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Conditional processes of effective instructor communication and increases in students' cognitive learning

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ABSTRACT

This study examined two effective teaching behaviors traditionally considered by instructional communication scholars to associate positively with students' academic experiences: instructor clarity and immediacy. Our study situated these teaching behaviors in a conditional process model that integrated two key assumptions about student learning: (a) the process by which student learning occurs is due, in part, to the sustained attention that students give to effective instructors (a mediated test of learning) and (b) some students self-regulate their learning despite the (in)effectiveness of the teaching they receive (a moderated test of learning). Three hundred and sixty-two college students were randomly assigned to one of four lecture conditions that manipulated instructor clarity and nonverbal immediacy in a 2 × 2 factorial experiment and completed post-test assessments including a test of cognitive learning. Results indicated that: (a) clear instruction with or without nonverbal immediacy cues directly increased students' test scores by over one letter grade on average; (b) the added benefit of nonverbal immediacy to clear instruction slightly increased test scores, but only indirectly through students' sustained attention; and (c) removing nonverbal immediacy from clear instruction proved detrimental only for students who were not self-regulated.

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Instructor clarity; instructor nonverbal immediacy; student cognitive learning; student recall; moderated mediation

College instructors strive to create learning environments that help students develop their cognitive, affective, and behavioral learning competencies (Richmond, Lane, & McCroskey, 2006). Though this may seem like a daunting task, communication scholars are well informed as to how instructors facilitate these objectives. Indeed, the instructional communication literature is replete with scholarship referencing effective teaching behaviors (Myers, Goodboy, & Members of COMM 600, 2014; Nussbaum, 1992; Waldeck, Kearney, & Plax, 2001). Of these, instructor clarity and immediacy are two behaviors considered to be especially important. For example, instructor clarity has consistently been found to bolster students' cognitive learning (for an empirical summary, see the meta-analyses of Titsworth, Mazer, Goodboy, Bolkan, & Myers, 2015), while instructor nonverbal immediacy has been found to influence classroom outcomes such as student liking for an instructor and state motivation (Hess, Smythe, & Communication 451, 2001). Several researchers have studied instructor clarity and immediacy in tandem to determine that

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they operate in conjunction to influence students' experiences in the classroom (Chesebro, 2003; Chesebro & McCroskey, 2001; Powell & Harville, 1990).

Though instructional communication researchers regularly assume that effective teaching is the principal cause for student learning, they often fail to consider evidence suggesting that some students perform well and learn in courses with substandard teaching. Thus, although it remains important to study effective teaching behaviors as these behaviors are linked to student learning outcomes (Waldeck, Plax, & Kearney, 2010), it is crucial that instructional communication researchers look beyond simply measuring the effectiveness of the instructor and consider that students' abilities and responsibilities may factor into estimates of their learning as well. For example, pertaining to students' abilities and responsibilities, it is essential that instructional communication scholars begin to consider students' self-regulation in their empirical estimates of cognitive learning because learners can and do "monitor, control, and regulate certain aspects of their own cognition, motivation, and behavior" in their learning contexts (Pintrich, 2005, p. 452). Indeed, students exposed to the same course lessons and teaching behaviors may leave with various levels of learning outcomes due to differences in deliberate effort control (Crede & Phillips, 2011; Duckworth & Carlson, 2013; Zimmerman, 2011). Thus, empirical models of student learning that do not account for differences in students' self-regulation, including their self-control or effort regulation (these terms tend to be used interchangeably, see Duckworth & Seligman, 2006), may be supporting a more rudimentary explanation of student success than is warranted.

The purpose of this study was to examine students' cognitive learning resulting from effective teaching by considering the mechanisms through which learning occurs and the student characteristics that moderate these effects. Specifically, we examined how instructor clarity and nonverbal immediacy work together to influence student learning by taking into account the role that student attention plays as a mediator in the learning process and by treating students' effort regulation as a moderator of these indirect learning effects. Put simply, we were interested in testing the conditional processes behind effective instructor behaviors and student learning.

Antecedents of student learning

Effective teaching: instructor clarity and nonverbal immediacy

Communication researchers have examined instructor clarity and nonverbal immediacy as two primary instructional behaviors affecting student learning and classroom experiences. Instructor clarity is a rhetorical behavior that represents instructors' ability to present information in a way that facilitates student understanding (Simonds, 1997) and includes concepts such as disfluency, working memory overload, interaction, coherence, and structure (Bolkan, 2016). Nonverbal immediacy is a relational behavior that highlights instructors' use of nonverbal communication to reduce the physical and psychological distance between themselves and their students and includes behaviors such as eye contact, vocal variety, and smiling (Richmond, Gorham, & McCroskey, 1987). Whether examined singly or jointly, instructor clarity and nonverbal immediacy are associated positively with a host of student outcomes including affective learning, state motivation, communication satisfaction, and perceived cognitive learning

(Chesbro & McCroskey, 2001; Myers et al., 2014; Powell & Harville, 1990; Sidelinger & McCroskey, 1997).

Importantly, the association between direct tests of cognitive learning and instructor behavior is weaker and less consistent for nonverbal immediacy than for clarity (see Witt, Wheeless, & Allen, 2004). Titsworth (2004) found, for instance, that students recorded more details in their notes when listening to a lecture by a clear instructor, but found no effect for immediacy. Similarly, Chesebro (2003) discovered that regardless of whether an instructor is high or low in immediacy, clear teaching resulted in a greater amount of information recall among students than less clear teaching. Moreover, although perceived nonverbal immediacy is correlated with students' perceptions of their own learning, in experimental work nonverbal immediacy has been found to have only a small causal impact (and sometimes no impact at all) on student learning operationalized as achievement tests/grades (accounting for less than 3% of the variance on average; Witt et al., 2004). Witt et al. (2004) concluded that

> because of the low associations of types of teacher immediacy with actual cognitive learning, care should be taken when interpreting the magnitudes of associations between immediacy and learning that are sometimes reported as cognitive but derived from studies relying on survey questionnaires like the learning loss measure. (p. 200)

Similarly, Hess et al. (2001) found that while instructor nonverbal immediacy is related to students' perceptions of learning, it is not related to actual test scores. Conversely, experimental research on instructor clarity has produced moderate, consistent, and positive causal effects on achievement tests (accounting for between 12% and 18% of the variance on average; Titsworth et al., 2015). Based on this collective body of research, it is likely that instructor clarity will directly influence student learning in presence or absence of nonverbal immediacy behaviors. To analyze the experimental effects of these teaching behaviors as they operated in conjunction, the first hypothesis was posited:

> H1: Instructor clarity positively affects student scores on a test of retention independent of the level of instructor nonverbal immediacy.

Sustained attention and self-control in student learning

Historically, instructional communication scholars have adopted the process-product paradigm when conducting research on effective teaching, and have articulated relationships similar to that proposed by the aforementioned hypothesis. That is, scholars typically study instructor communication behaviors that precede student learning. Although this paradigm has yielded important pedagogical findings, it is a limited approach to conducting student learning research. As an alternative, Cortez, Gayle, and Preiss (2006) noted that the student-mediated paradigm offers instructional scholars another perspective under the assumption that students bring with them abilities and a willingness to be involved in the learning process. As Cortez et al. argued, students' responses to the learning context determine the effectiveness of instructor behaviors.

As it relates to students' abilities and willingness to be involved in the learning process, students' attention to course materials is an important predictor of their success (Wei, Wang, & Klausner, 2012) since "information which has not been attended to cannot be encoded for storage and will be unavailable for retrieval" (Kelley & Gorham, 1988,

p. 200). As Barrett, Tugade, and Engle (2014) argued, individuals' ability to sustain their attention greatly affects their performance on tasks that engage working memory, and it has been suggested that "efficient task performance requires that attention be focused exclusively on information relevant to the task while task-irrelevant distractors are ignored" (Forster & Lavie, 2014, p. 251). This notion implies that students must not only pay attention to, but also sustain their attention toward, their course lessons in order to optimize their learning (Wei et al., 2012).

One way to help students pay attention to their course materials may be through the provision of nonverbally immediate instruction. Though nonverbal immediacy may impact classroom outcomes through the creation of positive affect and motivation, Richmond et al. (2006) noted that immediacy behaviors also promote attention to classroom lessons by arousing student interest. Likewise, Kelley and Gorham (1988) posited that one of the ways instructor immediacy works to benefit classroom outcomes is by arousing students and subsequently commanding their attention. Thus, the effects of nonverbal immediacy on student learning may be best understood as indirect insofar as immediacy may influence student learning through the attention it helps students pay to their course lessons.

Ultimately, nonverbal immediacy may have an indirect impact on students' cognitive learning because students exposed to nonverbally immediate instructors may find it easier to focus their cognitive resources on the learning task compared with instructors who deliver their course material in a less dynamic manner. In other words, if immediate behaviors can capture students' attention, and if students' attention can influence their learning (Wei et al., 2012), then nonverbal immediacy may indirectly influence student learning. Although hypothesis 1 predicted that instructor clarity will increase student learning with or without nonverbal immediacy cues, hypothesis 2 was designed to test the benefit of adding immediacy to an already clear lecture, predicting an indirect effect on learning through students' sustained attention. To test this prediction, the second hypothesis was offered as a test of mediation:

> H2: High-clarity/high-immediacy instruction (compared with low-clarity/low-immediacy instruction) increases students' scores on a test of retention both directly, and indirectly through students' attention.

Despite the ability for instructor nonverbal immediacy to increase students' attention to course content, it should be noted that whether students pay attention to their instructors is not regulated solely by external forces—students have the ability to focus their attention on tasks absent any external incentives for doing so (Snow, Corno, & Jackson, 1996). The ability to focus on important stimuli while ignoring less important stimuli is considered to reflect a component of the brain's executive function (Baddeley, 1996; Forster & Lavie, 2014) linked to an individual's self-control (Kool, McGuire, Wang, & Botvinick, 2013; Wilson, Sayette, & Fiez, 2014), which is defined as "the ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them" (Tangney, Baumeister, & Boone, 2004, p. 275). In academic contexts, the utilization of self-control may involve students' conscious efforts to regulate their behavior such as paying attention in class as opposed to daydreaming (Duckworth & Seligman, 2006). That said, though self-control is important for students throughout their academic experiences, it may be particularly crucial when instructors do

not facilitate their interest in the subject matter. If this is the case, it is likely that students who are high in self-control are better able to pay attention to lectures that are clear, but do not naturally stimulate their attention. Therefore, we predict that being exposed to clear instruction without nonverbal immediacy might only be detrimental for students who are low in self-control; conversely, students who are high in self-control will not have trouble sustaining their attention during a clear lecture without nonverbal immediacy. To test this prediction, the third hypothesis was offered as a test of moderated mediation:

> H3: High-clarity/low-immediacy instruction (compared with low-clarity/low-immediacy instruction) will increase students' scores on a test of retention indirectly through students' attention—but only for high-effort-regulated students (not low-effort-regulated students).

Method

Participants

After gaining approval from the Institutional Review Board, 362 students enrolled in several large lecture communication studies courses offered at a large Mid-Atlantic university were recruited to take part in the study. Participants were 145 men and 217 women whose ages ranged from 18 to 51 years ($M = 19.6$, $SD = 2.5$). One hundred and sixty-one students were in their first year, 82 students were in their second year, 57 students were in their third year, 50 students were in their fourth year, and 12 students were in their fifth year or beyond.

Procedures

Students were notified in class about the opportunity to participate in the study using recruitment flyers. They were subsequently e-mailed a link with directions to access study materials online. Students who agreed to take part in the study first answered questions pertaining to their self-control operationalized as effort regulation in academic contexts (Pintrich, Smith, Garcia, & McKeachie, 1991). They were then randomly assigned to one of four video-taped lectures on the topic of social cognitive theory (Bandura, 1998, 2004). These lectures were taught by an associate professor of communication studies from another university (to ensure that participants were not familiar with this instructor) and were manipulated to reflect high- and low-clarity cues as well as high- and low-immediacy cues in a 2 × 2 equivalent groups factorial experimental design (High/Low Clarity × High/Low Immediacy).

To capture the multidimensionality of the construct, clarity was manipulated through the presence (or absence) of previews, reviews, transition statements, concrete examples, verbal mazes, and vagueness terms such as "uh" and "ah" (Titsworth & Mazer, 2010). Nonverbal immediacy was manipulated through the enhancement (or reduction) of eye contact, smiling, gestures, and vocal variety (Witt, Schrodt, & Turman, 2010). Participants were forced to stay on the stimulus page and watch the lecture (approximately five minutes in length) until the video was complete. After viewing the assigned video lecture, participants answered a series of questions regarding the clarity of the lecture and the nonverbal immediacy displayed by the instructor as manipulation checks. In addition, students were asked to report their familiarity with the lecture material, the perceived difficulty of the

lecture material, and the extent to which they paid attention to the lecture. After responding to these measures, participants completed a 10-question test on the material to assess cognitive learning.

Instrumentation

Manipulation check

To check that the clear and immediate conditions were perceived by students as they were intended, we performed manipulation checks. To assess students' perceptions of clarity, we used items from Bolkan, Goodboy, and Kelsey (2016) based originally on items from the Teacher Clarity Short Inventory (Chesebro & McCroskey, 1998). These five items asked participants to report the extent to which the lesson "was clear," "was straightforward," "made sense," "was easy to understand," and "was easy to follow." Response options ranged from (1) *strongly disagree* to (5) *strongly agree* ($\alpha = 0.95$, $M = 3.29$, $SD = 1.16$).

To assess students' perceptions of the instructor's nonverbal immediacy, we used eight low-inference items from the Revised Nonverbal Immediacy Measure (McCroskey, Richmond, Sallinen, Fayer, & Barraclough, 1995) and three high-inference items from the Generalized Immediacy Scale (Andersen, 1979). Examples of these items include "this teacher smiled when talking" and "this teacher seemed cold to me." We combined these scales to get a comprehensive measure regarding students' assessment of the instructor's immediacy (both a behavioral and a perceptual assessment). Considering the correlation between these measures was high ($r = .67$, $p < .01$), the decision to combine these measures into a single variable was deemed tenable. Response options ranged from (1) *strongly disagree* to (5) *strongly agree* ($\alpha = 0.88$, $M = 2.66$, $SD = 0.82$).

Self-control

Students' self-control was operationalized in this context as their effort regulation and was measured using four items taken from the resource management strategy subscale of the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991). These items ask students about their ability to control their effort and attention when faced with uninteresting tasks. In this study, we measured effort regulation as a general tendency; examples of items include: "I work hard to do well in class even if I don't like what we are doing," and "I often feel so lazy or bored when I study for class that I quit before I finish what I do." Response options ranged from (1) *not at all true of me* to (7) *very true of me*. Cronbach's alpha reliability coefficient was .77 ($M = 5.09$, $SD = 1.12$).

Sustained attention

Students' attention was measured using four items from Wei et al.'s (2012) Sustained Attention Scale. Two items were dropped from the original six-item measurement scale. The first item was "I pay my full attention to classroom discussions in this class." This item was dropped because it pertains to class discussions which were not held in this scenario; this item has been previously dropped in Wei, Wang, and Fass's (2014) work. The second item, "My attention to classroom lecture is more than other leisure activities," was dropped because the wording of this item is vague and, unlike the items included in the measure we used (e.g. "I sustained my attention to learning throughout the lecture"),

it was not considered a straightforward assessment of students' attention in the experimental scenarios. The four items we used in the current study included statements such as: "I paid full attention to the lecture," and "I had difficulty sustaining my learning attention during the lecture" (reverse coded). Response options could range from (1) *not at all true of me* to (7) *very true of me* ($\alpha = 0.79$, $M = 3.84$, $SD = 1.43$).

Covariates

Covariates in this study included students' familiarity with, and the perceived difficulty of, the lecture material. These variables were included as covariates because they have been shown to influence students' performance on tests involving recall (e.g. Bolkan et al., 2016). Students' familiarity was measured with three items (Bolkan et al., 2016) which included statements such as: "How familiar were you with this topic before today?" and "To what extent had you been exposed to the material in this lesson in the past?" with response options ranging from (1) *not at all* to (5) *very much* ($\alpha = 0.94$, $M = 2.65$, $SD = 1.04$).

The perceived difficulty of the material was measured with Paas's (1992) one-item mental effort rating scale. This item asked participants to report "How difficult would the material have been to understand if it was taught in an ideal manner (e.g. by an ideal teacher, in a way that was simple to comprehend, etc.)?" Response options ranged from (1) *very low* to (9) *very high* ($M = 3.91$, $SD = 2.29$).

Test

To measure students' retention as it pertained to the lecture material, a 10-item test was developed specifically for this study. Six questions were multiple choice (with four response options) and four questions were true/false. Questions were coded as (1) for a correct answer and (0) for an incorrect answer; the exam was scored to reflect the percentage of correct answers (KR-20 = 0.49, $M = 58.34$, $SD = 20.37$, Range = 30–100). Across conditions, the scores ranged from 50–66% on average: low clarity/low immediacy ($M = 50.00$, $SD = 16.19$), low clarity/high immediacy ($M = 54.09$, $SD = 17.08$), high clarity/low immediacy ($M = 64.11$, $SD = 23.51$), and high clarity/high immediacy ($M = 65.57$, $SD = 19.93$).

Results

To examine the construct validity of the measures used in this study, we conducted a confirmatory factor analysis modeling clarity, nonverbal immediacy, effort regulation, sustained attention, and familiarity as latent variables with perceived difficulty modeled as an observed variable (nonverbal immediacy was modeled as a second-order latent variable with the behavioral and perceptual items reflecting first-order latent variables). Results indicated that the data fit our measurement model well, $\chi^2 = 716.18$, $df = 334$, $p < .01$, SRMR = 0.07, CFI = 0.94, RMSEA = 0.056 (CI: 0.051, 0.062). Next, to determine if the lecture manipulations were successful, t-tests were calculated to discern if differences existed between the two instructor clarity and two nonverbal immediacy conditions. The manipulations of both variables were successful; results indicated that participants perceived the lecture conditions in which clarity was enhanced ($M = 3.87$, $SD = 0.95$) to reflect clearer instruction compared with the low clarity

conditions, $M = 2.74$, $SD = 1.07$; $t(359) = -10.60$, $p < .001$, $d = -1.12$. Likewise, participants perceived the lecture conditions in which nonverbal immediacy cues were enhanced ($M = 3.08$, $SD = 0.72$) to reflect more immediate teaching compared with the low-immediacy lecture conditions, $M = 2.24$, $SD = 0.70$; $t(360) = -11.24$, $p < .001$, $d = -1.18$.

Hypothesis 1

The first hypothesis predicted that instructor clarity would have a positive effect on students' scores on a test of retention independent of the level of instructor nonverbal immediacy. This hypothesis was supported. To test the unique effects of the independent variables on students' test scores, a hierarchical ordinary least squares (OLS) regression analysis was conducted. Clarity (indicator coded 0 for low clarity and 1 for high clarity) and nonverbal immediacy (indicator coded 0 for low immediacy and 1 for high immediacy) were entered in block one; effort regulation, attention, familiarity, and difficulty were entered in block 2. In block 1, instructor clarity significantly increased students' test scores by about 13%, holding instructor immediacy constant, $F(2, 359) = 20.643$, $p < .001$ (see Table 1 for the regression coefficients). In block two, the covariates of attention and perceived difficulty significantly predicted test scores explaining an additional 4% of the variance, $F(6, 355) = 15.271$, $p < .001$.

Hypothesis 2

Hypothesis 2 predicted that high-clarity/high-immediacy instruction (compared with low-clarity/low-immediacy instruction) would increase students' scores on a test of retention both directly, and indirectly through students' attention. PROCESS (Hayes, 2013) was used to conduct path analyses with students' attention mediating the influence of the high-clarity/high-immediacy lecture condition on students' test scores (see Figure 1 for the conceptual model). Effort regulation, familiarity, and perceived difficulty were included in the model as covariates. Indirect effects were calculated using 50,000 bootstrapped samples and 95% bias-corrected confidence intervals (for an explanation of

Table 1. OLS hierarchical regression analysis predicting students' test scores (%).

Block 1	*B*	*SE*	*t*	*p*	LLCI	ULCI
$R^2 = .10$, $F(2, 359) = 20.643$, $p < .001$						
Constant	50.653	1.758	28.813	<.001	47.595	53.725
Clarity	12.797	2.034	6.292	<.001	8.761	16.830
Nonverbal Immediacy	2.793	2.034	1.374	.170	−1.164	6.804
Block 2						
$R^2 = .21$, $F(6, 355) = 15.271$, $p < .001$						
Constant	41.142	6.298	6.533	<.001	28.564	54.113
Clarity	11.060	1.974	5.603	<.001	7.144	14.890
Nonverbal Immediacy	1.968	1.963	1.002	.317	−1.925	5.906
Effort regulation	1.266	.908	1.394	.164	−.635	3.132
Attention	2.629	.699	3.763	<.001	1.111	4.112
Familiarity	.785	.940	.835	.404	−1.123	2.657
Difficulty	−2.005	.436	−4.605	<.001	−2.860	−1.179

Note. Coefficients are unstandardized and can be interpreted as a percentage scored on the test. Adjusted R^2 in block 1 = .10, adjusted R^2 in block 2 = .19, $\Delta R^2 = .11$ in block 2. Both clarity and nonverbal immediacy are coded as 0 (low-clarity or nonverbal immediacy) and 1 (high-clarity or nonverbal immediacy).

bootstrapping see Hayes, 2013). Three mediation models were estimated with D1, D2, and D3 each serving as the independent variable (or covariate when not entered as the predictor, for a full explanation see below). The reference condition in this model was condition 1: the low-clarity and low-immediacy lecture. Table 2 reports all path model coefficients including the relative direct and indirect effects.

A requirement for testing mediation using OLS path analysis is that the independent variable is entered as a continuous variable or a dichotomous categorical variable that is indicator coded (Cohen, Cohen, West, & Aiken, 2003). Until recently, multicategorical independent variables could not be estimated in an OLS mediation analysis. Hayes and Preacher (2014) provided a systematic solution for how to parameterize a linear model that includes a multicategorical variable by recoding it into $k - 1$ indicator codes where k represents the number of categories. By recoding the multicategorical variable into $k - 1$ separate dummy variables that are then entered into the model, the mathematical equivalent of analysis of (co)variance is modeled and the linear mediation model can be estimated. In respect to this procedure, Hayes and Preacher (2014) introduced the terms, "relative indirect" and "relative direct" effects to "quantify the effect of being in one group (or set of groups) relative to some reference group or set of groups" (p. 456). Using this procedure, the multicategorical independent variable (i.e. 4 experimental lecture conditions) were entered into a mediation model to quantify the relative indirect and direct effects of being in one experimental group [Condition 2 (i.e. D1): Low Clarity and High Immediacy; Condition 3 (i.e. D2): High Clarity and Low Immediacy; Condition 4 (i.e. D3): High Clarity and High Immediacy] compared with the reference group (Condition 1: Low Clarity and Low Immediacy). This procedure required the estimation of three dummy codes (D1, D2, D3) serving separately as the independent variable and

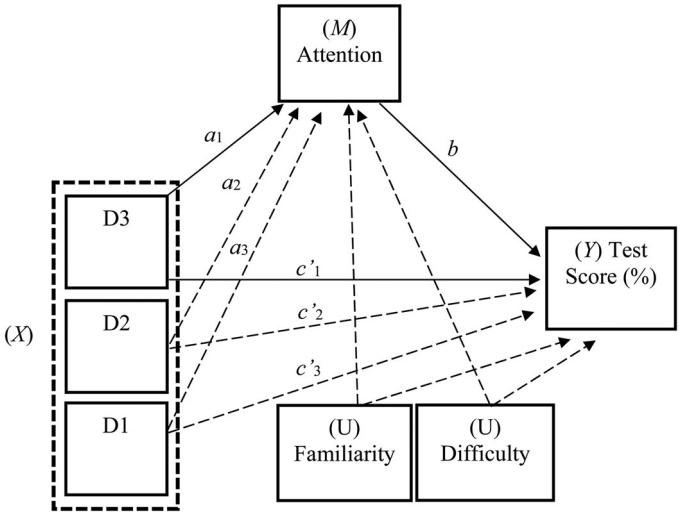

Figure 1. Conceptual diagram of mediation models.

Note: For each model, the lecture condition represents one of three indicator coded conditions serving as the independent variable (D1: low clarity, high immediacy; D2: high clarity, low immediacy; D3: high clarity, high immediacy) as it compares to the reference group condition: low clarity, low immediacy. In addition to covariates of familiarity and difficulty depicted in the figure, the indicator coded conditions that are not serving as the independent variable are entered as covariates for each model as well.

Table 2. OLS path model coefficients.

Models	Coefficient	*SE*	*t*	*p*	LLCI	ULCI
Attention						
$F(6, 355) = 4.11$, $p < .001$, $R^2 = .07$						
Constant	2.499	.466	5.368	<.001	1.583	3.415
Effort regulation	.211	.068	3.092	.002	.077	.345
Familiar	−.083	.071	−1.161	.246	−.223	.057
Difficulty	.018	.033	.554	.580	−.047	.083
D1 (a_1)	.344	.207	1.659	.098	−.064	.751
D2 (a_2)	.482	.208	2.318	.021	.073	.891
D3 (a_3)	.867	.211	4.110	<.001	.452	1.282
Test score (%)						
$F(7, 354) = 13.25$, $p < .001$, $R^2 = .21$						
Constant	40.139	6.370	6.301	<.001	27.610	52.667
Attention (b)	2.634	.698	3.771	<.001	1.261	4.008
Effort Regulation	1.294	.908	1.424	.155	−.493	3.081
Familiarity	.755	.941	.803	.423	−1.095	2.605
Difficulty	−2.027	.436	−4.649	<.001	−2.884	−1.169
D1 (Relative Direct Effect; c'_1)	3.953	2.737	1.444	.150	−1.431	9.337
D2 (Relative Direct Effect; c'_2)	13.063	2.757	4.739	<.001	7.641	18.484
D3 (Relative Direct Effect; c'_3)	13.000	2.843	4.573	<.001	7.408	18.589
Mediation (through Attention)					Bootstrapped CI	
$\vartheta = .100$ (95% CI: 0.011, 0.255)	*ab*	*SE*			LLCI	ULCI
Relative Indirect Effect for D1 (a_1b)	.906	.559			.047	2.312
Relative Indirect Effect for D2 (a_2b)	1.269	.711			.205	3.050
Relative Indirect Effect for D3 (a_3b)	2.285	.862			.921	4.404

Note. Direct and indirect effects are unstandardized and can be interpreted as a percentage scored on the test. For indicator coded groups (D1, D2, D3), coefficients reflect mean differences in test scores in comparison with the referent group (condition 1: low clarity, low immediacy). D1 = low clarity, high immediacy; D2 = high clarity, low immediacy; D3: high clarity, high immediacy. ϑ = omnibus test of indirect effect. Bootstrapped CIs that do not include zero indicate mediated effects.

allowing the remaining two dummy codes to serve as covariates for each analysis. Hayes and Preacher (2014) provide a detailed tutorial for how to estimate these relative effects with multicategorical variables.

Results indicated that the second hypothesis was confirmed. Relative to the reference condition, the high-clarity and high-immediacy lecture condition (D3) significantly increased students' test scores both directly ($c'_3 = 13.000$, $p < .001$) and indirectly through students' attention ($a_3b = 2.285$; CI: 0.921, 4.404). Although not hypothesized, compared with the reference condition, the low-clarity but high-immediacy condition (D1) did not produce a significant direct effect on students' learning ($c'_1 = 3.953$, $p = .15$), however there was a small indirect effect on students' test scores through attention ($a_1b = 0.906$; CI: 0.047, 2.312). As it pertains to the high clarity but low-immediacy condition (D2), relative to the reference condition, there was a significant direct effect on students' test scores ($c'_2 = 13.063$, $p < .001$) and an indirect effect through students' attention ($a_2b = 1.269$; CI: 0.205, 3.050); however, this indirect effect was predicted to be moderated in hypothesis 3 (see below). These collective results revealed that students scored, on average, 13% higher on the test when their instructor was clear. Moreover, students who attended a lecture high in clarity/high in immediacy scored approximately 2% higher on the test (compared with a lecture low in clarity/low in immediacy) through the indirect effect of attention to the lecture.

Hypothesis 3

The third hypothesis predicted that high-clarity/low-immediacy instruction would increase students' scores on a test of retention indirectly through students' attention, but only for high-effort-regulated students (not low-effort-regulated students). This hypothesis assumed that high-effort-regulated students would not need instructor immediacy to sustain their attention during the lecture; these students would pay more attention to a clear instructor and score higher on a test of retention even in the absence of immediacy behaviors. Identical to the previous model testing, the reference condition in this model was the low-clarity/low-immediacy lecture. To test this hypothesis, PROCESS was used to conduct a first-stage moderated mediation analysis with the high-clarity but low-immediacy condition (D2) influencing students' test scores directly and also indirectly through students' attention (relative to the comparison group). Students' effort regulation was hypothesized to moderate the path between the lecture condition and attention (i.e. path-*a*; see Figure 2). Covariates in the model included students' familiarity and the perceived difficulty of the material, along with the D1 and D3 coded lecture conditions.

As before, indirect effects were calculated using 50,000 bootstrapped samples and 95% bias-corrected confidence intervals. The third hypothesis was supported (see Table 3) with results indicating a relative direct effect ($c' = 12.619$, $p < .001$) and a conditional indirect effect. The index of moderated mediation (Hayes, 2015) was .798 (CI: 0.023, 1.981) confirming that that the indirect effect of the lecture condition on student learning through attention was conditional upon students' effort regulation. This result indicates that "*any* two conditional indirect effects defined by different values of the moderator are statistically significant" (Hayes, 2015, p. 14).

To probe the moderated mediation, conditional indirect effects were estimated at five values of the moderator (see Table 3). Relative to the reference group, students who attended the high-clarity/low-immediacy lecture and who were relatively more effort-regulated increased their test scores indirectly by paying more attention. In fact, as reported in Table 3, there was no indirect effect through attention when effort regulation was very low, $\theta(ab)|_{W = 3.75} = 0.267$ (CI: −1.213, 2.136), and low, $\theta(ab)|_{W = 4.25} = 0.666$ (CI: −.522, 2.404); however, significantly increasing relative indirect effects were found among

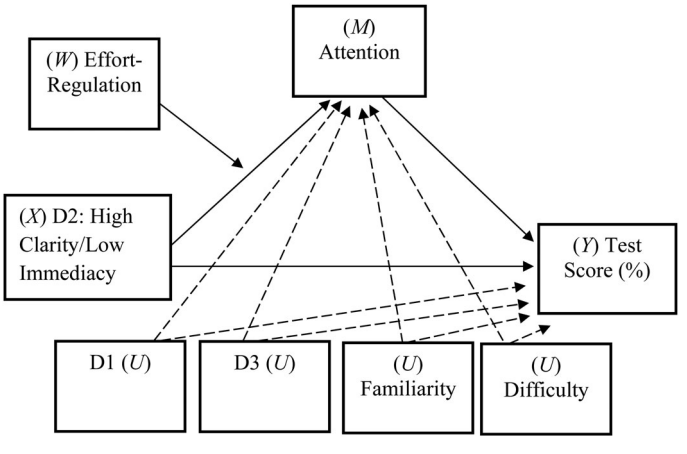

Figure 2. Conceptual diagram of first-stage moderated mediation model.

Table 3. OLS path model coefficients (First-Stage Moderated Mediation Model with D2: High Clarity, Low Immediacy as the Independent Variable).

Model	Coefficient	*SE*	*t*	*p*	LLCI	ULCI
Attention						
$F(7, 354) = 4.05$, $p < .001$, $R^2 = .07$						
Constant	2.882	.507	5.685	<.001	1.885	3.879
D2 (*a*)	−.975	.804	−1.212	.226	−2.557	.607
Effort Regulation	.140	.078	1.796	.073	−.013	.293
D2*Effort Regulation	.285	.152	1.874	.062	−.014	.585
D1	.326	.207	1.579	.115	−.080	.733
D3	.843	.211	4.003	<.001	.429	1.258
Familiarity	−.084	.071	−1.184	.237	−.224	.056
Difficulty	.018	.033	.534	.594	−.047	.083
Test scores (%)						
$F(6, 355) = 15.07$, $p < .001$, $R^2 = .20$						
Constant	46.798	4.333	10.802	<.001	38.277	55.319
Attention (*b*)	2.795	.690	4.050	<.001	1.438	4.153
D2 (Relative Direct Effect; *c*′)	12.619	2.743	4.601	<.001	7.224	18.013
D1	3.587	2.729	1.314	.190	−1.781	8.954
D3	12.353	2.810	4.396	<.001	6.826	17.879
Familiarity	.852	.939	.907	.365	−.996	2.699
Difficulty	−2.176	.424	−5.135	<.001	−3.010	−1.343
Moderated Mediation (through Attention)					Bootstrapped CI	
IMM = 0.798 (95% CI: 0.023, 1.981)	*ab*	*SE*			LLCI	ULCI
Relative Indirect Effect $\theta(ab)\|_{W = 3.75}$	.267	.835			−1.213	2.136
Relative Indirect Effect $\theta(ab)\|_{W = 4.25}$	.666	.733			−.522	2.404
Relative Indirect Effect $\theta(ab)\|_{W = 5.00}$	1.264	.720			.164	3.012
Relative Indirect Effect $\theta(ab)\|_{W = 6.00}$	2.062	.952			.597	4.420
Relative Indirect Effect $\theta(ab)\|_{W = 6.50}$	2.461	1.130			.720	5.264

Note. Conditional indirect effects are unstandardized and can be interpreted as a percentage scored on the test. IMM = index of moderated mediation. Conditional indirect effects are estimated at values of the moderator (W = values of effort regulation) at the 10th, 25th, 50th, 75th, and 90th percentiles. Bootstrapped CIs that do not include zero indicate mediated effects.

moderate, $\theta(ab)|_{W = 5.00} = 1.264$ (CI: 0.164, 3.012), high, $\theta(ab)|_{W = 6.00} = 2.062$ (CI: 0.597, 4.420) and very high-effort-regulated students, $\theta(ab)|_{W = 6.50} = 2.461$ (CI: 0.720, 5.264). Thus, the evidence suggests that in the condition of high-clarity/low-immediacy, students who scored moderately, high, or very high on the measure of effort regulation scored over 2% higher on their tests because they paid attention to the instructor, whereas students who scored low or very low on the measure of effort regulation did not (see Table 3 for a full report of coefficients). In addition, clear instruction without immediacy produced a direct gain of over 12% on students' test scores.

Discussion

This study examined how instructor clarity and nonverbal immediacy influence student learning both directly and indirectly through the attention students pay to their course lectures. Moreover, these indirect effects were predicted to be dependent upon whether or not students were self-regulated learners. Generally, the results obtained in this study suggest that both instructor clarity and immediacy continue to be important effective teaching behaviors that are related to students' cognitive learning. However, these results indicated that although instructor clarity was beneficial for student learning across all the

participants in this study and increased test scores equivalent to an entire letter grade, the lack of instructor nonverbal immediacy was only slightly detrimental to student learning and only for some students under mediating circumstances.

Clarity

Instructor clarity has been argued to be one of the most important aspects of effective teaching (e.g. Murray, 1983; Rosenshine & Furst, 1971); the findings of this study align with this perspective. In terms of students' test scores obtained in this study, clear teaching was the most influential variable in our model accounting for an approximately 13% boost in students' test scores. This finding corroborates Titsworth et al.'s (2015) meta-analyses, which reported that instructor clarity accounts for roughly 12–18% of the variance in students' cognitive learning. That said, these results have implications for scholars of instructional communication who might otherwise overestimate their influence on student success. Although clarity may be an important variable affecting students' academic performance, the results from this study and those from several others seem to indicate that there may be an upper limit on the impact that it (and, indeed, perhaps all instructional communication variables) has on student learning.

Ultimately, the direct impact of instructor clarity on student learning might be explained by the reduction in students' extraneous cognitive loads. According to cognitive load theory, humans have a limited mental capacity in terms of working memory and instructional design should be respectful of these limitations (Sweller, van Merrienboer, & Paas, 1998). In fact, according to Sweller et al. (1998), "anything beyond the simplest cognitive activities appear to overwhelm working memory" (pp. 252–253) and thus instructional materials that are not streamlined for students' consumption are likely to overwhelm their capacities for processing information. Because of its ability to reduce the extra effort students must exert to understand their course lessons (i.e. extraneous load), instructor clarity may be uniquely situated as an instructional variable that affects students' abilities to learn their course materials (Bolkan et al., 2016). In other words, because clarity functions to increase the cognitive space available for students to process course material, clarity may be an important instructional variable for all students regardless of their propensity to self-regulate their learning.

Immediacy and self-control

In conjunction with clarity, the additional impact of instructors' nonverbal immediacy on student learning was examined. Specifically, we found that the high-clarity/high-immediacy lecture caused students to pay more attention to and, in turn, score higher on the test of retention. These results are in line with prior assertions that nonverbal immediacy works to influence student learning because of its ability to arouse students and focus their attention (Frymier, 1994; Kelley & Gorham, 1988). Crucially, these results should be considered in light of the interaction between students' self-control (operationalized as effort regulation) and the high-clarity/low-immediacy lecture condition. As it pertains to the moderated mediation effect, when instruction was clear but not immediate, the indirect effect on student learning through attention was absent for low-effort-regulated students; yet high-effort-regulated students still benefited from the indirect effect. These results are congruent

with the argument that self-control "fosters the ability to stay on-task when our minds would rather wander" (Inzlicht & Berkman, 2015, p. 511) and indicate that while the inclusion of nonverbal immediacy with clear instruction might help students focus their attention and score higher on tests of retention, removing immediacy cues from clear instruction may only be problematic for the least self-controlled students.

As might be assumed, these findings point to the importance of self-control in students' learning experiences within the classroom. The ability to monitor and regulate their cognition means that self-controlled students need fewer external incentives (e.g. instructor immediacy) to engage in effortful information processing. Ultimately, this means that students high in self-control should be more likely to succeed academically because they are less sensitive to environmental fluctuations related to their learning contexts. In fact, students who are high in self-control *do* enjoy an academic advantage as Duckworth and Seligman (2005) found that "highly self-disciplined adolescents outperformed their more impulsive peers on every academic-performance variable, including report-card grades, standardized achievement-test scores, admission to a competitive high school, and attendance" (p. 941).

Overall, these findings have important implications for scholars studying instructor immediacy. Though it has largely been assumed that immediacy is beneficial for student learning in the classroom (Richmond et al., 1987), it appears that the impact of immediacy does not outweigh, or add to direct learning effects derived from instructor clarity. Instead, the impact of nonverbal immediacy on student learning appears to be indirect, with two important caveats. First, we found that immediacy's indirect effect on learning only occurs when instructors are also clear. Second, the indirect effects of nonverbal immediacy on student test scores were small and conditional. While nonverbal immediacy was important for capturing some students' attention in class, students with a higher propensity for self-control were able to focus on the lecture content regardless of the instructor's eye contact, vocal variety, and smiling behavior. These results reinforce the conclusions drawn from previous research indicating that clarity is much more important than immediacy when it comes to facilitating student learning.

Practical applications

Considering the importance of self-control on student learning, it might be appropriate to encourage students to be self-regulated learners if instructors want them to be more successful in their studies (Pintrich & Garcia, 1994). However, because self-control is believed to be subject to genetic influence (Kool et al., 2013; Moffitt et al., 2011; Wilson et al., 2014), it is likely that some students might be naturally more inclined to possess this characteristic than others. Still, even if self-control is a part of an individual's personality, like other aspects of a person's temperament it may wax and wane in relation to contextual demands (Baumeister, Gailliot, DeWall, & Oaten, 2006). That said, there might be a variety of ways instructors can help their students demonstrate self-control in their classrooms. For example, according to several researchers (e.g. Baumeister & Heatherton, 1996; Inzlicht, Legault, & Teper, 2014) this might be achieved by helping students focus on three important processes of self-control including setting goals, determining when behavior is in discord with these goals, and aligning behavior with these goals.

As it pertains to the first process of setting goals, the most promising goals are those that are specific, challenging, and attainable (Inzlicht et al., 2014). To this point, when instructors

help students set goals for learning they should help students set specific and measurable goals because these allow for the "straightforward monitoring of goal-behavior mismatches" (Inzlicht et al., 2014, p. 303). Relating to the second process, it is important for people to monitor their behavior to determine when it is out of line with their objectives (Inzlicht et al., 2014). That said, by helping students to be mindful of their progress toward their goals, instructors may help students notice when they are or are not behaving in ways that facilitate their success. For example, instructors should prioritize the provision of timely feedback and regular progress reports. Finally, pertaining to the third process, individuals should align their behavior with their goals if they are to be successful (Inzlicht et al., 2014). Therefore, instructors might consider providing what Inzlicht et al. (2014) call implementation intentions. Implementation intentions may include cues to action to help students remember to engage in desired behavior and might occur in the form of reminders for upcoming assignments or the provision of study guides to help students prepare for their exams.

In addition to the ideas noted above, Elstad (2008) argued that there are several other behaviors students can adopt to exercise more self-control in the classroom to help facilitate beneficial learning outcomes. Thus, if these behaviors can be highlighted for students (for example in freshmen seminars or new student orientations) then perhaps students may be more likely to understand how they can help themselves engage in purposeful self-control. Specifically, by teaching students about behaviors such as self-binding (i.e. eliminating a distraction or obstacle to learning), cue avoidance (i.e. avoiding small distractions so that they do not lead to bigger ones), attention management strategies (i.e. placing one's self in a location where it is easy to pay attention to course lessons), and transcendence (i.e. the practice of finding the long-term value in a stimulus even if the short-term value is missing) educators may be able to help students gain an understanding of tactics that might lead to beneficial academic outcomes.

Despite the importance of student agency in marshaling self-control, from an instructional perspective, it might be possible for instructors to create more egalitarian learning environments to the extent that the need for self-control can be reduced. Specifically, if instructors deliver lecture information clearly and present their material in a manner that piques students' attention, they might be able to reduce the need for students' to rely on self-control to pay attention to course lectures. As we found in our study, when instructors behave in the manner just described, students should be likely to pay attention to their lectures regardless of their natural propensity to focus their attention. Admittedly, this effect may be relegated to the classroom. Outside of the classroom, students with higher self-control may still be better able to control their efforts to engage in tasks related to learning in the face of obstacles and distractions (Duckworth & Gross, 2014).

Limitations and future directions

Like any study, this one had its limitations. One limitation stems from the manipulated setting students faced when participating in this project. It could be argued that watching a lecture video online, especially one as short as five minutes, does not allow researchers to approximate live student learning conditions in the classroom. For example, the manipulated setting may have affected students' motivation to learn the material presented and may have influenced students' desire to study the information or take notes to preserve

the short lesson. Despite these drawbacks, the method employed in our project allowed us to carefully manipulate instructor clarity and nonverbal immediacy together to test for causal relationships between these variables and student learning. Though manipulating these same variables in an actual classroom context may prove to be difficult, future researchers may want to extend our findings to various learning contexts to determine whether these results hold in more realistic classroom settings including longer lectures and lectures with external incentives for learning. Relatedly, another limitation of this study was the less than ideal KR-20 score. Although a KR-20 score of .50 might be considered adequate for an exam covering several aspects of a lesson, low scores may indicate that test questions do not associate together to assess a single construct or that students who did well on the exam did not answer all of the questions correctly (McGahee & Ball, 2009); that said, readers may want to interpret our results with caution. Thus, in addition to using more realistic classroom contexts, future researchers may consider testing for recall or comprehension in a manner that more clearly approximates what students are asked to learn in their actual coursework.

In addition, and related to what we noted above, another limitation is that the manipulations used in this study occurred over a short period of time. However, care was taken to ensure that the manipulations reflected either enhanced immediacy and clarity or diminished clarity and immediacy as opposed to total lack thereof. In other words, we were careful to create manipulations of instructor clarity and nonverbal immediacy that would be reflective of actual teacher behaviors that students might encounter in class. Analysis of the means of the manipulation checks indicated that we were able to achieve our goal.

Finally, the scope of this project was also a limitation. Though we were able to examine instructor clarity, nonverbal immediacy, and students' attention and self-control, there are a variety of other variables that we were not able to include in our model. Technically, all models are misspecified to some degree. That said, it would be important for researchers to continue to investigate the effects we found in this study as they apply to, or include, other communication variables.

Despite the limitations listed above, the findings of this study underscore the importance that instructor clarity plays in the college classroom, particularly in terms of its influence on students' academic performance. While this is not to say that instructor immediacy is less important than instructor clarity, given the extensive bodies of research generated to date on both instructional communication behaviors, these findings do suggest that, when studied jointly, instructor immediacy is not as essential when it comes to student learning as instructor clarity. Our findings also point to the fact that students' self-regulated learning is a variable that should be considered when exploring the effect of instructors' communication behaviors on cognitive learning. Despite the best efforts of instructors to be clear and nonverbally immediate, the effects of these efforts may be dependent, in some way, on the amount of self-control students attach to their involvement in any learning situation.

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