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Food for thought: Teacher immediacy, student learning and curvilinearity

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Effective teachers promote student learning, which involves cognitive, affective, and behavioral changes (Bloom, 1956). Researchers have demonstrated repeatedly that students learn most from teachers who are "warm, friendly, immediate, approachable, affiliative and fostering of close, professionally appropriate personal relationships" (Andersen & Andersen, 1987, p. 57). In other words, teachers who communicate positive regard to their students promote student learning.

Teachers can use immediacy behaviors to communicate this positive regard and stimulate their students. Immediacy behaviors are those that enhance closeness to and interaction with others because they reduce psychological and/ or physical distance between communicators, increase overall sensory stimulation and arousal, and promote liking (Mehrabian, 1971, 1981). Nonverbal immediacy behaviors are particularly useful to teachers in this regard because most relational messages are communicated non verbally, leaving the verbal channel available for messages of course content (Watzlawick, Beavin, & Jackson, 1967).

Immediacy is communicated by a set of nonverbal behaviors including (a) proxemics-decreased physical distance; (b) hap tics-socially appropriate touch; (c) vocalics-vocal variation and vocal expressiveness; (d) kinesics-facial animation, open postures, gestural activity and body relaxation; (e) eye contact; (f) chronemics-spending more time with students, arriving early, staying late; and (g) physical appearance-informal but socially appropriate attire which is not conservative (see Andersen & Andersen, 1987).

Those advocating the use of teacher nonverbal immediacy to promote learning typically characterize the relationship between immediacy and learning as linear (see Nussbaum, 1992, and Staton-Spicer & Wulff, 1984, for reviews). However, communication theories connecting high arousal with avoidance moves (e.g., P. Andersen, 1985; Capella & Greene, 1982; Patterson, 1982) suggest that, since high immediacy often is accompanied by high arousal (Mehrabian, 1981), highly immediate teachers may attenuate, rather than stimulate, learning. If so, the relationship between teacher nonverbal immediacy and student learning is better conceptualized as curvilinear. This experiment tested for such curvilinear patterns in the relationship between teacher immediacy and college students' cognitive, affective, and behavioral learning.

Teacher Immediacy and Cognitive Learning

Cognitive learning, comprising comprehension, recall, and retention of knowledge (Bloom, 1956), is the most conventional measure of teacher effectiveness. However, the link between teachers' nonverbal immediacy and students' cognitive learning is inconclusive because of inconsistent results and methodological issues in earlier research. Unresolved issues revolve around (a) subjective assessments of teacher nonverbal immediacy and student cognitive learning; and (b) the role of affect and arousal in cognitive learning.

Most recent research investigating teacher immediacy effects measures teacher immediacy and student learning through the use of student reports. Typically, teacher immediacy is assessed via students' memories of their teachers' classroom behaviors; that is, students are asked to recall either their best teacher, a teacher in the student's major, or the teacher in the student's last class period. In a similar vein, student learning often is measured via students' perceptions of how much they think they learned. The validity of these subjective measures as indices of reality can be affected by students' memory decay, affective biases, and other distortions (Greene, 1988). In addition, students' memories and perceptions of learning may be distorted by the grades they received from the teachers, and those grades may have been, in part, a reflection of the teachers' affect toward their students (Kelley & Gorham, 1988). For these reasons, reliance on students' perceptions and memories for both the independent and dependent variables in studies of teacher nonverbal immediacy (as in Christophel, 1990; Gorham, 1988; Gorham & Zakahi, 1990; Richmond, Gorham, & McCroskey, 1987; Richmond, McCroskey, Kearney, & Plax, 1987) should not be the sole basis for knowledge claims regarding teacher immediacy and cognitive learning.

Explaining the role of affect and arousal in cognitive learning is more complex. A few relatively early studies reported either no relationship or a negative relationship between affect and cognitive learning. Wheeless (1975) found that teacher social attraction, a by-product of nonverbal immediacy, was negatively related to student recall of message content. In later studies, Andersen (1979) and McDowell, McDowell, and Hyerdahl (1980) found that teachers' nonverbal immediacy, though it increased positive affect, made no significant difference in student recall or learning as measured by test scores and grades, respectively. Given these results, Andersen (1979) suggested that high affect might interfere with cognitive learning.

But as Richmond, Gorham, and McCroskey (1987) have noted, Andersen's suggestion is inconsistent with Bloom's (1956) formulation of the interrelationships among cognitive, affective, and behavioral learning as well as with Mehrabian's (1981) description of immediacy effects. They attributed the apparent inconsistencies to measurement problems in the early research on teacher nonverbal immediacy. The

attempt to overcome those measurement problems led to the earlier-noted reliance on student perceptions and memories. Using students' memories of their teachers and perceptions of how much they learned, Gorham (1988) found a positive linear relationship between teacher immediacy and cognitive learning (see also Richmond, Gorham, & McCroskey, 1987; Richmond, McCroskey, Kearney, & Plax, 1987).

To explain these results, Kelley and Gorham (1988) devised a four-step model linking teachers' nonverbal immediacy to students' cognitive learning. Consistent with Mehrabian (1981), they posit that immediacy is associated with increased arousal, and if increased arousal focuses attention, increases the intensity of information processing, and improves memory (recall and especially retention) (Phaf & Wolters, 1986), the teachers' nonverbal immediacy should increase cognitive learning regardless of its influence on affect toward the teacher. Teacher immediacy and cognitive learning are positively related because "immediacy is related to arousal, which is related to attention, which is related to memory, which is related to cognitive learning" (Kelley & Gorham, 1988, p. 201).

Kelley and Gorham (1988) carried out an experiment to test this model and rectify the problems associated with over-reliance on subjective data. By manipulating confederates' physical proximity and eye contact, they created a 2 X 2 experimental design in which confederates read four groups of six items to individual subjects and then asked subjects to recall the items in the lists. Short-term recall scores were highest in the high proximity/eye contact condition and lowest in the low proximity/no eye contact condition, indicating that proximity and eye contact, as elements of nonverbal immediacy, positively impact short-term recall.

While Kelley and Gorham's experimental methods represent progress, their study was, as they admit, relatively antiseptic, implying a need to move from the laboratory to the classroom and to add other immediacy behaviors to the manipulation so that the global impression is less artificial. These changes in research design would increase the ecological validity of such a study and therefore the generalizability of the results.

However, these changes also may result in excessive student arousal (Kelley & Gorham, 1988). The presence of multiple high immediacy cues will reduce the ambiguity of the relational message (Schwarz, Foa, & Foa, 1983) and strengthen the effects of immediacy, which, in turn, is likely to increase students' level of arousal (Mehrabian, 1981). P. Andersen's (1985) arousal-valencing model and Cappella & Greene's (1982) discrepancy arousal model suggest that the resulting high arousal is likely to produce discomfort and compensatory responses, such as decreased student involvement in the learning process, which ostensibly would negatively impact

cognitive learning. High arousal also may interfere with cognitive learning because it debilitates students' ability to pay attention (Easterbrook, 1959; Smith, 1982) and process information (Greene, 1988). As the Yerkes-Dodson Law (1908) postulates, an inverted U relationship may exist between level of arousal and task performance such that performance is strongest at moderate levels of arousal. Because students' level of arousal is directly affected by teachers' nonverbal immediacy behaviors (Mehrabian, 1981), this curvilinear relationship also should exist between teachers' nonverbal immediacy and students' cognitive learning.

This inverted U curvilinear relationship is not the same curvilinear relationship Richmond, Gorham, & McCroskey (1987, p. 587) meant when they said: "[Our data] suggest the possibility that the association between cognitive learning and immediacy is nonlinear." The relationship they suggest (p. 587) is an inverted L, not an inverted U: "Moderate immediacy is necessary for cognitive learning and low immediacy may suppress such learning. However, high immediacy may not increase cognitive learning over that generated by moderate immediacy."

To examine this inverted U curvilinear relationship, we manipulated immediacy at three levels in a naturalistic way and tested its effects in a classroom situation. It examined the following hypothesis:

HI: Teacher nonverbal immediacy will be related in an inverted U curvilinear pattern with students' (a) short-term recall and (b) long-term retention.

Teacher Immediacy and Affective Learning

Affective learning involves the development of favorable or unfavorable attitudes toward course content, the teacher, or learning in general (Bloom, 1956).
A direct linear relationship between teacher immediacy and affect toward the course and teacher has been widely documented (e.g., Andersen, 1979; Andersen & Andersen, 1982; Christophel, 1990; Gorham, 1988; Plax, Kearney, McCroskey, & Richmond, 1986; Richmond, Gorham, & McCroskey, 1987; Richmond, McCroskey, Kearney, & Plax, 1987; Sanders & Wiseman, 1990). This relationship manifests across K-12 classrooms (see Andersen & Andersen, 1987), in college classrooms (e.g., Andersen, 1979; Gorham, 1988), in adult learning centers (Roberts & Becker, 1978), and in multiethnic classrooms (Sanders & Wiseman, 1990).

Less attention has been given to the link between teacher nonverbal immediacy and student motivation. Christophel (1990), however, found a direct relationship between the two variables. She defined state motivation as "an attitude toward a specific class" (p. 32) and measured it by student reports of

their arousal, interest, involvement, excitement, invigoration, and so on, all of which were directly related to teacher immediacy. Her results are consistent with Mehrabian's (1971, p. 77) early claim for "immediacy producing liking" and Richmond et al.'s (1987) conclusion that affective learning increases across low, moderate, and high immediacy conditions, suggesting that, where teacher nonverbal immediacy is concerned, students cannot get too much of a good thing.

We are skeptical about a direct linear link between teacher nonverbal immediacy and affective learning, including student motivation. Unlike moderate levels of teacher immediacy, high levels of teacher immediacy, while not aberrant, may be uncommon, particularly in college classrooms (Richmond et aI., 1987). As P. Andersen's (1985) arousal-valence model suggests, when levels of nonverbal immediacy significantly deviate from student expectations or preferences for proper, professional teacher behavior, then they are likely to be negatively valenced (see also Patterson, 1982). This negative affect has at least two relevant consequences: It can interfere with cognitive learning (Easterbrook, 1959; Smith, 1982) and it can decrease positive regard for the source of the arousal (Burgoon & Hale, 1988; Patterson, 1982).

Following this reasoning, we predict that, as with cognitive learning, both low and high teacher immediacy will dampen students' motivation and their positive affect for the teacher and course content, whereas moderate levels of teacher nonverbal immediacy will maximize these aspects of affective learning.

H2: Teacher nonverbal immediacy will be related in an inverted U curvilinear pattern with students' (a) state motivation, (b) attitudes toward course content, and (c) attitudes toward the teacher.

Teacher Immediacy and Behavioral Learning

Behavioral learning is evidenced by psychomotor skill development or behavior change (Bloom, 1956). As with affective learning, substantial evidence supports a linear relationship between teachers' nonverbal immediacy and students' attitudes toward the proposed behaviors and their intentions to engage in the proposed behaviors (Andersen, 1979; Andersen & Andersen, 1982; Christophel, 1990; Gorham, 1988; Plax, Kearney, McCroskey, & Richmond, 1986; Richmond, Gorham, & McCroskey, 1987; Richmond, McCroskey, Kearney, & Plax, 1987; Sanders & Wiseman, 1990). However, to our knowledge no previous study has tested the relationship between teachers' nonverbal immediacy and students' *actual* behavior.

According to our reasoning, students are less likely to learn from or to have positive affect toward the content of the material discussed by low or excessively high immediacy teachers. As a result, students are more likely to intend to or to actually engage in behaviors proposed by moderately high immediacy teachers than those proposed by either a low or excessively high immediacy teacher. Hence, we predict that, as with cognitive and affective learning, moderately high teacher nonverbal immediacy will produce higher levels of behavioral learning than will either low or excessively high teacher immediacy.
Although behavioral intentions are strongly correlated with actual behavior as Andersen (1979) suggests, this correlation is not perfect. In fact, many people who intend to engage in behaviors never do so. Our study extends previous research by assessing attitudes toward the proposed behavior, intentions to engage in the proposed behavior, and the actual behavior.

H3: Teacher nonverbal immediacy will be related in an inverted U curvilinear pattern with students' (a) attitudes toward the proposed behavior, (b) intentions to engage in the proposed behavior, and (c) actual behavior.

Method

Employing a modified Solomon Four experimental design, this study tested three levels of manipulated teacher immediacy (low, moderately high, and excessively high) on cognitive, affective, and behavioral learning. Three intact groups (large-lecture, Liberal Arts lower division, core curriculum college classes in history, social psychology, and general psychology) were randomly assigned to one of the three levels of teacher immediacy. Within each treatment, subjects were assigned to one of four testing groups (see Table 1).

TABLE 1

EXPERIMENTAL DESIGN GROUPS WITHIN EACH TREATMENT

Group	Observation and Treatment Participation			
1	pretest	treatment	posttest 1	delayed posttest
2	pretest	treatment		delayed posttest
3		treatment	posttest 1	
4		treatment		delayed posttest

Posttest. The posttest measured (a) short-term cognitive learning (recall), (b) affective learning, (c) behavioral learning, and (d) perceptions of teacher immediacy and style to be used in the manipulation check. Recall was measured using the same 11 true-false items as in the pretest, with items again counterbalanced

to avoid order effects.

Three aspects of affective learning were measured. Christophel's (1990) State Motivation Scale was used to assess the *degree to which subjects were motivated* by the workshop. This instrument contained twelve 7 -point semantic differential scales to assess how students felt about participating in the workshop, including motivated-unmotivated, interested-uninterested, enthused-not enthused, and so on (Cronbach's alpha = .94). Student motivation also was assessed through determining whether or not subjects attended the second part of the workshop scheduled for their next regular class meeting.

The scales measuring subjects' *affect toward the content* of the workshop and their *affect toward the teacher* were drawn from Andersen (1979). Both of these affect dimensions were assessed by four 7 -point semantic differential scales: good-bad, worthless-valuable, fair-unfair, and positive-negative (Cronbach's alpha for affect toward content = .94, for affect toward teacher = .87).

Likewise, three aspects of behavioral learning were assessed. First, *attitudes toward the recommended behaviors* were measured by asking subjects to complete the prompt "Attitude about the behaviors recommended in this workshop ... " using four 7 -point semantic differential scales: good-bad, worthless-valuable, fair-unfair, positive-negative (]. Andersen, 1979) (Cronbach's alpha = .87). Second, *behavioral intentions* were measured by asking subjects to complete the statement "My likelihood of actually attempting to engage in the behaviors recommended in this workshop is ... " using four 7 -point semantic differential scales: likely-unlikely, possible-impossible, probable-not probable, would-would not (]. Andersen, 1979) (Cronbach's alpha = .95). Third, *actual behavior* was unobtrusively assessed. Research assistants collecting the posttest secretly recorded subjects' choices of snack food, either appropriate choices (fruit, pretzels) or inappropriate choices (potato chips, doughnuts, nothing).

As manipulation checks, perceptions of *teacher immediacy* and *teacher style* were assessed with a modified version of]. Andersen's (1979) Generalized Immediacy Scale (GIS). The GIS defines immediacy for subjects and includes two sets of 8-point semantic differential scales to assess perceptions of immediacy In this study, the two sets of semantic differential items were considered separately in order to produce two checks of the immediacy manipulation. Perceptions of teacher style were measured with four 8-point semantic differential scales: immediate-not immediate, cold-warm, unfriendly-friendly, close-distant (Cronbach's alpha = .94). Perceptions of teacher immediacy were assessed using four

8-point semantic differential scales to the prompt "In your opinion, the teaching style of the instructor for this workshop is very immediate": agree-disagree, true-false, correct-incorrect, yes-no (Cronbach's alpha = .97).
Delayed posttest. The delayed posttest measured subjects' long-term retention of "Brain Food" information using the same 11 true-false items used in the cognitive learning pretest, counterbalanced to avoid order effects. All subjects present at the time of the delayed posttest participated.

Results

Similarity of Intact Groups

To assure that subjects in the intact experimental groups came from the same population, responses to the II-item cognitive knowledge of "Brain Food" pretest were used as the dependent variable in a one-way analysis of variance. Results indicate that there were no significant differences in knowledge of "Brain Food" among the low (M = 4.36), moderately high (M = 4.68), and excessively high (M = 4.84) immediacy conditions, $F(2, 107) = 1.08$, $P > .05$. Given this, it is appropriate to assume that any differences in posttest scores were due to the experimental treatment.

Manipulation Check

To check the immediacy manipulation, responses to teacher immediacy and teacher style measures were used as dependent variables in a multivariate analysis of variance, yielding a significant multivariate F, $F(2, 220) = 51.50$, $P < .05$. A univariate test indicated that perceptions of style varied across immediacy conditions in the expected direction, $F(2, 220) = 68.19$, $P < .05$. Contrasts revealed that the immediacy manipulation was successful. Perceptions of style in the low immediacy condition (M = 12.76) were significantly different from perceptions in the moderately high condition (M = 23.27), $t(157) = 10.90$, $P < .05$, which were significantly different from perceptions in the excessively high (M = 26.36) immediacy condition, $t(220) = 3.36$, $P < .05$.

A univariate test indicated that perceptions of immediacy also varied across immediacy conditions in the expected direction, $F(2, 220) = 127.73$, $P < .05$. Contrasts for immediacy reinforced the success of the immediacy manipulation. Perceptions of style in the low immediacy condition (M = 12.46) were significantly different from perceptions in the moderately high condition (M = 23.98), $1(157) = 14.45$, $P < .05$, which were significantly different from perceptions in the excessively high condition (M = 27.39), $t(220) = 4.44$, $P < .05$.

Hypothesis 1 – Cognitive Learning

Hypothesis 1 predicted an inverted U curvilinear relationship between teacher immediacy and (a) short-term recall and (b) long-term retention. Hypothesis la was supported by a one-way analysis of variance using the "Brain Food" posttest as the dependent variable, $F = (2, 107) = 8.84$, $P < .05$. A polynomial contrast showed that recall was greater in the moderately high condition (M = 6.90) than in either the low (M = 5.69) or excessively high (M = 6.34) condition, t (lOS) = 2.13, $P < .05$. A second contrast showed that excessively high teacher immediacy produced greater recall than low teacher immediacy, $t(105) = 3.17$, $P < .05$ (see Table 2).

Hypothesis 1 b, predicting an inverted U curvilinear relationship between immediacy and retention, was not supported. A one-way analysis of variance using the delayed posttest scores as the dependent measure of retention was not significant, $F(2, 152) = .20, p > .05$ (see Table 2).

TABLE 2

COGNITIVE, AFFECTIVE, AND BEHAVIORAL LEARNING MEANS ACROSS LOW, MODERATELY HIGH, AND EXCESSIVELY HIGH TEACHER NONVERBAL IMMEDIACY

	Level of Immediacy		
	Low	Moderately High	Excessively High
Cognitive learning			
recall[ab]	5.69	6.90	6.34
retention (actual)[b]	5.35	5.91	6.31
retention (adjusted)	5.38	6.17	5.79
Affective learning			
motivation[ab]	50.00	58.48	55.09
affect toward content[a]	21.39	23.58	22.50
affect toward teacher[ab]	18.23	24.03	22.21
Behavioral learning			
affect toward behavior[ab]	21.93	25.06	23.74
behavioral intentions[a]	20.57	23.91	21.51

Hypothesis 2 – Affective Learning

Hypothesis 2 predicted an inverted U curvilinear relationship between level of teacher immediacy and (a) the degree to which subjects were motivated by the workshop, (b) subjects' attitudes toward the content of the workshop, and (c) subjects' attitudes toward the teacher. A multivariate analysis of variance with the affective learning measures as dependent variables was significant, multivariate $F(2, 221) = 8.47, p < .05$. Hypothesis 2a, asserting an inverted U curvilinear

relationship between immediacy and motivation, was supported for both measures of motivation. The analysis revealed a significant univariate effect of teacher immediacy on students' state motivation, $F(2, 221) = 6.36$, $P < .05$. A polynomial contrast showed that, as expected, moderately high teacher immediacy (M = 58.48) was more motivating than either low (M = 50.00) or excessively high (M = 55.09) teacher immediacy, $t(221) = 2.58$, $P < .05$. A linear contrast showed that excessively high teacher immediacy had a more positive impact on student motivation than low immediacy, $t(221) = 2.15$, $P < .05$ (see Table 2).

A teacher immediacy (low, moderately high, and excessively high) by attendance(present or absent) chi-square analysis indicated that, as expected, teacher immediacy influenced student motivation to attend the second workshop session, $X2(2, 259) = 6.95$, $P < .05$. Inspection of the frequencies revealed that student motivation followed a curvilinear pattern, with moderately high teacher immediacy having a greater impact on motivation than either low or excessively high teacher immediacy. Simple chi-square tests, using observed frequencies from the overall chi-square to calculate theoretical frequencies in the simple tests, showed that subjects in the moderately high condition were more likely to attend the workshop (72.3%, n = 47) than not attend (27.7%, n = 18), which was significant, $X2(1, 65) = 4.79$, $P < .05$. Although subjects in the low immediacy condition also appeared more likely to attend (56.4%, n = 66) than not attend (43.6%, n = 51) the workshop, this difference was not significant, X2(l, 117) = .32, $P > .05$. Subjects in the excessively high condition were about as likely to attend (50.6%, n = 39) as not attend (49.4%, n = 38) the workshop, $X2(1, 77) = 2.22, p > .05$. A chi-square analysis contrasting excessively high with low immediacy was not significant, indicating that excessively high was not more motivating than low, $X2(1, 194) = 1.542$, $P > .05$.

As hypothesis 2b predicted, immediacy also exerted a significant univariate effect on students' attitudes toward the workshop, $F(2, 221) = 3.80$, $P < .05$. A polynomial contrast indicated that students in the moderately high teacher immediacy condition (M = 23.58) had more positive feelings about the workshop than did students in the low (M = 21.39) or excessively high (M = 22.50) immediacy condition, $t(221) = 2.17$, $P < .05$. The difference between low and excessively high teacher immediacy on attitudes toward the workshop was not significant, $t(221) = 1.31$, $P > .05$ (see Table 2).
Hypothesis 2c, asserting an inverted U curvilinear relationship between immediacy and attitudes toward the teacher, also was supported. The univariate F for students' attitudes toward the teacher was significant, $F(2, 221) = 23.67$. $P < .05$. A polynomial contrast revealed that, once again, students' feelings were more positive in the moderately high teacher immediacy condition (M = 24.03)

than in either the low (M = 18.23) or excessively high (M = 22.21) teacher immediacy condition, $t(221) = 4.58$, $P < .05$. A second contrast showed that excessively high teacher immediacy produced greater positive affect toward the teacher than did low teacher immediacy, $t(221) = 3.94, p > .05$ (see Table 2).

Hypothesis 3 – Behavioral Learning

Hypothesis 3 predicted an inverted U curvilinear relationship between level of teacher immediacy and (a) attitudes toward the proposed behaviors; (b) behavioral intentions; and (c) actual behavior. A multivariate analysis of variance with the self-report behavior measures as dependent variables was significant, multivariate $F(2, 221) = 4.90, p < .05$.

Hypothesis 3a, predicting an inverted U curvilinear relationship between immediacy and attitudes toward the proposed behavior, was supported. The univariate test for attitudes toward the proposed behavior was significant, $F = (2, 221) = 8.57$, $P < .05$. A polynomial contrast showed that, as expected, attitudes toward the proposed behavior were more positive in the moderately high condition (M = 25.06) than they were in either the low (M = 21.93) or excessively high (M = 23.74) immediacy condition. $t(221) = 3.04$. $P < .05$. A second contrast revealed that excessively high teacher immediacy produced significantly more favorable attitudes toward the proposed behavior than did low teacher immediacy, $t(221) = 2.05, p < .05$ (see Table 2).

Hypothesis 3b, predicting immediacy effects on behavioral intentions, also was supported. The univariate test for behavioral intentions was significant, $F = (2, 221) = 5.84$, $P < .05$. A polynomial contrast showed that, as expected, behavioral intentions were strongest in the moderately high condition (M = 23.91), which was higher than the low (M = 20.57) and excessively high (M = 21.51) immediacy conditions, $t(221) = 3.11, p < .059$.Afurthercontrast showed no significant difference between the effect of low and excessively high teacher immediacy on behavioral intentions, $t(221) = .84, p > .05$ (see Table 2).

Hypothesis 3c, predicting immediacy effects on actual behavior, was supported. A teacher immediacy (low, moderately high, and excessively high) by food choice (appropriate or inappropriate) chi-square analysis indicated that, as expected, teacher immediacy influenced behavior, X2 (df = 2) = 8.19, $P < .05$. Inspection of the frequencies revealed that behavioral learning followed the now familiar pattern, with moderately high teacher immediacy having a greater impact on behavior than either low or excessively high teacher immediacy. Simple chi-square tests, using observed frequencies from the overall chi-square to calculate theoretical frequencies in the simple tests, showed that subjects in

the moderately high condition made substantially more appropriate food choices (71.9%, n = 46) than inappropriate food choices (28.1%, n = 18), which was significant, X2(df = 1) = 5.06, $P < .05$. Although subjects in the excessively high condition also apparently made more appropriate (56.9%, n = 33) than inappropriate (43.1%, n = 25) choices, this difference was not significant, X2(df= 1) = .029, $P > .05$. Subjects in the low immediacy condition made virtually the same number of inappropriate (50.5%, n = 54) as appropriate (49.5%, n = 53) food choices, X2(df = 1) = 3.17, $p > .05$. A chi-square analysis contrasting excessively high with low immediacy was not significant, indicating that excessively high teacher immediacy did not have a stronger impact than low on behavioral learning,X2(df= 1)= 1.542, $p > .05$.

Discussion

This study experimentally demonstrates that teacher nonverbal immediacy and cognitive, affective, and behavioral learning are related in a curvilinear manner, specifically in an inverted U curve. Several theoretical and methodological aspects merit consideration.

Theoretical

We predicted an inverted U relationship between teacher nonverbal immediacy and cognitive, affective, and behavioral learning. Although previous reports support the notion that low teacher immediacy interferes with learning and that excessively high immediacy may not enhance learning more than moderately high immediacy, this study extends our knowledge by demonstrating that excessively high immediacy also can attenuate cognitive, affective, and behavioral learning.

In this study, moderately high produced greater learning than either excessively high or low on all dependent variables except retention. In other words, it seems that where teacher nonverbal immediacy is concerned, students can get either too little or too much of a good thing. In addition, this study provides evidence that cognitive, affective, and behavioral learning are interrelated. In our results, they followed parallel curvilinear paths. We speculate that, as Christophel (1990) implies, without positive affect cognitive learning is unlikely. Without both positive affect and cognitive learning, appropriate behavior is unlikely, for behavior presupposes both knowledge and motive.

Only the test of long-term retention failed to show the inverted U curvilinear relationship between immediacy and learning. This result is anomalous. As we reported in the results for state motivation (hypothesis 2a), subject mortality between the first session and the delayed posttest session was high and uneven

across conditions. In the low immediacy condition, only 56.4% of those who had taken the posttest appeared for the delayed posttest. In the excessively high condition, mortality was even greater-only 50.6% appeared for the delayed posttest. In the moderately high condition, on the other hand, 72.3% of those who had taken the posttest also appeared for the delayed posttest session, indicating that moderately high teacher immediacy was most motivating to students.

The high mortality in two of three conditions results in a considerable loss of power for the analysis of variance involving delayed posttest (retention) scores. Possibly more important, we reason that those who failed to appear for the second workshop, (the delayed posttest session) were relatively unmotivated. If they were relatively unmotivated, they were likely to make low scores on a test of cognitive learning (Christophel, 1990). The conclusion of this line of reasoning would be that delayed posttest (retention) means in the excessively high and low immediacy conditions were artificially elevated because in those conditions a greater number of those most likely to make low scores were absent from the testing session.

We conducted a post hoc inspection of means to test this reasoning to the extent possible. Scores on the immediate posttest might be taken as predictors of scores on the delayed posttest. Therefore, if our reasoning is correct, means on the immediate posttest should be lower for those who did not attend the delayed posttest session than for those who attended the delayed posttest session. About half of those who attended the delayed posttest had not taken the immediate posttest because they were in groups used to identify testing effects. Among subjects for whom relevant data were available, the means lend some support to our post hoc explanation. In each of the three immediacy groups, the means on the immediate posttest were lower for those who did not attend the delayed posttest than for those who attended it. In the following, "attenders" denotes attendance at the delayed posttest and means apply to the immediate posttest: in the low immediacy group, attenders (n = 33) M = 5.82, nonattenders (n = 16) M = 5.42; in the moderately high group, attenders (n = 24) M = 6.92, nonattenders (n = 8) M = 6.84; and in the excessively high group, attenders (n = 24) At = 7.05, nonattenders (n = 3) M = 5.25. Given the disproportionately large nonattendance rate in the low and excessively high groups and given that nonattenders, especially in the low and excessively high groups, were likely to achieve lower scores, this evidence justifies to some extent the argument that means for the low and excessively high groups were artificially elevated on the delayed posttest.

We carried this line of speculation one step further. On the assumption that the best predictor of delayed posttest (retention) scores are posttest (recall) scores, we projected to all delayed posttest (retention) nonattenders the mean posttest {recall) score in their immediacy condition earned by nonattenders for whom we had data. Then we recalculated delayed posttest (retention) means as though the nonattenders had attended and had earned those scores.

This recalculation resulted in the "means" labeled in Table 2 as retention (adjusted). These "means" exhibit the expected inverted U curvilinear pattern, with moderately high exceeding both low and excessively high. In order to investigate the reliability and validity of these adjusted results, future experiments should be designed in such a way that assessment of retention is not affected by students' motivation to attend a second class.

Methodological

This study extended research on teacher nonverbal immediacy by (a) manipulating immediacy, rather than prompting students to recall their perceptions of immediacy; (b) measuring actual behavior rather than just behavioral intentions; and (c) measuring actual cognitive gain rather than perceptions of learning.

Manipulating Immediacy

Earlier studies failed to define a priori low, moderately high, and excessively high levels of immediacy. They took what existed in students' memories or perceptions and assumed that they encompassed the entire possible range. In this study, a trained professional exhibited the three levels of immediacy according to instructions derived from well-accepted definitions of the variable (see Andersen & Andersen, 1987).

Measuring Actual Behavior

We measured actual behavior (choice of food) in addition to behavioral attitudes and intentions. We understand why earlier research has relied on behavioral intentions as indices of behavior. As Fishbein and Ajzen (1975) indicate, behavioral intentions are the best predictors of behavior in the absence of actual behavior. Nevertheless, actual behavior is preferred as a measure of message efficacy. Even though students' food choice (or lack of choice) may be related to peer pressure, health-related dietary restraints, and so on, our study demonstrates that measures of behavior need not be restricted to attitudes and intentions.

Measuring Cognitive Gain

In addition to measuring actual behavior we measured actual recall and retention rather than students' perceptions of how much they learned. Unlike Andersen (1979), we found a relationship between teacher immediacy and actual cognitive gain using an objective test of message content. This indicates that Andersen's near zero correlations between teacher immediacy and cognitive learning may not be attributable to the fact that tests are inappropriate measures of cognitive learning, as Gorham (1988) suggested. On the other hand, we measured cognitive gain in a one-shot lecture setting while Andersen's results were based on midterm exam scores in an ongoing classroom setting. As such, it could be that the effects of teacher immediacy on cognitive learning dissipate in actual ongoing classrooms due to the many, naturally occurring intervening variables. Future research should address this issue so that we may determine the long term effects of teacher immediacy on cognitive gain.

Methodological limitations

Rather than randomly assign subjects to conditions, we used intact groups for this research project. Although this practice is common in educational research, some critics aptly argue that results based on intact groups can be confounded by some quality that differed across groups, especially if the groups differ on a variable likely to intervene with the variables of interest. However, in this case, we determined that our intact groups did not differ in age, gender composition, and most importantly, prior knowledge of brain food. As such, we feel confident that the use of intact groups did not threaten the validity of our conclusions. Researchers could avoid all aspects of the intact group controversy by randomly assigning actual students to actual lecture situations. Alternatively, researchers could design a random replication study wherein all groups receive all levels of the treatment without contamination.

Conclusion

This study clarifies the consequences of teacher nonverbal immediacy in a classroom environment. The current findings suggest that for college students in general, the relationship between teacher nonverbal immediacy and student cognitive, affective and behavioral learning is curvilinear: Moderately high teacher nonverbal immediacy results in more student learning than does low or excessively high nonverbal immediacy.

Notes

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l Andersen's (1979) GIS originally had nine 7-point semantic differential items rather than eight 8-point items. We intentionally dropped one of the items to produce two equal-item variables: style and immediacy. However, our use of 8-point scales rather than 7-point scales resulted from a *Communication Yearbook* printing error. Fortunately, despite this error, our reliability coefficients were quite high.

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