hazardous activities.

Participation seemed very manageable for this sample of college students. Few inconveniences or suggestions were noted by participants. The most common barrier to replying that participants mentioned was receiving messages at a time when they were unavailable due to sleep, work, or class, or when the phone was on silent. However, technical

problems kept two potential participants from participating, which could be a substantial limitation in terms of representativeness. Testing the text address during the intake session would be helpful by identifying whether problems with delivery exist. In that case, the participant might call the service provider with the researcher present, so that they can discuss the problem with a service provider representative to identify the problem and find a solution. Sending an e-mail to all participants after the first day of messages, confirming the number of messages they received and how many replies they sent, might also be useful.

Researchers might prepare for some degree of inevitable uncertainty regarding exactly when participants received the outgoing message or sent a reply. Also, researchers should recognize that they have no assurance that a text message sent to multiple recipients simultaneously will be received at the same time by all recipients. Studies that depend on precise timing of responses might not be best suited for text messaging due to these limitations.

Two additional recommendations based on our experience involve organization and management of data when sending messages from an e-mail program. First, researchers using the method might consider manually logging the time and recipient of all outgoing messages, because that information may not be automatically stored. Also, our experience with finding replies in the junk mail folder suggests the importance of checking that message replies and checking settings to insure that any message inadvertently forwarded to that location is not automatically deleted.

CONCLUSION

Text messaging as a data collection method appears to hold substantial potential for

collecting numerical and text responses, but within a set of limitations. When standardized responses are required or certainty regarding response timing is required, PDA devices or similar methods may have an advantage over text messaging (for example, we have recently been piloting collecting ESM data from college students using automated push-button telephone surveys). But if that is not the case, and when researchers wish to collect small amounts of open-ended responses across multiple time points, text messaging may be a good solution. Advantages to the text message data collection method appear to be low cost, minimal time required for training and implementation, favorable response rates, and that the existing popularity of text messaging minimizes the need to provide participants with equipment. Limitations appear to include the potential for technical problems, uncertainty regarding message reception, and restrictions on the amount of text that can be sent and received per message.

In a review of experience sampling studies, Scollon, and colleagues (2003) concluded that the method “is most useful when applied in conjunction with other methods” (p. 12). Based on the strengths and limitations that we

identified, we feel that using text messaging as a data collection tool might be most effective in studies that use the method along with other strategies (i.e., surveys, observations, or interviews). One approach would be to use follow-up interviews, daily e-mails, or other tactics to illicit elaboration on data that were collected in the text messages.

In conclusion, collecting data from students within the context of their natural environment via experience sampling methodology appears to be a valuable methodology for researchers and student affairs professionals who seek to collect data from students regarding their day-to-day experiences. Text messaging appears to hold promise as a tool for doing so. We hope that researchers and practitioners will be able to capitalize on strengths of the method as a means to improve the college experience and to better understand college student behavior and development.

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