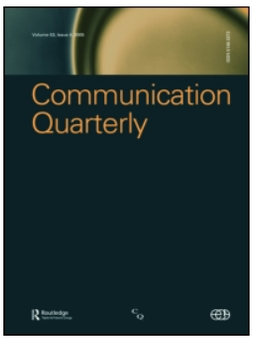

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College Students' Psychological Needs and Intrinsic Motivation to Learn: An Examination of Self-Determination Theory

Zachary W. Goldman, Alan K. Goodboy, & Keith Weber

Over the last several decades, instructional communication scholars have studied and measured student motivation as an important learning outcome. Unfortunately, this research has lacked theoretical guidance and has treated student motivation as a construct that varies only in quantity, ignoring existing theory that suggests student motivation is best understood as a construct that differs in quality (i.e., intrinsic motivation). To create two new measures that incorporate theoretical explanations of student motivation, three studies (N = 1,067) were undertaken using self-determination theory (SDT) to operationalize students' intrinsic motivation as a product of basic psychological need satisfaction. In the first two studies, the Student Psychological Needs Scale and the Intrinsic Motivation to Learn Scale were developed and validated. In the third study, parallel mediation analyses supported SDT's prediction that the fulfillment of students' psychological needs (i.e., autonomy, competence, relatedness) would mediate the relationship between personalized education practices and intrinsic motivation to learn.

Keywords: Instructional Communication; Intrinsic Motivation; Personalized Education; Self-Determination Theory; Student Motivation

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Most college educators have been fortunate enough to work with students who are genuinely excited about coming to class and eager to learn the course material. On the other hand, most educators have also worked with students who are apathetic about learning and generally uninterested in the events that transpire in the classroom; these students view learning as a "a chore rather than a joy—an activity to be avoided rather than sought out" (Ryan & Deci, 2009, p. 171). Contrary to early evidence, the distinction between these two types of students is not general intelligence, which accounts for less than 25% of students' overall achievement (Kuncel, Hezlett, & Ones, 2004). Rather, students' attitudes, communication behaviors, and success are best understood as products of their own intrinsic motivation to learn (Reeve, 2002).

Intrinsic motivation has been described as "one of the most important psychological concepts in education" (Vallerand et al., 1992, p. 1004). When individuals are intrinsically motivated, they "engage in activities that interest them and, in so doing, help them to learn, develop, and expand their capacities" (Ryan & Deci, 2000b, p. 16). At the college level, intrinsically motivated students find academic activities worthwhile and meaningful; thus, they actively seek out the intended benefits of assignments, assessments, and other forms of coursework (Brophy, 1983). It is unsurprising, then, that a considerable amount of interdisciplinary research has been devoted toward understanding and promoting the conditions that foster students' intrinsic motivation in the classroom (Black & Deci, 2000; Deci, Koestner, & Ryan, 2001; Pintrich, 2004). Student motivation has also been a topic of interest in the instructional communication literature; however, this research has been characterized as largely atheoretical (see Nussbaum, 1992) and has grown disjointed in many ways from the pioneering research originally conducted on the topic in educational psychology (Brophy, 1983). Moreover, due to limited instruments created in the discipline, instructional communication scholars have struggled with operationalization concerns that likely hinder the interdisciplinary appeal of this research (c.f., Rodriguez, Plax, & Kearney, 1996). Therefore, the purpose of this investigation was to (a) identify methodological weaknesses associated with student motivation research in the communication literature and incorporate self-determination theory (Deci & Ryan, 1985) to help address such shortcomings; (b) operationalize students' intrinsic motivation to learn as a product of their psychological needs in the classroom by creating and validating two original self-report instruments; and (c) evaluate the applicability of self-determination theory as a valid explanation for the relationships between instructional communication practices and the fulfillment of college students' psychological needs and their intrinsic motivation to learn.

Student Motivation in the Communication Literature

Regarded as one of the field's traditional learning outcomes (Goodboy & Myers, 2008), student motivation has been historically examined in the instructional communication literature as an outcome of instructors' communication behaviors (McCroskey, Richmond, & McCroskey, 2002). As Christophel (1990) noted, this focus is rooted in the idea that instructors are "active agents within the educational environment, capable of stimulating the development of student motivation toward learning" (p. 324). Scholars have

investigated student motivation as both a state- and a trait-like variable. *State motivation* is a situational construct that refers to the effort put toward a particular task or content area at a given point in time (Christophel, 1990). *Trait motivation* is a relatively stable construct that refers to the overall drive students have toward studying and learning in general (Richmond, 1990). Communication researchers often favor state motivation because of its strong associations with effective teaching behaviors such as nonverbal immediacy (Kerssen-Griep & Witt, 2012), clarity (Comadena, Hunt, & Simonds, 2007), affinity seeking (Frymier, 1994), confirmation (Goodboy & Myers, 2008), and humor (Wanzer & Frymier, 1999). Although these findings have yielded important pedagogical implications, this research has been limited by three methodological concerns that should be addressed in order to better align communication scholarship with modern theories of motivation (c.f., Ryan, 2012).

First, instructional communication researchers have not created instruments consistent with the historical conceptualization of student motivation to learn. Previous studies have relied almost exclusively on Christophel's (1990) 12-item self-report scale to operationalize state motivation in the classroom (Beatty, 1994). With essentially no alterative measures in the field, Christophel's instrument has been labeled by some as the "gold standard in the communication discipline" for investigating student motivation (Brooks & Young, 2011, p. 56); the overreliance on this bipolar adjective measure (as well as the scale's shortened five-item version; see Richmond, 1990) is problematic because it focuses mostly on short-term attention and affective learning (e.g., with items such as "Not Aroused/Aroused"), rather than intrinsic motivation to learn (c.f., Brophy, 1983). Rodriguez et al. (1996) argued that an "examination of the items employed to assess these two constructs [state motivation, affective learning] indicates that they measure highly similar affective states" (p. 298). Previous research has validated this concern of measurement isomorphism between state motivation and affective learning as the two variables often correlate at 0.80 or higher (Goodboy, 2011). That said, researchers continue to use Christophel's (1990) and Richmond's (1990) versions of the state motivation instrument in survey research, arguably because suitable alternatives have not been created in the field.

Second, instructional communication researchers have not yet made a concerted effort to differentiate the origins of student motivation; specifically, scholars have often overlooked the distinction between intrinsic and extrinsic motivation (Ryan & Deci, 2009). With few exceptions (e.g., Bolkan, Goodboy, & Griffin, 2011; Kerssen-Griep, Hess, & Trees, 2003), communication researchers treat student motivation as a construct that varies only in quantity (i.e., low to high), rather than quality. This is concerning because decades of research in educational psychology (see Lin, McKeachie, & Kim, 2001; Pintrich, 2004) have shown that multiple types of student motivation exist. Notably, scholars have identified three major forms of motivation: intrinsic, extrinsic, and amotivation (Vallerand et al., 1992). *Intrinsic motivation* refers to individuals' tendency to "engage in activities that interest them and, in so doing, help them to learn, develop, and expand their capacities" (Ryan & Deci, 2000b, p. 16); *extrinsic motivation* refers to the "performance of an activity in order to attain some separable outcome" (Ryan & Deci, 2000a, p. 71); *amotivation* refers to "having no intentions for behavior and not really

knowing why one is doing it" (Gagne & Deci, 2005, p. 336). Instructional communication scholars often ignore these differences and continue to treat state motivation as a variable that differs in quantity alone.

Third, instructional communication scholars have often failed to use theory to explain how classroom interactions influence student motivation. Instructional communication research has historically been criticized for lacking theory (Waldeck, Kearney, & Plax, 2001), but perhaps nowhere is this criticism more evident than within the student motivation literature. Few attempts have been made to explain the mechanisms behind the communication–motivation relationship, leaving scholars to speculate as to how instructors encourage or discourage student motivation through classroom interactions. One theory that fills this void, as well addresses the previous two criticisms of communication research, is self-determination theory (SDT; Deci & Ryan, 1985).

Self-Determination Theory: Psychological Needs and Intrinsic Motivation

SDT assumes that individuals possess "an active tendency toward psychosocial growth and integration," which drives them to "seek challenges, to discover new perspectives, and to actively internalize and transform cultural practices" (Ryan & Deci, 2002, p. 3). SDT asserts that people are naturally motivated to self-improve; yet, this drive can be supported or discouraged by one's social environment (Deci & Ryan, 1985). Specifically, SDT predicts that intrinsic motivation depends on three basic psychological needs: the need for autonomy, the need for competence, and the need for relatedness (Deci & Ryan, 1985). *Autonomy* refers to being the perceived source of one's own actions. Individuals feel autonomous when they internalize their behavior as an expression of their own freewill (Ryan & Deci, 2002). *Competence* refers to feeling effective in one's ongoing interactions in a social environment. Individuals experience competence when they encounter challenging opportunities that allow them to express their true capacities (Deci & Ryan, 1985). *Relatedness* refers to perceiving a connection with others (Ryan & Deci, 2009). Individuals experience relatedness when they develop a sense of belongingness with their peers, community members, or with others whom they respect (e.g., Beachboard, Beachboard, Li, & Adkison, 2011; Moller, Deci, & Elliot, 2010; Niemiec & Ryan, 2009).

SDT has been particularly useful for understanding college students' intrinsic motivation to learn (e.g., Black & Deci, 2000; Deci, Vallerand, Pelletier, & Ryan, 1991; Niemiec & Ryan, 2009). Reeve (2002) noted that two conclusions can be made from this extensive body of research. First, intrinsically motivated students flourish across academic settings, especially in comparison to extrinsically motivated and amotivated students. Students who are intrinsically motivated experience greater academic achievement (Miserandino, 1996) and have higher retention rates throughout college (Vallerand, Fortier, & Guay, 1997) than extrinsically motivated students. Second, instructors play an important role in promoting students' intrinsic motivation by helping to fulfill their psychological needs in the classroom. Multiple studies (e.g., Bolkan & Goodboy, 2015; Reeve & Jang, 2006) have shown that instructors who

support students' autonomy, competence, and relatedness through their behaviors are more likely to increase their intrinsic motivation to learn.

Overall, SDT provides a unique understanding of how motivation varies in both quantity and quality, an aspect that is often overlooked in communication research. As Deci and Ryan (2002) noted, "mainstream theories of human motivation…continue to use a relative mechanistic meta-theory to view motivation as a unitary phenomenon—something that varies in amount but not kind" (p. 433). By adopting SDT into the instructional communication literature, researchers could substantially improve students' learning experiences by examining the role that communication plays in facilitating intrinsic motivation to learn in the classroom. Put differently, "communication researchers [must] begin to embrace self-determination theory in order to understand how instructors meet students' basic needs and how the fulfillment of these needs facilitates students' behaviors and, ultimately, learning" (Bolkan & Goodboy, 2015, p. 60).

Rationale

One way in which scholars have begun to incorporate SDT into the communication literature is by adapting generic scales created in psychology to fit their investigations (Bolkan & Goodboy, 2015; Bolkan et al., 2011; Kerssen-Griep et al., 2003). This process of adapting proxy scales has helped introduce SDT into the field of instructional communication, but it also comes with additional problems. Many of the scales (see Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010; Reeve & Sickenius, 1994; Ryan & Connell, 1989) require significant modifications before they can be applied to the context of the classroom, and these alterations must be made in a consistent fashion to preserve content validity; such modifications unnecessarily burden communication researchers. Moreover, scales that do measure needs and motivation in the educational context also require their own modifications to meet the unique characteristics that define the contemporary college learning environment. For instance, Vallerand et al.'s (1992) Academic Motivation Scale (AMS) was designed to assess students' overall *motivation for attending college*, rather than students' motivation to learn material in a specific course or classroom. Additionally, scales such as the Academic Self-Regulation Questionnaire (ASRQ; Ryan & Connell, 1989), which was created to measure SDT among grade-school students, requires alterations to the language of items as students of this age have fundamentally different ways of perceiving, experiencing, and satisfying their psychological needs. If done incorrectly, the modification of such scales threatens the conceptual and structural integrity of the instruments as well as their intended constructs; thus, many psychometricians endorse the creation of items that organically assess their intended context (see DeVellis, 2017).

Therefore, the overall intention of this investigation was to utilize SDT to improve the study and measurement of students' motivation to learn in the communication literature. In line with this goal, we sought to create new measures to assess college students' psychological needs and their intrinsic motivation to learn in the classroom,

rather than relying on the few measures that have been created in the field of communication (i.e., Christophel, 1990; Richmond, 1990) or adapting measures created in other contexts. Moreover, our research sought to test SDT as a valuable theory for future instructional communication research by examining the extent to which psychological needs mediate the relationship(s) between effective teaching practices and students' intrinsic motivation to learn. To meet these intentions, three studies were conducted.

Study One: Scale Development

The purpose of the first study was to generate a preliminary item pool and explore the factor structures for two original instruments. Following standard psychometric procedures (Clark & Watson, 1995; DeVellis, 2017), study one included two phases of the scale development process: item-generation and item-reduction. Two recommendations guided the item-generation process. First, we utilized Haynes, Richard, and Kubany's (1995) suggestion that content for the scale items should be derived from multiple sources, including (a) previous literature and theoretical frameworks, (b) preexisting scales and related instruments, and (c) deductive reasoning on the behalf of the researchers. Second, we followed the recommendation of DeVellis (2017), who suggested that scale developers create at least three times the items expected in the measure in order to utilize the best-preforming items in the scale's final iteration.

Method

The first portion of the item pool was created by reviewing the basic tenets of SDT (e.g., Ryan & Deci, 2002) as well as dozens of SDT-related investigations that have been conducted within the educational context (e.g., Black & Deci, 2000; Niemiec & Ryan, 2009; Vansteenkiste, Lens, & Deci, 2006). An additional portion of the items were developed by reviewing and modifying preexisting SDT instruments that were originally designed to assess needs and motivation in contexts such as sports, general activities, workplaces, and K–12 education (Broeck et al., 2010; Guay, Vallerand, & Blanchard, 2000; Reeve & Sickenius, 1994). Finally, original items were also created by the authors after a thorough review of the instructional communication literature.

Clark and Watson (1995) noted that "the initial pool should be broader…than one's own theoretical view of the target construct and should include content that ultimately will be shown to be tangential or even unrelated to the core construct" (p. 311). Thus, an extensive item pool was created so that the best-performing items could be retained. Specifically, 120 total items were created to measure students' psychological needs (90 items) and intrinsic motivation to learn (30 items) using a seven-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). These items were pretested on a group of students (n = 25) who reviewed the wording and directions for readability. Based on this feedback, minor grammatical changes were

made to several items and the revised item pool was then distributed to a larger sample for completion.

Participants and Procedures

Participants were 450 undergraduate students (215 males, 235 females) from a large Mid-Atlantic university. The age of the participants ranged from 18 to 38 years (M = 19.25, SD = 1.83). The majority of participants were freshmen (n = 242, 53.8%), followed by sophomores (n = 102, 22.7%), seniors (n = 55, 12.2%), and juniors (n = 51, 11.3%). Participants reported having an overall grade point average of 3.26 (SD = 0.49), they represented 34 majors from across the university, and they primarily self-identified as Caucasian (n = 386, 86%). Participants were solicited from numerous communication and sociology classes to complete an anonymous self-report survey. They were instructed to reference the class they had before the data collection to answer all questions contained in the survey (Plax, Kearney, Richmond, & McCroskey, 1986).

Data Analysis

Two exploratory factor analyses (EFAs) with principal axis factoring and promax rotation were used to examine the factor structures of the newly developed scales. A large sample (n = 450) was recruited to ensure that each of the items were represented by at least five participants (Hatcher, 1994). Bartlett's test of sphericity (χ^2 [4005] = 26,874.25, $p < 0.001$) and Kaiser-Meyer-Olkin's test of sampling adequacy (0.95) suggested the initial item pool and sample size met the necessary assumptions for EFA. To be retained for analyses, each factor was required to: (a) have an eigenvalue greater than one, (b) account for more than 5% of the overall variance, (c) contain at least two or more items, and (d) have interpretability/face validity (McCroskey & Young, 1979). Individual items were required to have a primary loading greater than 0.60 and a secondary loading less than 0.40 to be retained (Hatcher, 1994). Items that cross-loaded or failed to meet the aforementioned criteria were deleted and the EFAs were recalculated until all remaining items met the requirements (DeVellis, 2017).

Results

The final iteration of the Student Psychological Needs Scale (SPNS) produced a four-factor solution that contained 24 of the original 90 items and accounted for 61.29% of the overall variance. The first factor, *competence*, consisted of eight items (e.g., "I can accomplish the most difficult assignments given in this class") and accounted for 34.38% of the variance. The second factor, *autonomy*, consisted of eight items (e.g., "The way this class is structured allows me to learn in my own unique way") and accounted for 11.74% of the variance. The third factor, *relatedness with classmates*, consisted of four items (e.g., "I share several common interests with my fellow classmates") and accounted for 9.65% of the variance. The fourth factor, *relatedness with instructor*, consisted of four items (e.g., "I can relate to my

instructor as a person") and accounted for 5.52% of the variance. Cronbach alpha reliability coefficients for the factors included: 0.94 (competence), 0.88 (autonomy), 0.86 (relatedness with classmates), and 0.81 (relatedness with instructor). Items and factor loadings for the SPNS can be found in Table 1.

The final iteration of the Intrinsic Motivation to Learn Scale (IMLS) produced a unidimensional solution that contained 10 of the original 30 items and accounted for 64.42% of the overall variance. Example items included "Learning new concepts in this class is fulfilling to me" and "Learning new things in this class makes me feel like I am growing as a person." The Cronbach alpha reliability coefficient for this scale was 0.94. Factor loadings and descriptive statistics for each of the 10 retained items can be found in Table 2.

Study Two: Scale Validation and Student Learning Outcomes

Kline (2011) argued that researchers should replicate newly uncovered factor structures if a measure "is ever to represent anything beyond a mere statistical exercise" (p. 94). Thus, the second study was conducted to (a) confirm the factor structures using an independent sample and (b) provide concurrent and discriminant validity for both of the newly developed scales. Validity refers to the degree to which an instrument assesses what it was intended to measure (Wolf, 1978). Specifically, *concurrent validity* refers to the extent to which a measure is empirically related to a similar construct in a way that is both theoretically meaningful and interpretable (Campbell & Fiske, 1959). In this study, both the SPNS and the IMLS were expected to correlate positively with intrinsic goal orientation (i.e., students' desire to find schoolwork meaningful and rewarding), affective learning (i.e., students' attitudes toward their learning experiences and their course instructor), and perceived cognitive learning in the classroom (i.e., students' success at comprehending and retaining knowledge). Moreover, the SPNS and the IMLS were thought to correlate negatively with extrinsic goal orientation (i.e., students' trait-like desire to engage in class-related behaviors exclusively for the acquirement of tangible rewards or outcomes).

It should also be noted that newly developed measures may be invalidated if they correlate too highly with instruments from which they were intended to differ (Campbell & Fiske, 1959). In other words, "although strong correlations may indicate construct similarity, different measures must have divergent factor structures if they are indeed measuring similar but distinct constructs" (Mazer, 2012, p. 115). This concern reflects *discriminant validity*, or the degree to which a measure can be empirically distinguished from related but discrete variables. In this study, the Student Motivation Scale (Christophel, 1990; Richmond, 1990), which assesses state-like feelings of arousal and interest, was hypothesized to be similar, but distinct from college students' intrinsic motivation to learn. Put differently, while the two scales were thought to share a strong positive correlation, previous instructional communication research and SDT suggest they should be distinguishable operationalizations.

Table 1 EFA Factor Loadings for Student Psychological Needs Scale (SPNS)

Items	Factor 1	Factor 2	Factor 3	Factor 4	(*M*, *SD*)
Autonomy					
1. In this class, I have the freedom to learn in my own way.	0.24	**0.56**	0.04	0.25	(4.61, 1.74)
2. I complete assignments in this class in the way I want to do them.	0.13	**0.70**	0.09	0.05	(4.22, 1.66)
3. The way this class is structured allows me to learn in my own unique way.	0.17	**0.58**	0.12	0.20	(4.00, 1.73)
4. I have the freedom to complete course assignments in my own way.	0.12	**0.77**	0.15	0.09	(4.28, 1.70)
5. I dictate how I will complete the assignments in this course.	0.09	**0.62**	0.03	0.11	(4.27, 1.58)
6. I have the opportunity to decide for myself how I will learn in this class.	0.17	**0.68**	0.12	0.16	(4.63, 1.57)
7. I have the freedom to succeed however I want to in this class.	0.27	**0.62**	0.13	0.21	(4.89, 1.58)
8. I am free to complete classroom assignments the way I want to do them.	0.05	**0.64**	0.17	0.12	(4.38, 1.66)
Competence					
9. I am competent in this class.	**0.62**	0.18	0.05	0.16	(5.25, 1.44)
10. When it comes to class assignments, I do *not* know what I am doing.[a]	**0.68**	0.14	0.05	0.20	(5.53, 1.52)
11. I can accomplish the most difficult assignments given in this class.	**0.72**	0.09	0.05	0.09	(5.14, 1.62)
12. I am *not* confident in my abilities to perform well in this class.[a]	**0.55**	0.07	0.07	0.26	(5.07, 1.89)
13. I can accomplish anything that is assigned to me in this class.	**0.74**	0.21	0.09	0.08	(5.49, 1.49)
14. I do *not* feel competent when I am working on coursework for this class.[a]	**0.67**	0.21	0.09	0.24	(4.99, 1.66)
15. I do well in this class compared to other students.	**0.58**	0.11	0.08	0.01	(4.63, 1.36)
16. I do *not* know what I'm doing in this class.[a]	**0.73**	0.12	0.04	0.23	(5.52, 1.67)
Relatedness with Classmates					
17. I am close to several of my classmates.	0.03	0.11	**0.67**	0.12	(3.77, 2.05)
18. I can relate to several of my classmates in this class.	0.09	0.11	**0.81**	0.17	(4.74, 1.58)
19. I share several common interests with my fellow classmates.	0.13	0.22	**0.82**	0.17	(4.76, 1.54)

(*Continued*)

Table 1 (Continued)

Items	Factor 1	Factor 2	Factor 3	Factor 4	(*M*, *SD*)
20. I have a lot in common with several of my peers in this class.	0.09	0.19	**0.82**	0.14	(4.62, 1.53)
Relatedness with Instructor					
21. I cannot relate to my instructor.[a]	0.27	0.20	0.27	**0.74**	(4.85, 1.80)
22. My instructor does not care about me as a student.[a]	0.31	0.23	0.11	**0.55**	(5.79, 1.47)
23. I feel distant from my instructor in this class.[a]	0.27	0.17	0.28	**0.62**	(4.45, 1.85)
24. I can relate to my instructor as a person.	0.23	0.29	0.22	**0.65**	(4.69, 1.70)
Eigenvalue	8.25	2.82	2.32	1.33	
% of Variance	34.38	11.74	9.65	5.52	

Note. Principal Axis Factoring with Promax Rotation. Response format ranging from (1) strongly disagree to (7) strongly agree. [a] Reverse-coded.

Method

Participants and Procedures

Participants for the second study were 348 undergraduate students (153 males, 195 females) from two large Mid-Atlantic universities. Students ranged in age from 18 to 40 years (M = 21.00, SD = 2.16) and were predominately juniors (n = 143, 41.1%), followed by seniors (n = 128, 36.8%), sophomores (n = 55, SD = 15.8%), and freshmen (n = 22, 6.3%). The majority of students identified as Caucasian (n = 286, 82.2%) and they were asked to complete a self-report survey in reference to their previous class. In addition to demographics and the two scales created in study one (i.e., SPNS, IMLS), participants completed the following: the Intrinsic Goal Orientation Subscale (Pintrich, Smith, García, & McKeachie, 1993), the Extrinsic Goal Orientation Subscale (Pintrich et al., 1993), the 12-item version (Christophel, 1990) and the five-item version (Richmond, 1990) of the Student Motivation Scale, the Affective Learning Scale (McCroskey, Richmond, Plax, & Kearney, 1985), the Cognitive Learning Measure (Frisby & Martin, 2010), and the Revised Cognitive Learning Indicators Scale (Frymier & Houser, 1999). Means, standard deviations, and Cronbach reliability coefficients for each of these scales can be found in Table 3.

Instrumentation

The *Intrinsic Goal Orientation subscale* is a four-item measure that assesses students' general orientation toward learning tasks. Responses are solicited using a five-point Likert-scale ranging from *completely disagree* (1) to *completely agree* (5). Previous alpha coefficients for the scale have ranged from .67 to .80 (Pintrich et al., 1993; Weber, 2003).

Table 2 EFA Factor Loadings for Intrinsic Motivation Scale

Items	Loading	(*M*, *SD*)
1. Learning new concepts in this class is fulfilling to me.	0.78	(4.90, 1.59)
2. Developing my understanding of the content is rewarding to me.	0.68	(5.07, 1.48)
3. Learning new things in this class makes me feel better about myself.	0.75	(4.98, 1.56)
4. I find learning new things in this class to be unfulfilling. [a]	0.65	(4.83, 1.73)
5. Understanding new concepts in this class is enjoyable to me.	0.81	(4.76, 1.57)
6. It is personally satisfying for me to learn new concepts in this class.	0.88	(4.80, 1.60)
7. I get a sense of fulfillment when I learn new things in this class.	0.85	(4.88, 1.57)
8. I do not enjoy trying to comprehend new ideas in this class. [a]	0.72	(4.94, 1.64)
9. Learning new things in this class makes me feel like I am growing as a person.	0.76	(4.82, 1.72)
10. I desire to learn new things in this class because it gives me a sense of fulfillment.	0.87	(4.72, 1.63)
Eigenvalue	6.44	
% of Variance	64.42	

Note. Response format ranging from (1) strongly disagree to (7) strongly agree. [a]Reverse-coded.

The *Extrinsic Goal Orientation subscale* is a four-item measure taken from the MSLQ to assess students' external orientation toward learning. Responses are solicited using a five-point Likert-scale ranging from *completely disagree* (1) to *completely agree* (5). Previous reliability coefficients for the scale have ranged from 0.62 to 0.80 (Pintrich et al., 1993; Weber, 2003).

The *Student State Motivation Scale* has been used as a 12-item or five-item assessment of students' attitude, effort, and energy toward a particular class. Responses are solicited using 7-point bipolar adjectives. Previous reliability coefficients ranging from 0.92 to 0.95 have been discovered for the scale (Christophel, 1990; Goodboy & Myers, 2008; Myers & Rocca, 2001).

The *Affective Leaning Scale* is a 12-item measure that assesses participants' affect for the course content, course instructor, and behaviors recommended in the course. Responses are solicited using three 7-point bipolar adjective subscales. Previous reliability coefficients ranging from 0.95 to 0.96 have been discovered for the scale (Ellis, 2000, 2004; Goodboy & Myers, 2008).

The *Cognitive Learning Measure* is a 10-item scale that assesses perceived recall, knowledge, and application of material. Responses are solicited using a five-point Likert-scale ranging from *strongly disagree* (1) to *strongly agree* (5). Previous reliability coefficients ranging from 0.83 to 0.88 have been discovered for the scale (Frisby, Mansson, & Kaufmann, 2014; Frisby & Martin, 2010).

The *Revised Cognitive Learning Indicators Scale* is a seven-item measure that assesses behaviors associated with cognitive learning. Responses are solicited on a five-point Likert-scale ranging from *never* (0) to *very often* (4). Previous reliability

Table 3 Study 2—Means, Standard Deviations, Cronbach's Alphas, and Correlation Matrix

Variables	M	SD	α	1	2	3	4	5	6	7	8	9	10	11
1. Intrinsic Motivation Scale	51.17	12.60	0.95	–										
2. Autonomy	36.46	10.05	0.90	0.45†	–									
3. Competence	44.02	8.45	0.87	0.51†	0.36†	–								
4. Relatedness with Instructor	20.50	5.68	0.87	0.55†	0.40†	0.44†	–							
5. Relatedness with Classmates	17.17	6.52	0.93	0.29†	0.18†	0.20†	0.18†	–						
6. Intrinsic Goal Orientation	13.16	3.18	0.79	0.65†	0.40†	0.36†	0.42†	0.20†	–					
7. Extrinsic Goal Orientation	15.20	3.83	0.86	0.05	0.08	0.01	0.05	0.01	0.11*	–				
8. State Motivation (12 item)[1]	56.28	14.97	0.94	0.75†	0.40†	0.42†	0.56†	0.28†	0.60†	0.06	–			
9. State Motivation (5 item)[2]	24.02	7.11	0.92	0.74†	0.42†	0.50†	0.58†	0.25†	0.57†	0.05	0.94†	–		
10. Affective Learning	67.55	14.39	0.94	0.60†	0.42†	0.43†	0.69†	0.17^	0.49†	0.17^	0.66†	0.70†	–	
11. Cognitive Learning	37.58	6.37	0.83	0.71†	0.42†	0.53†	0.58†	0.23†	0.54†	0.20†	0.68†	0.69†	0.69†	–
12. Learning Indicators	15.91	6.52	0.88	0.68†	0.37†	0.39†	0.50†	0.28†	0.62†	0.10*	0.71†	0.70†	0.56†	0.64†

Note. *$p < 0.05$, ^$p < 0.01$, †$p < 0.001$. [1]Measured with Christophel's 12-item scale. [2]Measured with Richmond's (1990) 5-item scale. Means are from overall composite scores.

coefficients for the scale have ranged from 0.83 to 0.88 (Frymier & Houser, 1999; Goodboy & Bolkan, 2009).

Data Analysis

The data in Study 2 was analyzed over three stages. First, the previously uncovered factor structure for the new scales was evaluated using a confirmatory factor analysis (CFA) with maximum likelihood estimation. A five-factor measurement model was examined to assess the model fit for both the SPNS and the IMLS. This measurement model was chosen because it is essential for assessing quantitative instruments and because it can serve as a "test of construct validity" by testing the fit of "manifest indicators and, by implication, the adequacy of the proposed latent variables" (James, Mulaik, & Brett, 1982, p. 112). Models are considered to be good fitting when they obtain: (a) non-significant chi-square values (χ^2), (b) a root mean square error of approximation (RMSEA) value less than 0.10 (although values less than 0.05 are ideal; Kline, 2011), comparative fit index (CFI) value greater or equal to 0.95, and a standardized root mean square residual (SRMR) less than 0.08 (see Hu & Bentler, 1999; Kline, 2011).

Second, two alternative CFAs were computed to offer discriminant validity for the IMLS. Specifically, these CFAs were used to distinguish the new measure of intrinsic motivation from Christophel's (1990) state motivation scale. In the first model, all 22 items from both scales were examined as one latent variable (i.e., treating student motivation as a unidimensional construct). In the second model, a two dimensional solution was tested with both scales loading on their own latent construct and indices from each model were compared to determine the best model fit.

Third, to establish concurrent validity, Pearson correlations were calculated to examine the relationships between students' psychological needs, intrinsic motivation to learn, and their affective and cognitive learning. The scales were also correlated with intrinsic and extrinsic goal orientation to highlight the relationships (or lack thereof) that exist between the new SDT measures and students' overall orientation toward completing their schoolwork in general.

Results

The first CFA (see Figure 1) revealed the five-factor measurement model fit the data reasonably well, χ^2 (517) = 1413.18, $p < 0.001$, RMSEA = 0.071 [90% CI = 0.066 to 0.075], CFI = 0.95, SRMR = 0.06. All of the individual items loaded significantly ($p < 0.05$) on their respective factors with standardized loadings ranging from 0.43 to 0.93. The Cronbach's alphas for each of the subscales were as follows: 0.87 (Competence), 0.90 (Autonomy), 0.93 (Relatedness with Classmates), 0.87 (Relatedness with Instructor), and 0.95 (Intrinsic Motivation to Learn). All five latent variables significantly co-varied with each other with standardized coefficients ranging from 0.13 to 0.50.

The 22-item unidimensional CFA that combined the IMLS and Christophel's (1990) state motivation scale yielded poor model fit, χ^2 (209) = 1647.41, $p < 0.001$, RMSEA = 0.141 [90% CI = 0.135 to 0.147], CFI = 0.79, SRMR = 0.08. The follow-up CFA that examined Christophel's scale and the IMLS as separate, yet related, latent constructs yielded acceptable model fit, χ^2 (208) = 814.54, $p < 0.001$, RMSEA = 0.092 [90% CI = 0.085 to 0.098], CFI = 0.91, SRMR = 0.05. A chi-square difference test revealed that the two-factor solution yielded a significantly better ($p < 0.001$) fit than the unidimensional 22-item model (χ^2_D [1] = 832.87), thus offering discriminant validity for the scale. Lastly, a follow-up CFA conducted only on Christophel's 12-

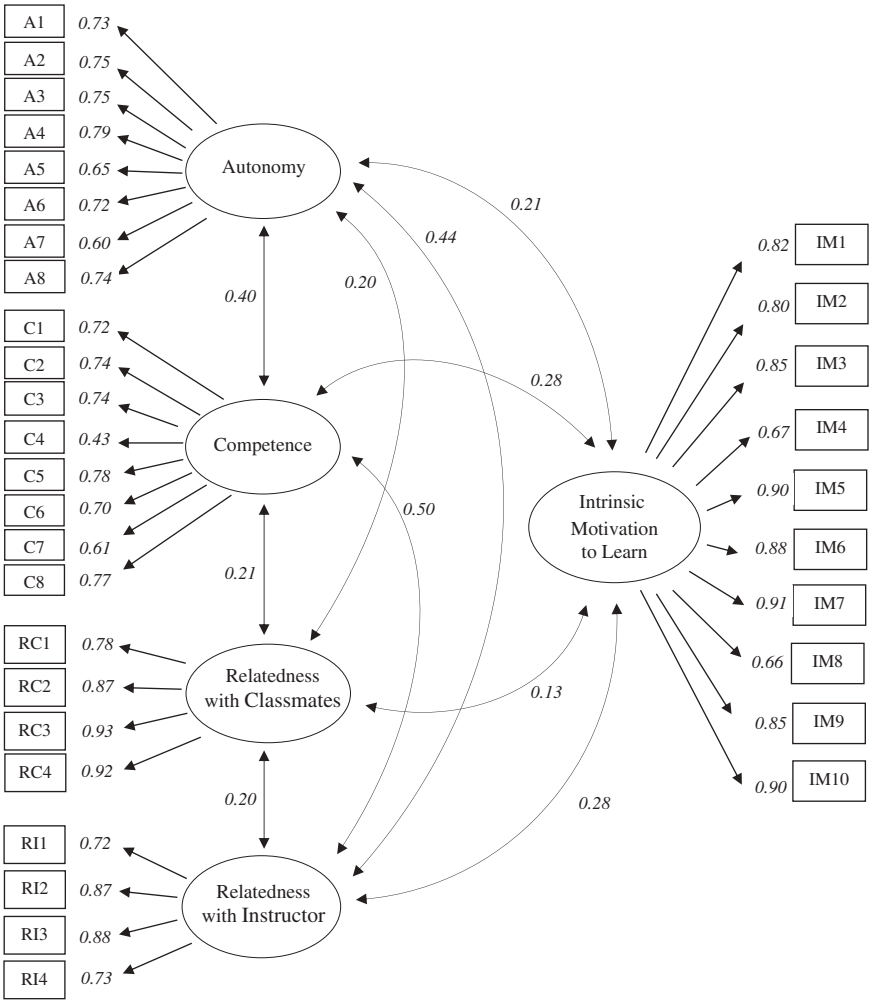

Figure 1. Five-factor measurement model with the SPNS and the IMLS.*Note*. Fit statistics: χ^2 (517) = 1,413.18, $p < 0.001$, RMSEA = 0.071 [90% CI = .066 to .075], CFI = 0.95, SRMR = 0.06. All paths are significant and displayed with standardized values.

item scale indicated a poor model fit, χ^2 (54) = 474.94, $p < 0.001$, RMSEA = 0.150 [90% CI = 0.138 to 0.162], CFI = 0.87, SRMR = 0.06.

Results of the Pearson correlation matrix (see Table 3) demonstrated that positive correlations existed between the SPNS, the IMLS, and students' (a) intrinsic goal orientation toward schoolwork, (b) affective learning, and (c) perceived cognitive learning (i.e., both the cognitive learning measure and learning indicators). However, neither the SPNS nor the IMLS were related ($p > 0.05$) to students' extrinsic goal orientation toward schoolwork.

Study Three: Theory Testing and Instructional Communication

A third study was conducted to integrate SDT into the instructional communication literature by replicating the theory's core assumption (i.e., the fulfillment of psychological needs mediate the effect of external stimuli on intrinsic motivation). We hypothesized that students' psychological need fulfillment would be met when their education is personalized by their instructor. Waldeck (2006) described *personalized education* as a multifaceted pedagogical approach that instructors utilize to address the individual learning needs of students. Goodboy, Myers, and Bolkan (2012) observed that personalized education "creates student perceptions of individualized attention from instructors in an effort to meet students' needs" (p. 94). Waldeck (2006) acknowledged that personalized education helps to ensure that researchers and teachers are "delivering on what has become a promise valued and relied upon by our students and their families" (p. 351). According to Waldeck (2007), personalized education fulfills students' needs across three dimensions: instructor accessibility (i.e., being physically and socially available for students), course-related practices (i.e., attempting to personalize the course through its design and management), and instructor interpersonal competence (i.e., communicating in a way that is friendly, approachable, dynamic, and warm). Because these constructs theoretically align with students' needs of autonomy, competence, and relatedness, we hypothesized that each of the three dimensions of personalized education would be related positively to the fulfillment of students' psychological needs and their intrinsic motivation to learn. More specifically, as SDT predicts, we hypothesized that perceptions of personalized education would indirectly influence intrinsic motivation to learn through its unique effects on students' psychological needs of autonomy, competence, and relatedness (with their classmates and their instructor).

Method

Participants and Procedures

Participants were 269 undergraduate students (139 males, 130 females) who were enrolled in communication courses at a large Mid-Atlantic university. Participants ranged in age from 18 to 34 years (M = 20.39, SD = 1.96) and were primarily Caucasian (n = 230, 85.5%). Participants represented 32 majors, including communication studies (n = 37, 13.8%), exercise physiology (n = 24, 8.9%), and business

management (n = 19, 7.1%). Participants were asked to complete a survey by reporting on their previous course and they completed demographic questions along with the SPNS, IMLS, and the Personalized Education Scale (Waldeck, 2007).

Instrumentation

The *Student Psychological Needs Scale* is a 24-item measure (created from Study 1) that measures the fulfillment of students' psychological needs: autonomy, competence, relatedness with instructor, and relatedness with classmates. Responses were solicited on a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). In the current study, Cronbach alphas ranging from 0.85 to 0.92 were obtained for each of subscales: 0.90 (Autonomy), 0.88 (Competence), 0.85 (Relatedness with Instructor), and 0.92 (Relatedness with Classmates).

The *Intrinsic Motivation to Learn Scale* is a 10-item measure (created from Study 1) that assesses students' intrinsic motivation to learn course material. Responses are solicited using a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). In this study, a Cronbach reliability coefficient of 0.95 (M = 52.33, SD = 12.90) was obtained for the measure.

The *Personalized Education Scale* is a 25-item instrument that assesses three dimensions of teaching behaviors: instructor accessibility (e.g., "The instructor has an adequate number of office hours to provide extra help for students"), course-related practices (e.g., "The instructor changes the syllabus based on student suggestions"), and interpersonal competence (e.g., "The instructor is a dynamic communicator"). Responses are solicited on a 5-point Likert scale ranging from *not at all* (1) to *very often* (5). Previous reliability coefficients ranging from 0.83 to 0.92 have been reported for the subscales (Goodboy et al., 2012; Waldeck, 2007). Cronbach alphas in this study were: 0.87 (M = 25.23, SD = 7.53) for accessibility, 0.88 (M = 23.49, SD = 8.46) for course practices, and 0.85 (M = 25.55, SD = 6.48) for interpersonal competence.

Data Analysis

To test the hypotheses, three parallel multiple mediation models were calculated using ordinary least squares path analysis. These models were estimated using PROCESS (Hayes, 2013) to determine whether the effects of personalized education (i.e., instructor accessibility, course-related practices, instructor interpersonal competence) on students' intrinsic motivation to learn were mediated through the fulfillment of students' psychological needs. Parallel multiple mediation models were selected because SDT predicts the causal mechanisms that promote intrinsic motivation occur through the fulfillment of psychological needs, which all operate as simultaneous mediators in tandem (c.f., Trepanier, Fernet, & Austin, 2013). Using a parallel mediation model (over simple mediation models) allows for multiple mediators to be correlated with each other to determine the unique indirect effects in the presence of each other and allows for pairwise comparisons between the strength of mediated

effects (Hayes, 2013). Indirect effects were calculated using 50,000 bootstrap samples and 95% bias-corrected confidence intervals.

Results

The first parallel mediation model (see Figure 2) revealed that *instructor accessibility* indirectly influenced students' intrinsic motivation to learn through its unique effects on students' psychological needs (controlling for each other) with a total indirect effect of 0.447 and a 95% bootstrapped CI ranging from 0.295 to 0.612. Indirect effects, confidence intervals, and completely standardized indirect effects were as follows: autonomy (ab = 0.072, 95% CI = –0.005 to 0.154, ab_{cs} = 0.042), competence (ab = 0.098, 95% CI = 0.027 to 0.191, ab_{cs} = 0.057), instructor relatedness (ab = 0.220, 95% CI = 0.104 to 0.361, ab_{cs} = 0.128), and class relatedness (ab = 0.056, 95% CI = 0.014 to 0.115, ab_{cs} = 0.033). Bootstrapped confidence intervals were entirely above zero for competence, instructor relatedness, and class relatedness, suggesting parallel mediation from these needs, with no evidence of a direct effect for instructor accessibility on intrinsic motivation (c' = 0.085, p = 0.36). Pairwise comparisons indicated that instructor relatedness was a stronger mediator than class relatedness (indirect effect contrast = 0.164, 95% CI = 0.028 to 0.319).

The second parallel mediation model (see Figure 3) revealed that *instructor course-related practices* indirectly influenced students' intrinsic motivation to learn through its unique effects on students' psychological needs (controlling for each other), with a total indirect effect of 0.420 and a 95% bootstrapped CI ranging from 0.276 to 0.578. Indirect effects, confidence intervals, and completely standardized indirect effects were as follows: autonomy (ab = 0.064, 95% CI = 0.003 to 0.130, ab_{cs} = 0.042), competence (ab = 0.104, 95% CI = 0.043 to 0.182, ab_{cs} = 0.068), instructor relatedness (ab = 0.197, 95% CI = 0.092 to 0.328, ab_{cs} = 0.129), class relatedness (ab = 0.055, 95% CI = 0.015 to

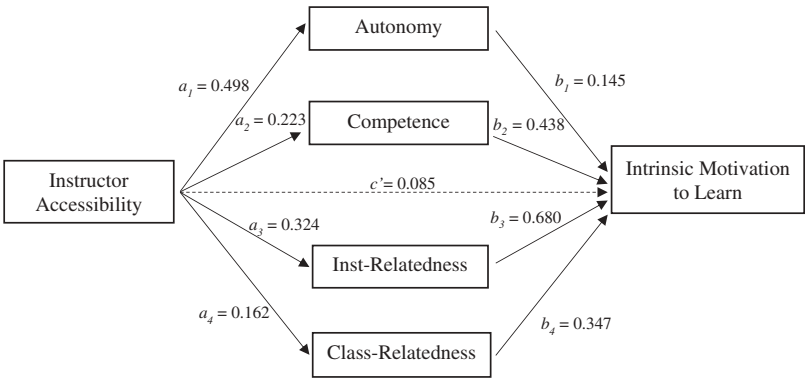

Figure 2. Parallel multiple mediation model for personalized education: Instructor accessibility. *Note.* SDT model with students' psychological needs simultaneously mediating the association between instructor accessibility and intrinsic motivation to learn. Paths are unstandardized coefficients. Solid paths are significant (p < 0.05).

0.110, ab_{cs} = 0.036). Bootstrapped confidence intervals were above zero, suggesting parallel mediation for all four psychological needs, with no evidence of a direct effect of course-related practices on intrinsic motivation (c' = –0.017, p = 0.83). Pairwise comparisons between indirect effects indicated that autonomy was a significantly weaker mediator than instructor relatedness (indirect effect contrast = –0.133, 95% CI = –0.290 to –0.006] and instructor relatedness was a stronger mediator than class relatedness (indirect effect = 0.142, 95% CI = 0.026 to 0.281).

The third model (see Figure 4) revealed that *instructor interpersonal competence* indirectly influenced students' intrinsic motivation to learn through its unique effects on students' psychological needs (controlling for each other), with a total indirect effect of 0.751 and a 95% CI ranging from 0.540 to 0.976. Indirect effects, confidence intervals, and completely standardized indirect effects were as follows: autonomy (ab = 0.091, 95% CI = –0.002 to 0.191, ab_{cs} = 0.045), competence (ab = 0.247, 95% CI = 0.136 to 0.387, ab_{cs} = 0.124), instructor relatedness (ab = 0.351, 95% CI = 0.154 to 0.562, ab_{cs} = 0.176), class relatedness (ab = 0.062, 95% CI = 0.011 to 0.133, ab_{cs} = 0.031). Confidence intervals were above zero for competence, instructor relatedness, and class relatedness, suggesting parallel mediation, with no evidence of a direct effect of instructor competence on intrinsic motivation (c' = 0.156, p = 0.22). Pairwise comparisons indicated that competence was a significantly stronger mediator than relatedness with classmates (indirect effect contrast = 0.185, 95% CI = 0.048 to 0.642) and instructor relatedness was a stronger mediator than relatedness with classmates (indirect effect = 0.289, 95% CI = 0.076 to 0.512).

Discussion

Ryan and Deci (2000a) noted, "Perhaps no single phenomenon reflects the positive potential of human nature as much as intrinsic motivation" (p. 70). Similar conclusions

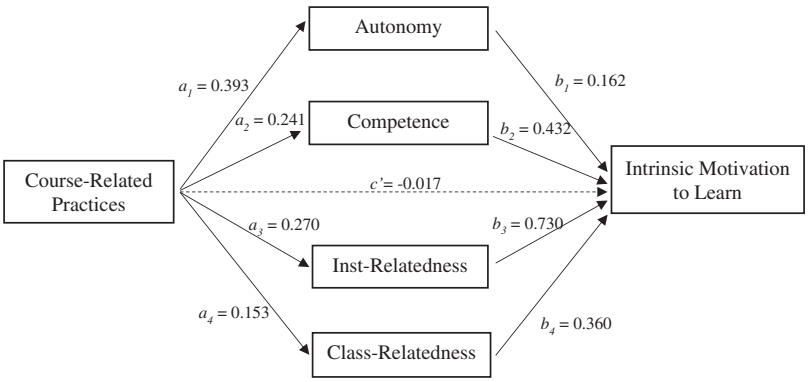

Figure 3. Parallel multiple mediation model for personalized education: Instructor course-related practices. *Note*. SDT model with students' psychological needs simultaneously mediating the association between course-related practices and intrinsic motivation to learn. Paths are unstandardized coefficients. Solid paths are significant (p < 0.05).

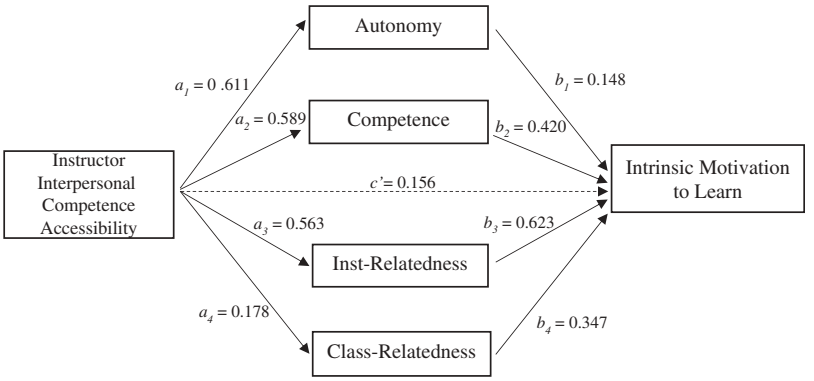

Figure 4. Parallel multiple mediation model for personalized education: Instructor interpersonal competence. *Note*. SDT model with students' psychological needs simultaneously mediating the association between instructor interpersonal competence and intrinsic motivation to learn. Paths are unstandardized coefficients. Solid paths are significant ($p < 0.05$).

are likely true for students and their potential in the classroom (Deci et al., 1991). Our research sought to develop and validate measures for understanding college students' psychological needs and their intrinsic motivation to learn in the classroom in order to advance the study of motivation in the instructional communication literature. Toward this goal, SDT was utilized to create and validate two original instruments (i.e., SPNS and IMLS). Concurrent validity was found as the measures correlated modestly with each other in addition to students' affective and cognitive learning. Discriminant validity was also found for the IMLS, as the scale appeared to be a distinct measure of motivation from the traditionally utilized Student Motivation Scale (Christophel, 1990).

The created measures were also used to evaluate the primary assumption of SDT: mainly, that elements of the social environment (in this case, the classroom) influence individuals' intrinsic motivation by either fulfilling or stifling their psychological needs (Deci & Ryan, 1985). Strong support for the theory was revealed as the results of parallel mediation path models indicated that the fulfillment of students' psychological needs mediated the relationships between personalized education practices and students' intrinsic motivation to learn. In other words, the process by which personalized education influences students' intrinsic motivation is explained by the fulfillment students' psychological needs in the classroom. Collectively, these results have important theoretical and practical implications for both researchers and instructors.

For instructional communication researchers, the findings provide an empirically validated and theoretically supported approach for examining students' intrinsic motivation in the classroom. Although some scholars have begun to embrace the importance of SDT in the instructional communication literature (e.g., Bolkan, 2015; Kerssen-Griep et al., 2003), little is known about the relationship between classroom communication and college students' self-determined behavior. This gap in the literature is likely attributable to a lack of classroom-specific SDT instruments

that, until this study, have caused researchers to use proxies to indirectly assess the fulfillment of students' needs and their intrinsic motivation to learn (c.f., Bolkan & Goodboy, 2015). Ideally, researchers can now use these two new scales to expand their examination of SDT, communication, psychological needs, and intrinsic motivation.

For instructors, this study discovered that personalized education can fulfill students' psychological needs and encourage their intrinsic motivation to learn. Reeve (2002) noted that students need opportunities that allow them to demonstrate their true capacities and challenge their abilities if they are to become self-determined. Likewise, Waldeck (2007) discovered that personalized education is associated positively with students' affective and cognitive learning. Instructors demonstrate personalized education by making themselves available to students outside of class (i.e., accessibility), integrating students' interest into their course design (i.e., course-related practices), and communicating with students in a way that is appropriate and effective (i.e., interpersonal competence). Instructors should incorporate these techniques to personalize students' educational experiences as previous SDT research suggests that "positive motivational outcomes result when students feel that their needs for competence, relatedness, and autonomy are respected in instructional interactions" (Kerssen-Griep et al., 2003, p. 363).

Future Directions and Limitations

There are many ways in which future research can build from this study. Instructional communication scholars should continue to implement SDT into their examinations of student motivation because the theory has continuously shown that "positive classroom outcomes experienced by autonomously [or intrinsically] motivated students appear in both the academic and developmental domains" (Reeve, 2002, p. 183). Similar to Study 2, instructional researchers should continue to examine the relationship(s) between students' psychological needs, intrinsic motivation to learn, and learning outcomes. Despite its interdisciplinary appeal, SDT has yet to attract mainstream attention in the communication discipline, even though it is considered to be a premier theory of human motivation in other disciplines (Ryan, 2012).

We offer two ways in which researchers can further incorporate SDT into this literature: (a) scholars should begin to recognize the importance of psychological needs and the mediating role in which they serve between classroom interactions and students' intrinsic motivation to learn, and (b) researchers should explore the ways in which instructors satisfy or thwart students' autonomy, competence, and relatedness needs through classroom communication (c.f., Niemiec & Ryan, 2009). First, investigating the interceding role of students' psychological needs within the communication–motivation relationship would advance the theoretical mechanism(s) underpinning one of instructional communication's most complex teacher-student phenomena. Future research should explicitly examine the conditions under which these mediators maintain, or fail to maintain, their predictive utility of intrinsic

motivation. Such investigations could consider student characteristics, academic beliefs, or components of the learning environment as potential moderating variables that limit or extend the explanatory power of SDT in this context.

Second, by uncovering the instructional behaviors that relate to students' intrinsic motivation to learn, researchers can begin to understand the ways in which instructors create learning environments that foster autonomous student behavior and promote high quality learning experiences that transcend the boundaries of the classroom (Frymier, Shulman, & Houser, 1996).

Reeve (2002) noted that college instructors should focus on *guiding* rather than *controlling* behaviors, as previous research has shown that students "achieve highly, learn conceptually, and stay in school in part because their teachers support their autonomy" (p. 183). Thus, future research should explore specific teaching behaviors that instructors use to communicatively promote autonomous and self-determined learning environments. Relatedly, future research should also examine the instructional behaviors and conditions that stifle intrinsic motivation by denying students of their psychological needs. For instance, future investigations should look at instructor misbehaviors (Goodboy & Myers, 2015), as they likely thwart students' psychological needs in the classroom and thus discourage their intrinsic motivation to learn.

Of course, this research was not without limitations. First, this study only examined intrinsic motivation to learn and not the full continuum of self-determination including students' extrinsic and amotivation. This decision was made to address the most important shortcoming of the communication/motivation literature. Nonetheless, researchers should explore additional types of motivation, specifically extrinsic motivation (i.e., external regulation, introjected, identified), as these motives likely play a significant role in determining students' behavior in the classroom and ultimately their desire to learn (Reeve, 2002). Similarly, this study examined just one set of communication behaviors (i.e., personalized education) in relation to students' self-determination. In the reality of the classroom, instructors use a combination of behaviors while interacting with students; thus, researchers should examine teacher behaviors and practices that interact together to enhance and/or repress students' needs and their motivation to learn. Finally, researchers should explore whether psychological needs and intrinsic motivation to learn operate similarly for minority students, non-traditional students, or students at other types of institutions.

In sum, motivation is imperative for student success in college (Vallerand et al., 1992). Frymier and colleagues (1996) challenged instructional communication researchers to investigate how instructors "manage the classroom environment so that students feel intrinsically motivated to learn and perform high quality work" (p. 181). To an extent, this study addresses their call by operationalizing students' intrinsic motivation and their psychological needs in the classroom. With these measures and SDT as a framework for future studies, instructional communication scholars can more accurately apply theory to understand the ideal conditions that intrinsically motivate students and help them to genuinely enjoy learning as a personally fulfilling experience.

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